



THE EFFECT OF THE RISK FACTORS ON THE PERFORMANCE OF CONTRACTORS IN BANDA ACEH, INDONESIA

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ABSTRACT

In the implementation of construction projects, contractors often face the risk factors that affect the performance and hinder the success of a construction project. Construction project is a mission, undertaken to create a unique facility, product or service within the specified scope, quality, time, and cost (Chitkara, 2004). Many contracting companies that grows and develops in Banda Aceh, therefore, the contractor should be able to maintain its performance in order to compete with other contractors. The purpose of this study is to identify risk factors that have a frequency of occurrence is very frequent in the implementation of construction projects in Banda Aceh. Risk factors reviewed are a risk factor in the implementation of construction projects in general. The collection of primary data collected through the distribution of questionnaires to the respondents that having the small qualification in Banda Aceh. Performance of contractor is a result of work accomplished by the contractor in carrying out a construction project. Contractor performance associated with risk factors gained during the performance of construction projects and can influence the success of a construction project itself. The main problem in this study is what the risk factors that can affect the performance of the contractor. Barcarini (2004) noted that construction projects are notorious for overrunning budgets because of unforeseen factors.

Keywords: risk, importance index, contractors, project construction, performance.

1. INTRODUCTION

Risk factors in construction projects can arise from a variety of sources, and vary both the likelihood and impact on the success of the construction project. In order to carry out construction projects on time according to the schedule, the contractor in general will face the risk factors that can hinder the success of the implementation of construction projects and affect performance. Uncertainties can cause losses that can lead to increased costs, time delays, and reduced project quality (Simu, 2006). The research problem is what the risk factors that can affect the performance of contractors in the execution of construction projects. The purposes of this study are to identify factors of risk that have an impact the performance of contractors in the execution of construction projects. The scope of this study is limited to the risks accepted by the contractor in Banda Aceh, where the respondents in this study are contracting company that has grade 5 in carrying out construction projects. The research method used is through several stages, starting with the formulation of the problem, the study of literature, primary data collection and secondary data collection, data processing using statistical software, and data analysis and discussion.

In order to achieve the intended objectives, it is necessary primary and secondary data. Primary data are collected through the distribution of questionnaires; the respondents are the non-qualifying small contractors who live in Banda Aceh. Secondary data are names of contractors who are registered as members of the association GAPENSI (Society of Construction Contractors).

Calculation analysis of Importance Index (II) can be performed after the value obtained from frequency index (FI) and severity index (SI). Data processing are done by statistical methods and computational tools utilizing the

software Statistical Package for Social Sciences (SPSS 21.0 for Windows) and Microsoft Excel. Based on the index value frequency is the objective of this research have been achieved with the acquisition of ten risk factors that having impact fatal influence on the implementation of construction projects in Banda Aceh, Indonesia. The benefit of this study for researchers expected to increase knowledge of the risk factors contained in the implementation of construction projects, especially the risk factors that have a frequency of occurrence is very frequent in the implementation of construction projects that could affect the successful implementation of construction projects. Meanwhile, contractors are expected can be input on the risk factors that have a frequency of occurrence is very frequent in the implementation of construction projects in order to improve the performance of the contractor.

The construction industries in the implementation of infrastructure development, which has variety of project types, the volume of which must be done, as well as methods of implementation are complicated and complex in its implementation will certainly have risk factors that could affect the execution of construction. This is due to construction projects generally involve many parties with different skills, coordination of many activities, and require a large fee. Implementation of successful project management is measured on the achievement of project objectives, among others, the project completed on time, within budget, in accordance with the technical specifications, the use of project resources effectively and efficiently, and accepted by the customer (Kerzner 2006).

1.1 Definition and types of construction project

Shah (2004) defines the notion of a series of projects are planned and executed in sequence with logic and using many types of resources are constrained by the



dimensions of cost, quality, and time. Meanwhile, according to Oberlender (2000), project is an activity undertaken to produce something that is expected of a request. Projects may include the design, construction, or a combination of design and construction.

Ervianto (2005) explains the construction project can be divided into two groups of buildings, namely:

- a) **Buildings:** homes, offices, factories and others. The characteristics of the building are:
 - Construction projects produce where people work or live;
 - Work is carried out on a relatively narrow and foundation conditions generally known;
 - Management is needed, especially for the Progress of work.
- b) **Civil constructions:** roads, bridges, dams, and other infrastructure. The characteristics of the building are:
 - Construction projects to be implemented to control nature for the interest of men;
 - The work carried out on site wide or long and foundation conditions are very different from each other in a project;
 - Management is required to solve the problem.

Schexnayder (2003) generally classifies four types of construction projects, namely:

- a) Construction of residential: Construction includes residential homes and apartments.
- b) Commercial Construction: Construction includes commercial buildings, shopping malls, schools and libraries and so on.
- c) Construction industry: Construction industry includes mills, oil refineries, pipelines, power generation facilities, and other facilities required by public services and basic industries.
- d) Heavy engineering construction: Heavy engineering construction includes dams and levees, canals, roads, bridges, railways and tunnels.

1.2 Parties involved in construction projects

Husen (2009), states that in order for the wants and needs of each party in the project can be realized in a concerted effort to achieve the goals and objectives, it is necessary to identify the organization or individual (stakeholder), both from internal and external, which will play a role affecting the project and should be anticipated

during the project. Stakeholder project generally described as below.

- Project Manager: a person responsible for managing the project.
- Customer: a person / organization to use the project product.
- Project Organization: hierarchy / order of individual tasks and authority.
- Sponsor: provider of funding for the project.

1.3 The Project success

Kerzner (2006) mentions the definition of success of the project to change the perspective or judgment, which 20 years ago, the success of the whole project is defined as the completion of the project activity in terms of time, cost and quality. At this time, the definition of success of the project has been modified to include the completion of all work items include:

- In the period of time that allocated,
- The costs budgeted,
- Meets the performance (quality) / level specification,
- Acceptance of the good by the user,
- The minimum change in the scope of work that can be accepted,
- Without disturbing the main work flow of the organization,
- Without changing the corporate culture.

1.4 Risk Factors in construction projects

Laia (2010) understanding of the risk factors mentioned in the context of the project can be defined as a translation of the unfortunate consequences, both financially and physically, as a result of decisions made or the result of environmental conditions the location of an activity. Santoso (2004) mentions the risk factors contained in construction projects are many and varied, but not all risk factors need to be predicted and considered to start a project because it will take a long time. According to Subramanyan et al. (2012), uncertainty in construction projects are affected by interest rates. In the study by Memon *et al.* (2011), they concluded that uncertainty in construction projects are affected by lack of experience. Doloi (2013) found that uncertainty in construction projects are affected by delays in subcontractor's work. The level of the interest rate applied depends on the developmental rate of inflation, Risk factors affecting the implementation of construction projects and their source can be seen in Table-1.

**Table-1.** Risk factors affecting implementation of construction.

	Categories	Risk Factors	Sources
1	Physical	Natural disasters	(Ahmed, 1999)
		Land surface conditions	(Ghosh, 2004)
		Groundwater conditions	(Ghosh, 2004)
		Uncertainty conditions in the field	(Ghosh, 2004)
2	Labor and Experts	Skills and expertise	(Kangari, 1995)
		Discipline	(Suharti, 2009)
		Productivity	(Ahmed, 1999)
		Lack of teamwork	(Suharti, 2009)
		Arguments workers	(Ahmed, 1999)
		Lack of workforce	(Laia, 2010)
3	consultant	Labor strike	(Ahmed, 1999)
		Design errors	(Doloi, 2013)
		Incomplete design data	(Doloi, 2013)
4	Owner	Inadequate planning	(Subramanyan, 2012)
		Financial Failure owner	(Subramanyan, 2012)
5	Material	Change order	(Suharti, 2009)
		Delay in delivery	(Suharti, 2009)
		Damage during shipment	(Suharti, 2009)
		Damage during storage	(Ghosh, 2004)
6	Equipment	Low quality material	(Suharti, 2009)
		Productivity and efficiency	(Doloi, 2013)
		Lack of equipment	(Suharti, 2009)
		Age tools unsuitable	(Suharti, 2009)
7	Construction Process	Damage to equipment	(Suharti, 2009)
		Changes in construction work due to difficult to implement	(Ahmed, 1999)
		The quality of work is not good / quality of work	(Ahmed, 1999)
		Communication problems	(Suharti, 2009)
		Coordination problems	(Suharti, 2009)
		The number of real jobs	(Kangari, 1995)
8	Approximately Environmental Projects	Wrong method implementation	(Laia, 2010)
		Access to the project site	(Ahmed, 1999)
		Traffic jam	(Suharti, 2009)
		Disturbances	(Suharti, 2009)
9	Safety and accidents	Lack of equipment and material storage	(Laia, 2010)
		The machine is not checked before operating	(Suharti, 2009)
		Workers do not include protective equipment	(Doloi, 2013)
		Safety regulations are not implemented	(Laia, 2010)



10	Politics or Regulation	Changes in government regulations	(Ahmed, 1999)
		Government policies that led to the Cessation of the project	(Subramanyan, 2012)
		Complicating the matter licensing	(Laia, 2010)
		Monetary instability	(Laia, 2010)
11	Finance	Availability of funds	(Ghosh, 2004)
		Late payments by owner	(Ahmed, 1999)
		Inflation	(Rauzana, 2015)
		Fluctuation	(Rauzana, 2015)
		Material prices are more expensive than expected	(Suharti, 2009)
		Incremental cost of leasing equipment	(Ghosh, 2004)
		Wage workers are more expensive than slightly its estimate	(Suharti, 2009)
The high cost of equipment maintenance	(Suharti, 2009)		

2. MATERIALS AND METHODS

Data used for research activities include primary data and secondary data. Primary data was obtained through a questionnaire survey and secondary data from a list of company names listed contractor who live in Banda Aceh.

Measurement scales to the questionnaire using an ordinal scale. Supangat (2007) explains the sequence of ordinal scale is numeric symbols or codes of significant levels of sequence can be started from the most negative to the most positive or otherwise. Measurements this study was conducted to measure the frequency of occurrence of risk factors. Details of measurement to measure the frequency of occurrence of risk factors, the scale is a scale of 1 (never), scale 2 (rarely), scale 3 (fairly often), scale 4 (often), and the scale of 5 (very often).

The questionnaire is designed in two parts, the respondent characteristics and risk factors affecting the implementation of construction projects.

- A. Characteristics of respondents and decryption of project, In this section, the questions are provided aims to determine the long experience of the respondents work in the construction, education, respondent, respondent experience, and others. A questionnaire was open-ended.
- B. Risk factors affecting the performance of the contractor on the construction project implementation,. This section deals with the risk factors affecting the implementation of construction projects.

Questionnaires conducted by distributing questionnaires to the respondents by way of direct transfer, with the intention of asking for the willingness of the respondents fill out the questionnaire. If the respondents are busy, the researchers left the questionnaire, and then asked that filled directly by the respondent and taken after

a lapse of a few days. The data was collected during 1.5 months.

A target respondent in this study is the head of the company or the project manager of a construction company based in Banda Aceh. Target respondents restricted to contractors who are registered as members GAPENSI qualified Non-Small (qualifying grade 5). Determination of the minimum number of samples is done using Slovin, with the analysis of fault tolerance allowed is 10%. Step sample calculations performed as follows:

$$n = \frac{N}{1 + (N \cdot e^2)} = \frac{35}{1 + (35 \times 0,1^2)} = 26$$

Processing of research data using the help of a software program Statistical Package for Social Sciences (SPSS 21.0 for Windows) and Microsoft Excel. The results of this treatment in the form of charts and tables that is easier to understand. In addition, Microsoft Excel and Microsoft Word are also used to assist the analysis of research data.

According Arikunto (2002), reliability analysis is points to the notion that something instrument trustworthy enough to be used as a data collection tool. Reliability analysis commonly used is the analysis Cornbach Alpha (c-alpha). The test using C-Alpha coefficients must be greater or equal to 0.6 is considered to test the value of the appropriateness of the questionnaire were used. The formula used is as follows:

$$r = \frac{k}{(k-1)} \left[1 - \frac{\sigma_b^2}{\sigma_1^2} \right]$$

where

r = reliability of the instrument
k = number of items questions



σ_b^2 = Variant grain

σ_1^2 = Total variance

The formula for the variance and variance items total:

$$\sigma_1^2 = \frac{\sum Xt^2}{n} - \frac{(\sum Xt)^2}{n^2}$$

$$\sigma_b^2 = \frac{Jki}{n} - \frac{Jks}{n^2}$$

Where

σ_1^2 = Total variance

σ_b^2 = Variant grain

$\sum Xt^2$ = total number of respondents Squares

$\sum Xt$ = total number of respondents

JKi = sum squared whole grains

Jks = sum of squares subject

n = number of respondents

Frequency index shows the frequency of risk factors that affect the performance of the contractor Banda Aceh. For frequency analysis calculation index (FI) using the formula in the following equation (Bernstein and Bernstein, 1999 quoted by Long, *et al*, 2008).

$$\text{Frequency Index (F.I)} = \frac{\sum_{i=1}^5 a_i n_i}{5N}$$

Where

I = index response categories (1, 2, 3, 4 and 5)

a_i = weights associated with the response to the value of i (1, 2, 3, 4, 5 respectively)

n_i = frequency of response to i as a percentage of total respondents for each factor

N = total number of respondents

Severity index is an index of the impact events of risk factors that affect the performance of contractors in Banda Aceh. For analysis calculation severity index (SI) using the formula in the following equation (Bernstein and Bernstein, 1999 quoted from Long, *et al*, 2008):

$$\text{Severity Index (S.I)} = \frac{\sum_{i=1}^5 a_i n_i}{5N}$$

Where

I = index response categories (1, 2, 3, 4 and 5)

a_i = weights associated with the response to the value of i (1, 2, 3, 4, 5 respectively)

n_i = frequency of response to i as a percentage of total respondents for each factor

N = total number of respondents

These calculations are used to show the importance index or interests index of the multiplication of the frequency and impact on the risk factors that affect the performance of the contractor in Banda Aceh. Results of calculation of the index show the importance of the most influential factors on the performance of contractors in carrying out construction projects. (Bernstein and Bernstein, 1999 quoted from Long, *et al*, 2008), the formula used is as follows:

Importance Index (II) = FI x SI

where

FI = frequency index

SI = severity index.

3. RESULTS AND DISCUSSIONS

The questionnaire in this study was open-ended, where the purpose of this study is to identify the factors influencing the performance of the contractor in the execution of the project. All of the factors that affect the performance of the contractor in the execution of projects are analyzed based on respondents' answers. The analysis used is:

- Reliability analysis,
- Frequency analysis,
- Analysis of frequency index

To test the questionnaire that has been compiled, author used a tool to achieve the objectives of this research are used Cronbach Alpha for reliability analysis. The testing using Cronbach Alpha coefficients must be greater or equal to 0.6. Calculation of reliability analysis carried out with the help of Statistical Package for Social Sciences (SPSS 21.0 for Windows). Calculation of Cronbach Alpha coefficients for the frequency of occurrence of the risk is 0.895 which is greater than 0.6. This means that the questionnaire could be used as a tool to achieve the objectives of this study.

This section describes the results of the processing of questionnaire data through Microsoft Excel program on risk factors that affect the performance of contractors who show importance value index based on frequency of occurrence and impact of the level of influence of risk, so it is known what the risk factors that most influence on the performance of contractors in the implementation of construction projects. The calculation result Importance Index (II) can be seen in Table-2.

Based on the results of the calculation of the value of importance index (II), which is obtained by multiplying the value of FI and SI, then obtained risk factors that influence the performance of contractors in the execution of construction projects. From these factors selected 10 rank order ranking for factors that most influence the performance the contractor. 10 of these factors can be seen in Table-2.

**Table-2.** Ten risk factors that affecting performance of contractors.

Factors	II	Rank
Change order	0,399	1
The uncertainty of field conditions	0,378	2
Security disturbances	0,369	3
Monetary instability	0,366	4
The high cost of maintenance tools	0,356	5
The quality of work is not good / quality of work	0,343	6
Delays in delivery	0,334	7
The price of the material is more expensive than expected	0,298	8
Design errors	0,276	9
The damage tools	0,221	10

4. CONCLUSIONS

From the calculation of the index obtained ten importance of risk factors that influence the performance of contractors in the execution of construction projects, namely; Change order has a value of 0,399, The uncertainty of field conditions has a value of 0,378, Security disturbances has a value of 0, 369, Monetary instability has a value of 0, 366, The high cost of maintenance tools has a value of 0, 356, The quality of work is not good has a value of 0, 343, Delays in delivery has a value of 0, 334, The price of the material is more expensive than expected has a value of 0, 298, Design errors has a value of 0, 276, The damage tools has a value of 0, 221.

Change order is a risk factor that was ranked first, Importance Index value of 0.389 out of ten risk factors that most affect the performance of contractors in Banda Aceh. Change the order is a written form of consent or agreement to modify, adding, or change the the work of contract documents that occur during the execution of the construction after the signing of the contract between the owner and the contractor (Fisk, 2006). Change the order at the time of project implementation are often due to the unfolding of the new conditions when implementing construction projects. Causes of change orders in the project implementation is often the case in a design change of the owner, improving the quality of design, the design is less complete and less complete specification. As for the impact that occurs at the risk of change order is a matter of cost and time. In the process of carry out a change (change orders) resulting in the implementation of the project stalled and the addition of job reductions at the same time.

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