

Delay Factors in Building Construction Project of State Elementary School

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Abstract

The state elementary school No.027 building construction project in Samarinda Ulu District, Samarinda City, Indonesia, in the 2019 fiscal year, which experienced delays, was allegedly due to the use of inappropriate scheduling methods. Therefore, to overcome these delays, it must use the curtain methods that are appropriate with efficient cost. In this study, we used factor analysis and multiple linear regression methods to measure answers from a questionnaire distributed to 45 respondents like consultants, contractors, and owners who were involved in the state elementary school in above. The results show that the elements that influence the delay in the construction of state elementary school building No.027 Samarinda is a factor in the work scheduling method and construction delay. For Scheduling work get a coefficient value is $t_{table} = 7,575 > t_{table} = 2,026$, and for construction delay method get a coefficient value is $t_{table} = 3,120 > t_{table} = 3,120$. It can be concluded is the most dominant factor construction delay in the State Elementary School No.027 Samarinda in case above is the Work Scheduling Method with a value coefficient is 1.057.

Keywords: Delay Scheduling Factors; Scheduling Method; Building Construction Project.

1. Introduction

The building construction project has a complicated working process that can influences planning, controlling, and supervision [1, 2]. One of the issues that should be deemed in implementing the construction project is building delay. This is caused by several factors including less commitment; inadequate management of construction site; lack of site coordination; inappropriate scheduling; less clarity of construction scope; poor communication; and inadequate contract [3].

In our observation, a lot of projects have been done for the construction project of government school buildings in Indonesia is also delayed in its implementation caused by a lack of competent resources in its fields, so that, the government, contractors, and consultants have to change the existing and usual implementation process of building construction project that has been carried out so far. Thus, indications of construction delay factors such as financial constraints (Doloi et al. 2012) [3], human resources (Yang et al. 2010) [4], scheduling methods such as work plans that are not well-structured (Assaf and Al-hejji 2006 [5]; Hossain et al. 2019 [6]; Yau and Yang 2012 [7]; Yang et al. 2010 [4]), implementation methods related to failures the contractor in carrying out the work (Feyzbakhsh et al. 2017 [8]), design changes involving incomplete drawings and specifications (Yau and Yang 2012 [7]), material availability (Assaf and Al-hejji 2006 [5]; Yang et al. 2010 [4]), shortage of equipment (Assaf and Al-hejji 2006 [5]) can be anticipated.

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In preliminary cases, we found the delay factors in implementation of Building Construction Project at state elementary school No.027, Samarinda Ulu Subdistrict, Samarinda City Government in East Kalimantan Province. It can be seen from the implementation of the building construction has experienced a time delay reaching 7.748% by buildings built during 11 weeks. Unfortunately, the factors causing problems in their project is not yet known with certainty.

Based on the aforementioned problems, this research was conducted to discern what factors could influence the time delay in the structural work on construction projects. It is expected that knowing these factors can help contractors to minimize the time lag in the completion of construction projects, especially in the aspect of structural work.

This study is organized as follows. In section 2, there is an explanation of the study literature. In section 3, there is a presentation of the research methodology. The results discussion is given in section 4. Finally, the last section is devoted to concluding the work of this paper.

2. Literature Review

2.1. Service Providers

According the Law of the Republic of Indonesia No.18 of 1999 concerning construction services states that service providers are individuals / entities whose business activities are providing construction services, consisting of planning consultants, supervisory consultants, and contractors (Yanita and Mochtar 2018) [9]. The understanding of each service provider was explained as follows:

- Consultant Planner is a person/ business entity service provider who is declared a professional expert in the field of construction service planning that is able to realize work in the form of building planning documents or other forms.
- Supervisory Consultants are service providers of people/ business entities that are declared professional experts in the field of construction service supervision who are able to carry out supervisory work from the beginning of the work until the completion of the work.
- Contractor is a service provider of a person/ business entity that is declared a professional expert in the field of construction services that is capable of carrying out activities to realize a planning result into a building form or other physical form.

2.2. Construction Management

The success of a project requires careful planning, coordination, and supervision because the project contains a variety of activities. The project itself is defined as a complex system, which involves the coordination of a number of separate parts of the organization, in which there are schedules and conditions that must be done, within the specified implementation time. Therefore, the success of a project is very dependent on the leader as the project manager and also the work of its members (Project Team) (Williams 2016 [10]; Charitopoulos et al. 2019 [11]; Moradi and Shadrokh 2019 [12]).

A Project management is the activity of planning and organizing a project, in which there is an organizational structure consisting of managers as project leaders who control the resources and oversee the work of its members, and the members coordinate with each other, working together to achieve the desired goals, in time predetermined to work on the project. Furthermore, it is the effort or activity of planning, organizing, leading and controlling company resources to achieve short-term goals that have been determined in advance as efficiently and effectively as possible (Harold 2017 [13]; Meissner and Aurich 2019 [14]). The flow activities in project management vertically or horizontally using a systems approach.

The project management concept contains the following main points:

- a. Using the management understanding based on its function, which is to plan, organize, lead and control the company's resources in the form of people, funds, and material;
- b. Management System Approach;
- c. Have a horizontal hierarchy (activity flow) besides a vertical hierarchy;
- d. Activities are managed short-term, with specific targets outlined. This requires special management techniques and methods, especially aspects of planning and control.

Literature results from several previous studies are summarized in the following table:

Group A: Finance (X1)

- A. 1. Lack of capital for the project (X1.1)
- A. 2. Late payment by the contractor to the supplier (X1.2)
- A. 3. Late payments by the government/ owner to the contractor (X1.3)

Group B: Human Resources (X2)

- B. 1. Manpower shortage (X2.1)
- B. 2. There are still many human resources who have not been certified (X2.2)
- B. 3. The difficulty of finding resources (X2.3)
- B. 4. Poor coordination (X2.4)
- B. 5. Poor a sense of responsibility (X2.5)

Group C: Job Scheduling Method (X3)

- C. 1. Incorrect/ideal scheduling planning method (X3.1)
- C. 2. The method of scheduling work implementation is not in accordance with the provisions (X3.2).
- C. 3. Waiting for shop drawing approval (X3.3)

Group D: Work Implementation Method (X4)

- D. 1. Stages of implementation are not in accordance with the provisions (X4.1)
- D. 2. Work is nearing the end of the year (X4.2)

Group E: Review Design (X5)

- E. 1. Review Design by Owner (X5.1)
- E. 2. Delay in the process of change from (X5.2)
- E. 3. Non-fulfillment of initial planning (X5.3)

Group F: Material (X6)

- F. 1. Material deficiencies (X6.1)
- F. 2. Late material delivery (X6.2)
- F. 3. A change in material specifications (X6.3)
- F. 4. Material Damage in storage (X6.4)
- F. 5. There is often a scarcity of material on the market (X6.5)

Group G: Equipment (X7)

- G. 1. Equipment in bad condition (X7.1)
- G. 2. Equipment is not used according to its function (X7.2)
- G. 3. Equipment not in accordance with specifications (X7.3)
- G. 4. Delay in equipment delivery (X7.4)
- G. 5. Limited number of equipment (X7.5)

3. Research Methodology

3.1. Proposed Method

In Data collection methods in this study using a questionnaire method. The final goal of this study is to find out what influences the delay in the implementation of the SDN No.027 SDN Samarinda District Government building construction project in Samarinda City, so as to determine the strategies that must be taken to overcome them. The proposed method shown in Figure 1.

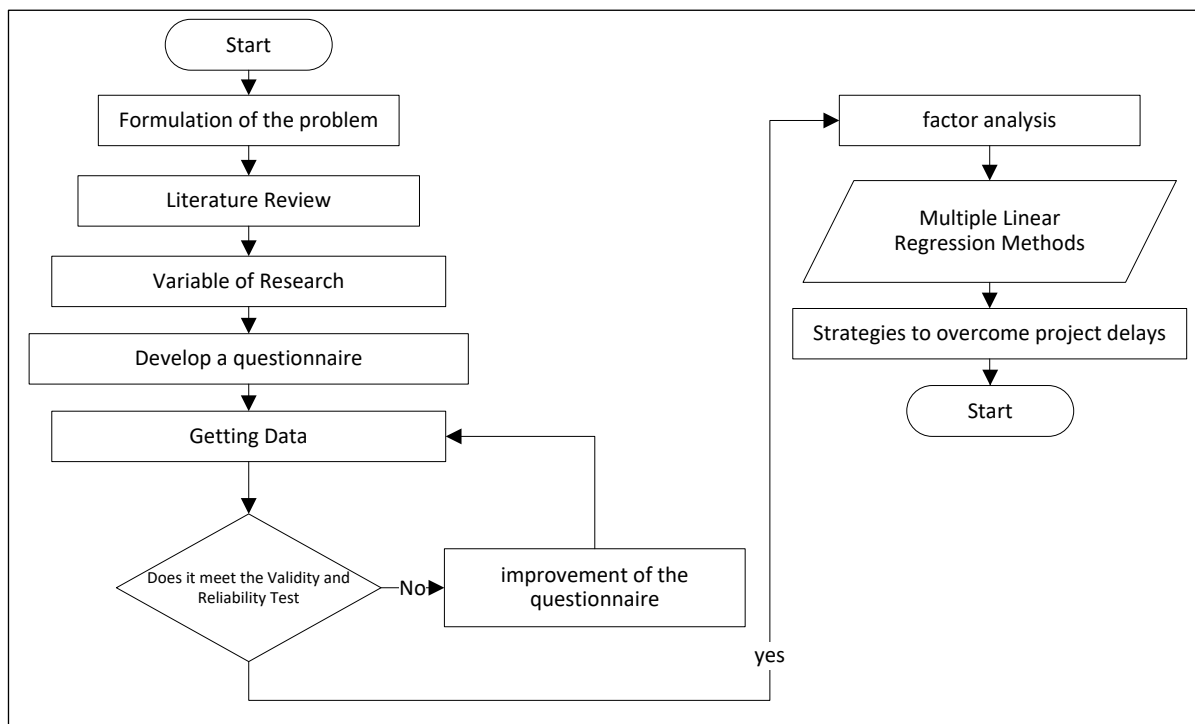


Figure 1. Flowchart of the proposed method

3.2. Data Collection

In present study, researchers used a questionnaire method as the research instrument. Data collection was carried out by distributing questionnaires about the Factors of Time Delay in Structural Work to 45 respondents. This research was conducted at the state elementary school No.027 building construction project in Samarinda Ulu government in Samarinda city.

Because the questionnaire was used in a qualitative form, the Likert scale was used to transform it into a qualitative form so that the data obtained could be tested. In this Likert scale, values of 5 to 1 are used to represent strongly agree, agree, doubt, disagree, and states strongly disagree respectively.

3.3. Data Processing

The questionnaire data is processed using factor analysis. SPSS software is used for the validity test. Furthermore, the reliability test was used for data examining to determine the consistency of respondents in answering things related to questions that are variables and arranged in the form of questionnaires. Reliability testing was done by calculating Cronbach's Alpha, which shows that the indicators used to measure concepts in this study are quite reliable. In this reliability test, there is a requirement that the Cronbach Alpha value must be greater than 0.7.

3.4. Variable of Research and Definition

The definition of operational variable research is anything that is determined by the study to be studied so that information is obtained about it and then conclusions are drawn (Zhou et al. 2019) [15]. In accordance with the objectives, the identification of research variables to determine the factors that influence the delay in the implementation of government building projects in and to find out the most dominant factors influencing them.

3.5. Develop a Questionnaire

The Data collection used questionnaires method with items questions relating to the factors that influence the delay in implementation of development projects and to find out the most dominant factors affecting it using a Likert scale with a range of 1 to 4 (very no influent - very influent), to avoid the middle value, so that the firmness of the respondent is obtained in answer the questions from the questionnaire. The items in the research variables are designed (designed) with positive questions, so that the number one as a respondent code is a very negative response to one of the questions, while the number four to provide a very positive response to one of the questions.

Data collection is done in two ways: primary and secondary data. The questionnaire was made to obtain primary data compiled based on the required and relevant analysis parameters in accordance with the aims and objectives of this study which were shown to people who worked or were involved in work on office building construction projects in the city of Pasuruan. Secondary data obtained from literature studies include theories, concepts, etc. in order to strengthen and support this study.

3.6. Testing Instrument Method

Validity testing

The validity test is done to show the extent of the accuracy of the use of measuring instruments against the symptoms you want to measure. According to Kamali et al. 2019 [16], the questionnaire can be said to be valid if the questions in a questionnaire or questionnaire are able to express something that will be measured by the questionnaire.

A valid instrument can be determined by comparing the *Product Moment Person* correlation index with a significant level of 0.05 (5%) by comparing r_{hitung} with r_{table} , the instrument validity can be determined with the following criteria:

$$r_{hitung} > r_{table} : Valid$$

$$r_{hitung} < r_{table} : Tidak Valid$$

Reliability testing

Reliability aims to show which gauges can be trusted and relied upon. Reliability shows the consistency of a measuring tool on the same symptoms (Singarimbun and Efendi, 2006) [17]. In this study the reliability test uses the Cronbach's Alpha method to find the reliability of instruments whose scores are not 1 and 0 (Yes and No). The instrument is said to be reliable if the Alpha Cronbach's value > 0.6 .

3.7. Factor Analysis Method

In this study, factor analysis is used to reduce the factors of delay in implementation so as to produce information on the causes of the delay in the implementation of development. The result is, there are 7 variables that are suspected as causes of delay in implementation where the feasibility of the variables will be tested to determine the relationship between variables and indicators, if the value of MSA < 0.5 will be issued then recalculated until it has an MSA value > 0.5 then a factor analysis Furthermore. Furthermore, extraction is done until the dimension is smaller than the total number of indicators (Aparecida et al. 2020) [18]. There are several stages in factor analysis, and the steps in the reduction process consist of Selecting Components, Determining Number of Factors, and Classifying Components into Factors. More details can refer to Aparecida et al. 2020 [18]; Yang et al. 2019 [19].

3.8. Multiple Linear Regression Method

The multiple linear regression test was used to examine questions relating to what factors influenced the delay in implementation of development projects in the Pasuruan City Government and what factors were most dominant. In this test the ANOVA test or the f test, the t test and the search for the coefficient of determination or adjusted R^2 are performed with the help of SPSS software following the multiple linear equations below:

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 \quad (1)$$

In where sequence are:

Y = Implementation Delay;

X_1 = Finance;

X_2 = Human Resources;

X_3 = Job Scheduling Method;

X_4 = Job Implementation Methods;

X_5 = Design Changes;

X_6 = Material;

X_7 = Peralatan;

b_0 = Konstanta;

$b_1, b_2, b_3, b_4, b_5, b_6, b_7$ = Regression Coefficient.

4. Results and Discussion

The number of questionnaires collected was 45 with the value is 0.3081. From the results of the validity test, all indicators are declared valid because they have a value greater than 0.3081. The reliability test was done by calculating the Cronbach Alpha coefficient. A questionnaire is reliable if the Cronbach Alpha value is greater than 0.7 or 70%. In this test, the variable regarding the causes of the time delay on the construction project is tested. From the reliability test results, it was found that there is 1 variable that has an r value below the r table value of 3.081, thus do

re-testing it by reducing the variable. After re-testing, it is found that all indicators are valid and reliable and can be tested further.

In this study, we used factor analysis and multiple linear regression methods to measure answers from a questionnaire distributed to 45 respondents like consultants, contractors, and owners. This method got the value of 0.796 on KMO and Bartlett's test so that it meets the requirements namely above 0.5 and significance must be less than 0.005.

Based on the findings above, there are two most dominant factors causing time delays are Job Scheduling Method Factor and Work Implementation Method Factor. Detail factors can be seen in Table 1.

Table 1. Summary of Regression Analysis Results

Variables	Coefficient β	T _{count}	P-value	note
Constant	0,343	0.727	0.472	Not significant
Finance Factor (X1)	-0.130	-0.812	0.422	Not significant
Human Resources Factor (X2)	0.182	1.714	0.095	Not significant
Job Scheduling Method Factor (X3)	1.057	7.725	0.000	Significant
Work Implementation Method Factor (X4)	-0.358	3.120	0.003	Significant
Review Design Factor (X5)	-0.048	-0.723	0.474	Not significant
Material Factor (X6)	0.169	0.906	0.371	Not significant
Equipment Factor (X7)	0.050	0.409	0.685	Not significant

$\alpha = 0.05$

$R^2 = 0.765$

$R = 0.875$

F-hitung = 17,218

F-tabel (0.05, 6, 39) = 2.340

p-value = 0.000

t-tabel (0.05, 37) = 2.026

Table 2. Community Test on Factors Job Scheduling Methods

Manifest Variable	Items	Score
X3.2	Job Implementation Scheduling Method does not comply with the provisions	0.851
X3.3	Waiting for shop drawing approval	0.821
X3.1	Ncorrect / Ideal scheduling planning method	0.413

As shown in Table 2, the indicator of factor of the Job Scheduling Method Factor that most influences the delay is the Method of scheduling the execution of work not in accordance with the provisions (X3.2) with a communality value of 0.851. The strategy that can be used to tackle this problem is before the work begins to strive for prepare an implementation efficient schedule so that the implementation can be carried out appropriately to reduce time and costs, the stages can be carried out properly, and if there is a critical progress delay, immediate restructuring can be done immediately.

Table 3. Community Test on Work Method Implementation Methods

Manifest Variable	Item	Score
X4.1	The stages of implementation are not in accordance with the provisions	0.786
X4.2	Work is nearing the end of the year	0.786

As shown in Table 3, the two indicators of the factors of the job implementation method that most dominant influences of delay is the same as both, The implementation stage is not in accordance with the provisions (X4.1) with a communality value of 0.786 and the Implementation of work nearing the end of the year (X4.2). The strategy used to overcome this are follow the planned schedule so that there is no overload or underload of workload, continue to control the progress of the work planned in the implementation schedule, and pay attention to implementation of work that will approach the end of the year carefully and earlier before the end of the year.

We can deduce that from 26 factors causing time delays in structural work on construction projects, there are 2 (two) domain factors causing namely Job Scheduling Method Factor and Work Implementation Method Factor. Group A is related to job scheduling method, scheduling method, job implementation is not in accordance with the provisions, waiting for shop drawing approval from the commitment maker official. Group B is having to do with a work implementation method such as stages of implementation are not in accordance with the provisions and work

implementation is nearing the end of the year. Meanwhile, the most dominant factor in the delay of state elementary school No.027 building construction project in Samarinda is the job scheduling method (X3) with a Coefficient value of β of 1.057. The present results are relevant to the previous studies Gebrehiwet and Luo 2017 [20]; Zhang et al. 2019 [21]; Doloi et al. 2012 [3]; Assaf and Al-hejji 2006 [5]; Hossain et al. 2019 [6]; Yau and Yang 2012 [7]; J.-B. Yang, Yang, and Kao 2010 [4].

5. Conclusion

This research reveals that one of the most critical factors of construction delay is the lack of commitment we found there are 26 factors that caused delays in building construction projects. The job scheduling method is reported as the most dominant factor which is the obstacle in carrying out building construction projects. The results showed quite good. Some strategies are needed for implementing building construction projects where working time can be optimized with minimum cost. Before the work begins, they required to prepare an implementation schedule in accordance with the stages of work so every stage can be carried out properly, and if there is a delay in progress of the work critically then it can quickly be changed in scheduling work.

6. Conflicts of Interest

The authors declare no conflict of interest.

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