

The Effect of Project Management Functions Related to Cost, Quality, and Time on the Success of Road Condition Survey Projects Case Study: Survey of Road and Bridge Conditions By the North Sulawesi Regional Public Works Office

Michelle Angelita Monica Karundeng^{1*}, Steenie E. Wallah², Ariestides K. T. Dundu³
Universitas Sam Ratulangi, Indonesia^{1, 2, 3}
Email: mkarundeng17@gmail.com*

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Abstract

This study examines the influence of project management functions on the success of road and bridge condition survey work at the National Road Implementation Agency (BPJN) of North Sulawesi. The research focuses on four management functions—planning, organizing, implementation, and control—measured through cost, quality, and time indicators. A quantitative approach was applied using questionnaire data collected from consultants involved in the BPJN North Sulawesi Road and Bridge Condition Survey project. The data were analyzed using Partial Least Squares–Structural Equation Modeling (PLS-SEM) with SmartPLS 4.0. The results indicate that all four management functions have a positive and significant effect on survey work success. The implementation function shows the strongest influence, followed by control, organizing, and planning functions. The R-square value of 0.682 indicates that 68.2% of the variation in survey work success can be explained by the four management functions, while the remaining 31.8% is influenced by other factors outside the model. The Q-square value of 0.439 confirms that the model has good predictive relevance. These findings highlight the importance of effective implementation, cost monitoring, quality control, time efficiency, and adaptive field management in improving the success of road condition survey projects. Therefore, strengthening project management practices is essential to ensure accurate, accountable, timely, and budget-efficient survey outcomes.

INTRODUCTION

Road infrastructure development is a crucial aspect of increasing a country's economic growth and social well-being (Foster et al., 2023; Hussain et al., 2022; Mahmood et al., 2025; Nawir et al., 2023). A good road network not only facilitates the movement of people and goods but also supports various vital economic activities such as trade, tourism, and industry. In Indonesia, a rapidly developing country, road development is a priority to support sustainable economic growth.

According to 2023 data from the Ministry of Public Works and Public Housing (*Kementerian Pekerjaan Umum dan Perumahan Rakyat* [PUPR]), of the total 47,603.491 km of national roads in Indonesia, 39.38% are in good condition, 54.80% are in moderate

condition, 4.39% are in lightly damaged condition, and 1.43% are in severely damaged condition. This means that 94.18% of the national road network is in serviceable condition, while 5.82% is in poor condition. In total, there are 680.73 km of national roads in poor or severely damaged condition and 2,089.79 km in lightly damaged condition throughout Indonesia.

In North Sulawesi Province, national roads are in better condition than the national average, with 95.03% in good condition and 4.97% in poor condition (Arifin et al., 2024; Ma'rifah, 2022; Nawir et al., 2023; Saragih et al., 2024; Utomo et al., 2024). However, 4.80 km of national roads in North Sulawesi are still categorized as severely damaged, 78.74 km as lightly damaged, and 929.33 km as being in moderate condition (*BUKU KONDISI JALAN NASIONAL 2023 S II_rev26032024*, n.d.) (2023).

Road surveying is a critical component of project management. Road inventory and condition data are key sources of information for road network management (Bosurgi et al., 2022; Mohammadi et al., 2023). These data are used to evaluate current road conditions, forecast future conditions, and support strategic decision-making in road management. Furthermore, these data form the basis for planning, scheduling, and budget allocation, as well as facilitating network performance monitoring and maintenance contract management. Accurate road condition data are crucial for ensuring the effectiveness and sustainability of road operations.

The purpose of a road survey is to collect accurate, reliable, and consistent data on road conditions. These data are then used to provide accurate reports on existing road assets and serve as a basis for planning road asset management and investment strategies.

Time, cost, and quality management are three interrelated aspects of construction project management (Silalahi et al., 2023). Time refers to the project schedule and the ability to complete the project on time, which is often a determining factor in the success of a construction project. Cost includes all resources required to complete the project, including labor, materials, equipment, and other overhead expenses. Quality refers to the level of stakeholder satisfaction with the final project outcome, encompassing aspects such as reliability, performance, and conformance to specifications.

Therefore, the effective integration of time, cost, and quality is crucial for successful construction project management. These three aspects are interrelated and influence one another. For example, proper scheduling can help avoid project delays that may increase costs and reduce the quality of work. Conversely, sound cost management can help prevent inefficiencies that may affect project schedules and quality. Therefore, construction project managers need to carefully consider and integrate these three aspects throughout the project life cycle.

In this context, research on the influence of project management functions related to cost, quality, and time on the success of construction projects, particularly in road and bridge condition surveys conducted by the *Balai Pelaksanaan Jalan Nasional* (BPJN) in North Sulawesi, is highly relevant. Complex construction projects require an integrated approach to managing these aspects. By understanding how project management functions related to cost, quality, and time interact and influence one another, construction project managers can increase the likelihood of overall project success.

Based on the background described above, the problems discussed in this study cover two main points. First, how the four management functions, as measured by cost, quality, and time indicators, influence the success of road condition survey work. Second, which factors dominantly influence the success of road condition survey work. The scope of this study is limited to several aspects. This study was conducted only on the BPJN North Sulawesi Road and Bridge Condition Survey project, and its focus is limited to the four management functions measured through cost, quality, and time indicators in managing road condition survey work. This study also examines management function aspects related to cost, quality, and time, as well as their impact on the success of road condition survey work. To analyze the relationships among the variables involved, this study uses *SmartPLS* as an analytical tool. The respondents in this study are consultants involved in the BPJN North Sulawesi Road and Bridge Condition Survey project. The purpose of this study is to determine how the four management functions, as measured by cost, quality, and time indicators, influence the success of road condition survey work management and to identify the dominant factors influencing the success of the work management process.

METHOD

The research was conducted within the North Sulawesi BPJN Road and Bridge Condition Survey project. The location can be seen in the image below.

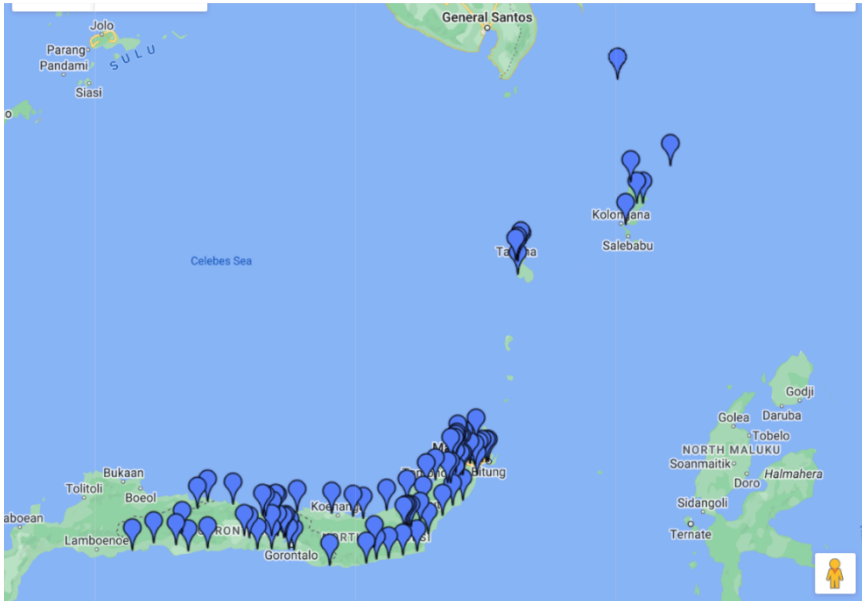


Figure 1. Research Location

The author conducted a survey to collect data on the factors influencing project success, particularly in terms of cost, quality, and project implementation time. Data were collected through literature studies and questionnaires. Relevant theoretical information related to the research problem was obtained through literature studies. Meanwhile, data collection through questionnaires was conducted using Google Forms to examine project management functions related to cost, quality, and time that influenced the success of the road condition survey

project. The questionnaires were distributed to consultants involved in the project as respondents.

To ensure data quality, validity and reliability tests were conducted on the research instrument. In this study, a five-point Likert scale was used, consisting of strongly agree (SS), agree (S), neutral (N), disagree (TS), and strongly disagree (STS).

Table 3.2 Assessment Scale with Likert scale

Alternative Answers	Score Weight
Strongly Agree (SS)	5
Agree (S)	4
Neutral (N)	3
Disagree (TS)	2
Strongly Disagree (STS)	1

The research variables rely on primary and secondary data. Primary data was obtained through questionnaires and interviews, while secondary data was obtained from literature studies such as journals, books, and articles.

The variables used in the project to be studied include:

Table 3.3 Indicators of the Influence of Management Functions on Project Success

Planning factor indicators
Time:
The survey schedule is arranged efficiently.
Technology and equipment are used to speed up the implementation of the survey.
The project schedule is prepared in a realistic and accountable manner.
Cost:
The budget is prepared according to the scale and scope of the survey.
The survey method used is cost-effective.
Budget management is carried out carefully to avoid waste or lack of funds.
Quality:
The survey method used is accurate and reliable.
Survey staff receive training to maintain data quality.
Standards and quality control are applied throughout the survey process.
Organizing factor indicators
Time:
The organizational structure is efficient with a clear division of tasks.
The work schedule is prepared according to project needs and resource availability.
Communication between teams is effective and supports work coordination.
Cost:
The budget includes organizational, personnel, and equipment costs.
Expenditures are monitored regularly and adjusted when necessary.
Resources are used efficiently to reduce costs.
Quality:
The assigned personnel have appropriate skills and experience.
Staff regularly receive coaching or training to improve the quality of work.
Standard working procedures (SOPs) are implemented to ensure consistent and accurate survey results.

Implementation factor indicators
Time:
The survey was carried out according to the planned schedule.
Working time in the field is utilized efficiently.
The survey team is responsive to schedule changes or obstacles that arise.
Cost:
Project expenditures are monitored periodically throughout the survey.
The use of resources is carried out efficiently.
Potential additional costs can be anticipated and addressed as early as possible.
Quality:
Operational procedures and work standards were properly implemented during the survey.
Data quality is monitored throughout the survey process.
Quality issues are promptly reported and followed up.
Control factor indicators
Time:
The project implementation schedule is always monitored to avoid delays.
Backup plans are prepared to deal with possible delays.
Schedule adjustments are made if changes occur to ensure the project continues to run smoothly.
Cost:
Expenditures are monitored to ensure they are in accordance with the established budget.
Potential waste can be detected and addressed quickly.
Changes that may affect project costs are evaluated and controlled.
Quality:
Quality control procedures are implemented to monitor data quality.
Survey results are checked regularly to ensure consistency and accuracy.
If quality problems are found, corrective action is taken immediately.
Indicators of survey work success variables
The survey data collected is accurate
Work is carried out in accordance with applicable standards and regulations
The survey results report is easy to understand and can be accounted for.
Use of resources in accordance with the established budget
Job completed on time

A questionnaire was distributed to collect data for this study. The respondents were consultants involved in the North Sulawesi BPJN Road and Bridge Condition Survey project from PT *Epadascon Permata*, PT *Laksana Disain Daya Cipta*, and PT *Panca Prakarsa Muliatama*.

The data were analyzed using the Structural Equation Modeling (SEM) method with the assistance of *SmartPLS 4.0* software. SEM was used to examine the relationships between endogenous and exogenous variables and to evaluate the relationships among latent variables (Babin et al., 2008). This study applied the Partial Least Squares–Structural Equation Modeling (PLS-SEM) approach because it is suitable for exploratory research and the development of existing structural theories (Ghozali, 2021; Hair et al., 2012).

The evaluation of the PLS-SEM model consisted of outer model and inner model assessments. The outer model assessment was conducted to evaluate the validity and reliability of the research instruments (Ghozali, 2021). Validity testing included convergent validity and discriminant validity. Convergent validity was assessed through loading factor

and Average Variance Extracted (AVE) values, where loading factors between 0.60 and 0.70 and AVE values above 0.50 were considered acceptable. Discriminant validity was evaluated using cross-loading values greater than 0.70 (Ghozali, 2021).

Reliability testing was conducted using Composite Reliability and Cronbach's Alpha. Composite Reliability values between 0.60 and 0.70 were considered acceptable for exploratory research, while Cronbach's Alpha values above 0.60 indicated satisfactory reliability (Ghozali, 2021).

The inner model evaluation was conducted to assess the predictive capability of the structural model. The evaluation included the R^2 value, effect size (f^2), predictive relevance (Q^2), and significance testing through bootstrapping. R^2 values of 0.75, 0.50, and 0.25 indicated strong, moderate, and weak predictive power, respectively (Chin, 1998; Ghozali, 2021). Effect size (f^2) values of 0.02, 0.15, and 0.35 indicated small, medium, and large effects, respectively. A Q^2 value greater than 0 indicated good predictive relevance. Significance testing was conducted using a two-tailed test with T-values of 1.65, 1.96, and 2.58 corresponding to significance levels of 10%, 5%, and 1%, respectively.

This analytical method was selected because it could explain the relationships among variables influencing the success of the North Sulawesi BPJN Road and Bridge Condition Survey project. The analysis results were then used to examine the influence of project management functions related to cost, quality, and time on project success.

RESULTS AND DISCUSSIONS

Evaluation of Measurement Model (Outer Model)

The purpose of the outer model evaluation is to assess validity through convergent validity and discriminant validity, as well as the reliability of the model which is evaluated using composite reliability and Cronbach's alpha for the indicator block (Ghozali, 2021).

1. Convergent Validity

Convergent validity testing examines each construct indicator. An indicator is considered valid if its value is greater than 0.70, while a loading factor of 0.50 to 0.60 is considered sufficient (Chin, 1998). Based on this criterion, any factor loading below 0.50 is dropped from the model.

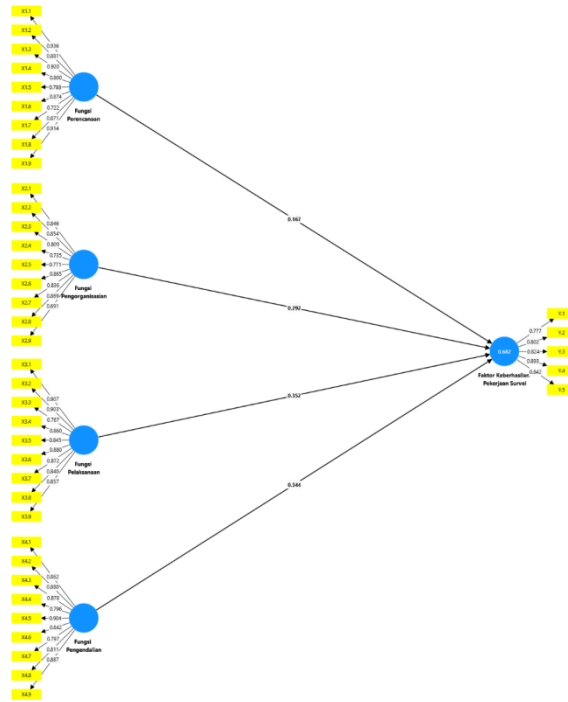


Figure 2. SmartPLS 4.0 Algorithm Results
Source: Processing Output with SmartPLS 4.0

Table 4.1 Convergent Validity Test Results

	Planning Function	Organizing Function	Implementation Function	Control Function	Success Factors for Survey Work
X1.1	0.936				
X1.2	0.881				
X1.3	0.920				
X1.4	0.800				
X1.5	0.788				
X1.6	0.874				
X1.7	0.722				
X1.8	0.871				
X1.9	0.914				
X2.1		0.846			
X2.2		0.854			
X2.3		0.809			
X2.4		0.735			
X2.5		0.771			
X2.6		0.865			
X2.7		0.836			
X2.8		0.869			
X2.9		0.691			
X3.1			0.907		
X3.2			0.903		
X3.3			0.767		
X3.4			0.860		

	Planning Function	Organizing Function	Implementation Function	Control Function	Success Factors for Survey Work
X3.5			0.845		
X3.6			0.880		
X3.7			0.872		
X3.8			0.840		
X3.9			0.857		
X4.1				0.862	
X4.2				0.880	
X4.3				0.878	
X4.4				0.796	
X4.5				0.904	
X4.6				0.842	
X4.7				0.797	
X4.8				0.811	
X4.9				0.887	
Y.1					0.777
Y.2					0.802
Y.3					0.824
Y.4					0.893
Y.5					0.842

Source: Processing Output with smartPLS 4.0

Based on the table above, all indicators of this research variable are declared valid, as the Outer Loadings value for each indicator is greater than 0.7. Therefore, the questionnaire items can be used in further analyses.

2. Discriminant Validity

The next examination is to compare the correlation between variables with the root of AVE (\sqrt{AVE}). The measurement model has good \sqrt{AVE} discriminant validity if each variable is greater than the correlation between variables. The value \sqrt{AVE} can be seen from the Fornell Larcker Criterion Smart -PLS 4.0 Output presented in table 4.2.

Table 4.2 Results of the Discriminant Validity Test (Fornell Larcker Criteria)

	Success Factors for Survey Work	Implementation Function	Control Function	Organizing Function	Planning Function
Success Factors for Survey Work	0.828				
Implementation Function	0.536	0.860			
Control Function	0.605	0.153	0.852		
Organizing Function	0.653	0.283	0.485	0.811	
Planning Function	0.570	0.291	0.394	0.569	0.859

Source: Processing Output with *SmartPLS 4.0*

From table 4.2 above, it can be concluded that the square root of the Average Variance Extracted for each construct is greater than the correlation between one construct and another construct in the model. Based on the statement above, the constructs in the estimated model meet the discriminant validity criteria. The results of the Cross Loading are as follows:

Table 4.3 Cross Loading Results

	Planning Function	Organizing Function	Implementation Function	Control Function	Success Factors for Survey Work
X1.1	0.936	0.530	0.279	0.322	0.534
X1.2	0.881	0.459	0.268	0.255	0.477
X1.3	0.920	0.499	0.232	0.301	0.474
X1.4	0.800	0.495	0.112	0.224	0.361
X1.5	0.788	0.428	0.196	0.273	0.388
X1.6	0.874	0.540	0.401	0.414	0.535
X1.7	0.722	0.390	0.067	0.334	0.344
X1.8	0.871	0.521	0.329	0.479	0.637
X1.9	0.914	0.510	0.243	0.368	0.539
X2.1	0.453	0.846	0.313	0.550	0.663
X2.2	0.480	0.854	0.260	0.433	0.592
X2.3	0.415	0.809	0.178	0.306	0.524
X2.4	0.459	0.735	0.179	0.297	0.407
X2.5	0.415	0.771	0.161	0.328	0.464
X2.6	0.581	0.865	0.270	0.511	0.609
X2.7	0.427	0.836	0.205	0.450	0.523
X2.8	0.520	0.869	0.219	0.333	0.536
X2.9	0.387	0.691	0.257	0.200	0.325
X3.1	0.227	0.237	0.907	0.118	0.464
X3.2	0.180	0.228	0.903	0.029	0.497
X3.3	0.307	0.267	0.767	0.111	0.539
X3.4	0.227	0.257	0.860	0.156	0.441
X3.5	0.279	0.276	0.845	0.284	0.390
X3.6	0.186	0.201	0.880	0.125	0.404
X3.7	0.327	0.226	0.872	0.112	0.509
X3.8	0.246	0.272	0.840	0.098	0.395
X3.9	0.253	0.224	0.857	0.182	0.447
X4.1	0.398	0.421	0.175	0.862	0.534
X4.2	0.335	0.420	-0.021	0.880	0.448
X4.3	0.319	0.463	0.016	0.878	0.534
X4.4	0.296	0.336	0.327	0.796	0.504
X4.5	0.336	0.419	0.063	0.904	0.489
X4.6	0.347	0.444	0.239	0.842	0.604
X4.7	0.325	0.425	0.105	0.797	0.554
X4.8	0.284	0.412	0.215	0.811	0.485

	Planning Function	Organizing Function	Implementation Function	Control Function	Success Factors for Survey Work
X4.9	0.367	0.349	-0.001	0.887	0.425
Y.1	0.532	0.393	0.463	0.479	0.777
Y.2	0.455	0.511	0.419	0.374	0.802
Y.3	0.548	0.614	0.440	0.518	0.824
Y.4	0.462	0.560	0.457	0.580	0.893

3. HTML

Table 4.4 HTMT Results

	Heterotrait-monotrait ratio (HTMT)
Implementation Function <-> Success Factors of Survey Work	0.575
Control Function <-> Success Factors of Survey Work	0.646
Control Function <-> Implementation Function	0.190
Organizing Function <-> Success Factors of Survey Work	0.696
Organizing Function <-> Implementation Function	0.296
Organizing Function <-> Controlling Function	0.491
Planning Function <-> Success Factors of Survey Work	0.605
Planning Function <-> Implementation Function	0.289
Planning Function <-> Control Function	0.402
Planning Function <-> Organizing Function	0.598

Meanwhile, an acceptable threshold level of discriminant validity was also obtained from the Heterotrait-Monotrait Ratio (HTMT) value which was less than 0.90 as suggested by (Hair et al., 2021). All HTMT values were lower than 0.9.

4. Average Variance Extracted (AVE)

The AVE value aims to measure the level of variation of a construct component collected from its indicators by adjusting for the error rate. Testing with the AVE value is more critical than composite reliability. The minimum recommended AVE value is 0.50. The AVE output obtained from Smart PLS 4.0 is presented in Table 4.5.

Table 4.5 Results of the Average Variance Extracted (AVE) Test

	Average variance extracted (AVE)
Success Factors for Survey Work	0.686
Implementation Function	0.739
Control Function	0.725
Organizing Function	0.657
Planning Function	0.738

Source: Processing Output with SmartPLS 4.0

Based on table 4.5 above, the AVE value is greater than 0.50, which means that all indicators have met the established criteria and have potential reliability for further testing.

5. Composite Reliability and Cronbach's Alpha

To ensure there are no measurement-related issues, the final step in evaluating the outer model is to test its reliability. Reliability testing is conducted using Composite Reliability and Cronbach's Alpha indicators.

Composite Reliability and Cronbach's Alpha tests aim to assess the reliability of instruments within a research model. If all latent variable values have a Composite Reliability or Cronbach's Alpha value of ≥ 0.70 , this indicates good reliability of the construct, indicating that the questionnaire used as a research tool is consistent.

Table 4.6 Results of Composite Reliability and Cronbach's Alpha Tests

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)
Success Factors for Survey Work	0.885	0.889	0.916
Implementation Function	0.956	0.959	0.962
Control Function	0.952	0.955	0.960
Organizing Function	0.935	0.947	0.945
Planning Function	0.955	0.969	0.962

Source: Processing Output with SmartPLS 4.0

Based on table 4.6 above, the results of the Composite Reliability and Cronbach's Alpha tests show satisfactory values, namely all latent variables are reliable because all latent variable values have Composite Reliability and Cronbach's Alpha values ≥ 0.70 . So, it can be concluded that the questionnaire used as a research tool is reliable or consistent.

Inner Model

After the estimated model meets the Outer Model criteria, the next step is to test the structural model (Inner Model). Inner model testing is the development of a concept-based model from theory to analyze the influence of exogenous and endogenous variables outlined in the conceptual framework. The stages of testing the structural model (inner model) are carried out with the following steps:

1. Model Testing

Table 4.7 Goodness of Fit Model Results

	Saturated model	Estimated model
SRMR	0.085	0.085
d_ULS	6,258	6,258
d_G	8,324	8,324
Chi-square	1950,142	1950,142
NFI	0.553	0.553

The Goodness of Fit test using the Standardized Root Mean Square Residual (SRMR) criteria showed a value of 0.085. This value is above the recommended threshold for a fit or good model, which is 0.080. Therefore, $0.085 > 0.080$, it can be concluded that strictly speaking, the tested structural model has not reached the ideal level of fit or met the very good Goodness of Fit criteria based on the SRMR criteria.

2. R-Square Value (R²)

Look at the R-Square value which is a test of the Goodness of Fit of the model.

Table 4.8 Results of the R-Square Test (R²)

	R-square	R-square adjusted
Success Factors for Survey Work	0.682	0.663

Success Factors for Survey Work 0.682 0.663

Source: Processing Output with SmartPLS 4.0

The test results show that the R-Square (R²) value for the endogenous variable of the Survey Work Success Factor is 0.682. This means that 68.2% of the variation (diversity) in the Survey Work Success Factor can be explained or influenced by the exogenous variables (Implementation Function, Control Function, Organizing Function, and Planning Function) included in the structural model. The remaining 31.8% ($1 - 0.682 = 0.318$) is explained by other variables outside this research model.

3. f² Effect Size

The f-square value (f²) indicates the magnitude of the partial influence of each predictor variable on the endogenous variable. The following is an interpretation of the f-square value (Ghozali, 2021):

- 1) If the f-square value is ≥ 0.35 , it can be interpreted that the latent variable predictor has a strong influence.
- 2) If the f-square value is $0.15 \leq f \leq 0.35$, then it has a medium effect.
- 3) If the f-square value is $0.02 \leq f \leq 0.15$, then it has a weak influence.

f² value of each exogenous variable against the endogenous variable:

Table 4.9 Results of the f² Test Effect Size

	f-square
Implementation Function -> Success Factors of Survey Work	0.349
Control Function -> Success Factors of Survey Work	0.277
Organizing Function -> Success Factors of Survey Work	0.157
Planning Function -> Success Factors of Survey Work	0.056

Source: Processing Output with SmartPLS 4.0

- 1) Partial Influence of Implementation Function on Survey Work Success Factors
The f² value for the influence of Implementation Function on Survey Work Success Factors is 0.349. Based on the criteria (Ghozali, 2021), this value is in the range of $f^2 \geq 0.35$ (approaching 0.35), which indicates that the Implementation Function variable has a strong partial influence on Survey Work Success Factors.

- 2) Partial Influence of Control Function on Survey Work Success Factors The f^2 value obtained for the influence of Control Function on Survey Work Success Factors is 0.277. This value is in the range of $0.15 \leq f^2 \leq 0.35$, so it can be interpreted that the Control Function variable has a medium (moderate) partial influence on Survey Work Success Factors.
 - 3) Partial Influence of Organizing Function on Survey Work Success Factors The test results show that the f^2 value for the influence of Organizing Function on Survey Work Success Factors is 0.157. This value lies in the range $0.15 \leq f^2 \leq 0.35$ (slightly above the lower limit of 0.15), which means that the Organizing Function variable has a medium (moderate) partial influence on Survey Work Success Factors.
 - 4) Partial Influence of Planning Function on Survey Work Success Factors The f^2 value for the influence of Planning Function on Survey Work Success Factors is 0.056. This value is in the range of $0.02 \leq f^2 \leq 0.15$, so it is interpreted that the Planning Function variable has a weak partial influence on Survey Work Success Factors.
4. Q-Square (Goodness of Fit Model)

Goodness of Fit Model Testing The structural inner model uses a predictive relevance value (Q^2). A Q-Square value greater than 0 (zero) indicates that the model has a predictive relevance value. The R-Square value for each endogenous variable in this study can be seen in the following calculation:

Table 4.10 Q-Square Test Results

	SSO	SSE	$Q^2 (=1-SSE/SSO)$
Success Factors for Survey Work	350,000	196,396	0.439

Source: Processing Output with SmartPLS 4.0

The predictive relevance (Q^2) calculation for the endogenous variable Survey Job Success Factors shows a value of 0.439. Based on the criteria that the Q^2 value must be greater than 0 ($Q^2 > 0$) to indicate predictive relevance, this value of 0.439 confirms that the structural model has a good predictive relevance value. This means that the exogenous variables (Execution, Control, Organizing, and Planning Functions) used in the model are adequately able to predict or explain the diversity in the endogenous variables (Survey Job Success Factors).

5. Hypothesis Testing Results (Path Coefficient Estimation)

The estimated value for the path effect in the structural model must be significant. This significant value can be obtained using the bootstrapping procedure. To determine the significance of the hypothesis, look at the parameter coefficient value and the significant t-statistic value in the bootstrapping algorithm report. To determine whether it is significant or not, look at the t-table at alpha 0.05 (5%) = 1.96. Then, the t-table is compared with the calculated t-statistic.

Table 4.11 Hypothesis Testing Results

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (O/STDEV)	P values
Implementation Function -> Success Factors of Survey Work	0.352	0.361	0.063	5,576	0,000
Control Function -> Success Factors of Survey Work	0.344	0.347	0.077	4,471	0,000
Organizing Function -> Success Factors of Survey Work	0.292	0.285	0.114	2,563	0,010
Planning Function -> Success Factors of Survey Work	0.167	0.165	0.080	2,074	0,038

The following are the results of hypothesis testing on the structural model:

- 1) The Influence of Implementation Function on Survey Work Success Factors The test results show that the path from the Implementation Function to the Survey Work Success Factors has a path coefficient (O) of 0.352 with a very high t-statistic value (| O/STDEV |), namely 5.576. Because the t-statistic value (5.576) is much greater than the t-table value (1.96) at a significance level of $\alpha=0.05$, and the P value (0.000) is smaller than $\alpha=0.05$, it can be concluded that the Implementation Function has a significant positive effect on the Survey Work Success Factors.
- 2) The Influence of Control Function on Survey Work Success Factors The relationship between Control Function and Survey Work Success Factors has a path coefficient (O) of 0.344 and a t-statistic value (| O/STDEV |) of 4.471. Considering that the t-statistic value (4.471) exceeds the t-table value (1.96) and the P value (0.000) is below $\alpha=0.05$, it is found that the Control Function has a significant positive influence on Survey Work Success Factors.
- 3) The Influence of Organizing Function on Survey Work Success Factors The path from Organizing Function to Survey Work Success Factors shows a path coefficient (O) of 0.292 with a t-statistic value (| O/STDEV |) of 2.563. Because the t-statistic value (2.563) is greater than the critical value of the t-table (1.96) and the P value (0.010) is less than $\alpha=0.05$, this indicates that the Organizing Function has a significant positive influence on Survey Work Success Factors.
- 4) The Influence of Planning Function on Survey Work Success Factors For the path of Planning Function to Survey Work Success Factors, the path coefficient value (O) is 0.167 and the t-statistic value (| O/STDEV |) obtained is 2.074. Because the t-statistic value (2.074) is still greater than the t-table (1.96) and the P value (0.038) is smaller than $\alpha=0.05$, it can be interpreted that the Planning Function also has a significant positive influence on Survey Work Success Factors.

CONCLUSION

Based on the research results, it can be concluded that all management functions—planning, organizing, implementation, and control—related to cost, quality, and time had a positive and significant influence on the success of road and bridge condition survey work. Among these variables, the implementation function was identified as the most dominant factor influencing project success, as reflected by the highest effect size value, indicating its strong role in ensuring cost efficiency, maintaining quality standards, and achieving timely project completion. The findings also showed that 68.2% of the variation in survey work success could be explained by the four management functions, while the remaining variation was influenced by other factors outside the research model. In addition, the structural model demonstrated good predictive relevance. These results highlight the importance of strengthening management practices, particularly the implementation function, to improve the effectiveness and success of survey projects. Future research is recommended to examine additional factors influencing survey project success, such as leadership, communication, technology adoption, team competency, and external environmental conditions, as well as to expand the study to different regions or infrastructure project types for broader generalization.

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