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Study Delay of Road and Bridge Construction Project in Yalimo Regency, Papua Province

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Abstract

A construction project is an activity that involves various parties such as project owners, contractors, consultants, experts, and also the community. In the implementation of construction projects, delays often occur which result in losses from various parties, especially from the owners who are slow in operating the project. The aim of this study was to evaluate the factors that caused the delay and analyze the ranking of the factors that influence the delay in project completion, also analyze the delay factors based on the frequency and level of importance of road and bridge construction projects in Yalimo Regency, Papua Province. The analysis method for the ranking factors of delay is using the factor analysis method and the relative index method. The research shows that the factors that influence the delay in the completion of road projects are planning and scheduling factors, scope factors and work documents (contracts), resource preparation or readiness factors, inspection system factors, control, and job evaluation factors beyond the capabilities of the owner and contractor. Meanwhile, for the bridge projects, planning and scheduling factors such as work order plans are not well-structured / integrated, inaccurate determination of work duration, incorrect methods of construction/work implementation, and errors in planning and scheduling. The causes of delays in the implementation of construction project work based on the level of importance for road and bridge projects are organizational system factors, coordination, and communication, inspection system factors, work control and evaluation, scope factors, and work documents (contracts), beyond the ability of owners and contractors factors, planning factors and scheduling, resource preparation and readiness factors.

Key words: implementation, delay, road, bridge.

1. Introduction

A construction project is an activity that involves various parties such as project owners, contractors, consultants, experts, and also the community. In the implementation of construction projects, delays often occur which result in losses from various parties, especially from the owners who are slow in operating the project. An activity in a project is a temporary activity that lasts for a limited period of time, the allocation of sources of funds is determined to achieve the main objectives, which are relatively low cost, the right implementation of time, and accountable quality of construction.

Project delay is a source of conflict between the Project implementer and the Project provider. This has been arranged in a work contract between the Project Owner and the Project implementer. The impact of the delay will harm to all parties, both those involved in the implementation and those who will take advantage of the project, such as the community. These direct impacts include (1) the contractor. Delay in project completion results in an increase in overhead costs, due to increased length of implementation time. Overhead costs include costs for the company as a whole, regardless of whether the contract is being handled or not. (2) planning consultants and supervisors. The consultant will experience a loss of time and will be late in working on other projects if the completion of project implementation is delayed. (3) The owner of the delayed project to the part of the owner means the loss of income from the building which should have been able to be used or leased. If the owner is the government, for public facilities such as hospitals, for sure the delay will harm public health services, or harm the service program that has been prepare [1]-[2].

The Relative Index Method and the Factor Analysis Method are methods that can be used to reveal the delay in project implementation time. Disclosure of delays in a project by giving a ranking to the factors that are assumed can contribute to the delay. The relative index method is used to rank the factors obtained, while the factor analysis method will test the validity of the data for the continuation of the analysis and form factors that are assumed to be the main cause of delays in

project implementation [3]. The analysis to reveal the problems in this study using the Index Relative Method and the Factor Analysis Method.

Yalimo Regency is one of the districts in Papua province, this regency was formed on January 4, 2008 based on Law Number 4 of 2008, together with the establishment of 5 other regency in Papua [4]. Several road and bridge projects in the 2019 fiscal year experienced delays in resulting the utilization of the project could not be used until 2020. The obstacles faced in implementing road and bridge projects in this regency are mainly the terrain factor which is difficult to overcome by the contractors. Apart from the difficult terrain conditions, the limited availability of construction materials, erratic weather factors are also challenges in implementing the Project in the field. Such problems can become the cause of delays in projects, in resulting the project cannot proceed according to the predetermined plan. From the mentioned cases above, this research was conducted to determine the factors that cause the project delays in Yalimo Regency.

Various studies that focus on project delays include, Kurniawan & Rudi, (2019) studied the analysis of factors causing delays in government building projects in City Bukittinggi[5]. Henong, (2016) studied the analysis of factors that affect delays in government projects in Kupang city[6]. Aniceto, (2015) studied the analysis of the factors causing delays in public and private construction projects in Timor Leste. Saputra, (2017) studied the analysis of factors causing delays in mall construction project completion[7]. Suyatno, (2010) studied analysis of the factors causing the delay in building project completion (regression model application) [8].

The aim of this study was to evaluate the factors that caused the delay and analyze the ranking of the factors that influence the delay in project completion, also analyze the delay factors based on the frequency and level of importance of road and bridge construction projects in Yalimo Regency, Papua Province. The analysis method for the ranking factors of delay is using the factor analysis method and the relative index method.

2. Research Method

2.1. Research location

The research location is in Yalimo Regency, Papua Province by taking project locations on several road and bridge projects scattered in several districts. Construction of the Hobakma Ring Road in Elelim district, Construction of the Kali Landik Bridge (Lower Strutur) and Construction of the Abanaho - Iluga Ring Road in the Abenaho District, Construction of the Kali Lek Bridge at the Apalapsili District, Construction of the Wara - Walarek Road in the Walarek District and the construction of the Trans Lawe-Lulum Road at Ditrik Benawa. The research location can be seen in Figure 1.

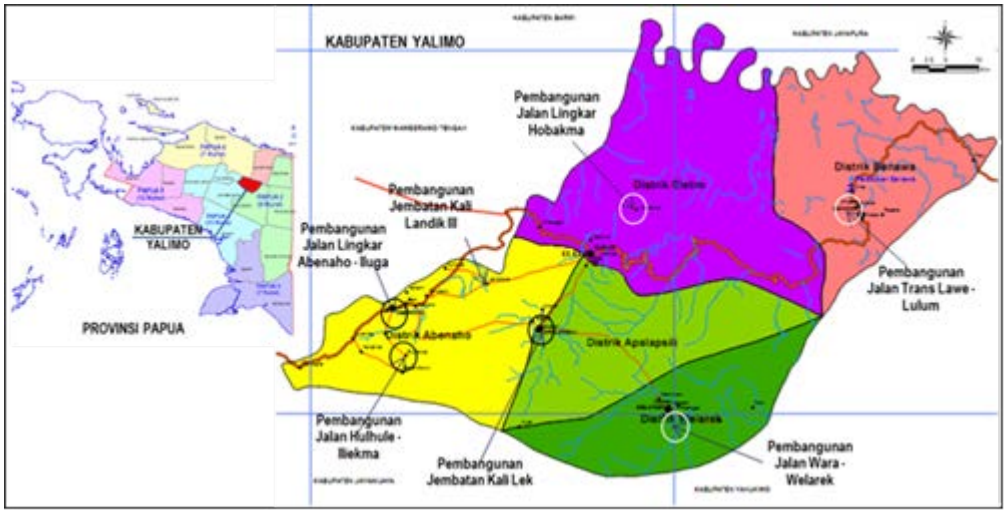

Figure 1. Research Location

2.2. Population and Sample

The population in the study using road and bridge projects in Yalimo Regency which consisted of 5 road projects and 2 bridge projects as shown in Figure 1. The sample used was the parties involved in project implementation reviewed both from the Public Project Office, contractors and consultants. . The positions include K3 Expert, Cost Estimator Engineer, Geodetic Engineer, Highway Engineer, Inspector, Head of Service, Head of Section of Highways, Executor, Supervisor, PPK, PPTK, Project Manager, Quality Control, Site Engineering, Soil and Materials Engineer, Engineer Supervision.

2.3. Research Variable

The research variables used are 6 (six) factors that affect the delay in the implementation of road and bridge works, (1) the Planning & Scheduling factor consisting of 7 sub-factors for the frequency level and 7 sub-factors for the level of importance. (2) Scope Factor and Work Document (contract), consisting of 8 sub-factors for the frequency level and 8 sub-factors for the level of importance. (3) Organizational, Coordination and Communication System Factors consisting of 9 sub-factors for frequency level and 9 sub-factors for frequency level. (4) Resource Readiness / Preparation Factor consisting of 8 sub-factors for frequency level and 8 sub-factors for the level of importance. (5) The Inspection, Control and Job Evaluation System Factor consisting of 7 sub-factors for frequency level and 7 sub-factors for the level of importance. (6) Other Factors (Aspects beyond the ability of the Owner and Contractor), consisting of 7 sub-factors of frequency level and 7 factors of importance level.

2.4. Data analysis techniques

To analyze the dominant factors that affecting delays in road and bridge project implementation, the Factor Analysis Method is used through Common Factor Analysis (CFA) to obtain the Kaiser-Meyer-Olkin (KMO) value, the significance value, the Measure of Sampling Adequacy (MSA) value, and the Extraction value[9]-[10]. The terms used for the KMO value are> 0.50 with a significant number <0.05. From the results of the KMO analysis, it was analyzed with (MSA)> 0.50 and the extraction factor value> 0.50. To analyze the ranking of the factors that influence the delay in the implementation of road and bridge projects, the Relative Index Analysis is used. Determination of Relative Index (RI) aims to determine how much the factors influence of study, where the range of RI value about between 0 (minimum) and 1 (maximum), the closer the value of RI to 1 the more influential these factors in the delay in implementation of construction project work. Analysis of factors was analyzed using the Statistical Program for Social Science (SPSS) for Windows version 17.

3. Analysis And Discussion

3.1. Characteristics of Respondents

a. Road Project

Questionnaires for parties involved in road projects according to their respective positions, of which 85 respondents consist of Head of Office 1 respondent, Head of Highways Section 1 respondent, PPK 3 respondents, PPTK 3 respondents, Service Supervisor 15 respondents, Project Manager 3 respondents, Site Engineering 3 respondents, Soil and Material Engineer 3 respondents, Quality Control 6 respondents, Geodetic Engineer 3 respondents, Highway Engineer 3 respondents, K3 Expert 4 respondents, Cost Estimator Engineer 3 respondents 6 Inspector, Engineer Supervision 5 respondents and Implementer 25 respondents. The education of the parties involved in the implementation was dominated by Bachelor's degree in the percentage of 88.24%, then Bachelor of Architecture in the percentage of 7.06%, Bachelor of Environmental Engineering in the percentage of 2.35%, and Master of Civil Engineering in the percentage of 2.35%. Respondents with a Master's degree come from the local government office while a Bachelor of civil engineering, a Bachelor of Architectural engineering, and a Bachelor of Environmental Engineering came from the government agency also contractors, and consultants.
The length of work in agencies and companies is dominated by working time between 1 year and 2.9 years in the percentage of 44.71%, length of work between 3 years to 5.9 years was 35.47%, length of work between 6 years to 8.9 years was 10.59% and the percentage of years worked over 9 years was 8.24%. The work experience of each party involved in the implementation is dominated by work experience between 3 years to 5.9 years was 54.12%. Then work experience between 1 year and 2.9 years was ranked second with 21.18%, then those with experience between 6 years and 8.9 years were ranked third with a percentage of 15.29% and respondents with more than 9 years experience was 9.41%.

b. Bridge Project

The questionnaire for the parties involved in the bridge project according to their respective positions consists of a Department Head, a Head of Human Settlements, head of Division. Roads and Bridges 1 person, a Secretary of Human Settlements, 2 people of Highways Section Head, 7 people of Implementer, 5 people of Service Supervisor, PPK 1 person, PPTK 1 person, Site Manager 1 person, 5 people of Engineer Supervision, 4 people of Quality Control, K3 expert 1 person, Inspector 2 person, Material Technician 1 person. The education of the parties involved is dominated by Bachelor's degree in civil engineering in the percentage of 91.18%, then Bachelor of Architecture in the percentage of 5.88% while Bachelor of Architectural Engineering in the percentage of 2.94%. The Length of work in companies and government service offices found that the percentage of the length of work between 1 year and 2.9 years was 47.06% then the length of work between 3 years and 5.9 years was 29.41%, the percentage of the length of work between 6 years to 8.9 years was 14.71%. Meanwhile, those who worked for more than 9 years were 8.82%. 17.65% of work experience in Public Projects, Contracts and Consultants with work experience between 1 year and 2.9 years, 41.18% working experience between 3 years and 5.9 years; The percentage of work experience between 6 years and 8.9 years was 26.47% and work experience of more than 9 years was 14.71%.

3.2. Factor analysis

a. Road Project

The results of the analysis of the 6 factors that are considered influencing project delays are only 5 factors that are very influential, which are planning and scheduling factors, project scope and document (contract) factors, preparation factor or readiness factor, inspection system factor, project control and evaluation and other factors beyond the capabilities of the owner and the contractor.

Planning and scheduling factors

There are 14 sub factors of planning and scheduling factors, which consist of 7 sub factors of frequency and 7 factors of importance. After the factor analysis was carried out, it was found that only 3 factors were very influential due to frequency and 3 factors of importance.

The results of the analysis are as in table 1, the table shows the factors that influence planning and scheduling in terms of frequency is the incomplete identification of the types of projects that must exist, the work order plan that is not well structured/guided. Meanwhile, the level of importance is the factor of errors in planning and scheduling, also errors in planning and scheduling.

Table 1. Planning and scheduling factors

Variable		MSA	Extraction
Frequency	Incomplete identification of the type of project that must exist	0.513	0.611
The level of importance	Errors in planning and scheduling	0.613	0.688
	Unwell structured / guided work sequence plan	0.608	0.623
	Errors in planning and scheduling	0.601	0.570
	KMO Value : 0,613 dan Sig. = 0.000		

Scope factors and Project documents (contract)

The results of data analysis using the Factor Analysis method were obtained for the Scope factor and Project Documents (Contract), KMO value was 0.635 with a significant amount of 0.000, which means that the data is suitable for further analysis shown in table 2.

Scope factors and Project documents (contract) have 16 sub-factors where the frequency factor consists of 8 sub-factors and the level of importance was 8 sub-factors. After the factor analysis is carried out, the sub-factors that influence the scope factor and the Project document (contract) are in terms of the frequency was 5 sub-factors and the level of importance was 6 sub-factors. Factors that influence the occurrence of Project delays on the scope factor and Project documents (contracts) based on frequency are requests for changes to projects that have been completed, changes in Project design/details during implementation, changes in Project scope during implementation, legal/technical disputes between owners, unclear

information and the drawing less in detail while based on the level of importance are incomplete planning (drawings/specifications), requests for changes to projects that have been completed, changes in project designs/details during implementation, legal/technical disputes between owners and contractors, unclear information and the drawing less in detail, also there are many additional projects.

Tabel 2. Scope factors and Project documents (contract)

Variabel		MSA	Extraction
Frequency	Requests for changes to projects that have been completed	0.655	0.512
	Changes in Project design / details during implementation	0.807	0.584
	Changes to the Project scope during implementation	0.615	0.661
	Legal / technical dispute between owner and contractor	0.515	0.627
	Unclear information and the drawing less in detail	0.660	0.613
The level of importance	Incomplete planning (drawings / specifications)	0.579	0.638
	Requests for changes to projects that have been completed	0.579	0.690
	Changes in Project design / details during implementation	0.597	0.560
	Legal / technical dispute between owner and contractor	0.656	0.521
	Unclear information and the drawing less in detail	0.702	0.582
	Many additional projects	0.596	0.509

KMO Value = 0.635 & Sig. = 0.000

Resource Readiness / Preparation Factor

The results of data processing as in attachment 4 Factor 4 Readiness / Resource Preparation obtained for the Resource Preparation or Readiness factor, the KMO value is 0.725 with a significant value of 0.000, which means the data is suitable for further analysis. shown in table 3.

Table 3. Resource Readiness / Preparation Factor

Variable		MSA	Extraction
Frequency	Slow mobilization of resources (materials, tools and labor)	0.705	0.583
	Unavailability of work tools / equipment which are adequate / as needed	0.575	0.521
The level of importance	not enough material available for needs	0,725	0.543

KMO Value = 0.725 & Sig.= 0.000

From the 16 sub-factors of Resource Readiness / Preparation, after analyzing the influencing factors, only 3 sub-factors had an effect on the Resource Readiness / Preparation factor, which the effect on frequency was slow mobilization of resources (materials, tools and labor) while for the level of importance is the unavailability of work tools / equipment which are not sufficient / not suitable with the need and not sufficient materials which are suitable for the need.

Project Inspection, Control and Evaluation System Factors

From the results of data processing of 14 sub-factors, 10 sub-factors that influence the Inspection, Control, and Project Evaluation System are obtained, where the KMO value is 0.655 with a significant amount of 0.000, which means the data is suitable for further analysis as shown in table 4. After analyzing the value of MSA and extraction, there are 5 sub-factors that influence the frequency, there are 3 sub-factors and the level of importance was 2 sub-factors. Factors that influence the delay in road projects from the frequency are slow response from the owner, slow response and insufficient inspection from the contractor, the work permit approval process is complicated while from the level of importance is the quality

management and inadequate supervision of the contractor and Project results that must be repaired / repeated because of defects / incorrect.

Table 4. Project Inspection, Control and Evaluation System Factors

Variable		MSA	Extraction
Frequency	Slow response from owner	0.651	0.554
	slow response and inadequate inspection of contractors	0.635	0.664
	the work permit approval process is complicated	0.638	0.575
The level of importance	quality management and inadequate supervision of contractors	0.545	0.694
	Project results that must be repaired / repeated because of defects / incorrect	0.701	0.515

KMO Value = 0.655 & Sig. = 0.000

Other factors beyond the ability of the owner and contractor

The results of the analysis for other factors beyond the ability of the owner and contractor, the KMO value is 0.690 with a significant value of 0.000 as shown in table 5.

Table 5. Other factors beyond the ability of the owner and contractor

Variable		MSA	Extraction
Frequency	Unfavorable of weather conditions	0.779	0.530
	Poor transportation to the project locations	0.669	0.661
	the occurrence of unexpected things such as fire, flood, storm / hurricane, earthquake, landslide, very bad weather	0.701	0.562
	labor strike	0.729	0.509
	Riot,war	0.693	0.519
	The occurrence of damage/destruction due to negligence or the actions of third parties	0.663	0.679
	changes in the situation of the government political/economic policies	0.502	0.563
The level of importance	Unfavorable of weather conditions	0.707	0.528
	Poor transportation to the project locations	0.593	0.642
	the occurrence of unexpected things such as fire, flood, storm / hurricane, earthquake, landslide, very bad weather	0.578	0.761
	The occurrence of damage/destruction due to negligence or the actions of third parties	0.761	0.535

KMO Value = 0.690 & Sig. = 0.000

The planning and scheduling factor has 14 sub-factors consisting of 7 frequency sub-factors and 7 importance level sub-factors. The analysis results from factor analysis, but only 11 subfactors are suitable for further analysis to fulfill the requirements that the MSA value is> 0.50 and the extraction is> 0.5. Subfactors that affect other factors beyond the ability of the owner and contractor to frequency, which unfavorable weather conditions, poor transportation to the project locations, unexpected events such as fires, floods, storms/hurricanes, earthquakes, landslides, very bad weather, labor strikes, riots, wars, damage/destruction due to negligence or actions of the third parties, changes in the situation of the government political/economic policies, while the level of importance is unfavorable weather conditions, poor Transportation to the project locations, the occurrence of unexpected things such as fire, flood, storm/hurricane, earthquake, landslide, very bad weather, damage/destruction due to negligence or actions of the third parties.

b. Bridge Project

From the six factors or factors that are assumed affect the bridge project, which planning and scheduling factors, project scope and document (contract) factors, organizational system factors, coordination and communication, resource preparation or readiness factors, inspection system factors, project control, and evaluation also other factors beyond the capabilities of the owner and the contractor, only the planning and scheduling factors have a KMO value> 0.50. as shown in table 6.

Table 6. Planning and Scheduling Factors

Variable		MSA	Extraction
The level of importance	Unwell structured / guided work sequence plan	0.685	0.602
	Inaccurate determination of the duration of work time	0.475	0.906
	wrong or inaccurate Methods of construction/work implementation	0.631	0.683
	Planning and scheduling errors	0.599	0.743

KMO Value = 0.622 & Sig. = 0.005

The results of the analysis with factor analysis obtained subfactors that influence the planning and scheduling factors in accordance with the KMO results was 0.622 with a significance of 0.005, which means that the data is suitable for further analysis. The analysis results from 14 sub-factors, only 4 sub-factors that are assumed to greatly influence the delay in the bridge project, which the importance level of the work order plan that is not well structured/guided, the determination of the duration of work is not careful, the construction method/work implementation is wrong or not right, errors in planning and scheduling.

3.3. Relative Index Analysis

The results of the analysis of the Relative Index analysis obtained the rankings of the factors that influence the delay in the completion of road and bridge construction projects.

a. Road Project

The results of the index analysis relative to the factors that are assumed of causing delays in road projects are ranked as shown in table 7.
From table 7 the ranking that causes road project delays is the first factor of scope and work documents (contracts), the second factor is the preparation and readiness of resources, the third factor is beyond the capabilities of the owner and the contractor, the fourth factor is the inspection, control and evaluation system of work, the fifth factor is planning and scheduling, the last factor is the organizational system, coordination, and communication.

Tabel 7. The factors causing the delay are based on the frequency

No.	Variable	Total Value	Total Score	Relative Indeks	Ranking
1	Planning & Scheduling Factors	1439	205.571	0.605	5
2	Scope Factors and Work Documents (contracts)	1715	214.375	0.630	1
3	Organizational, Coordination and Communication System Factors	1849	205.444	0.604	6
4	Resource Readiness / Preparation Factor	1695	211.875	0.623	2
5	Inspection, Control and Job Evaluation System Factors	1450	207.143	0.609	4
6	Other Factors (Factors beyond the ability of the Owner and Contractor)	1476	210.857	0.620	3

From table 8, it can be seen that the ranking of the factors causing the delay to the level of importance is the organizational system factor, coordination and communication, the second factor is the inspection, control and job evaluation system, the

third factor is the scope and work documents (contracts), the fourth factor is a factor outside the ability of the owner and the contractor, the fifth factor is planning and scheduling, the last factor is the preparation and readiness of resources.

Table 8. Factors that cause delays based on the level of importance

No	Variable	Total Value	Total Score	Relative Indeks	Ranking
1	Planning & Scheduling Factors	1552	221.71	0.652	5
2	Scope Factors and Work Documents (contracts)	1811	226.38	0.666	3
3	Organizational, Coordination and Communication System Factors	2085	231.67	0.681	1
4	Resource Readiness / Preparation Factor	1768	221	0.650	6
5	Inspection, Control and Job Evaluation System Factors	1609	229.86	0.676	2
6	Other Factors (Factors beyond the ability of the Owner and Contractor)	1579	225.57	0.663	4

b. Bridge Project

Based on the results of the relative index analysis, the ranking of factors causing the delay in the implementation of bridge construction project works is obtained as shown in table 9.
From table 9, it is obtained that the first factor causes the delay in the implementation of bridge construction project work based on frequency, which factors beyond the ability of the owner and contractor, the second factor is the preparation or readiness of resources, the third factor is the inspection, control and work evaluation system, the fourth factor is the organizational system. , coordination and communication, the fifth factor is the scope and work documents (contracts), the last factor is the planning and scheduling factor.

Tabel 9. Factors that cause delay based on frequency

No	Variable	Total Value	Total Score	Relative Indeks	Ranking
1	Planning & Scheduling Factors	586	83.714	0.615	6
2	Scope Factors and Work Documents (contracts)	687	85.875	0.631	5
3	Organizational, Coordination and Communication System Factors	780	86.667	0.637	4
4	Resource Readiness / Preparation Factor	696	87	0.640	2
5	Inspection, Control and Job Evaluation System Factors	607	86.714	0.638	3
6	Other Factors (Factors beyond the ability of the Owner and Contractor)	629	89.857	0.661	1

From table 10, it can be seen that the ranking of factors causing delays in the bridge project based on the first level of importance is the Inspection, Control and Evaluation System Factor, the second factor is beyond the Capabilities of the Owner and the Contractor, the third factor is the Organization System, Coordination and Communication, the fourth factor is Scope and Work Documents (Contracts), the fifth factor is Resource Preparation or Readiness, the last factor is Planning and Scheduling.

Tabel 10. Factors that cause delays based on the level of importance

No	Variable	Total Value	Total Score	Relative Indeks	Ranking
1	Planning & Scheduling Factors	596	85.143	0.626	6
2	Scope Factors and Work Documents (contracts)	714	89.250	0.656	4
3	Organizational, Coordination and Communication System Factors	813	90.333	0.664	3
4	Resource Readiness / Preparation Factor	702	87.750	0.645	5
5	Inspection, Control and Job Evaluation System Factors	652	95.143	0.685	1
6	Other Factors (Factors beyond the ability of the Owner and Contractor)	650	92.857	0.683	2

4. Conclusion

Factors that influence the delay in completion of road projects are planning and scheduling factors, work scope and document (contract) factors, resource preparation or readiness factors, inspection system factors, control and job evaluation factors, other factors (beyond the ability of the owner and contractor) while for the bridge project are planning and scheduling factors such as not well-structured / integrated work order plans, inaccurate determination of work duration, incorrect construction / work implementation methods, and errors in planning and scheduling.
The causes of delays in the implementation of construction project work based on the level of importance for road and bridge projects are organizational system factors, coordination and communication, inspection system factors, work control and evaluation, scope factors and work documents (contracts), factors beyond the ability of owners and contractors, planning factors and scheduling, resource preparation and readiness factors.

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