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Analysis of Alternative Development Bridge in Banjarmasin City

Andi Maghfirah[1], Irfan Prasetia[2]
[1](*Master of Civil Engineering, Faculty of EngineeringInLambungMangkurat University)*
Corresponding Author: AndiMaghfirah

ABSTRACT :*Bridge in the city of Banjarmasin is a vital means for the people living in the city with the nickname "The City of a Thousand Rivers" is. Direct and indirect benefits is perceived by the public are: the smooth flow of traffic, saving time and costs, stimulate economic growth, etc. There are two (2) types of bridges that are often used in Banjarmasin, namely: concrete bridge type T and arch prestressed concrete, but the limited budget of Banjarmasin then need an analysis of the two bridges are the most effective methods of implementation and can be applied to the condition of local wisdom Banjarmasin City community and the level of risk against the cost and time.*

This study uses observations, interviews and questionnaires. Methods of implementation are analyzed using the observation at the bridge construction project, open-ended interviews with service providers (contractors and consultants) and secondary data, the level of risk with respect to time and cost is measured using a matrix of probability and impact (PMBOK, 2008) with the low risk category, medium and high. A questionnaire was distributed to 25 respondents, consisting of service users (Office PUPR Banjarmasin) and service providers (consultants and contractors).

From the analysis of primary and secondary data obtained results for the implementation of the method is the most effective type of bridge prestressed concrete arch bridge. The results of the questionnaire calculation of respondents regarding the level of risk against the cost of using a matrix of probability and impact is prestressed concrete arch bridge and a low level of risk with respect to time is a concrete arch bridge.

KEYWORDS *bridge, methods of implementation, the risk of cost and time.*

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I. INTRODUCTION

Banjarmasin city has many rivers that are used by the public as a means of transportation. The rivers are composed of large rivers, streams medium and small rivers. If the river who were then categorized with a medium-size river. Most of the construction of bridges across the rivers in Banjarmasin are wood with a damaged condition.

Construction of buildings on the bridge are most often used in Banjarmasin is the type of concrete T type girder and prestressed concrete arch. But there are financial constraints on the budget (Budget Revenue and Expenditure) Banjarmasin so effective bridge planning is necessary in terms of the method of implementation, the level of risk against the cost and time.

Analysis of system construction or method of implementation of the concrete girder bridge type T and prestressed concrete arch using a reference from Hasanin research Ade Putra, for risk variables used in the questionnaire using a reference from a study conducted by Nima, Mekdam AP, SyafranNoferi, Good YuntarKurniawanandSiswanto.

II. RESEARCH METHODS

Collection and Processing of Data

The data used in this study is divided into two (2) primary data and secondary data. Primary data collection techniques include: observation (observation) on the construction of the bridge are being or have been carried out interviews with users and service providers (consultants and contractors), questionnaires distributed to users and service providers (consultants and contractors). Secondary data were obtained from the data available in companies of construction and consulting services as well as data in Banjarmasin government environment.

Population and Sample Research

In the construction of the bridge, the population is taken perpetrator construction supervision consultant and the city administration of Banjarmasin (Banjarmasin city PUPR Office). Respondents who will serve as the study sample as many as 25 people consisting of: project manager, site engineer manager, site operations manager, engineering supervisor, chief inspector, quality engineers, official commitment maker, technical enforcement officials and the activities of the technical team.

Data analysis

The data analysis in this study were divided into 2 (two), namely: construction system analysis and risk analysis (probability and impact). The method used in the analysis system construction on concrete girder bridge structure type T and prestressed concrete arch through the study of literature sourced from the print media and the internet, observation techniques made during construction and engineering conducted interviews with service providers (consultants and contractors).

To determine the risk against the cost and time used questionnaire method with variable amounts of the costs as much as 30 variables and variable against time as many as 18 variables used to scale study to respondents, the Likert scale in which respondents are asked to provide an assessment of the 5 levels of scale. Criteria and scale of research on measuring the probability and impact can be seen in Table 1.

Table 1. Criteria and Assessment Scale

Measurement scale	probability	Impact
1	Very Rare (SJ) There may be <10%	Lightweight Once (RS) Value does not mean loss of 0% -2%
2	Rarely (J) 10% <possibility of <40%	Light (R) Value small losses of 2% -5%
3	Sometimes (K) 41% <possibility of <60%	Medium (S) Total losses were 5% -10%
4	Often (S) 61% <possibility of <80%	Weight (B) Value huge losses of 10% -15%
5	Very Often (SS) 81% <possibility of <95%	Very Heavy (SB) Value huge losses of> 15%

The data obtained were then tested for validity using Spearman Rank analysis with SPSS version 17. Validity test is done by comparing the value of each variable rhitung questionnaire with rtabel with the calculation of degree of freedom (df) and the number of samples (n) is 25, df = n-2 , then df = 25-2 with a significance level of 5% (0.05) is 0.336. Phase reliability test using Cronbach Alpha method on SPSS ver 17 variables are valid on probability and impact that will be used in the calculation of the risk level analysis of the costs and time on concrete girder bridge type T and prestressed concrete arch. From questionnaires distributed to be obtained by the number of probability and impact of each risk variable then the value will be plotted into Probability and Impact Matrix (PMBOK, 2008).

Table 2. Probability and Impact Matrix

Likelihood (Probability)	Impact (Impact)				
	1	2	3	4	5
5	Low	moderate	High	High	High
4	Low	moderate	High	High	High
3	Low	Low	moderate	High	High
2	Low	Low	moderate	moderate	High
1	Low	Low	Low	moderate	moderate

III. DISCUSSION RESULT

Construction Systems Analysis

From the results of the literature study, observation and interviews open to service providers (consultants and contractors) obtained information that the methods of construction bridge girder concrete T type were calculated using a cast in situ (cast in place) requires teanga more work and more time plus again with concrete during the maturation process ± 28 days. Weather conditions in construction, especially during the casting process greatly affect the bridge deck construction time and quality. The time of construction, traffic flow under the bridge community is also disturbed by the many scaffolding blocking kelotok. This construction method prestressed concrete arch bridge by way of post tension. Girder bridge using precast concrete materials, girder installation process using 2 cranes to lift and put a girder on the bearing pad and then continued by stressing girder. The entire construction process using less time, less labor and traffic flow under the bridge when the construction can still be used by the public for not much use scaffolding.

Risk analysis

1. Against the Construction Costs

Having tested the validity and realibility on variable probability and the impact on the cost of both types of bridge, then carried out a risk analysis using probability and impact matrix. The median value of each variable that pass the test of the validity of the questionnaire will be plotted into a probability and impact matrix in order to obtain risk criteria. The same variable in the same risk category will be disqualified. Criteria risks to the concrete girder bridge construction costs of type T can be seen in Table 3.

Table 3. Criteria Risk to Bridge Construction Costs with Concrete Girder Bridge Structure Type T

No Label	variable risk	probability (P)	Impact (I)	Value P x I	Criteria
	I. Pre-construction / planning				
A3	Error analysis of unit price by planners	3	4	12	High
	I. Implementation				
A8	The method implementation is wrong or not working right	2	4	8	moderate
A10	Errors caused because of the technology used	2	3	6	moderate
A14	Quality of work is not within specifications	2	4	8	moderate
A15	The accuracy of the estimated time of work and material supply	4	3	12	High
A17	Extra work item or a design review	4	3	12	High
A18	weather conditions	3	3	9	moderate
	I. Resource				
A20	The different perceptions, priorities and assessments among members of the engineering team	3	3	9	moderate
A21	The lack of availability of experts and skilled manpower	3	3	9	moderate
A22	Material specifications are less detailed and less accurate	2	3	6	moderate
A23	Error analysis of unit price by contractor	2	3	6	moderate
A24	Constraints affecting the economic aspects of the specification and material criteria	2	3	6	moderate
A25	Distance quarry to the project location is quite far	3	4	12	High
A26	Less company resources	3	3	9	moderate
A27	Determining specifications, equipment and material that is not appropriate	2	3	6	moderate
A28	Difficulties or delays in the transport of heavy equipment	2	3	6	moderate
	/. Maintenance				
A29	Damage by third parties	2	3	6	moderate
A30	The material used is not within specifications	2	3	6	moderate
A31	Difficulties in maintenance	2	3	6	moderate
A32	The type of equipment used inappropriately	2	3	6	moderate
A33	Unfavorable weather	3	3	9	moderate
Total				166	
Average				7.90	

Criteria for risk against the cost of the concrete girder bridge structure type T is: to high criteria of 4 (four) variable, the criterion was 17 (seventeen) variable and no variables for the low category. Criteria of risk versus cost for prestressed concrete arch bridge structure can be seen in Table 4.

Table 4. Criteria Risk to Bridge Construction Costs withPrestressed Concrete arch bridge structure

No Label	variable Risk	probability (P)	Impact (I)	Value P x I	Criteria
	I. Pre-construction / planning				
A1	Data are incomplete and inaccurate situation and the state of the land in a field investigation (site investigation)	2	4	8	moderate
A2	And design errors or design changes	2	3	6	moderate
A3	Error analysis of unit price by planners	2	3	6	moderate
A4	Errors in the calculation of the structure and analysis	2	4	8	moderate
A5	HR capability planners	3	4	12	High
	I. Implementation				
A7	Conditions difficult locations	3	3	9	moderate
A8	The method implementation is wrong or not working right	2	4	8	moderate

A10	Errors caused because of the technology used	2	2	4	Low
A14	Quality of work is not within specifications	2	4	8	moderate
A16	Skill levels less competent contractors	2	3	6	moderate
A18	weather conditions	3	3	9	moderate
	I. Resource				
A20	The different perceptions, priorities and assessments among members of the engineering team	2	2	4	Low
A21	The lack of availability of experts and skilled manpower	2	3	6	moderate
A22	Material specifications are less detailed and less accurate	2	3	6	moderate
A23	Error analysis of unit price by contractor	2	3	6	moderate
A24	Constraints affecting the economic aspects of the specification and material criteria	2	3	6	moderate
A25	Distance quarry to the project location is quite far	3	3	9	moderate
A26	Less company resources	2	3	6	moderate
A27	Determining specifications, equipment and material that is not appropriate	2	3	6	moderate
A28	Difficulties or delays in the transport of heavy equipment	2	3	6	moderate
	/. Maintenance				
A29	Damage by third parties	2	3	6	moderate
A30	The material used is not within specifications	2	3	6	moderate

Table 4 (Continued)

No Label	variable Risk	probability (P)	Impact (I)	Value P x I	Criteria
A31	Difficulties in maintenance	2	2	4	Low
A32	The type of equipment used inappropriately	2	3	6	moderate
A33	Unfavorable weather	3	3	9	moderate
Total				170	
Average				6,80	

Criteria for risk against the cost of the prestressed concrete arch bridge structure is: to high criteria of 1 (one) variable, the criterion was 21 (twenty-one) variable and low criteria of 3 (three) variables.

2. Against Time Construction

Validity and realibility on variable probability and impact on time were also conducted on two types of bridge, then carried out a risk analysis using probability and impact matrix. Criteria risks to the time construction of the bridge with concrete girder structure of type T can be seen in Table 5.

Table 5. Criteria for Bridge Construction Risks to time with Concrete Girder Structure Type T

No Label	variable risk	probability (P)	Impact (I)	Value P x I	Criteria
	I. design				
B1	design changes	2	3	6	moderate
B2	Experienced Team	2	3	6	moderate
B3	Surveys conducted during the design is not accurate	2	3	6	moderate
	I. Materials and Equipment				
B4	The increase in prices is not taken into account in the contract	2	4	8	moderate
B5	Delays in the delivery of materials	3	3	9	moderate
B6	Loss on material	2	3	6	moderate
B7	Repairs are not in accordance with specifications	2	3	6	moderate
B9	Damage to the machine	3	3	9	moderate
	I. Environment				
B10	Delays caused by weather	3	3	9	moderate
	/. Resource				
B13	Worker safety and job security neglect	2	3	6	moderate
	/. Implementation				
B15	Changes in methods of work	2	3	6	moderate
Total				77	
Average				7.00	

Risk criteria against time on a concrete girder bridge structure type T is: the absence of a variable with high and low categories and 11 (eleven) variable with the medium category. Risk criteria against time on prestressed concrete arch bridge structure shown in Table 6.

Table 6. Criteria Risk to Construction Time by Structure Prestressed Concrete arch bridge

No Label	variable Risk	Probability (P)	Impact (I)	Value P x I	Criteria
	I. Materials and Equipment				
B4	The increase in prices is not taken into account in the contract	2	3	6	moderate
B5	Ketelambatan in delivery of materials	2	3	6	moderate
B7	Repairs are not in accordance with specifications	2	3	6	moderate
B8	Disadvantages number / capacity of heavy equipment needed	2	3	6	moderate
B9	Damage to the machine	3	3	9	moderate
	I. Environment				
B10	Delays caused by weather	3	3	9	moderate
	/. Resource				
B11	The delay in work due to the fault of contractors / sub-contractors	3	3	9	moderate
B12	The difference between the volume of work to the implementation plan	2	3	6	moderate
B13	Worker safety and job security neglect	2	3	6	moderate
B14	Difficulty finding skilled labor	2	3	6	moderate
Total				69	
Average				6,90	

Risk criteria against time on prestressed concrete arch bridge structure there are variables with high and low categories and 10 (ten) variable with the medium category.

IV. CONCLUSION

The final conclusion is that in terms of implementation methods are most effective with the location on the river wish is arch bridge prestressed concrete because it uses fewer workers, the execution time is shorter and the traffic under the bridge can be used during the construction process to maintain local wisdom Banjarmasin.

level of expertise incompetent contractors and quarry within the project site far enough. The results of the risk analysis of time acquired risk with category 4 (four) variables include: deficiencies number / capacity of heavy equipment is needed, the delay in the work due to the fault of contractors / sub-contractors, the difference in the volume of work of plans to the execution and difficulty finding employment skilled. All variables can be avoided before and during the construction process. the difference between the volume of work to the implementation plan and having trouble finding skilled labor. All variables can be avoided before and during the construction process. the difference between the volume of work to the implementation plan and having trouble finding skilled labor. All variables can be avoided before and during the construction process.

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