

Analysis of Factors Causing Project Delay using Importance Index Method (Case Study: West Java International Airport Terminal Roof Structure & Roof Cover Project)

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Abstract

The government is build a new international airport in Majalengka, West Java. The concept of the West Java International Airport is the feel of a peacock on the roof of the terminal that makes the characteristics of grandeur, uniqueness, and good looking. During the construction of this project, there were various obstacles causing delays in the work. The purpose of this study is to determine the factors causing project delays and provide suggestions for managing the most influencing factors so that the causes of delays can be minimized so that the project can run according to a predetermined schedule. In this study the authors used quantitative research methods by distributing questionnaires to PT.BA employees as contractors who had been selected as competent respondents. This study uses 3 stages of questionnaire using validity and reliability tests using SPSS software version 25 and data analysis of importance index (IMPI). The results of this study are the West Java International Airport Terminal Roof Project has the 5 factors that most influence the work delays. including constraints on the procurement of imported materials (68.23%), delays in the delivery of material (67.24%), limited work access, due to other work related / lack of access (66.96%), improper construction methods causing errors during construction (64.92%) , and the application of new / specialized technologies that are not yet well known (62.30%).

Keywords

Airport Terminal Project, Importance Index, Project Delay Analysis

1. Introduction

The airport terminal is a building at the airport where passengers move between ground transportation and facilities that allow them to board and leave the plane. The concept and shape of the airport terminal is very diverse, each region carries its own concept and uniqueness. The concept of West Java International Airport (BIJB) for example, the thick nuance of peacocks on the roof of the terminal is characteristic. The concept of peacocks was chosen because west Java has one of the typical dances of peacocks and philosophically peacocks are symbols of the grandeur, uniqueness, beauty, and character of the country of Indonesia. The selection of imported materials and the difficulty of the construction installation system is not presented to support the success of the concept. PT.BA as a Design and Build contractor appointed to work on the frame and roof covering of the airport terminal. Where design and build contracts make the stage of planning, procurement – equipment – installation / workmanship as the responsibility of the provider of goods and serv ices. The volume of work is very large and has many internal or external aspects or technically or non-technically that affect the implementation of its construction. Basically construction projects are not separated from existing constraints that can cause delays in the project. Project delays for contractors will suffer loss of time and cost, therefore the profit expected by the contractor will be reduced, or even not profited at all. For the owner of the project (Owner) the delay in completion of the work of a project can cause losses to the up time of operation of the project results, so that the use of the project construction results becomes backwards or late (Durdyev and Hosseini, 2019).

1.1. Problem Identification

At each stage of the project it is an inevitable that the delay of work accompanies its implementation. Similarly, in the Framework and Roof Cover project of BIJB Airport Terminal, there are various factors that result in project delays such as: delay in importing material, poor management, poor human resources, limited access to jobs, and so on. The project experienced a delay in completion which was originally due to be completed on

November 30, 2017 and was only completed on January 31, 2018 with the application for an extension addendum 3 times. In case the project has never been done research into the causes of work delays, therefore in this study, researchers will conduct an assessment of the cause of project delay by using the Importance Index (IMPI) method to assess what factors are classified as high categories on the project. Research is expected to be used as a lesson learn so as not to repeat it if it finds a similar project.

1.2. Problem Formulation

Based on the identification of the problem and in order for the discussion to be more targeted according to its purpose, the problem is formulated as follows:

1. What are the factors that cause delays in the construction of bijb airport's frame and roof covering projects that are classified as high ?
2. How do we prevent delays and reduce the impact on bijb airport's frame and roof cover projects?

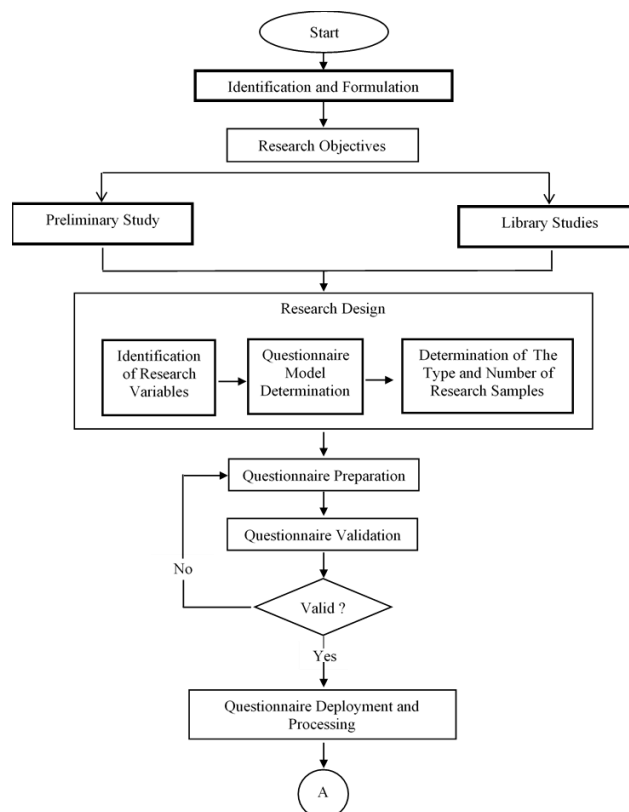
1.3. Research Objectives

The objectives of this research include:

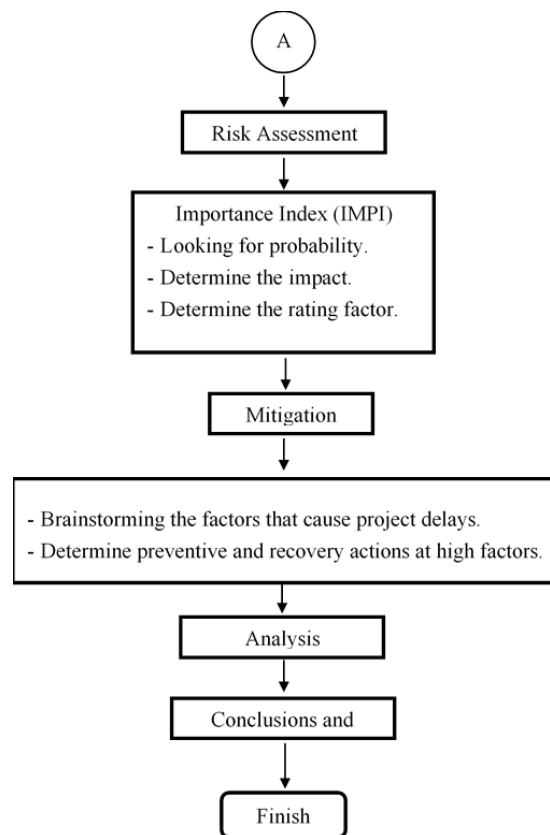
1. Identify the causative factors of delays that fall into the high category during the construction of the bijb airport framework and roof cover project.
2. Knowing the prevention of delay factors and reducing the impact of delays on the frame project and roof covering of BIJB airport.

2. Methodology

Here's a flow chart of the research in the image below :



Picture 1. Flow Chart Of Research Method
 Source: Processed Author,2020



Picture 2. Flow Chart Of Research Method (Continued)
Source: Processed Author,2020

2.1. Population

Population is a generalized region consisting of objects/subjects that have certain qualities and characteristics set by researchers to be studied and then drawn conclusions (Sugiyono, 2014) . In this study, the population that became the object in the study was employees / staff and workers in the Framework and Roof Cover Project of BIJB Airport. The selection of population characteristics of this study was conducted with the consideration that employees/staff have a direct role in ongoing projects. The population will be used as a questionnaire for respondents in this study as many as 30 respondents.

2.2. Data Collection And Instrument Development Techniques

Research instruments are tools used by researchers in measuring natural and social phenomena that correspond to the research variables. The instruments used in this study are primary data and secondary data. (Sugiyono, 2014).

Primary data is data collected by researchers directly with a questionnaire survey consisting of several questions addressed to respondents. While Secondary Data is obtained from project management and reviewing previous research.

Research variables to be used as questionnaires, previously validated by experts.. Whether the variables are relevant or inappropriate, and experts will add some additional variables if the graded variables presented do not yet represent the problem that occurred.. Here are the variables agreed by experts:

Table 1. Research Variables.

Category	Variable	Cause Of Delay
Office Work		Design Stage
	X.1	Company Management Where For One Human Resource Is Allocated For Various Projects.
	X.2	Many Changes Wanted By The Project Owner & The Changes Are Too Late.
	X.3	The Short Time Allotted For The Design Stage
	X.4	Engineering Stage
	X.5	Inadequate Company Resources Such As Software, Hardware And Human Resources
	X.6	The Product Of The Engineering Team Is Demanded To Be Economical
X.7	Lack Of Experience Of The Engineering Team In Preparing A Budget Plan (Boq)	
		Involve External Engineering Experts

Source: Processed Author,2020

Table 2. Research Variables. (Continued)

Category	Variable	Cause Of Delay
Office Work	X.8	Shop Drawing / Detail Engineering Stage Work Complexity
	X.9	Lack Of Availability Of Experts For Technical Problems
	X.10	The Logic Of The Design Decisions Taken Is Not Communicated Effectively
	X.11	Late Shop Drawing Approval
	X.12	The Scope Of Work Of The Shop Drawing Team Is Too Much (Including Production & Installation Drawings, Boq Manufacturing, To Material Orders. Procurement Stage
	X.13	The Company's Financial Capability
	X.14	Poor Procurement Management
	X.15	The Procurement Team Is Demanded To Get Very Cheap Prices
	X.16	Inaccurate Boq Estimates
	X.17	Obstacles In The Procurement Of Imported Materials
Workshop Work	X.18	The Material Is Not Available In The Local Market Production Stage
	X.19	Late Delivery Of Materials
	X.20	The Equipment Used Is Outdated & Equipment Maintenance Is Inadequate
	X.21	Equipment Capacity That Does Not Match The Workload
	X.22	Drawing Details Are Not Complete
	X.23	Lack Of Appreciation From The Company
	X.24	Job Monitoring And Evaluation Are Not Carried Out Delivery Stage
	X.25	The Delivery Location Is Far From The Workshop
	X.26	Delivery Requires A Large Fleet, And Can Only Be Done At Night Install Stage
	X.27	Poor Site Management
Site Work	X.28	Unclear Work Policies And Procedures
	X.29	Incorrect Construction Methods That Cause Errors During Construction
	X.30	Application Of New / Special Technology That Is Not Well Known
	X.31	Production Objects Are Not In Accordance With The Conditions, So Field Adjustments Are Required
	X.32	Inadequate Equipment
	X.33	Slow Decision Making
	X.34	Unstable Weather Conditions
	X.35	Access To Work Is Limited, Because It Is Related To Other Jobs (Lack Of Access)
	X.36	The High Standard Quality Of Work Requested By The Owner Causes The Work To Be Repaired. Commercial Stage
	X.37	Difficult Collection Bureaucracy
	X.38	The Project Owner (Owner) Is Difficult To Be Meet

Source: Processed Author,2020

2.3. Data Analysis

The data that has been obtained from the field through literature studies and processing of questionnaire variables based on previous research, is then analyzed using the following statistical techniques:

1) Validity Test

Validity tests are measured when items are arranged using more than one factor (between factors with each other there are similarities). Measuring the validity of these factors by correlated between the factor score (the summation of items in one factor) and the total factor Score (the total of the total factors). Measure the validity of an item by correlated between the item score and the total score of the item. The validity of the item is indicated by the correlation or support of the total item (total score). In determining whether or not an item is used, calculate the correlation between each statement and the total score using the product moment correlation formula. This study used Statistical Package for Social Sciences (SPSS 25.0 for Windows) software.

2) Reliability Test

Reliability test aims to know the level of data reability generated by an instrument to ensure consistency of research instruments in the same concept. A commonly used reliability analysis is cronbach alpha (C-alpha) analysis. This research conducted reliability test with statistical package for social sciences (SPSS 25.0 for Windows)software programtools.

3) Frequency index

Frequency index is a percentage of the probability or frequency of events of a risk calculated based on the respondent's answer. Frequency index value is obtained by formula:

$$FI (\%) = \frac{\sum_{i=1}^5 a_i n_i}{5N} \times 100$$

Remarks:

FI : Frequency Index.

ai : Weight given by respondents with a value of i; ai = 1,2,3,4, and 5.

ni : The number of respondents who responded with the value i.

N : Total number of respondents.

4) Severity index

Severity index is a percentage of the event impact value of a risk viewed in terms of time, cost, andkulaitas calculated based on the respondent's answer. Severity index obtained with formula:

$$SI (\%) = \frac{\sum_{i=1}^5 a_i n_i}{5N} \times 100$$

Remarks:

SI : Severity Index

ai : Weight given by respondents with a value of i; ai = 1,2,3,4, and 5

ni : The number of respondents who responded with the value i

N : Total number of respondents.

5) Importance Index

Calculation of importance index (IMPI) analysis can be done after obtaining values from frequency index (FI) and severity index (SI). This calculation is used to indicate the importance index or index of importance of multiplication between frequency and impact. importance index obtained with formula:

$$IMPI (\%) = \frac{FI (\%) \times SI (\%)}{100}$$

Remarks :

FI : Frequency Index

SI : Severity Index

IMPI : Importance Index

Table 3. Value Range Classification

No	Scale	Remaks
1	Index 0% -20%	Low
2	Index 21% -40%	Moderate
3	Index 41% -60%	Signifxant
4	Index 61% -100%	High

Source : Tobing;et al, 2019

3. Result and Discussion

3.1. Result

The data of the analysis results is obtained by the method that has been presented above. The data shown is the top 10 peringkat rankings. The results are as follows:

Table 4. Importance Index Analysis Results

No	Cause Of Delay	Fi%	Si%	Impi%	Category
1	Obstacles In The Procurement Of Imported Materials			86.00 79.33 68.23	High
2	Late Delivery Of Materials			82.67 81.33 67.24	High
3	Access To Work Is Limited, Because It Is Related To Other Jobs (Lack Of Access)			76.67 87.33 66.96	High
4	Incorrect Construction Methods That Cause Errors During Construction			72.67 89.33 64.92	High
5	Application Of New / Special Technology That Is Not Well Known			71.33 87.33 62.30	High
6	Involve External Engineering Experts			70.67 76.00 53.71	Significant
7	The Material Is Not Available In The Local Market			72.67 72.00 52.32	Significant
8	Equipment Capacity That Does Not Match The Workload			69.33 69.33 48.07	Significant
9	Poor Procurement Management			70.00 68.00 47.60	Significant
10	The Product Of The Engineering Team Is Demanded To Be Economical			66.67 65.33 43.56	Significant

Source: Processed Author,2020

3.2. Discussion

Based on the results of the importance index analysis, then get 5 faktor factors with high category and will be cari searched for preventive and recovery measures..

From 5 (five) causes of project delays, to 3 (three) experts have provided advice on preventive and recovery measures, namely:

1. Obstacles in the procurement of imported materials
 - a. Preventive Measures: Complete import licensing documents, Divide shipments into multiple shipments, so that when problems occur, other shipments are affected, as well as create alternative designs with materials using domestic products.
 - b. Recovery Action: Ask third parties (import services bureaus) for permission to adjust the updates of applicable regulations in Indonesia, ask the supplier for responsibility to complete the material permits already in order, and to seek alternatif material in the country or import from other countries.
2. Late delivery of materials
 - a. Preventive Measures: Provide gap time to suppliers so that material delivery is not late, find alternative suppliers with greater production capacity, and divide cutting size orders into several suppliers, in order to shorten procurement time.
 - b. Recovery Action : Change the design with the specifications of material type standart that is many in the market, look for ready materials that suit the needs and buy materials with type standart for priority zone needs and modified themselves.

3. Access to work is limited, because it is related to other jobs (lack of access)
 - a. Preventive Measures: Conduct coordination meetings with MK consultants and other contractors, convey limited access to work, can be a contributing factor to delays, and ask permission to prioritize access to our work.
 - b. Recovery Action: Look for alternative methods such as installing temporary aids to increase job access as well as bring greater equipment and further reach.
4. Inappropriate construction method that causes errors during construction
 - a. Preventive Measures : Conduct research related to the method of work with similar projects, and selected the most appropriate method. Then create a mockup/trial before applying in the field related methods to be used.
 - b. Recovery Action : Bring in external party experts, to replace and improve the methods that have been used with other methods that have been implemented in similar projects.
5. Application of new / special technologies that are not well known
 - a. Preventive Measures: Recruiting experts by contracting projects / joining operations companies that have often worked and describing the work in detail the stages of the work to be carried out and conducting training on workers.
 - b. Recovery Action: Bring in external experts to be able to standby and provide continuous briefing on work that is not yet well known to local workers and supervise the work until the work is completed or to a narrow level until the worker understands and is ready to stay.

4. Conclusion

Based on the results of the analysis and discussion of the data collected from the respondents' answers in this study, it can be concluded that:

1. Factors causing delays in the West Java International Airport Terminal Roof Structure and Roof Covering project are the delay in procuring imported materials, limited access to jobs (lack of access) and inappropriate construction methods due to the type of work using new technology that is not well known.
2. Work delays can be minimized by careful preparation and planning from all stakeholders, good procurement methods, involving experts / professionals and also doing mockups if you find work with new technology that is not well known.

4.1. Advice

Based on the results of the analysis of the research and all the limitations of the existing research, the authors suggest for further research on the same topics, including:

1. All data from this study is preliminary data in the research on The Causative Factors of Delay in The Roof Project of West Java International Airport which is reviewed from the contractor's point of view. The authors suggest, if there will be further research on this topic, expect to increase the number of respondents from the owner and consultants of MK. As well as conduct additional analysis using the Critical Review method on the factors causing the delay of existing projects, as has been done by Chandra and Putra, (2016). with the title of the study " Critical Review untuk Membandingkan Faktor-Faktor Penyebab Keterlambatan Kontruksi di Negara Maju dan Berkembang.

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