The Influence of Delays in the Implementation of Work on Budget Plan and Field Management on Building Project in Banjarmasin

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Abstract. The construction service company needs to think about the best strategy for dealing with delay in the project work schedule so that the cost overruns can be reduced to a minimum. The purpose of this research is to make a strategy for overcoming the delay of building project construction work in Banjarmasin. Primary data were obtained by field survey and interviews. The survey was conducted to project directors, project managers and the field, supervisors, and experts who are experienced in handling construction projects. The survey aims to collect data on the dominant factors causing delays in structural work, the impact of such delays on the budget plan, and the strategy of handling delays. The data were analyzed descriptively and AHP. Variable Y, which is the impact of the delay on changes in the work plan cost budget structure, is at a large level that is changing between 3% - 4% of the budget plan cost. The dominant factor to the cause of the delay is the slow decision-making process by the owner, the owner's financial problem, the financial difficulties by the contractor, the mistake of choosing the construction method, the shortage of the project.

1 Introduction

Project delays are a major contribution to project cost overruns [1]. According to Praboyo, work delays occur due to various factors, such as volume estimation error, poor contractor management, nature and other factors [2]. Other factors that potentially affect the execution time are manpower, materials, place characteristics, managerial, finance, the intensity of rainfall, economic conditions, and accidents of work. Work delays may result in changes to planned project costs. Any construction work that is not completed in time requires action to analyze the factors causing the delay [3]. To overcome these delays requires good managerial skills for the parties involved in the construction process. According to Puspitasari, time delays are caused by poor project management and human resources errors [4]. Project delays can result in reduced profits targeted by the contractor.

The purpose of this research is to make a strategy for overcoming the delay of building project construction work in Banjarmasin. The benefits of this research as a reference for determining policies for contractors, supervisory consultants and project owners, so that

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projects can be completed on time without any cost overruns. Benefits for the owner is to facilitate the supervision of expenses and payments to contractors.

2 Literature Review

2.1 Scheduling

Project scheduling is the process of calculating the completion time of a given project, taking into account the limits that affect the implementation of the activity. Soeharto defines the schedule is the explanation of project planning into a systematic sequence of activities to achieve one goal [5]. The approach used is a network that describes a graph of the relation of the work of the project. Which work should take precedence over other work, should be identified about the timing of the job.

According to PMBOK, the function of the scheduling is as a guideline and control for the implementation of activities to fit the plan, as a basis for determining the progress payment, preparation of project cash flow and making project funding strategy [6]. Scheduling guides sub-ordinate units regarding time limits for the start and end of each task. This scheduling can be used to evaluate impacts due to changes in project implementation.

2.2 Cost Management

The Cost management consists of four main processes, namely Resource Planning, Cost Estimation, Cost Budgeting, and Cost Control [7]. The entire process of project cost management interacts with each other and with other disciplines of knowledge. Each process may involve the efforts of one or more individuals or groups, based on the needs of the project. Resource planning is the activity of estimating and determining the required resources of the project (labor, equipment, and materials).

2.3 Cost Performance

According to Ashworth, the project cost is the sum of the commitments in the form of money needed to work on a construction product such as a building [8]. Duncan defines project cost the quantitative need for the cost of resources needed to complete the project activity [9]. Asiyanto explained the cost of the project is categorized into two types, namely direct cost and indirect cost [10].

Taylor states that indirect costs depend on project size and type, ongoing workload, client development, project prestige, and market conditions [11]. Indirect costs are often referred to as contractor fees, which are added costs to cover various things, such as central office overheads, unpredictable risks, and corporate profits

2.4 Time Management

Performance time is the process of comparing actual work with a planned schedule [12]. The definition of the project time according to Clough is the completion of the project at the time agreed upon in the contract, or the time required to complete the work [12]. Meanwhile, according to Sunny and Kim Baker, project time is the duration required to complete the construction work starting from the process of the initial procession at the project site until the work is done [13]. Duration is time, generally in the unit time required

to complete the entire project process, from the first work phase to the last management consists of four main processes, namely Resource Planning, Cost Estimation.

2.5 Time Management

According to Amperawan R. Kusjadmikahadi, the delay of the construction project meant the increase in the time of completion of the planned project and contained in the contract document [14]. Delays are categorized into 3, namely compensation delays, non-excusable delays, and excusable delays. Several factors cause delays in construction project work are [15]:

a) Jordania (A.M Odeh, 2001): inexperienced contractor, late work payments, work delays by subcontractors, interference from the owner, error in choosing a construction method [16]
b) Ghana (Frimpong, 2003): difficulty paying monthly, Inadequate contract management, Poor material procurement, inflation, financial crisis by contractors [17]
c) Arab (S.A. Assaf, 2005): error Owner, contractor's fault, design team, labor, consultant error [18]
d) Mesir (M.E.A.El-Razek, 2008): inadequate financial management of contractors, late payment by owner, design changes by the owner during the construction process, partial payment during construction, inadequate contract management [19]
e) Malaysia (M. Sambasivan, 2006): bad planning, poor management site, inexperienced contractor, delay payment repayment work, contractor's fault [20]
f) Libya (S.A.H Tumi, 2009): bad planning, less effective communication, design error, lack of material, slow decision making [21]
g) Vietnam (L.Le-Hoai, 2008): poor field management, poor project management, owner's financial difficulties, contractor's financial difficulties, design change [22]
h) Korea Selatan (Acharya, 2006): investment from the community, change the condition of the project location, failure in location preparation, estimated unrealistic work time, design error [23]
i) Uni Emirat Arab (Faridi, 2006): image preparation and approval, initial bad planning, slow decision-making process by the owner, lack of manpower, inadequate supervision, and field management [24]
j) Kuwait (Koushiki, 2005): request change, financial constraints, the owner is less experienced, lack of material, the effect of weather [25]
k) Nigeria (Aibinu, 2006): contractor's financial difficulties, owner's financial difficulties, unfinished architect drawing, sub-contractor mobilization is slow, equipment damage [26]

2.6 Relationship Cost to Time

The total project cost is the sum of the direct costs and indirect costs used during the project implementation. The amount of this cost depends on the length of time (duration) of the completion of the project, both of which change with time and progress of the project. Figure 1 shows the relationship of direct costs, indirect costs and total cost in a graph and optimum cost.

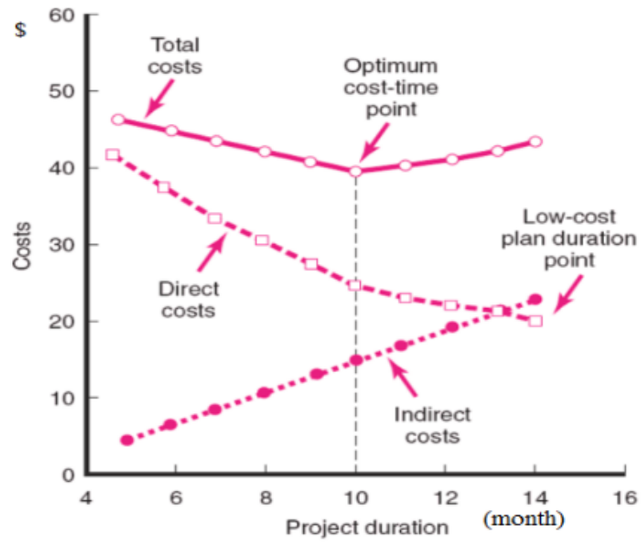

Fig 1. Relationship Time with Cost [27]

2.6 Analitycal Hierarchy Process (AHP)

AHP is one form of non-statistical data processing. AHP is a method used to make decisions of a complex nature, in which there is dependence and influence (feedback) are analyzed for the benefits, opportunities, costs, and risks [28] (Saaty, 1970). The AHP process consists of 4 stages of prioritization; the four stages are the decomposition of the problem, the assessment to compare the elements, the calculation of element weights by using Eigen Vector, hierarchy consistency. Assessment to compare the elements of decomposition by using pairwise comparisons with reference values as in Table 2 [29].

Table 2 Weighted Interest Scale

Intensity of Interest	Interpretation
1	Both elements are equally important
3	One element is slightly more important than other elements
5	One element is more important than the other
7	One element is strongly more important than the other
9	One element is absolute than the other
2, 4, 6, 8	Average rating between 2 adjacent consideration point

A measure of consistency, called Consistency Index as deviation or degree of consistency using the following formula

$$CR = CI / RI \quad (1)$$

$$CI = (\lambda \text{ maks} - n) / (n - 1) \quad (2)$$

whit CR = Consistency Ratio, CI = Consistency Index, RI = Random Consistency Index (see Table 3), λ maks = maximum eigen value, n = number of elemens.

Table 3. Random Consistency Index RI [28]

Order	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
RI	0	0	0.52	1.11	1.25	1.35	1.40	1.45	1.49	1.52	1.54	1.54	1.56	1.58	1.59
First Order Differences		0	0.52	0.37	0.22	0.14	0,10	0.05	0.05	0.04	0.03	0.02	0.02	0.02	0.01

3 Research Methodology

Primary data were obtained by field survey (distributing questionnaires) and interviews, while secondary data were obtained from the literature study. The survey was conducted to project directors, project managers and the field, supervisors (as respondents to the questionnaire), and experts who are experienced in handling construction projects. The survey aims to collect data on the dominant factors causing delays in structural work, the impact of such delays on the budget plan, and the strategy of handling delays. The data were analyzed descriptively and AHP statistically.

The independent variable (variable X) in this research is the cause factor of delay in structural work. Assessment of variables based on the weight of the impact on the delay, with the scale of the assessment seen in Table 4. The dependent variable (Y) in this study is the impact of the delay on changes in the cost structure budget plan (Table 5).

Table 4. Assessment Scale of Independent Variable [30]

Variable X		
Scale	**Category**	**Interpretation**
1	No effect	No impact on schedule
2	Low	There was a schedule delay < 5%
3	Medium	There was a schedule delay < 5%-7%
4	High	There was a schedule delay < 7%-10%
5	Very High	There was a schedule delay > 10%

Tabel 5. Variable Y

Value	Indicator	Interpretation
1	Enormous	> 4% from cost estimate
2	great	3% - 4% from cost estimate
3	Medium	2% - 3% from cost estimate
4	little impact	1% - 2% from cost estimate
5	very small	< 1% from cost estimate

4 Data Analysis

4.1 Variable of Analysis

Based on the validation results of the experts, variables that have been approved by the five experts (experts from academia and practitioners) can be seen in Table 6.

Table 6. Variable of Research

No.	Source Cause of Delay	Variable	
1	Project	X1	Contract duration is too fast
		X2	Inadequate definition of work completed substantially
		X3	Type of contract
2	Owner	X4	Late payment process by the owner
		X5	There was a change order by the owner
		X6	Poor communication and coordination
		X7	The slow decision-making process
		X8	Financial problem
3	Contractor	X9	Financial Problem
		X10	Occurs rework due to construction errors
		X11	Low coordination
		X12	Error selecting construction method
4	Material	X13	Lack of construction materials in the market
		X14	Material delivery delay
		X15	Material damage when the material is needed
		X16	Increase in material prices
		X17	Low quality of material
5	Equipment	X18	Equipment damage
		X19	Lack of equipment
		X20	Low skills of equipment operators
		X21	Low efficiency of equipment
6	Labor	X22	Lack of manpower
		X23	Less competent manpower
		X24	Origin of labor
		X25	Low labor productivity
7	External Factors	X26	Project permissions
		X27	Unpredictable weather factor
		X28	Social-cultural effects
		X29	Work accident
		X30	Access to the project
		X31	Mistakes in monitoring productivity levels
		X32	Selection of less competent project manager
		X33	Poor communication between workers
		X34	The complexity of the project
		X35	Working methods used
		X36	the utilization of working time is not optimal
		X37	Delayed work by subcontractors
		X38	Low qualification of contractor technical staff
		X39	Existing condition of the project

Respondents for this study consisted of 30 people. Respondents were selected based on experience in the management of high rise buildings and infrastructure projects. Respondents are educational background S1 and D3 with long working experience from 3 to 30 years. Testing data validity using Corrected Item-Total Correlation, and for reliability test using Cronbach's Alpha Method. Validity and reliability test result in four variable that has corrected item-total correlation less than r table that is X1 (contract duration too fast), X3 (the type of contract), X4 (late payment process by owner), X24 (origin of labor). These variables should be omitted in subsequent data analysis.

4.2 Descriptive Analysis

The result of the descriptive analysis of the Y variable, is 2.4 for the mean value, 2.0 for the median value and 2.0 for the mode value. The mode value for variable Y is 2.0, is at a large level (changing between 3% - 4% of the initial budget plan). The mean distribution for the variable X is in the range of values 2 to 4 with the smallest mean value of 2.5 for the variable X28 with a mean value of 2.50, and the largest mean value lies in the variable X8 with a mean of 4.05. Broadly speaking the distribution of X variable data illustrates that the impact of the variables causes delays to the schedule.

4.3 Analytical Hierarchy Process (AHP)

The purpose of AHP is to identify the factors causing delays in the most dominant building structures of buildings and how to cope with those factors. The first stage is the normalization of the matrix, followed by the matrix consistency calculation and the level of accuracy, the calculation of the local value of the impact, which produces a rank based on the weight of the calculation result. Matrices are made for pairwise comparisons on each impact. Comparisons between criteria, on the degree of importance of one criterion over the other, are intended to determine the weight of each criterion. These criteria are the impact of work delays on the budget plan, i.e., very high, high, medium, low and no influence.

The calculation of element weight for each element in the impact matrix is obtained by dividing the value in normalization by the normalization amount for each criterion. For example, divide the number 1 (normality value for a very high scale) with the number 1.787 (the number of values for a very high scale) to get the number 0.5595. The weight matrix of pairwise results must have a one-diagonal value of consistent. To test consistency, the maximum eigen value (λ max) should be close to the number of elements and the remaining eigen value approaching zero. The proof of consistency matrix paired with elements in each column divided by the number of columns in question obtained matrix in Table 7. The number of elements in the matrix (n) is 5, then λ max = 26.26/5, to obtain λ max of 5.25. Eigen value approximates the number of elements (n) in the matrix is 5, and the remaining eigen value is 0.24 which means close to 0, then the matrix is consistent.

Table 7. Paired Matrix Consistency Test

					Mean
0.5595	0.6415	0.5245	0.4286	0.3600	0.50
0.1865	0.2138	0.0733	0.3061	0.2800	0.26
0.1119	0.0713	0.1049	0.1837	0.2000	0.13
0.0799	0.0428	0.0350	0.0612	0.1200	0.07
0.0622	0.0305	0.0210	0.0204	0.0400	0.03

Based on the consistency test, the calculation of local values of impact can be done by inserting the weight of the elements of each criterion. The ratings for impact are derived from variables that have the highest local values to the lowest locales. Table 8 shows the five largest sequence values. Table 8 shows that the dominant factor on the cause of the delay is the slow decision-making process on the owner, the financial problems experienced by the owner, the financial difficulties experienced by the contractor, the mistake in choosing the construction method, the shortage of the project equipment.

Table 8. Impact Rating

Variable	Value of Risk Factors	Rank
X8	28.208	1
X7	22.716	2
X9	21.721	3
X10	20.079	4
X18	19.899	5

4.4 Expert Validation

Validation of the results of data analysis is done by distributing questionnaires to 5 experts. Validation is done to ensure that the results of research variables are a factor that has an important role in the occurrence of delay in the work process of building structures of storied buildings. The validation result is an expert recommendation on preventive and corrective actions to cope with the delays that occur in the project, namely:

A. Preventive Action:

1. Owner Factor:
   a. Slow decision maker:
      - Intensive meetings involving planners, QS and MK consultants together to help the owner provide the best alternative
      - Study and customize the design with existing conditions for immediate proposals
      - The consultant/owner must have a complete schedule of implementation, materials, and permissions

   b. Financial problem:
      - Submission of financial security
      - The contractor can assess the organizational structure of the owner and team of consultants
      - Contractors see how the track record owner in the world of construction
2. Contractor Factor
   a. Financial problem:
      - mention the guarantee of implementation
      - The down payment
      - Fixed cash flow shortage with bank credit
      - Design a more efficient cash flow
      - The Owner should conduct a study of the financial capacity of the contractor before selecting the contractor
      - Owners should be more selective in the contractor selection process

   b. Error selecting construction method
      - Simulate the use of construction methods before the project runs
      - The process of constructing the construction method is left to an experienced person
      - The owner must prepare a team of experts before approving the construction methods offered by the contractor
3. Equipment Factor
   a. The occurrence of equipment shortages
      - Calculation of the number of tools to be used, adjusted to the productivity that has been planned

B. Corrective Action

1. Owner Factor:
   a. Slow decision maker
      - Urge the owner to decide quickly and provide an alternative solution
      - Construction Management explains to the owner about the consequences of the slow decision-making process over time, especially for critical work

   b. Financial problem:
      - The project is paused
      - Actively remind the owner of financial matters relating to the project so that the project can run smoothly
2. Contractor Factor
   a. Financial problem:
      - Find additional funding sources
      - Contractors are looking for suppliers who can provide debt
      - Control of liquidity
      - Conducting project efficiency by minimizing activities that are unrelated to the project and focusing on project progress

   b. Error selecting construction method
      - Change the construction method used to a more suitable form
3. Equipment Factor
   a. The occurrence of equipment shortages
      - Using alternative equipment while waiting for the replacement tool to come

5 Conclusion

1. The dominant factor causing the delay in the work of the structure of the multi-story building is caused by the owner's mistake, especially related to cost and decision making.
2. The dominant factors affecting the delay in project implementation are the owner's financial problems, the slow decision-making process of the owner and the financial difficulties of the contractor.
3. The delay influences the budget plan changes on the structural work, amounting to 3% to 4% of the budget plan.

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