

Analysis of Delay in Implementation of Work on Road Projects in Highways Division of Katingan Regency

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ABSTRACT. This paper studied 21 road projects in Katingan Regency. In this research, nine factors were used, which were divided into 61 indicators that cause work delays. The analysis used in the research is descriptive analysis with index and variance analysis, which were previously tested for the validity and reliability of the questionnaire instrument.

The research results show that 3 factors are very dominant in causing work delays, namely the equipment factor with indicators of delays in providing heavy equipment or delays in delivery or provision of equipment; material factors with indicators of delays in material delivery to the project location; and other factors with natural disaster indicators. Steps to minimize delays in work implementation are: holding periodic meetings; communicating and agreeing upon the critical path in order to obtain the most efficient and effective strategy; planning and scheduling the procurement of tools, materials, and labor in terms of purchasing, transportation, and delivery times; determining appropriate routes for transportation and delivery; determining the appropriate route and means of transportation for access to the project location to suit time and cost planning; as well as the readiness of supervisory consultants in the field to supervise contractor work methods.

Keywords: Delays in Work Implementation, Delay Factors, Roads

1. INTRODUCTION

Activities in the road sector include new road construction and rehabilitation or improvement of roads. The Public Works and Spatial Planning Agencies of Katingan Regency also conduct this activity annually. The completion of work on this road construction project often experiences delays every year. In the 2021 budget year, of the 19 work packages carried out, 14 (73.68%) experienced delays. From 14 packages that experienced delays, 4 work packages had permanent contract termination (21.00%). In the 2022 budget year, of the 28 work packages carried out, 7 work packages (25%) experienced delays. If this situation continues, it will have an impact on local governments, namely that budget absorption will not be realized according to plan or will not be absorbed optimally, and it will also affect road users, in this case, the community, because the results of road work cannot be utilized optimally. Delays in implementation also significantly impact contractors because they can cause losses in time and costs because the contractor's expected profits will be reduced, or no profits at all.

Several previous researchers have studied regarding delays in government projects (Hairiyah, 2018; Prayitno, 2020; Budiyanis's research, 2015). These studies show that the delays were mainly caused by poor project management by the contractor. Therefore, further research has also been carried out by other researchers regarding the performance of contractors and consultants, especially regarding the performance of road project management (Ramadani and Prasetya, 2023; Apriani and

Prasetia, 2023; Riany and Prasetia, 2022; Noor and Prasetia, 2020). Apart from project management factors, other risks may arise in construction projects that can result in project delays, such as land acquisition problems, technical planning capabilities, and others (Koirin and Prasetia, 2023; Nashrullah and Prasetia, 2022; Widhiasari and Prasetia, 2018).

Delays in construction work, in this case road work, always encounter obstacles, both those that have been calculated and those that are not calculated by the implementer (service provider). Project delays can be caused by incorrectly estimating the time needed to complete the project in the planning stage or by various possibilities, for example, inappropriate management, problems with materials and labor, equipment, finances, and an unsupportive environment that causes delays. Completion of road work so that the work is late or not carried out according to plan.

Based on this, further research needs to be carried out regarding delays in implementing road projects in Katingan Regency. From this research, it is hoped that the factors that most influence the occurrence of project delays in Katingan can be identified. Apart from that, it is also hoped that this research can provide recommendations for the best handling to mitigate delays that occur during the implementation of road projects in Katingan.

2. RESEARCH METHOD

Preliminary Stage

The background, problem formulation, research objectives, and problem limitations are formulated in the preliminary stage. This research aims to analyze the dominant factors causing delays in road work and create appropriate strategic approaches to minimize delays in road work implementation. In addition, a literature study was carried out to study theories and concepts related to road work delay analysis by analyzing the results of questionnaire recapitulation to determine the dominant factors causing road work delays and create appropriate mitigation to minimize delays in road work implementation.

Data Collection Stage

Data collection aims to obtain the information needed to achieve research objectives. A critical component of research is the data collection process. The correct data collection process will produce valid data for use in research.

The data collection results are used to analyze the dominant factors causing road work delays and create appropriate strategic approaches to minimize delays in road work implementation, especially in road work case studies of the Highway Sector in Katingan Regency. The types of data used are primary data and secondary data.

Primary Data Collection

- Questionnaire Data

Data from the questionnaire is the perception data of respondents who assessed nine factors consisting of 61 (sixty-one) indicators causing delays in work implementation. These were analyzed to obtain the dominant factors causing delays in work implementation. The questionnaires were distributed to 60 respondents directly related to project objects or road work. Apart from distributing questionnaires, in this research, observations were carried out by observing the research object to confirm or check whether the questionnaire results stated the factors causing delays were following the results obtained. Moreover, more in-depth interviews with competent experts were also conducted.

- Secondary Data Collection

Secondary data is a source of information collected to complete research data needs. The data used is previously existing data, such as through literature studies or previous research; road project data, such as budget plans, contract data, documentation, time schedules, physical reports, and others obtained from the highways sector; and the PUPR service of Katingan Regency. Secondary data is used for the following: 1. Preparing questionnaires; the question instruments in the questionnaire were obtained from the results of literature studies and previous research. 2. Create appropriate mitigation strategies to minimize delays in road work implementation using literature studies, previous research, and information from road project data such as time schedules, physical reports, and so on as materials for making appropriate mitigation strategies to minimize delays.

Analysis of Measurement Results

Index numbers are numbers used to compare two or more similar activities at different times. The resulting index value is used as a basis for sorting or ranking the factors that influence delays in work implementation. Factors with higher index values will have higher rankings as well. Apart from finding the index value, the variance value is also used to determine the ranking of two variables with the same index value.

Research Instrument Test

The questionnaire as a data instrument consists of nine factors and 61 indicators that cause delays in road work implementation (Table 1). The final stage of questionnaire data processing is the validity and reliability test.

Table 1. Questionnaire Question Variables

Factor	Indicator	Item
Labor	Lack of labor availability	X1.1
	Insufficient number of workers for activities in the field or shortage of workers owned by contractors	X1.2
	Lack of workforce discipline	X1.3
	Lack of quality of labor or labor skills	X1.4
	Low labor productivity	X1.5
	Work accidents in the workforce	X1.6
	Poor communication between workers and foremen	X1.7
	Lack of work motivation of the workforce	X1.8
	Wrong or inappropriate construction/work implementation methods	X1.9
	Lack of personnel with experience in the world of construction	X1.10
Equipment	Delay in providing heavy equipment / Delay in	X2.1

	delivery/provision of equipment	
	Damage to heavy equipment during project implementation	X2.2
	Lack of operator expertise in operating equipment	X2.3
	Low quality of work / Inadequate quality of equipment	X2.4
	Lack of equipment	X2.5
	Low equipment productivity	X2.6
Material	Scarcity of required materials	X3.1
	Delay in delivery of materials to the project site	X3.2
	Material damage	X3.3
	Material replacement	X3.4
	Poor material quality	X3.5
	Inaccuracy in order time	X3.6
	Damage to materials in storage	X3.7
Construction Design and Planning	Design changes occur before project implementation	X4.1
	Design changes occur during project implementation	X4.2
	Design error	X4.3
	Slow approval of working drawings	X4.4
	Owner's delay in making decisions	X4.5
Project Location Characteristics	Project locations that are difficult to reach	X5.1
	Insufficient material storage space	X5.2
	Bad weather at the project site	X5.3
	Rainfall intensity/waterlogged work location	X5.4
	Insufficient work area	X5.5
Project Management/managerial	Lack of control of work in the field	X6.1
	Delay in contractor payments	X6.2
	Inexperienced contractor	X6.3
	Changes in the scope of work at the time of implementation	X6.4
	Disagreement between working drawings (planner) and contractor	X6.5
	Poor supervision of work on the project	X6.6
	Improper construction methods	X6.7
	There is a lot of additional work	X6.8
	Poor work planning	X6.9
	The owner's qualifications are not professional in their field	X6.10

	Poor technical and managerial qualifications of personnel in the contractor's work organization	X6.11
	Lack of coordination and communication between parts in the contractor's work organization	X6.12
	Lack of coordination and communication between the owner's representative, supervisory consultant and contractor	X6.13
	Managers' experience in the field is lacking	X6.14
Financial	Higher material prices due to material mobilization very far away	X7.1
	Funding difficulties for contractors	X7.2
	Difficulty in payment by the project owner	X7.3
	Late payment by the owner	X7.4
Changes in Scope and Contract/Work Documents	Incorrect/incomplete planning (drawings/specifications)	X8.1
	There was a design change by the owner	X8.2
	Errors in planning and specifications	X8.3
	Unclear planning and specifications	X8.4
Other factors	Riot	X9.1
	Natural disasters	X9.2
	Job strike	X9.3
	Accidents at work	X9.4
	Bad weather conditions	X9.5
	There was a dispute due to land acquisition issues	X9.6

- Validity test

The validity test shows how much a measuring instrument can be trusted or reliable. The validity test is carried out by measuring the correlation between the score of each research indicator, which is the cause of delays in work implementation, and the total score of these indicators. Test the significance of the correlation coefficient at a significance level of 0.05, meaning that an item is valid if it correlates significantly with the total score. The significance test was carried out by comparing the Sig.2 Tailed value with a value of 5% (0.05).

- Reliability Test

Reliability is an index that shows how much a measuring instrument can be trusted or reliable. The reliability of a test refers to the level of stability, consistency, predictive power, and accuracy.

A questionnaire can be reliable if the Cronbach's alpha value exceeds 0.60. Measurements with high reliability are measurements that can produce reliable data.

3. RESULTS AND DISCUSSION

Research Instrument Test

- Validity Test

The validity test was carried out by comparing the calculated r and r table values with the Spearman correlation coefficient with a one-way test significance level of α 0.05. The significance test was carried out by comparing the Sig.2 Tailed with a value of 5% (0.05). The Sig.2 Tailed value is smaller than the α value of 5% (0.05), or $r_s < \alpha$. After carrying out 3 validity tests, of the 61 questionnaire items, there were 10 invalid questionnaire items. The 10 invalid questionnaire items were indicators: X12, X13, X14, X25, X42, X44, X45, X63, X82, and X95.

- Reliability Test

Reliability testing was carried out on valid question items. Question items are said to be reliable if the answers to the questions are consistent. The consistency of data reliability is intended to show the answers to the questions given by respondents. The Cronbach's alpha value in Table 2 shows that the calculated r is 0.746, greater than the value of 0.60. Thus, the instrument is declared reliable. The analysis can be seen in Table 2.

Table 2. Reliability Test Results

<i>Cronbach's Alpha</i>	N of Items
0.746	52

- Index and Variance Data Analysis

Data analysis was carried out to determine sub-factors causing delays in work implementation. The analytical tool used is index and variance analysis. The recapitulation of the frequency of respondent's answers to each indicator is presented in Table 3.

Table 3. Frequency Indicator Results

Factor	Item	Index	Varian	Ranking	Dominant indicator (61 ≤ index value ≤ 81)	Very dominant indicator (81 ≤ index value ≤ 100)
Labor	X1.1	79.17	5657.20	5	✓	
	X1.5	70.00	4376.58	12	✓	
	X1.6	7.50	20.63	44		
	X1.7	41.67	1456.17	29		
	X1.8	9.17	36.63	43		
	X1.9	78.33	5534.07	6	✓	
	X1.10	61.67	3354.78	17	✓	
Equipment	X2.1	92.50	7812.86	1		✓
	X2.2	70.83	4486.29	11	✓	

	X2.3	35.00	997.29	32		
	X2.4	40.00	1333.49	31		
	X2.6	50.00	2152.54	25		
Material	X3.1	80.83	5907.78	4	✓	
	X3.2	90.83	7524.42	2		✓
	X3.3	22.50	344.51	37		
	X3.4	20.00	286.12	38		
	X3.5	33.33	895.97	33		
	X3.6	66.67	3951.59	13	✓	
	X3.7	6.67	14.20	45		
Construction Design and Planning	X4.1	-15.83	349.75	50		
	X4.3	54.17	2551.24	22		
Project Location Characteristics	X5.1	66.67	3951.97	14	✓	
	X5.2	0.83	5.85	47		
	X5.3	76.67	5291.66	7	✓	
	X5.4	76.67	5291.66	8	✓	
	X5.5	-10.83	189.61	49		
Project Management/managerial	X6.1	61.67	3354.71	18	✓	
	X6.2	19.17	254.32	39		
	X6.4	33.33	895.83	34		
	X6.5	63.33	3548.31	16	✓	
	X6.6	60.83	3260.19	19		
	X6.7	66.67	3952.00	15	✓	
	X6.8	45.00	1719.12	28		
	X6.9	59.17	3074.66	20		
	X6.10	10.83	60.19	42		
	X6.11	50.00	2152.64	26		
	X6.12	54.17	2551.24	23		
	X6.13	53.33	2468.85	24		
	X6.14	55.00	2635.05	21		
	Financial	X7.1	75.83	5172.69	9	✓
X7.2		75.83	5172.69	10	✓	
X7.3		23.33	402.44	36		
X7.4		6.67	13.59	46		
Changes in Scope and Contract/Work Documents	X8.1	31.67	799.97	35		
	X8.3	47.50	1929.17	27		
	X8.4	40.83	1394.49	30		
Other factors	X9.1	-74.17	5825.41	51		
	X9.2	88.33	7101.93	3		✓
	X9.3	15.83	160.80	41		
	X9.4	-3.33	41.08	48		
	X9.6	19.17	254.22	40		

Table 3 (in the ranking column) shows the overall sequence of indicator index values. The literature review shows that the dominant and very dominant indicators have an index value of more than or equal to 61 (sixty-one). So, from these findings, it can be seen that the dominant and very dominant indicators are 18 (eighteen) indicators, which caused delays in project implementation. Of the 18 indicators, 3 are very dominant, and the other 15 are dominant.

1. Very dominant factors and indicators ($81 \leq \text{index value} \leq 100$), namely:
 - a. Equipment Factor, with indicator: delays in providing heavy equipment/delays in delivery/supply of equipment X2.1 (92.50).
 - b. Material Factor, with indicator: late delivery of materials to the project location X3.2 (90.83).
 - c. Other Factor, with the indicator: natural disaster X9.2 (88.33).
2. Dominant factors and indicators ($61 \leq \text{index value} \leq 81$), namely:
 - a. Material Factor, with indicators: Scarcity of required materials X3.1 (80.83) and Order time inaccuracy X3.6 (66.67).
 - b. Labor Factor, with indicators: Lack of labor availability X1.1 (79.17), Wrong or inappropriate construction/work implementation methods X1.9 (78.33), Low labor productivity X1.5 (66,67), and Lack of experienced personnel in the world of construction X1.10 (61,67).
 - c. Project Location Characteristic Factor, with indicators: Rainfall intensity/waterlogged work location X5.4 (76.67), Bad weather at project site X5.3 (76.67), and Hard to reach project locations X5.1 (66.67).
 - d. Project Management/managerial factor, with indicators: Improper construction method X6.7 (66.67), Disagreement between working drawings (planner) and contractor X6.5 (63.33) and Lack of control of work in the field X6.1 (61.67).
 - e. Financial Factor, with indicators: Higher material prices due to very long material mobilization X7.1 (75.83) and Funding difficulties in contractors X7.2 (75.83).
 - f. Equipment Factor, with indicator: Damage to heavy equipment during project implementation X2.2 (70.83).

- Mitigation Effort to Minimize Project Delays Caused by Very Dominant Indicators

The approach taken to minimize project delays was obtained from a literature review and compiled based on a brief description of the results of interviews with competent expert/expert appraiser respondents, which is presented in Table 4.

Table 4. Mitigation Efforts to Minimize Project Delays

Rank	Item	Factor	Indicator	Mitigation
1	X2.1	Equipment	Delays in providing heavy equipment/ delays in delivery/supply of equipment	Equipment mobilization is carried out as quickly as possible by creating a schedule or deadline for supplies that the contractor must implement.
2	X3.2	Material	Late delivery of materials to the project location	Material mobilization is carried out as quickly as possible by creating a schedule or deadline for supplies that the contractor must implement.
3	X9.2	Other factors	Natural disaster	- Review schedules and budget plans and conduct coordination meetings. - It is necessary to pay attention to flood hazard maps, rainfall data, river

water boundaries, and evacuation routes.

- Carry out training for workers on disaster response awareness.
- Create a schedule for remaining work where the work completion target is made more advanced to anticipate unexpected events such as disasters.

4. CONCLUSIONS

Of the 61 (sixty-one) indicators causing delays in road work in the Highways Sector of the PUPR Service in Katingan Regency, Central Kalimantan Province, for the 2021 and 2022 fiscal years, the results were obtained for the dominant factors causing delays based on the index and variant analysis of 3 indicators. very dominant, i.e., indicators of delays in providing heavy equipment or delays in delivery or provision of equipment in the Equipment Factor; indicators of late delivery of materials to the project location in Material Factors; and indicators of natural disasters in other factors.

Several approaches can be proposed for mitigation effort priority strategies to minimize project delays: Owner representatives, supervisory consultants, and contractors hold regular meetings to quickly monitor and resolve problems that occurred in the field and ensure good communication between each party. In a time-crunch situation, the project team must communicate and agree upon the critical path: Carry out regular updates on the critical path (CPM); the more often, the better. The owner representatives should create simulations of project plans to obtain the most efficient and effective strategy from the procurement stages until the implementation of the project. Moreover, the contractor must determine the appropriate route and means of transportation for access to the project site to suit time and cost planning. In addition, supervisory consultants must always be ready in the field to supervise contractors' work methods in carrying out work to avoid mistakes and actively evaluate existing implementation methods so that the most effective and efficient implementation methods are obtained.

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