

The Impact of Construction Material Supply Delays on Contractor X in Jakarta, Indonesia

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ABSTRACT: Construction materials are the main component in the physical implementation of the work, so their availability on time, in the right amount, and according to specifications greatly affects the smooth running of activities in the field. Without good planning and management of material procurement, projects are at risk of delays, cost overruns, and even a decrease in the quality of work results. In addition, an inefficient procurement system can cause disruptions to work schedules, reduce labor productivity, and trigger conflicts between contractors, suppliers, and project owners. This research was conducted at contractor X using a survey method (questionnaire) to determine the Impact of Material Supply Delays. The results indicated a positive relationship between the variables “Delay in Supply of Construction Materials” (X) and “Impact on Contractor X” (Y) with a regression equation $Y = 11.524 + 0.141X$. While the correlation also shows a positive relationship between the two variables. This is a very meaningful input for contractor X, so they must make careful planning regarding the supply of construction materials for each project undertaken.

KEYWORDS: Delay, Construction Material, Contractor X

INTRODUCTION

Construction materials are one of the crucial resources in project execution. Material procurement, as a vital part of construction activities, can account for about 50 to 70% of the overall project cost. This process is not only limited to purchasing activities, but includes various important stages, from identifying needs, purchasing processes, inventory management, production monitoring, receiving and storing materials at the project site, to managing related documents. Therefore, material procurement must be carefully designed and managed in a structured manner.

However, sometimes in a construction project implementation, there is a delay in the procurement of the required materials. Delays in the supply of materials in construction projects refer to situations where the materials required for project implementation are not available or arrive at the project site beyond the predetermined schedule. Some of the factors that can cause this delay include theft, design changes, complexity of technical drawing details, material orders that do not meet specifications, damage during shipping or moving, delays in material delivery, and the use of materials that are not in accordance with specifications (Ariyanto et al., 2019). This situation can cause project costs to exceed the predetermined budget, as additional time is required for project implementation as well as extra costs such as material storage costs that are not in accordance with the plan. In addition, material delays can force work to be carried out in a hurry and not in accordance with

predetermined standards, which ultimately has a negative impact on the quality of work (Darasepti et al., 2022).

Delays in material procurement can cause delays in project implementation. The impact of losses will be directly felt by the parties actively involved in the project, especially the contractor. The contractor will experience losses both in terms of time and cost, because the originally expected profit is not achieved, even at the risk of not making a profit at all. This is due to additional costs such as labor wages, extension of equipment rental periods, and other activities that require extra expenses. According to Putra and Miftahul (2018), delays in project implementation can tarnish the reputation of contractor companies, which in turn makes it difficult for them to gain trust in subsequent projects and potentially lose other work opportunities. Meanwhile, for project owners or service users, delays in work completion have an impact on disrupting the operating schedule of project results, so that the use of development results is delayed or not as planned.

Based on the preliminary data that has been collected, research is conducted on the impact of delays in material supply on contractor X located in Jakarta. This contractor has 12 years of experience in working on construction projects in the Jakarta, Bogor, Depok, Tangerang and Bekasi areas. Even during the COVID-19 pandemic in 2020-2021, the contractor was still actively operating, unlike a number of other contractors who stopped their operational activities during that period.

LITERATURE REVIEW

A. CONSTRUCTION MATERIALS

Construction materials or building materials are the main components used in building activities, either obtained directly from the surrounding environment or specially produced. Some naturally occurring materials, such as clay, sand, wood, and stone, have long been utilized as support in the building process. The following is the definition of construction materials according to several researchers

1. According to Chudley and Greeno (2006):

“Construction materials are substances used in the construction of buildings and civil engineering structures, chosen based on their suitability, durability, availability, and economic factors.”

2. According to Jackson and Dhir (1996):

“Construction materials refer to any materials used for construction purposes, including natural and synthetic products, which must meet specific physical and mechanical properties to ensure structural integrity.”

3. According to Illingworth (1993):

“Construction materials are those materials used in the building process, which significantly influence the performance, cost, and quality of the finished structure.”

While according to Ervianto (2007), construction materials in a project can be divided into two, namely materials that will become a permanent part of the structure (permanent materials) and materials needed by contractors in building projects but will not become a permanent part of the structure (temporary materials).

1. Permanent Materials, are materials required by the contractor to form the building and are inherently fixed as an element of construction material. This type of material is listed in the contract documents (working drawings and specifications).
2. Temporary Materials, which are materials needed by the contractor in building the project, but will not become part of the building after use. This type of material is not included in the contract document, so the contractor is free to determine the materials to be used and their suppliers. For this type of material, the contractor does not get paid explicitly. So the executor includes the cost of this material in the cost of implementing the various works included in the contract.

Construction materials have a very important function in project management. According to Neville and Brooks (2010), Construction materials serve a crucial function in providing strength, durability, and stability to a structure. They must be chosen carefully to ensure safety and long-term performance. Meanwhile Mamlouk and Zaniewski (2011) said that The function of construction materials extends beyond structural performance; they also affect the aesthetics, thermal comfort, and sustainability of buildings. Whereas Mehta and Monteiro (2014) argued that Construction materials are fundamental in defining the behavior of

structures under various environmental and load conditions, thereby playing a functional role in both design and safety.

B. THE IMPORTANCE OF GOOD CONSTRUCTION MATERIAL SUPPLY PLANNING

Construction material supply is a series of processes that include planning, procurement, transportation, storage, and distribution of building materials needed in the implementation of a construction project. This process aims to ensure the availability of materials of the right type, quantity, quality, and time of use, so as to support the smooth implementation of the project efficiently and effectively.

According to Hendrickson (2000), the supply of construction materials is part of project management which includes planning, procurement, control, and distribution of materials to the project site to ensure that the implementation of construction can run according to a predetermined schedule, cost, and quality. Meanwhile, according to Soeharto (1999), the supply of construction materials is a process that includes identifying needs, scheduling arrivals, and managing material logistics so that they are available on time and according to specifications, to support the smooth implementation of the project as a whole.

Good construction material supply planning is very important in construction project management. According to Ervianto (2007), material planning and control includes aspects of procurement, purchasing, shipping, receiving, storage, and distribution of materials to the project site. Careful planning allows the integration and coordination of all components of the material management system, so that control of material flow can be carried out effectively. This helps reduce the risk of project delays due to untimely arrival of materials. In addition, effective material management can reduce costs and time, and ensure the quality of construction work, so that the project can achieve its goals efficiently. Thus, good construction material supply planning plays an important role in ensuring the smooth, efficient and overall success of a construction project.

RESEARCH METHOD

This research is based on the framework as shown in Figure 1 below.

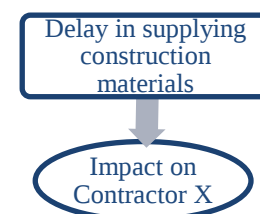


Figure 1. Research Framework

Based on the framework previously described, the following hypothesis is formulated:

Ho: Delays in the supply of construction materials have a significant influence on contractor X.

Ha: Delays in the supply of construction materials do not have a significant effect on contractor X.

To prove the above hypothesis, a survey method was used through the distribution of questionnaires addressed to personnel involved in the X contractor project, such as project managers, site managers, field supervisors, implementers, logistics departments, and HSE personnel. The total number of respondents who actively participated in filling out the questionnaire was 37 people. Data analysis was carried out using regression and correlation methods, assisted by SPSS statistical software, to determine the extent of the relationship between variable X (delay in supplying construction materials) and variable Y (impact on contractor X).

RESULT AND DISCUSSION

Based on the results of data processing using SPSS statistical tools, a series of stages have been carried out towards regression and correlation analysis. One of them is testing the validity and reliability of the questionnaire using the Cronbach's Alpha technique, with 37 respondents. From this test, the Cronbach's Alpha value was obtained at 0.835. Referring to the test standard, because the value is greater than 0.6, the questionnaire instrument is declared reliable. Meanwhile, normality testing using the Monte Carlo method shows a result of 0.079 which is greater than 0.05. This indicates that the questionnaire data is normally distributed.

The next step is to conduct a Linear Regression test to determine the direction of the relationship between the independent variable and the dependent variable, whether the relationship is positive or negative. In addition, this test also aims to predict changes in the value of the dependent variable if there is an increase or decrease in the independent variable. The results of the regression analysis can be seen in Table 1 below.

Table 1. Regression Test Results

Coefficients ^a					
Model	UnStandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
Constant	11,524	1,842		5,861	0,000
Impact on Contractor X	0,141	0,042	0,497	3,296	0,047

Based on Table 1, a significance value of 0.047 is obtained which is smaller than 0.05. This shows that the regression test results can be used to predict that variable X has an effect on variable Y. The resulting regression equation is $Y = 11,524 + 0,141X$. This result indicates a positive

relationship between the variables “Delay in Supply of Construction Materials” (X) and “Impact on Contractor X” (Y).

Furthermore, correlation testing is carried out which can be seen in Table 2.

Table 2. Pearson Correlation Test Results

Correlations			
Model		Delayed Supply Construction Materials	Impact on Contractor X
Delayed Supply Construction Materials	Pearson Correlation	1	0,497
	Sig. (2-tailed)		0,047
	N	37	37
Impact on Contractor X	Pearson Correlation	0,497	1
	Sig. (2-tailed)	0,047	
	N	37	37

Based on Table 2, it can be concluded that there is a positive relationship between variable X and variable Y with a correlation level that is in the medium category. This shows that delays in the supply of construction materials have a significant impact on contractor X.

According to Hardina (2022), risks in the supply chain can have an impact on contractors in the form of delays in work or not achieving the target implementation time. This generally occurs due to the process of delivering materials that do not match the number of needs in the field, thus requiring additional time for re-delivery. Meanwhile, Hatmoko in Saputra (2017) stated that this risk greatly affects the decline in profits obtained by the contractor. Another risk is the increase in material prices which can cause cost deviations from initial planning. In addition, sudden requests from the owner often force contractors to conduct additional surveys to find suitable materials, and often cause additional costs that must be borne by contractors due to disrupted financial flows.

Huqban et al. (2020) stated that the material supply chain has a significant influence on project performance, which is 70%. Meanwhile, the remaining 30% is the impact of other factors in the material supply chain that have not been studied in depth. One of the main factors causing delays in the supply of materials in construction projects in Simeulue Regency, Aceh Province, is the material distribution process, most of which must be imported from outside the island. This is due to the limited availability of materials that meet the standards for use in construction projects in the region.

When analyzed in more depth, delays in the supply of construction materials can have various impacts on the contractor, including:

1. Disruptions to the Project Schedule, such as:
 - a. Work is delayed because the required materials are not available on time.
 - b. Potential revisions to the work schedule, which could trigger readjustments in the sequence of work and the use of labor.
2. Increased Costs
 - a. Increased labor costs, as workers may still have to be paid even if work is delayed.
 - b. Liquidated damages if the project is not completed according to the contract.
 - c. Additional costs for emergency material procurement or express delivery.
3. Quality degradation, under emergency conditions, contractors may use substitute materials that are not up to specifications, which can impact the final quality of the project.
4. Logistics and Coordination Issues
 - a. Disrupts the flow of work between subcontractors or other technical teams, as delays in one item can hold up other work.
 - b. Overlapping of previously scheduled work can lead to inefficiencies.
5. Reputational Loss
 - a. The client or project owner may lose confidence in the contractor.
 - b. The impact may be the loss of future project opportunities, especially if the project is financed by the government or a large institution.
6. Contract Conflicts, this can lead to legal disputes or claims between parties, especially if the delay is deemed to be the contractor's negligence.

In general, delays in the supply of construction materials have a multidimensional impact that can disrupt the overall success of the project.

To overcome delays in the supply of construction materials, contractors need to make various strategic efforts that are integrated in project management. The first step that must be taken is to prepare a thorough and detailed material procurement plan, which is adjusted to the project implementation schedule. This planning includes identifying the type, quantity, arrival time, and priority of materials needed during the project.

Furthermore, the contractor must establish good and intensive communication with the supplier. This aims to ensure that the entire procurement process runs according to the agreed time, while anticipating potential obstacles from the vendor side. In this case, the use of contracts with clear Service Level Agreement (SLA) provisions is very important to provide assurance of delivery accuracy.

The use of technology such as project management software is also very helpful in monitoring the status of material procurement in real-time. With this monitoring system, contractors can find out the position of materials that are in the process of being delivered and take immediate

action if there is a delay. In addition, contractors are also advised to provide backup stock or buffer stock, especially for materials that are critical and have a long procurement time.

In emergency situations, accelerated procurement through express delivery methods or replacement of materials with other equivalent types can be done with the approval of the planner or supervisor. To reduce risks in the future, contractors also need to diversify supplier sources so as not to rely too much on one party. In addition, good cooperation and coordination between internal teams, such as the field team, logistics team, and project management, must be maintained so that the flow of information related to materials remains smooth.

Finally, any delays should be evaluated for lessons learned in subsequent projects. By conducting root cause analysis of delays and documenting them as part of continuous improvement, contractors can minimize similar risks in the future. Through this approach, it is expected that construction projects can run more efficiently, on time, and within budget.

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