

An Analysis of Delay Causing Factors in Implementation of working construction Project (Case Study: Building of the Agriculture Office in Masohi City, Central Maluku Regency)

Jevericov Tetelepta, Nelda Maelissa , Abraham Tuanakotta

State Polytechnic, Ambon, Indonesia

Abstract— Agriculture Office Construction Project located in Masohi City, Central Maluku. In this agricultural office construction project the project owner worked together with the Office of Public Works and Spatial Planning in Central Maluku. The contractor is PT. Olovia Indah and her consultant is CV. Tricipta Consultant. Building level 2 with a size of 88m x 14m, contract value of Rp. 4.7221 billion ,the source of the funds is district budget. Central Maluku. The duration of work is 150 days, in working day reseacherbut the realization is more than 150 days.Based on this problem, the reseacher are interested in analyzing the factors causing delays in the implementation of construction project work.The method was Principal Component Analysis (Principal Component Analysis) is the analysis of multivariate transforming the variables of origin which are correlated into new variables that are not correlated with reducing the number of these variables so as to have smaller dimensions, but can be explained largely diversity of original variables. The data collection techniques in this study are the interview method, observation method and literature method.There were 26 respondents and 22 variables obtained 9 Main Components. The number of factors formed is seen in the Initial Eigen Values Total which is equal to or greater than one ($\lambda \geq 1$). Component 1 (project resource factor) is the most influential component among the other components. This is indicated by the highest total component eigen value (factor) was 4,200 with variables: (Discipline of labor, Damage to materials in the workplace, storage place for materials / materials, Late payment by the owner). The least effect on the construction implementation, namely Component 9 (Surrounding environment), this component (factor) had a total eigen value of 1.083 with variables: (Surrounding environment).

Keywords— Delaying Factor, Principal Component Analysis, Eigen Value.

I. INTRODUCTION BACKGROUND OF THE RESEACHER

The Agriculture Office Construction Project is located in Masohi City, Central Maluku. In this project the project owner works closely with the Office of Public Works and Spatial Planning in Central Maluku. The contractor is PT. Olovia Indah and her consultant are CV. Tricipta Consultant. Building level 2 with a size of 88m x 14m, contract value of Rp. 4.7221 billion , - the source of the funds the district budget. Central Maluku. The duration of work is 150 calendar days, but the realization is more than 150 calendar days. Based on this problem, the reseacher are interested in analyzing the factors causing delays in the implementation of construction project work.

II. LITERATURE REVIEW

A. Delaying Project

Delay in construction projects means increasing the time to carry out the planned completion and stated in the contract documents. Inadequate completion of work is a deficiency in the level of productivity and of course all of this will result in waste of funding, whether in the form of direct financing spent on government projects, or in the form of swelling investment and losses on private projects. The active role of management is one of the main keys to the success of project management. An assessment of the project schedule is needed to determine the fundamental change steps so that delays in project completion can be avoided or reduced.

B. Delaying Construction Projects often experience delays.

It can even be said that almost 80% of projects have been delayed (Budisuanda, 2011). Project delay often repeats itself on the aspects that are affected as well as the factors that influence it. Frequent delays in the work of the planned schedule can be caused by several things, it could be due to internal factors namely;

1. Delaying due to Contractor's mistakes, including:

- Delay in starting project implementation.
- Workers and Executors lack experience.
- Too late to bring in equipment.
- The less active foreman.
- Poor work plan.

2. Delaying due to Owner error

- Late payment installments by the Contractor.
- Delay in land supply.
- Making a big job change.
- The owner assigns another contractor to work on the project.

And external factors namely;

3. Delaying caused by other than the two parties above, among others;

- As a result of fire that is not the fault of the contractor , consultant , owner.
- As a result of war, earthquake, flood, or other disasters.
- Monetary change.

A construction project is said to be successful if it can be completed in a timely manner as scheduled, according to the budget, according to the desired specifications and to obtain satisfaction from interested parties in it (Majid, 2006).

C. The Causing Factors of Delay

Time is one of the constraints in project management in addition to cost and quality. Project delays will affect other aspects of the project. For example, increasing costs for efforts to speed up work and increase project costs. Another impact also often occurs is a decrease in quality because work is 'forced' to be done faster than it should so that it allows some technical things to be 'violated' in order to reduce project delays.

The factors that influence the project delay according to Suyatno , 2014 (thesis) are:

1. Material related delays.

In project implementation, there are often some materials prepared by the owner. Problems will occur if the owner is late in providing material to the contractor from the

scheduled time. The project cannot be continued, labor productivity is low due to unemployment, which results in project delays.

2. Delay in labor.

Lack of skills and expertise of workers can result in low labor productivity resulting in a long time in completing the project.

3. Slow resource mobilization

The mobilization referred to in this case is the movement of suppliers to project locations, between locations within the project, and from within the project site to outside the project site. This is strongly influenced by the provision of project roads and the time of delivery of tools or materials.

4. Improper planning.

delays cause loss of income from buildings that should have been able to be used or leased delays in the completion of the project due to increased overhead due to increased implementation time, so detrimental due to the possibility of rising prices due to inflation and rising labor costs, will also depend on contractor capital which is most likely to be used for another project.

5. Lack of technical personnel.

The amount of labor needed in each stage of project implementation varies , depending on the size and type of work. Planning that is not appropriate to the needs in the field can cause problems because labor is a resource that is not easily obtained and is very expensive.

III. RESEARCH METHODOLOGY

A. Research sites

Project for the Construction of the Agriculture Office of Masohi City, Central Maluku Regency. This Project Is Located To The Left Of The Masohi City Civil Registry Office JlnNamaelo, Masohi City, Central Maluku Regency, Maluku 97511.

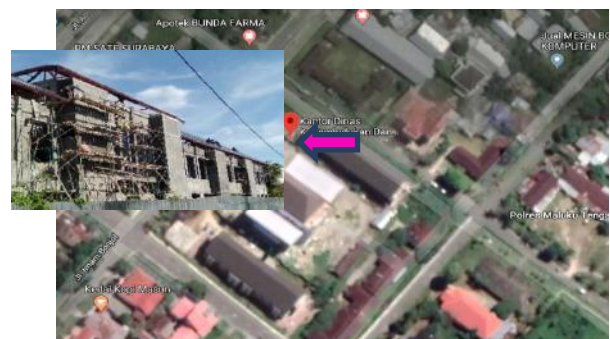


Fig.3.1 : Layout of the Masohi City Civil Registry Office (Google maps source)

B. Technique of data collection

Technique of data collection are describe bellow :

1. Interview (Interview)

The interview is used as a collection technique and if the researcher wants to do a preliminary study to find the problem that needs to be investigated, and also if the researcher wants to obey things from the respondents in more depth.

2. Observation

In addition to the interview method, the observation method was carried out to complete the data needed and obtain a picture of an event or event to answer the research question.

3. Questionnaire

Data collection is done by way of giving a set of questions or a written statement to the respondent to answer. Questions or written statements to respondents to answer. Questionnaires are efficient data collection techniques if the researcher knows for sure the variables to be measured and knows what can be expected from the respondent .

4. Literature

Literature research is conducted to support the interview and observation methods that have been conducted. The collection of information needed is done by looking for references relating to the research conducted, references can be obtained from books or the internet.

5. Data Type

The types of data used in this paper are:

1. Primary Data, data that the reseacher can directly in the field in the form of: questionnaire and interview
2. Secondary Data, Data that the author can from the planning office / owner in the form: a project image and company history.

C. Technique Of Data Analysis

For processing the data the reseacher used principal component analysis by using of the SPSS 23 for windows program .

Principal Component Analysis (*Principal Component Analysis*) is the analysis of *multivariate* transforming origin variables are correlated into new variables that are not correlated with the reduction of the number of variables that have smaller dimensions but can explain most of the diversity of the original variables.

Suppose that you have p variables originating from X, namely $X_1, X_2, X_3, \dots, X_p$, where assumptions will be taken as follows:

$$X \sim Np (U, \Sigma) = (X_1, X_2, X_3, \dots, X_p)$$

$$E (X) = U, Cov(X) = \Sigma$$

The study was conducted on N individuals, where each individual will be investigated as many as p variables. These observations can be written as matix N Nx_p as follows:

$$X = \begin{bmatrix} X_{11} & X_{12} & \dots & X_{1p} \\ X_{21} & X_{22} & \dots & X_{2p} \\ \dots & \dots & \dots & \dots \\ X_{N1} & X_{N2} & \dots & X_{Np} \end{bmatrix}$$

With the mean vector μ and the variance matrix. From the variance matrix the covariance can be derived from the root characteristic, namely $\lambda_1 \geq \lambda_2 \geq \lambda_3 \geq \dots \geq \lambda_p \geq 0$ with the equivalent feature vector, namely $\alpha_1, \alpha_2, \alpha_3, \dots, \alpha_p$.

Depreciation of the original variable X with the new variable Y can be formulated as follows:

$$Y = \alpha_{11} X_1 + \alpha_{12} X_2 + \dots + \alpha_{p1} X_p$$

$$Y = \alpha_{12} X_1 + \alpha_{22} X_2 + \dots + \alpha_{p2} X_p$$

$$\dots \dots \dots$$

$$Y = \alpha_{1p} X_1 + \alpha_{2p} X_2 + \dots + \alpha_{pp} X_p$$

The selection of α is made so that $Var (Y) = \alpha' \alpha = 1$ can be determined from the equation

$(\Sigma - \lambda I) \alpha = 0$. To solve this problem the Lagrange function or the Langrange Multiplier Method is precisely used, and can be formulated as follows:

$$Y = \alpha' \Sigma \alpha - \lambda (\alpha' \alpha - 1)$$

By maximizing the above equation, the main component will be obtained.

The first main component is able to explain the greatest data variance so that $Var(Y_1) = \lambda_1$ and the covariance between each major component = 0. This means that the main components do not correlate with each other. The first major component is a linear combination of origin-weighted variables which can account for the greatest diversity, and so on for the other main components. The total variance of data that can be emphasized by each major component is the proportion between the characteristic root (λ) of the component to the number of characteristic roots or the covariance variance trace matrix which is formulated as follows:

$$Tr \Sigma = \lambda_1 + \lambda_2 + \dots + \lambda_p = \sum_{j=1}^p \lambda_j$$

Thus, the percentage of variance that can be explained by the jth major component is:

$$\frac{\lambda_j}{Tr\Sigma} \times 100\%$$

In the analysis of the main components, from the main components there are selected k main components that have been able to explain the diversity of data is quite high, for example around 80% - 90%. As an illustration, suppose that p is large and it is known that 80% - 90% of total diversity has been able to be explained by one, two, or three main components first, then the major components have been able to replace the p variable variables from the past rules, usually those can be used as a representative to explain diversity is the main component that has a root feature value (λ) minimum = 1 or in other words $\lambda \geq 1$. With consideration, the main component has a root feature value below 1, the contribution in explaining the diversity of data is very small.

The number of main components formed is the same as the number of original variables. Reduction (simplification) of dimensions is carried out with the criteria for the percentage of diversity of data explained by the first few main components. If the first few main components have explained more than 75% of the diversity of the original data, then the analysis is sufficient to do up to the main components.

The reviewer also uses the Likers scale to determine the score on the questionnaire to be distributed to respondents, the **Likert Scale** is a psychometric scale that is commonly used in questionnaires and is the scale most used in research in the form of surveys. The name of this scale is taken from the name of RensisLikert, who published a report explaining its use. When responding to a question on a Likert scale, respondents determine their level of agreement with a statement by choosing one of the available choices. Usually there are five choices of scale with a format like this:

- a. For answers that have no effect given a score of 1
- b. For rather influential answers given a score of 2
- c. For influential answers given a score of 3
- d. For answers quite influential given a score of 4
- e. For very influential answers given a score of 5

This questionnaire was delivered directly by researchers to the intended location and provided explanations regarding matters relating to researchers. The completion of the questionnaire was distributed to respondents by means of being delivered directly by the researcher, with the intention of asking the respondent to fill out the questionnaire. If the respondent is busy enough, the researcher leaves the questionnaire, then requests that it be filled directly by the employee or staff working directly on the project being carried out and will be taken after a lapse of several days.

After all data obtained through the questionnaire is collected, then the next stage is held, namely data analysis. The analysis of this study uses the main component method, which is operated by using the SPSS 23 for windows program, to find some of the factors that are given influencing the delay in project implementation, as well as the factors that influence and determine the most based on the ranking order in each assessment of each company studied.

Broadly speaking the analysis of the data the author is doing as follows:

Table 3.1 The form of raw data matrix.

Variable	1	2	3	4	5	22
Individual							
1							
2							
3							
4							
.							
.							
26							

1. After the raw data matrix has been compiled, extraction of these variables can be carried out. For this purpose, the researcher use the principal component analysis method. The number of variables formed can be seen from the number of *eigen values* in the *total variance table explained*.
2. Factors that are formed, in many cases do not adequately describe the differences between the factors that exist, so that the *factor rotation* process needs to be done. The purpose of rotation is to clarify the variables that fall into certain factors.
3. After the factors are completely formed, the process is continued by naming the existing factors.

D. CONCEPTUAL FRAMEWORK OF THE RESEARCHER

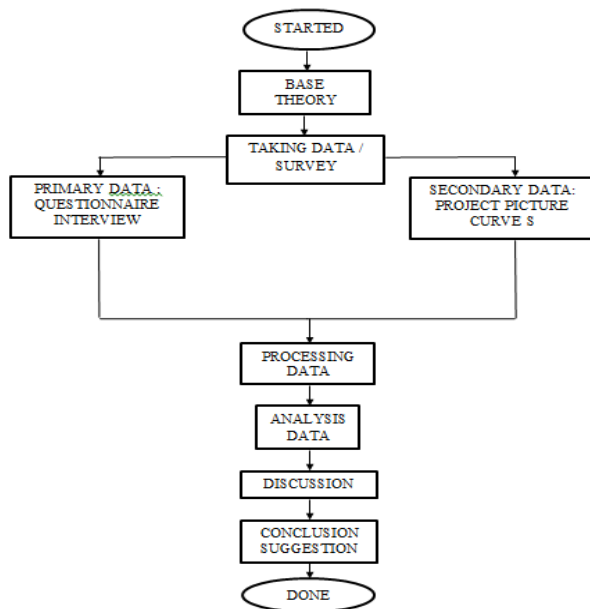


Fig.3.2: Conceptual Framework of the researcher

IV. DISCUSSION

A. Project Overview

The following data and specifications from the Masohi City Agriculture Office Construction Project:

SP (Contract): NUMBER: 640.01 / BP / KPA / DPUPR-TR / APBD / VIII / 2018

Date : JULY 16, 2018

Job: Construction of the Agriculture Office

Volume : 1 (One) Package

Contract Value :Rp. 4,722,100,000

Location :Masohi City District

Source of Funds: District Budget. Central Maluku

Execution Time : 150 (One Hundred Fifty) Calendar Days

Fiscal Year : 2018

Implementing Contractor : PT. Olovia Beautiful

Supervisory Consultant : CV. Tricipta Consultant

B. Data Analysis

Based on the results obtained with Principal Component Analysis with the help of the SPSS program, 9 main components were formed (can be seen in the Appendix). The number of components known through the *initial eigenvalues*. *Initial Eigen Values* figures indicate the importance of the factors of each variable in calculating the overall variance of the analyzed variables. *Component* shows the number of factors or the number of variables. The number of factors formed is seen in the *Initial Eigen Values* numbers that are equal to or greater than one ($\lambda \geq 1$).

Based on the results of the analysis with SPSS contained in the Appendix, for the total matrix visible main components formed up to the 9th component. It was concluded that 9 main components have been able to explain the diversity of data amounting to a cumulative percentage of 82.487%. Then obtained variables that clustered to form a factor. The *component matrix* table in the appendix shows the distribution of the variables on the 9 factors formed, but the results of this matrix need to be rotated first to clarify the variables that fall into certain factors.

In the matrix, the numbers listed in each column are called *factor loading*, which shows the correlation between a variable with each factor formed. Each variable is grouped into factors according to the largest *factor loading* number. For example, the variable "Number of Workers" has a loading factor : 0.119 (in component 1); 0.049 (in component 2); 0.320 (in component 3); 0.727 (in component 4); 0.023 (in component 5); 0,125 (in component 6); 0.070 (in component 7); 0.404 (in component 8); 0.269 (in component 9). The '-' sign only points to the direction of the correlation. So based on the *loading factor* number, the variable "Number of Workers" can be included in component 4. This method of grouping also applies to other variables.

After each of these variables are grouped into components (factors) based on the largest *loading factor* number, the final result is as follows:

Component 1, this component is the most influential component among other components. This is indicated by the *eigen value* of this component which is the highest at 4,200. Component (factor) 1 consists of variables:

1. Discipline of the workforce.
2. Material damage at work.
3. Material storage.
4. Late payment by the owner.

Based on the variables clustering in component 1, this factor can be called a project resource factor. The most dominant delay factor for the whole class with a large influence of 19.092%.

Component 2, is the second most influential component with an *eigen value* of 2.782 and consists of variables:

1. Lack of materials and materials.
2. Material changes in form, function and specifications.
3. Access to project sites.
4. Effect of rain on construction activities.

Based on the variables clustering in component 2, this factor can be called a material factor and a supporting project. The most dominant delay factor for the whole class with a large influence of 12.645%.

Component 3, this component has an *eigen value* of 2,216 and consists of variables:

1. Workforce expertise.
2. Shortage of labor.
3. Hold a job change.

Based on the variables clustered in component 3, this factor can be called the Labor factor. The most dominant delay factor for the whole class with a magnitude of 10,072%.

Component 4, this component has an *eigen value* of 1.902 and consists of variables:

1. Number of workers.
2. Poor quality of goods.
3. Equipment damage.

Based on the variables clustering in component 4, this factor can be called the Tool and material factor. The most dominant delay factor for the whole class with a large effect of 8.645%.

Component 5, this component has an *eigen value* of 1.774 and consists of variables:

1. Management of materials and materials that are less than optimal.
2. Delay in delivery / equipment provider.
3. Design changes by the owner.

Based on the variables clustering in component 5, this factor can be called Management. The most dominant delay factor for the whole class with a magnitude of influence is 8.062%.

Component 6, this component has an *eigen value* of 1.573 and consists of variables:

1. Material delivery delays.
2. Something unexpected happened.

Based on the variables clustered in component 6, this factor can be called a non-technical factor. The most dominant delay factor for the whole class with a magnitude of effect is 7,150%.

Component 7, this component has an *eigen value* of 1.426 and consists of one variable: There is less work added.

Based on the variables clustering in component 7, this factor can be called a plus less occupation factor. The most dominant delay factor for the whole class with a large influence of 6.480%.

Component 8, this component has an *eigen value* of 1.192 and consists of one variable, namely: Equipment productivity.

Based on the variables clustering in component 8, this factor can be called the equipment productivity factor. The most dominant delay factor for the whole class with a large influence of 5.417%.

Component 9, this component has an *eigen value* of 1.083 and consists of one environment variable .

Based on the variables clustering in component 9, this factor can be called an environmental factor. The least delay factor is the effect for the whole class with a large effect of 4.923%.

V. CONCLUSION AND SUGGESTION

A. CONCLUSION

From the results of the analysis and discussion it can be concluded that:

1. From the analysis results obtained 9 factors that influence the delay in building works at the Masohi City Agriculture Office, namely:

- a. Project Resource Factor.
- b. Material factors and project support.
- c. Labor Factor.
- d. Tool and material factors.
- e. Management Factor.
- f. Non-technical Factors.
- g. Work Factor added less.
- h. Equipment productivity factors, and
- i. Surrounding environmental factors.

From the test results of SPSS program, it is obtained that the project resource factor was the most influential factor among other factors. This is indicated by the highest *total eigen value* of this factor which was 4,200. And the smallest influence on the implementation of construction was the environmental factors around this factor has a *total eigen value* of 1.083.

2. The solutions for the late implementation of the project include:

- a. By way of replacing a less productive workforce with a more productive, the duration of the construction work is highly dependent on labor productivity.
- b. Workers must be careful when lifting the material in order to avoid damage.
- c. Request that the owner immediately make a payment, otherwise the project will experience delays and not in accordance with the progress of the work.

B. SUGGESTION

Based on the results of this study it can be suggested:

- a. Construction service company that carry out the project should pay attention to labor discipline.
- b. For the elements that play a role in handling the problem of the construction service industry, these results can be

a significant input in relation to their duties and responsibilities.

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