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The Effect of Supervision Consultant Performance on the Implementation Quality of the National Road Construction

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Abstract: The performance of supervision consultants in determining the project's success is influenced by the quality of implementation. This quality is often the main focus in construction because it plays a central role in project performance. This research was conducted to identify several factors and their influence on the performance of the supervision consultant in the case of national road construction. This study belonged to a descriptive case study. Data of the study were collected by distributing questionnaires to the officers of the Public Works Department of Highways, the Implementing Contractors, and the Supervision Consultants. In total there were 58 respondents randomly selected to get involved in the study. Regression analysis was performed on the data obtained by using SPSS software version 17. The results of the study indicated there are several performance factors of the supervision consultant, that simultaneously affect the implementation quality of the national road construction. The factors of supervision consultants which partially influenced the implementation quality of the national road construction, if reviewed respectively based on the order were (1) field attendance (1.851); (2) Work Experience (1,613); (3) Supervision officers (1.467); and (4) planning (0.854).

Keywords: *Performance; supervision; construction; national roads*

1. Introduction

Construction project implementation refers to the physical commencement of activities as planned. In general, these activities are carried out by service providers, individuals, or business entities declared by professional experts in the field of construction service implementation, who are capable of carrying out activities to realize the planning into a building or physical form. Many of the construction projects, including the construction of national roads, have been carried out well, however, many are still not doing well, thus harming the government and the community.

Some experts in the field of administration define supervision as a discipline that focuses on improving the quality of work (Gregorio, 1966, Glickman Carl D, 1990, Sergiovanni, 1993, Gregg Miller, 2003). The statement was supported by the Association for Supervision and Curriculum Development in America (Association for Supervision and Curriculum Development, 1987:129). They stated "Supervision carried out by construction supervisors, certainly, has a different mission from supervision in other fields. Supervision is more aimed at providing services to contractors in managing projects effectively and efficiently as well as developing the quality of institutions providing goods and services".

Good supervision can prevent problems in the project and make it run smoothly, under control, and result in a satisfactory outcome. In Law Number 18 of 1999 concerning Construction Services, it is stated that supervision can be carried out by individuals or business entities as

declared by professional experts in the field of supervision for construction services. The expert must be able to carry out supervision work from the beginning until the construction work is completed and handed over. Supervisors should know both project administration and engineering.

Given the importance of the supervision role in project development, it is necessary to increase the capacity and competence of the supervision consultant. The implementation of construction supervision on the construction of national roads is one of the efforts to improve the process quality of the work and the outcome quality of the basic infrastructure and facility construction for public works in the road sector.

The purpose of the construction supervision implementation is to make the quality control process following the applicable standard procedures so that the quality improvement of the implementation of field activities can later be under the pre-determined requirements.

Based on the aforementioned discussion, it is very important to research the effect of the supervision consultant's performance on the implementation quality of the national road construction work. This research was conducted on the national road projects in Nusa Tenggara Barat (NTB). This study aimed at finding out what factors of the supervision consultant's performance affected the implementation quality of the national road construction work in NTB. In addition, how significant the performance of the supervision consultant affected the implementation quality of the national road construction in the province.

The results of this study are expected to be contributive to the Public Works Office in the Province of NTB as a basis to implement the policies imposed in the National Road construction program in the province.

2. Method

2.1. Form, population and sample

This research belonged to a case study research with a descriptive approach aimed at exploring the implementation of the national road construction project in NTB.

In total, there were about 115 people involved in the construction project; 60 were from the Public Works Office of the Province (in the Highways Sector - all of them were involved in the road construction projects); 35 were from the implementing contractors, and 20 were from supervising consultants.

Purposive quota random sampling strategy was used to select participants of the study. From 115 people in the population, only 50% were involved (58 participants). See table 1 for detail. To result in the sample as required, selection was based on certain criteria: (1) a minimum education level of Senior High School (SLTA), and (2) being involved in the implementation of road construction work for at least 3 years.

Table 1. Population and sample

No	Institution	Number of populations	Sample (50%)
1	Dinas PU Bina Marga NTB	60 People	30 People
2	Contractor	35 People	18 People
3	Consultant	20 People	10 People
Total		115 People	58 People

2.2. Data Collection

Primary data were obtained from the results of questionnaires. While secondary data were information from reference books and journal articles related to this research topic.

The distribution of the questionnaire was carried out in 2 stages, (1) obtaining data about the performances of the supervision consultant which affected the implementation quality of the national road construction. Variables in the questionnaire sheets of this stage were based on scientific evidence from library research, 1 dependent variable, and 7 independent variables. The dependent variable is the implementation quality of the national road construction, while the independent variable referred to the consultant supervision, work experience, level of presence in the field, coordination with contractors, planning, work methods, and implementation. (2) Obtaining data about the influence value of the supervised consultant performance on the implementation quality of the national road construction, with criteria of the value based on the Likert scale 1-5. See table 2 below for detail.

Table 2. Variable measurement criteria

Score		Criteria	
Scale	**Description**	**Mean**	**Description**
1	Very uninfluencing	1,00 – 1,50	Very low
2	No influencing	1,51 – 2,50	Low
3	Indecisive	2,51 – 3,50	Average
4	Influencing	3,51 – 4,50	High
5	Very influencing	4,51 – 5,00	Very high

2.3. Method of Data Analysis

The data in this study were processed and analyzed statistically using SPSS software version 17 as described below.

2.3.1. Descriptive Analysis

The statistical methods used in the descriptive analysis of this research are:

a. Statistical method of Percentage Value, this method was to percentage the answers given by respondents to the items of questions in the questionnaires. Equation of Walpole and Myers (1986) was used to calculate the percentage value:

$$percentage\ value = \frac{data\ value}{total\ amount\ of\ data} \times 100\% \quad (1)$$

b. Statistical method of Average Value (Mean), this was to find out the frequency of each answer on the items of certain question given by the respondent. Thus, it could be identified which of each item in each question had more priority in the situation. To calculate the mean ($\bar{X}$), the following formula was used:

$$\bar{X} = \frac{\sum_{i=1}^{n} \overline{X_i}}{n} \quad (2)$$

Where:
x_i = Data-i
n = amount of data

2.3.2. Validity and Reliability tests

The validity test is carried out based on the parameter value of r (Santoso, 2000):

- If r results are posit`ive, and r results > r table, then the variable is valid.
- If r results are not Positive, and/or r results < r table, then the variable is not valid.

Based on the level of significance (α) = 5%, 1-tailed test, and degrees of freedom (df) = number of data – 2 = 58 – 2 = 56, the value of r table = 0.218.

The reliability test of the questionnaire in this study was measured once (one-shot) with the help of the SPSS 17 program, with a significance level (α) used of 5%. Reliability testing is based on the Cronbach Alpha (r alpha) value, with limitations if r alpha is positive and r alpha > r table, then the variable is considered reliable, whereas if r alpha is negative and/or r alpha < r table, then the variable is not reliable.

2.3.3. Regression Analysis

Multiple regression analysis was used to help determine the extent of the influence of supervision officers, work experience, attendance level in the field, coordination with implementing contractors, planning, work methods, and supervision on the implementation quality of the construction. Below is the regression line equation used in the study:

$$Y = a + b_1.X_1 + b_2.X_2 + b_3.X_3 + b_4.X_4 + b_5.X_5 \quad (3)$$

where:

Y = Implementation quality of construction work (bound variable),
a = Constant (*intercept*),
b_n = Independent variable coefficient,
X_1 = Supervision officers (Independent variable),
X_2 = Work experience (Independent variable),
X_3 = attendance rate (Independent variable),
X_4 = Coordination with contractor (Independent variable),
X_5 = Planning (Independent variable).
X_6 = Working method (Independent variable)
X_7 = Implementation (Independent variable).

To find out whether there is a relationship among the independent variables (Supervising Consultant, Work Experience, Field Attendance, Coordination with implementing Contractors, Planning, Work Methods, and Implementation) and the dependent variable (quality of implementation of national road works), it is necessary to do a correlation test. To determine the simultaneous and partial effect of independent variables on the dependent variable, respectively, analysis of variance (F test) and t test (t test) were used.

The following is the basis of making decisions for the correlation test with SPSS 17 (Santoso, 2000):

- If the correlation coefficient value > 0.5 or a significance value < 0.05, it means there is a strong relationship between the independent variables and the dependent variable, and if the correlation coefficient value is < 0.5 or a significance value > 0.05, the relationship is weak.
- If the correlation coefficient is positive, it means the relationship between the independent variables and the dependent variable is undirectional, and if it is negative, then the relationship between the independent variables and the dependent variable is opposite in direction.

The following are the criteria used in the simultaneous effect test with the F test:

- If F count is equal to or less than F Table, it means Ho (implementation quality of road construction) is accepted or H1 (supervision consultant performance) is rejected. Thus, the factors of supervision consultant, work experience, field attendance rate, coordination with

implementing contractors, planning, working method, and simultaneous implementation have no significant effect on the implementation quality of the national road construction works.

- If F count is greater than F table it means Ho (quality of road construction implementation) is rejected or H1 (supervision consultant performance) is accepted. Thus, the factors of supervision consultant, work experience, level of field attendance, coordination with implementing contractors, planning, working methods, and implementation simultaneously have a significant effect on the implementation quality of the national road construction works.

In this study, a significance level of 5% was used. Based on the level of significance (α) and the degree of freedom (df) = the amount of data – 1 = 58 – 1 = 57, the value of F table = 3.159 was obtained.

The following are the criteria for the partial or individual effect testing procedure with the t test:

- If t count is equal to or less than t table, it means that Ho is accepted or H1 is rejected. Thus, the factors of Supervising Consultant, Work Experience, Level of Field Attendance, Coordination with implementing Contractors, Planning, Work Methods, and Implementation partially have no significant effect on the quality of the implementation of national road works.
- If t count is greater than t table, it means that Ho is rejected or H1 is accepted. Thus, the factors of supervising consultants, work experience, level of field attendance, coordination with implementing contractors, planning, work methods, and implementation partially have a significant effect on the quality and quantity of the implementation of national road works.

In a study with a one-tailed test, the significance level (α) is 5% and the degree of freedom (df) = the amount of data – 2 = 58 – 2 = 56, the t table value = 1.673. With the one-tailed test, the significance level (α) is 10% and the degree of freedom (df) = total data – 2 = 58 – 2 = 56, the t table value = 1.297. With the one-tailed test, the level of significance (α) is 25% and the degree of freedom (df) = the amount of data – 2 = 58 – 2 = 56, the t table value = 0.679.

3. Results and discussions

3.1. Analysis of Respondents

Data of respondents show the education average of the respondents is high school equivalent with 46,551 percent, then Diploma to Bachelor degree is 37.931 percent and master's degree is 15,517 percent. Based on the type of work, it is recognized that 30 respondents (53.1%) work for DPU Bina Marga, 18 people (31.20%) are employees of contractor, and 10 people (16.69%) are employees of consultant. Based on the work experience data, 8 people have 3 to 4 years working experience (13.80%), 28 people have 5 to 9 years of working experience (48.28%), and 22 people (37.92 %) have a working experience of more than 10 years. The results above show that all respondents (1) have a minimum of high school education, (2) work on road projects as employees under DPU Bina Marga, (3) are contractors and supervision consultants, and (4) have 3 years or more work experience. They all met the requirements for the study.

3.2. Questionnaire Validity and Reliability Analysis

Based on the results of respondents' answers to the same question asked several times, the SPSS output results are shown in table 2 as follows:

Table 2. Item – Total Statistics

	Scale Mean if item deleted	Scale Variance if Item Deleted	Corrected Item – Total Correlation	Cronbach's Alpha if Item Deleted
X1	14.1333	3.637	.808	.866
X2	14.2333	3.702	.855	.855
X3	14.1000	4.231	.734	.885

	Scale Mean if item deleted	Scale Variance if Item Deleted	Corrected Item – Total Correlation	Cronbach's Alpha if Item Deleted
X4	14.2667	3.995	.693	.891
X5	14.3333	3.816	.695	.892
X6	14.2331	3721	.655	.871
X7	14.2431	3.615	.701	.843

From results of the analysis, it appears that the total correlation coefficient and Cronbach's alpha are all positive and greater than the value of r table (0.218), so that all questionnaire variables were reliable and valid.

3.3. Analysis of Variables

The variables and indicators as shown in table 3 below were obtained from the results of filling out the phase 1 questionnaire.

Table 3. Variabel and Indicator

Symbol	Variable	Indicator
Y	Implementation quality of National Road	Road Quality According to Standard
		Work is completed on time
		The road is well functioned
X1	Supervision Consultant	Decent safety standards
		Education
		Owning SKA
		Technical Ability
X2	Work experience	Less than 3 years
		More than 5 years
		More than 10 years
X3	Level of field attendance	Every day
		Twice in a week
		Once in a week
X4	Coordination with contractor	Meeting once in a week
		Reporting Physical Project
		Evaluating results of Physical Work
X5	Planning	Clear Technical Specification
		Quality Standard
		Design according to location
X6	Working method	Availability of standards, operations and
		procedure (SOP)
		Contract Quality Plan (RMK)
		Occupational Health and Safety (K3)
X7	Implementation	In accordance with Technical Specifications
		Material quality according to standard
		Work Results Tested

3.4. Regression Analysis

From the results of regression analysis with multiple linear regression methods, the following results are obtained:

Table 4. Results of SPSS analysis with one tail test, significance level (α) 5%

No.	Independent variable	Coefficient of Regression	t-test	BETA	Sig.
1	(Constant)	8.713	1.254		.175
2	Supervision officers	1.467	2.297	.215	.029
3	Work experience	1.613	2.420	.617	.022
4	Attendance level	1.851	3.824	.930	.011
5	Coordination with contractors	.401	.735	.187	.457
6	Planning	.854	2.193	.358	.014
7	Work method	.554	1.612	.311	.116
8	Implementation	.153	.364	.061	.719
F count = 4.473		F table = 3.159		R = 0.503	
Sig. F count = 001		T table = 1.673		R square = 0. 709	

Based on the results of table 4 it can be explained that:

a. The R value of 0.503 indicates that the relationship among the variables (supervision officer, work experience, attendance level, coordination with contractors, planning, work method and implementation) had a strong effect on the supervision to get the quality of construction implementation in the national road.

b. The value of R square or the coefficient of determination of 0.709 indicates that 70.90% of the variable of the national road construction implementation quality can be explained by the influencing performance factors of the supervision consultant, consisting of supervising officers, work experience, attendance level, coordination with contractors, planning, working method and implementation.

c. The F count value of 4.473 is greater than the table F value of 3.159. This shows that the supervision consultant performance factors, consisting of supervising officers, work experience, attendance level, coordination with contractors, planning, work methods, and implementation, simultaneously affect the implementation quality of the national road construction.

Based on table 4 and the t test criteria as presented in the method of analysis with the t test, the analysis and conclusion of the significance of the t test are described in the following table.

Table 5. Significance Results of t Test

Variable	t count	Significance	Description
Supervision officers	2.297	.031	Significant
Work experience	2.420	.021	Significant
Attendance level	3.824	.001	Significant
Coordination with contractor	.735	.468	No significant
Planning	2.193	.015	Significant
Work method	1.612	.117	No significant
Implementation	.364	.718	No significant
Note: t table = 1,673; level of significance (α) 5 %			

Based on table 5, the significance of each variable is described as follows:

- Variables of supervision officers, work experience, attendance and planning have significant numbers below 0.05. The value of t-count is greater than the value of t-table. Therefore, this variable partially affected the quality of the implementation of the national road construction.
- Variables of coordination with contractors, work methods and implementation have significant values above 0.05. The value of t count is below the value of t table. Therefore, this variable did not partially affect the quality of the implementation of the national road construction.

d. The following is the regression equation derived from the data in table 4::

$$Y = 8.713 + 1.467\ X1 - 1.613\ X2 + 1.851\ X3 + 0.401\ X4 + 0.854\ X5 + 0.554\ X6 + 0.153\ X7$$

Where:

Y = The national road construction quality in Region III, the Province of Nusa Tenggara Barat
X1 = Supervision officers
X2 = Work experience
X3 = Attendance level
X4 = Coordination with contractors
X5 = Planning
X6 = Working method
X7 = Implementation

The regression equation above illustrates data as follows:

- The constant of 8,173 states that if there are no factors that affect the implementation quality of of national road construction, such as supervision officers, work experience, attendance level, coordination with contractors, planning, work methods, and implementation; the coefficient on the implementation quality of the national road construction in the Province of Nusa Tenggara Barat is 8,173.
- The coefficient of supervision officer (X1) of 1.467 indicates that one unit of education, technical skills and technical ability will increase the implementation quality of the national road construction by 1.467.
- The coefficient of work experience (X2) of 1.613 indicates that each addition of work experience will cause an increase in the implementation quality of the national road construction by 1.613.
- The coefficient of attendance rate (X3) of 1.851 indicates that every addition of the attendance level will cause an increase in the implementation quality of the national road construction of 1.851.
- The coefficient of coordination with contractors (X4) of 0.401 indicates that each addition of coordination with contractors will cause an increase of 0.401 in the implementation quality of the national road construction in Region III, the Province of Nusa Tenggara Barat. However, because the t test results are considered insignificant, the coordination factor with contractors (X4) was named to have no effect on the implementation quality of national road construction.
- The planning coefficient (X5) of 0.854 indicates that each addition of planning will cause an increase in the implementation quality of national road construction by 0.554.
- The coefficient of working method (X6) of 0.554 indicates that each addition of work method will cause an increase in the implementation quality of construction in the national road by 0.554. However, because the results of the t test are considered insignificant, the work method factor (X6) was named to have no effect on the implementation quality of the national road construction in Region III, the Province of Nusa Tenggara Barat.

- The coefficient of implementation (X7) of 0.153 indicates that each addition will cause an increase in the implementation quality of the national road construction by 0.153. However, because the results of the t test are considered insignificant, the implementation factor (X7) was named not to have an effect on the implementation quality of the national road construction in the Region III, the Province of Nusa Tenggara Barat.

Based on the analysis of the first stage of the questionnaire, it was revealed that supervision officer, work experience, attendance level, coordination with contractors, planning, work methods and implementation are factors which affected the implementation quality of the national road construction, Region III, the Province of Nusa Tenggara Barat.

Based on the second stage of the questionnaire analysis, the following results were obtained:

a. The value of R square or the coefficient of determination of 0.709 indicates that 70.90% of the variable quality of the national road construction implementation can be explained by the influencing factors of the supervision consultant performance.
b. The value of F count of 4.473 is greater than the value of F table of 3.159. It indicates that the supervision consultant performance simultaneously affected the implementation quality of the national road construction.
c. The supervision consultant performance variable, such as supervision officer, work experience, attendance and planning level, has a significant value below 0.05 and the value of t-count is greater than the value of t-table. Therefore, this variable partially affected the implementation quality of the national road construction.
d. Based on the analysis, the regression equation results which show the relationship among factors of the supervision consultant performance is presented as follows:

   $$Y = 8.713 + 1.467\ X1 - 1.613\ X2 + 1.851\ X3 + 0.854\ X5$$

   Where:
   Y = Implementation quality of the national road construction, Region III in the Province of Nusa Tenggara Barat
   X1 = Supervision officers
   X2 = Work experience
   X3 = Attendance level
   X5 = Planning

e. Based on the results of regression analysis and t-test, if sorted by the value of the effect, the magnitudes of the influence value of the supervision consultant performance on the implementation quality of the national road construction are as follows:
   - field attendance level with an influence value of 1.851,
   - work experience with an influence value of 1.613,
   - supervision officer with an influence value of 1.467,
   - planning with an influence value of 0.854.

4. Conclusion

Below are the conclusions based on the findings and discussion:

a. The performance factors of the supervision consultant simultaneously affected the implementation quality of the national road construction, especially in Region III, the Province of Nusa Tenggara Barat.
b. The supervision consultant performance factors that partially influenced the implementation quality of the national road construction include supervision officers, work experience, and field attendance and planning levels.

c. The influence magnitude of the supervision consultant performance factors on the implementation quality of the national road construction (A case study in Region III, West Nusa Tenggara Province), if sorted by the magnitude values are (1) field attendance level (1,851); (2) Work Experience (1,613); (3) Supervision Officer (1.467) and (4) planning (0.854).

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