ANALYSIS OF FACTORS AFFECTING QUALITY FROM ROAD CONSTRUCTION PROJECTS WEST SUMATRA PROVINCE

RAHMI FITRIANA GULTOM [1], NASFRIZAL CARLO[2], WAHYUDI P UTAMA BQS[3]
Fakultas Teknik, Univesitas Bung Hatta[1,2,3]
Email: rahmifitriana59@yahoo.com[1], carlo@bunghatta.c.id[2,] wahyudi@bunghatta.ac.id[3]
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Abstract: *In connection with road is supporter main in the development, then quality from road the must become something convenience is important user road. However at in fact Lots found quality results work a path that doesn't in accordance with what is required, so happen consequential damages age plan should not yet happened. Objective study that is For identify factors and analyze the most influential factor to quality project development road West Sumatra Province as well measure connection influencing factors to quality project. Method research used that is method study in a manner quantitative that is with spread questionnaire to para respondent. Results research conducted there are 5 influencing factors quality from project development road West Sumatra Province namely factor implementation occupation, factor power work, factor individual, factors equipment, factors method work.*
Keywords: *Quality, Factors, Project Road, Construction Projects*

A. Introduction

Roads are the main support in development, so the quality of the road must be important for the comfort of its users. However, in reality, it is often found that the quality of road work is not in accordance with what is required, resulting in damage that should not have occurred in the design life, and during the road work implementation process (including at the maintenance stage) quality discrepancies are often found, resulting in must be dismantled and reworked (Wildani, 2018).

Highway flexible pavement has been designed to last up to 10 years taking into account annual traffic growth. A quality road pavement can reach the design life according to the planning design by passing the planned number of vehicles, if the construction of the road pavement is carried out well and the materials meet the standards required in the design specifications and are carried out correctly (Arnady in Ikhwan 2018).

In an effort to meet the optimum needs for road facilities and infrastructure, through the West Sumatra Provincial Highways and Spatial Planning Service for the 2020 to 2022 Fiscal Year, through the Commitment Making Officer of West Sumatra Province, carrying out road construction work in 2020, there are 3 road work packages, namely: Tapus - Muaro Sei Road Development Package. Lolo - Gelugur (P.101), Duku - Sicincin Road Development Package (P.087), Alahan Panjang - Kiliran Jao Road Development Package (P.082); In 2021 there will be 5 road work packages, namely: Construction of Provincial Roads on the Abai Sangir - Sei Road Section. Dareh (P.056.3), Construction of Provincial Roads on Jalan Duku - Sicincin (P.087), Construction of Provincial Roads on Jalan Pangkalan Koto Baru - Sialang - Gelugur (P.076), Construction of Provincial Roads on Lubuk Panggang - Talu Section (P.096), Construction of Provincial Roads on the Pasar Baru - Alahan Panjang Section (P.073) DAK, Construction of Provincial Roads on the Teluk Bayur - Nipah - Purus Section (P.098) DAK; In 2022 there will be 7 road work packages, namely: Construction of the Bukittinggi-Gaduik -Pincuran Road, Construction of a Provincial Road in the Duku Sicincin Section (P.087), Construction of a Provincial Road in the Subdistrict Office Section - Berkat (P.104), Construction of a Provincial Road in Lubuk Suhuing - Talu Section (P.096), Provincial Road Construction on the Palupuh - Puagadih - Koto Tinggi Section (P.090), Provincial Road Construction on the Simpang Padang Karambia - Tj. Bungo (Regional TPA) (P.085), Construction of Provincial Roads on the Pasar Baru - Alahan Panjang Section (P.073) DAK.

From the data obtained regarding the implementation of road asphalting activities in West Sumatra Province, from year to year the results of the work are the same and tend to decrease from the results of the author's visual observations. From visual observation, there were puddles of water like small lakes on the newly paved road surface after it rained. This means that the asphalting activity does not meet the slope of the road as required so that water does not flow properly into the drainage channel.

In road construction projects in West Sumatra Province, it is necessary to pay attention to the quality during construction, because one of the goals and indicators of the success of a project is to maintain the quality and quality of the construction project which is the benchmark, especially by the project owner, for all types of construction work that have been carried out. The application of quality is carried out in order to produce quality products/services to meet the expectations of the project owner and also maintain competitive advantage in the field of construction projects.

B. Methods

In this research the author used a quantitative research method, namely by distributing questionnaires to respondents. The selected respondents were owners, consultants and contractors involved in the Road Construction project at the Cipta Kaya Bina Marga and Spatial Planning Department of West Sumatra Province for the 2020 to 2022 Fiscal Year. The author used quantitative research because the aim of the research the author conducted was to analyze factors. Factors that influence the quality of West Sumatra Province road construction projects. With a quantitative method, the author can achieve this goal by using a questionnaire and distributing it to respondents, namely the parties involved in the construction work project for the Road Development project at the Department of Bina Marga Cipta Kaya and Spatial Planning of West Sumatra Province for the 2020 to 2022 Fiscal Year, namely the owner, consultant and contractors.

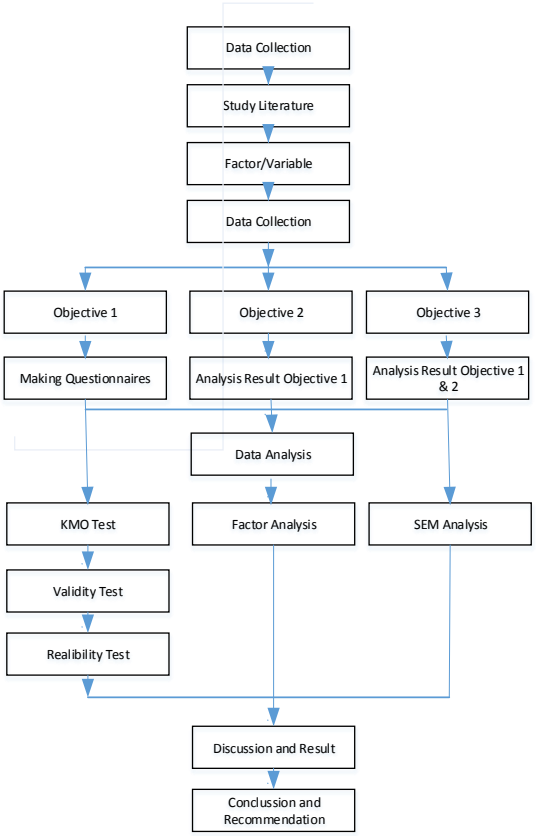

Figure 1. Framework of thinking

C. Results and Discussion

Factors that most influence the quality of road construction projects in West Sumatra Province

Measure of Sampling Aduquaecy (MSA)

The results of the factor analysis carried out were obtained by the Measure of Sampling Adequacy (MSA) value in the anti-image matrix table, which is as follows.

Table 1. Recapitulation of Measure of Sampling Adequacy (MSA) Values

No	Variable	MSA Value	Information
1	X1a	0,560	Variables worth using
2	X1b	0,571	Variables worth using
3	X1c	0,753	Variables worth using
4	X1d	0,835	Variables worth using
5	X1e	0,787	Variables worth using
6	X2a	0,695	Variables worth using
7	X2b	0,597	Variables worth using
8	X2c	0,751	Variables worth using
9	X2d	0,695	Variables worth using
10	X2e	0,699	Variables worth using
11	X3a	0,809	Variables worth using
12	X3b	0,730	Variables worth using
13	X3c	0,733	Variables worth using
14	X3e	0,897	Variables worth using
15	X4a	0,814	Variables worth using
16	X4b	0,796	Variables worth using
17	X4c	0,729	Variables worth using
18	X4d	0,553	Variables worth using
19	X5a	0,805	Variables worth using
20	X5b	0,717	Variables worth using
21	X5c	0,761	Variables worth using
22	X5d	0,536	Variables worth using
23	X5e	0,868	Variables worth using

The 23 variables produce MSA values above 0.50 so that the variables are suitable for use and can be continued with the next analysis test.

Communalities

The next stage of factor analysis is Communalities. Based on the results of the analysis that has been carried out, a summary of the results is found as shown in Table 2.

Table 2. Communalities

	Initial	Extraction
X1a	1.000	.801
X1b	1.000	.728
X1c	1.000	.753
X1d	1.000	.657
X1e	1.000	.662
X2a	1.000	.731

X2b	1.000	.724
X2c	1.000	.645
X2d	1.000	.748
X2e	1.000	.755
X3a	1.000	.688
X3b	1.000	.692
X3c	1.000	.623
X3e	1.000	.608
X4a	1.000	.698
X4b	1.000	.706
X4c	1.000	.700
X4d	1.000	.693
X5a	1.000	.830
X5b	1.000	.726
X5c	1.000	.724
X5d	1.000	.839
X5e	1.000	.542

Extraction Method: Principal Component Analysis.

From the table above, 23 variables have a correlation coefficient value of > 0.50 which can explain the factors formed, provided that the greater the communalities value, the closer the relationship between the variable in question and the factors formed.

Factor Analysis

Explaining the Variance Value (Total Variance Explained)

TotalVariance Explained is an analysis used to see the optimal number of factors in explaining the variance of 23 variable items. Based on the analysis that has been carried out, a summary of the results is found as shown in Table 3.

Table 3. Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.682	33.400	33.400	7.682	33.400	33.400	6.347	27.597	27.597
2	2.731	11.876	45.276	2.731	11.876	45.276	2.909	12.649	40.246
3	2.126	9.244	54.520	2.126	9.244	54.520	2.462	10.704	50.949
4	1.538	6.688	61.208	1.538	6.688	61.208	1.660	7.215	58.165
5	1.167	5.074	66.282	1.167	5.074	66.282	1.639	7.128	65.293
6	1.026	4.462	70.744	1.026	4.462	70.744	1.254	5.451	70.744
7	.987	4.292	75.036						
8	.840	3.651	78.687						
9	.792	3.445	82.132						
10	.566	2.459	84.591						

11	.529	2.300	86.891						
12	.494	2.148	89.039						
13	.421	1.829	90.868						
14	.393	1.709	92.577						
15	.351	1.526	94.103						
16	.320	1.391	95.494						
17	.239	1.040	96.534						
18	.218	.946	97.480						
19	.177	.768	98.247						
20	.150	.653	98.901						
21	.135	.588	99.489						
22	.071	.310	99.798						
23	.046	.202	100.000						

Extraction Method: Principal Component Analysis.

From the table above, it can be seen that the variables analyzed can be grouped into 6 factors, namely those that have eigenvalues that show a number greater than one. Thus there are 6 factors formed. Determining the variables included in each factor is done by comparing the magnitude of the correlation in each row. A correlation figure below 0.50 indicates a weak correlation, while above 0.50 indicates a strong correlation.

Matrix Rotation Analysis

Based on the results of the

Table 4. Rotated Component Matrix

	Component					
	1	2	3	4	5	6
X1a	.064	.031	.885	.050	.096	-.032
X1b	.000	.248	.802	.142	.055	.022
X1c	.076	.829	.213	.074	.010	-.099
X1d	.349	.690	.141	.010	.018	.199
X1e	.323	.741	.041	.030	-.072	.031
X2a	.134	.132	.126	.809	.100	-.126
X2b	.308	.058	.103	.706	-.117	.319
X2c	.563	.150	.208	.497	-.091	-.079
X2d	-.125	.479	-.043	.045	.178	.684
X2e	.073	-.121	.668	.013	-.177	.508
X3a	.769	.079	.003	.081	.029	-.287
X3b	.759	-.130	.076	.201	.005	.230
X3c	.729	.235	-.137	.093	-.042	-.083
X3e	.682	.084	-.075	.117	.334	.063
X4a	.792	-.038	.108	-.022	.233	-.045
X4b	.785	.068	.220	.111	.061	-.145
X4c	.676	.448	-.051	.066	-.043	-.180
X4d	-.208	.693	-.046	.241	.282	.173
X5a	.607	.101	.116	-.028	.451	-.117
X5b	.800	.109	.182	.120	.089	.136
X5c	.779	.176	.151	.176	.048	.175
X5d	.133	.041	.092	-.008	.896	.085
X5e	.343	.147	.528	.194	.186	-.226

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 6 iterations.

tests that have been carried out, 23 items can be seen that influence the quality of the West Sumatra Province road construction project, as shown in Table 4.

From the rotated component matrix table, the variable value > 0.50 is taken, which is said to influence the factor or is also called a forming factor. So the rotated component matrix table functions to clarify which variables are included in each factor. Many loading factors experience rotation to become smaller or larger.

Dominant Factor

Based on factor analysis, the factors that have the most influence on the quality of West Sumatra Province road construction projects are obtained, which can be seen from the value of % of variance Rotation Sum of Squred Loadings on the 5 factors formed, namely factor 1 (one), the resulting % of variance value is 27,597 %, factor 2 (two) 12.649%, factor 3 (three) 10.704%, factor 4 (four) 7.215%, factor 5 (five) 5.451%. So the dominant factor is factor 1, namely the Work Implementation factor.

Table 5. Rotation Sum of Squred Loadings

Rotation Sums of Squared Loadings	
Component	% of Variance
1	27.597
2	12.649
3	10.704
4	7.215
5	5.451

The factors that most influence the quality of road construction projects in West Sumatra Province are work implementation factors which consist of the completeness of the equipment used in implementation according to needs, the response of the surrounding environment regarding project safety, the existing and physical characteristics of buildings around the location, the project location, natural disasters, capital finances in implementing the project being carried out, material prices, funding difficulties at the contractor, incorrect/incomplete planning (drawings/specifications), there is a lot (often) additional work, work sequence plans that are not well/integrated.

Measuring the Relationship of Factors That Influence Project Quality

To measure the relationship between factors that influence project quality, first carry out the following stages:

Evaluation Results of the Measurement Model (Outer Model)

There are 3 measurement criteria for assessing the outer model, namely convergent validity, discriminant validity and composite reliability.

Convergent validity

Convergent validity is tested through loading factor and Average Extracted (AVE) parameters. A measurement can be categorized as having convergent validity if the loading factor value is >0.7 and the AVE value is >0.5. From the results of Smart-PLS data processing,CFA on the construct variables against the indicators can be seen in Figure 2.

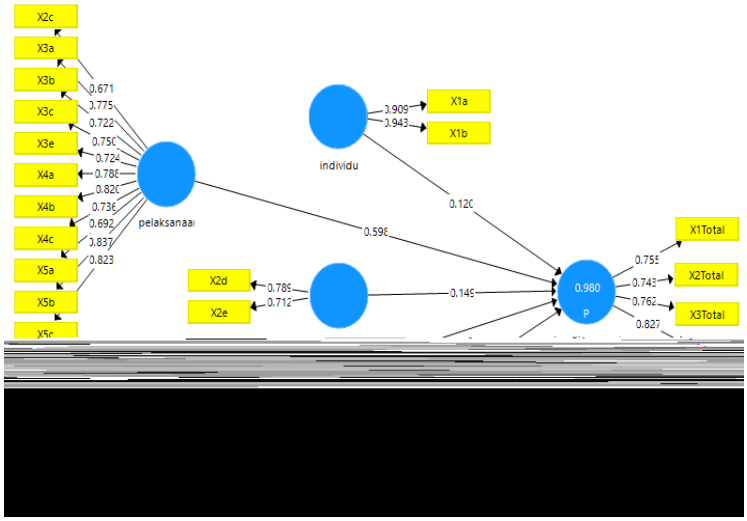

Figure 2. Initial Research Model

From the outer loading value, it can be seen that all items or indicators have an outer loading value of <0.7 and an AVE value below <0.5. So the researcher decided to discard this construct (Latan & Ghozali, 2015). The research construct image after several constructs have been removed, namely X2c, X4d. The image of the model after repair can be seen in Figure 3.

Figure 3. Final Research Model

As forThese invalid indicators do not represent the existing construct and must be excluded from the PLS algorithm analysis.So, based on the validity of the outer loading, it is stated that all items or indicators are valid in terms of item validity. Apart from evaluating factor loading values, construct validity can also be assessed by looking at the AVE (Average Variance Extracted) value, where the AVE value is able to show the ability of the latent variable value to represent the original data score. The greater the AVE value indicates the higher its ability to explain the value of the indicators that measure latent variables. The AVE cut-off value used is 0.5, where the AVE value of at least 0.5 indicates a good measure of convergent validity, which means that the probability of an indicator in a construct entering into other variables is lower (less than 0.5) so that the probability of the indicator converging and entering. in constructs whose value in the block is greater than 50% of the convergent validity value. The following is the AVE value resulting from data processing.

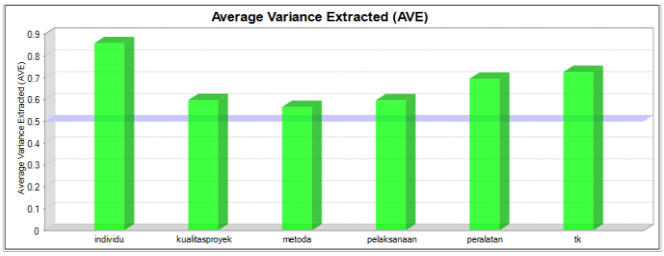

Figure 4. AVE

Based on Figure 4, it can be seen that the construct has a validity above 0.5. This can be concluded that the construct has a good level of validity.

Construction Reliability Test

In this research reliability instrument determined using two criteria, namely the composite reliability value and Cronbach's alpha for each indicator block in construct reflective. As a general rule, the

composite value should be more of 0.7, but 0.6 is fine. The reliability composite results from the Smart PLS output can be seen in Figure 5.

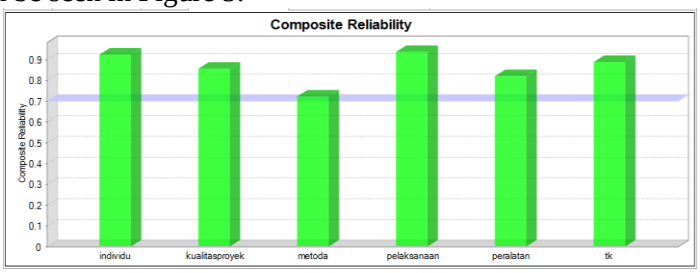

Figure 5. Reliability Composite Results from Smart PLS Output

From Figure 5 it can be seen that the research model is considered reliable because the composite reliability and Cronbach's alpha values for all variables are at values above 0.7. Thus, it can be concluded that all variables have reliable reliability because they meet the reliability test criteria.

Discriminant validity test

Discriminant validity is used to test whether the indicators of a construct are not highly correlated with indicators of other constructs. Discriminant validity of the measurement model with reflective indicators is assessed based on the cross loading of the measurement with the construct. If the correlation of the construct with the measurement item is greater than the other construct measures, it indicates that the latent construct predicts the pad block size better than the other block measures.

Structural Model Evaluation Results (Inner Model)

Evaluate the inner model or test the structural model to see the direct and indirect influence between variables.

VIF (Variance Inflated Factors)

Table 6 VIF Test

Outer Values VIF

	VIF
X1Total	1.590
X1a	2.066
X1b	2.066
X1c	1.587
X1d	1.912
X1e	1.984
X2Total	1.446
X2a	1.181
X2b	1.181
X2d	1.018
X2e	1.018
X3Total	1.756
X3a	2.579
X3b	2.103
X3c	3.025

X3e	2.120
X4Total	2.048
X4a	5.058
X4b	5.139
X4c	2.609
X5a	2.131
X5b	6.929
X5c	5.664

Based on the VIF test, it can be seen that all constructs in this study are more than 1 but less than 10 or even < 5. This indication can be interpreted as meaning that the constructs in this study do not experience multicollinearity.

R SQUARE

The predictive power of the model structural in PLS is determined by use statistics (R Squared). Whether to choose substantive impact, R square explains influence of variables to leave specific exogenous to endogenous latent variables. R Square values of 0.67, 0.33, and 0.19 indicate a strong, moderate, or weak model, respectively. Based on data processing with SmartPLS 3.0 Professional, the R-Square value is produced in Table 7.

Table 7. R-Square Value

	R Square	R Square Adjusted
Quality of Project	0.971	0.969

From Table 7 it shows that Project Quality can be explained by independent variables of 0.971 or 97.1% in the high category, while the remaining 2.9% is explained by other variables outside the research model.

Effect Size (F-Square)

Table 8. F-Square

	Individuals	Project quality	Method	Implementation	Equipment	TK
Individuals		0.411				
Project Quality						
Method		0.713				
Implementation		8.076				
Equipment		1.554				
TK		2.968				

From Table 8 above, it shows that the f-square value for kindergarten and equipment has a moderate value, namely <0.35 or others have a large value because it is >0.35.

Relationship or Latent Variable

Next, look at the relationship between variables, and this is the aim of this research, the values can be seen in Table 9.

Table 9. Relationship Between Variables

	Individuals	Project quality	Method	Implementation	Equipment	TK
Individuals	1.000	0.423	0.358	0.170	0.259	0.251

Project Quality	0.423	1.000	0.356	0.826	0.620	0.718
Method	0.358	0.356	1.000	0.019	0.190	0.280
Implementation	0.170	0.826	0.019	1.000	0.391	0.411
Equipment	0.259	0.620	0.190	0.391	1.000	0.282
TK	0.251	0.718	0.280	0.411	0.282	1.000

Based on table 9, it can be seen that each correlation can be seen differently. If we look at the aim of this research to see the relationship between variables that influence the quality of the West Sumatra Province Road Construction Project, then it is the implementation factor that has the highest relationship to the quality of the project, followed by the workforce. The lowest is the method used.

D. Conclusions

From the analysis stages, analysis results and research discussions, research conclusions can be drawn regarding the factors that influence the quality of West Sumatra Province road construction projects, namely as follows:

1) There are 5 factors that influence the quality of the West Sumatra Province road construction project, namely the Work Implementation factor, Labor factor, Individual factor, Equipment factor, and Work Method factor.
2) The factor that most influences the quality of the West Sumatra Province road construction project is the Work Implementation factor.
3) The relationship that influences the quality of the West Sumatra Province Road Construction Project is the implementation factor, followed by the workforce. The lowest is the method used.

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