

Risk factors affecting the quality of high rise office building projects in DKI Jakarta province

Putri Arumsari*, Andryan Suhendra, Hana Indira

Civil Engineering Department, Faculty of Engineering, Bina Nusantara University
Jakarta, Indonesia 11480

Corresponding author: parumsari@binus.edu

Abstract. Construction project failure can be caused by several factors associated with the quality of the project. The lack of quality standards of the construction method and the in compliance of quality of work in general according to the technical specification of each construction work are some of the factors associated with construction project failure. Risk is the unexpected result that might happen. Risk in a project can influence the productivity, performance, quality and the cost of a project. Even though a project has been planned smoothly, it still has the uncertainty that the project will go as planned. The goal of the research is to categorise risk factors affecting the quality of construction projects. Risk factors will be categorised using the SNI category method. The object of the research will be high rise office building projects located in the DKI Jakarta Province. Questionnaires will be distributed to 20 high rise office building projects and the analysed quantitatively. Based on the result of the categorization, 3 risk factors were categorised as high risks.

Keywords: risk management, quality management, office building, survey, DKI Jakarta

1. Introduction

Construction project is one of the type of project that has the potential of high risk compared to non-construction project. The complexity of the project tend to add the level of risk, as there will be more stakeholders involved, more method of construction used and the use of new technology in the construction project.

Risk is the unexpected result that might happen. Risk in a project can influence the productivity, performance, quality and the cost of a project. Even though a project has been planned smoothly, it still has the uncertainty that the project will go as planned [1]. Construction project failure can be caused by several factors associated with the quality of the project. The lack of quality standards of the construction method and the in compliance of quality of work in general according to the technical specification of each construction work are some of the factors associated with construction project failure. Besides cost and schedule, the quality of the construction project is one of the goals in project management. In accordance to that, all of the equipment, material and method of construction need to meet the quality requirement of the project [2]. Project failure caused by the quality of the project can result in losses to contractors [3].



Due to several factors associated with the quality of the project that causes construction project failure, this research is aim to know the impact of risk on the quality of the project. The result of this research will be the classification of the impact of risk on the quality of the project and will be classified according to the Indonesian National Standard (SNI) quadrant.

2. Risk

2.1. Risk Management

In every business activity including construction activity, there will always be the risk of gaining profits or losses directly or indirectly. In a contractor's point of view, risks are possible outcomes in the line of construction work that have negative impact toward the goals of the project [4] & [5].

Risk has three main elements which are:

- a. **Event** is a situation that happen in a certain place during a certain time period,
- b. **Likelihood** is a qualitative description of a probability or frequency,
- c. **Consequences** is the result of an event, both quantitative and qualitative, in a form of loss [7].

Regarding the risks in a project, risk management is applied during the project cycle. Risk management is an activity to respond to potential risks (that is identified through planned risk analysis or other kind of observation) to minimise the bad consequences that might occur [6]. Risk management is defined as all of the activity regarding the risks, which include planning, assessing, identifying and analysing, handling, and monitoring risks [7]. Risk happens in every construction project and cannot be neglected however can be minimised and transferred so that it can be controlled. The understanding of risk is very important to systematically identify and analyse the risk, to handle and control the risk so that the goal of the project is according to the time, cost and quality planned.

2.2. Risk Classification

The risk classification used in this research is based on the SNI method that can be seen in Table 1.

Table 1. Risk Classification based on the SNI method

RF Value	Category	Steps of action
> 0,7	High Risk	The risk should be lowered into a lower level
0,4 – 0,7	Medium Risk	Improvement steps are needed within a certain timeframe
< 0,4	Low Risk	Step improvement when possible

To classify risks using the SNI method, the RF value need to be calculated using equation 1.

$$RF = L + I - (L * I) \dots\dots\dots 1$$

RF = the risk factor in the scale of 0 – 1

L = the probability of risks occurring

I = the impact of the risks occurring

3. Quality Management

Quality is defined by some expert based on the alignment of its needs and the suitability of its use. The alignment of its needs means that the process and the project is aligned with the specification proposed. While the suitability of its use means that the project can be use according to the goal of the project. The main purpose of Quality Project Management is to ensure that the project satisfied the needs. If the stakeholders are not satisfied by the result of the quality of the project, the team project will therefore adjust the scope, time, and cost of the project to satisfy the needs and expectations of the stakeholders [5].

Construction works need to be done according to the technical specification proposed in the planning stage. Low quality performance can lead to rework which can affect the cost and time performance of the project significantly. The owner of the project not only need the project to be executed within to the budget proposed, but also a guarantee from the contractor that the quality of the end result is according to the specification proposed. Several factors affecting the quality of the project are the owner of the project, the project itself, the environment of the project, the project leaders, the procedure of the project, and the actions of the project management.

4. Methodology

The object of the research are high rise office buildings. Twenty office buildings were selected throughout the DKI Jakarta Province. The methodology of the research can be seen in Figure 1. This research consist of 3 stages of survey. The 1st survey will be conducted to narrow down the 38 variables selected through comprehensive literature review and validated by 5 experts. The 2nd survey is a pilot survey given out to 5 respondents. The aim of a pilot survey is to figure out whether respondent can easily understand the content of questionnaire before spreading the questionnaire to the real respondents. The 3rd survey is given out to 20 respondents to 20 office buildings. The result of the 3rd survey will then be analysed using the risk breakdown structure. Variables are then classified based on the SNI classification method to categorise the variables into high risk, medium risk or low risk.

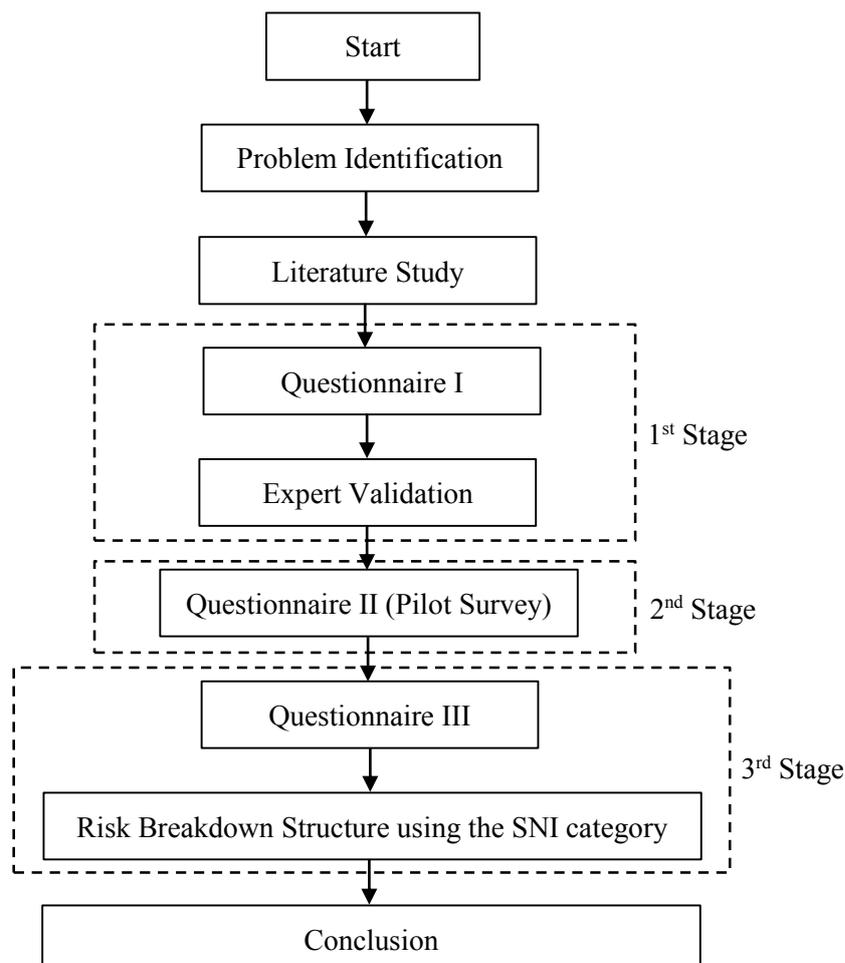


Figure 1. Methodology Study of the Research

5. Analysis

The following are results of the 3 stages conducted in this research:

5.1. 1st Stage

In the 1st stage of survey, questionnaires are distributed to 5 experts with the following criteria:

- Have been working on high rise construction project especially office buildings in DKI Jakarta;
- Have minimum 10 years of experience in the construction project;
- Have minimum an undergraduate degree or have a high position in the construction project.

Experts are asked to fill out the questionnaire to give their opinion on the factors that affect the quality of project in the office buildings project collected through literature study. Their opinions are in the form of responses, corrections, inputs and eliminations of the factors. Through the expert validation 38 factors are narrowed down to 33 factors that can be seen in Table 2.

Table 2. The research variables

Risk No.	Risk Factor	Risk No.	Risk Factor
X ₁	Weak time system control	X ₁₈	Design can't be implemented
X ₂	Bad in the arrangement of activity sequences	X ₁₉	Planner doesn't understand material
X ₃	No evaluation of job specifications prior to implementation	X ₂₀	Incomplete drawings and technical specifications
X ₄	No operation procedure of every work	X ₂₁	Inspection of contractor performance isn't done for each project but only based on reputation in the past
X ₅	Error in understanding contract documents	X ₂₂	There is a change request for a completed job
X ₆	Poor of Safety and Health Management	X ₂₃	Do not create WBS database of similar projects
X ₇	Improper quality management procedures	X ₂₄	Unavailability of project operating procedures for each activity or process
X ₈	Change the scope and work items	X ₂₅	Error handling work by management
X ₉	Lack of manpower	X ₂₆	Poor coordination with sub-contractor
X ₁₀	Lack of labour skills	X ₂₇	Unavailability or not used of job description of each function or position
X ₁₁	There are work accidents and not running safety and health procedures.	X ₂₈	Lack of control and coordination within the team
X ₁₂	Much of the work that must be repaired/repeated due to defects or incorrect.	X ₂₉	Unclear job scope between main contractor and sub-contractor
X ₁₃	Top Management is always late getting job information due to lack of communication and conflicting interests.	X ₃₀	Low level of management discipline

X ₁₄	Project fund planning is not good.	X ₃₁	The existence of internal conflicts within the project management ranks
X ₁₅	It takes a long time to process the request and approval of sample material by the owner.	X ₃₂	Period of payment not in accordance with the contract
X ₁₆	The existence of design cost cuts to fulfil the budget owner	X ₃₃	Incomplete daily report
X ₁₇	Change of design/detail of work at execution time		

5.2. 2nd Stage

On the 2nd stage of the survey, a pilot survey is distributed to 5 respondents with the following criteria:

- a. Have the knowledge and is currently or was involved in the office buildings construction project in DKI Jakarta;
- b. A representative of an office buildings construction project.

The aim of a pilot survey is to provide input on the questionnaire that will be distributed in the 3rd stage of the survey. Respondents will give input whether the questionnaire is easy to understand. The result from the pilot survey shows that the questionnaire is easy to understand, therefore the questionnaire can be continued to be distributed to the 3rd stage of the survey's respondents.

5.3. 3rd Stage

On the 3rd stage of the survey, questionnaires are distributed to 20 respondents from 20 high rise office buildings with the following criteria:

- a. Have the knowledge and is currently or was involved in the office buildings construction project in DKI Jakarta;
- b. A representative of an office buildings construction project.
- c. Have minimum 10 years of experience in the construction project;
- d. Have minimum an undergraduate degree or have a high position in the construction project.

Each respondent will give their judgement and views on the factors that affect the quality of project in the office buildings project based on their knowledge and experiences.

5.3.1 Respondents' profile of the 3rd survey

The 20 questionnaires given out the respondents, all 20 questionnaire were filled out. Therefore the response rate for the survey was 100%. The minimum response rate requirement for a survey is 30% [8]. The profile of the respondents based on their education degree and job position can be seen in Figure 2, and Figure 3 respectively.

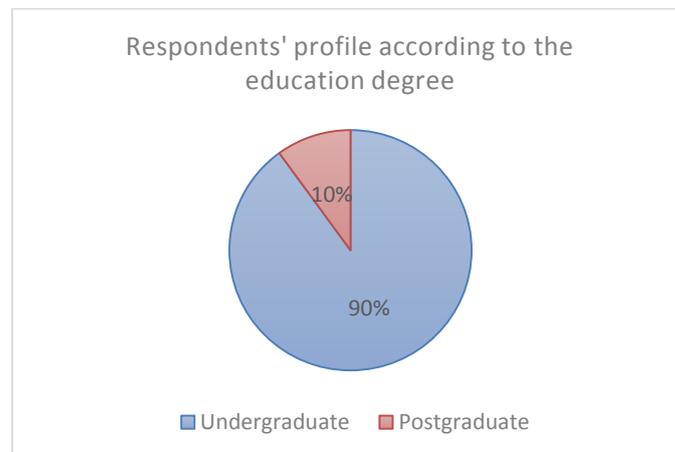


Figure 2. Respondents' profile according to the education degree

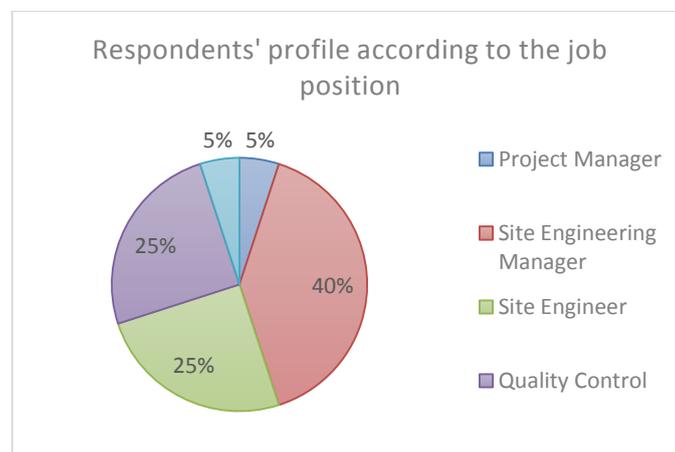


Figure 3. Respondents' profile according to the job position

5.3.2 *Descriptive analysis*

The result from the questionnaire will be analysed using descriptive analysis based on the mode and means values of the frequency and the impact of risk. The result of the average value of frequency and impact can be seen in Table 3.

Table 3. The average value of frequency and impact of the risk factors

Risk No.	Average Frequency	Average Impact	Risk No.	Average Frequency	Average Impact
X ₁	0,3	0,24	X ₁₈	0,33	0,255
X ₂	0,305	0,26	X ₁₉	0,365	0,295
X ₃	0,34	0,27	X ₂₀	0,285	0,285
X ₄	0,35	0,255	X ₂₁	0,34	0,345
X ₅	0,305	0,265	X ₂₂	0,29	0,275
X ₆	0,3	0,265	X ₂₃	0,3	0,255
X ₇	0,3	0,245	X ₂₄	0,345	0,26
X ₈	0,27	0,245	X ₂₅	0,34	0,225
X ₉	0,315	0,265	X ₂₆	0,325	0,25
X ₁₀	0,29	0,26	X ₂₇	0,305	0,28
X ₁₁	0,365	0,175	X ₂₈	0,305	0,26
X ₁₂	0,295	0,25	X ₂₉	0,345	0,255

X ₁₃	0,355	0,25	X ₃₀	0,345	0,255
X ₁₄	0,34	0,235	X ₃₁	0,38	0,25
X ₁₅	0,265	0,28	X ₃₂	0,305	0,24
X ₁₆	0,355	0,315	X ₃₃	0,32	0,31
X ₁₇	0,25	0,28			

5.3.3 Risk factors analysis using SNI method

Using equation 1. the risk factor is calculated to classify the risk according to the SNI category method based on Table 1. The category of each risk factors can be seen in Table 4 and in Figure 4.

Table 4. Risk factors analysis using SNI method

Risk No.	Risk Factor Value	Category	Risk No.	Risk Factor Value	Category
X ₁	0,468	Medium	X ₁₈	0,501	Medium
X ₂	0,486	Medium	X ₁₉	0,552	Medium
X ₃	0,518	Medium	X ₂₀	0,387	Low
X ₄	0,385	Low	X ₂₁	0,568	Medium
X ₅	0,489	Medium	X ₂₂	0,485	Medium
X ₆	0,375	Low	X ₂₃	0,479	Medium
X ₇	0,729	High	X ₂₄	0,515	Medium
X ₈	0,449	Medium	X ₂₅	0,489	Medium
X ₉	0,497	Medium	X ₂₆	0,494	Medium
X ₁₀	0,475	Medium	X ₂₇	0,500	Medium
X ₁₁	0,326	Low	X ₂₈	0,486	Medium
X ₁₂	0,736	High	X ₂₉	0,512	Medium
X ₁₃	0,516	Medium	X ₃₀	0,512	Medium
X ₁₄	0,495	Medium	X ₃₁	0,535	Medium
X ₁₅	0,471	Medium	X ₃₂	0,764	High
X ₁₆	0,558	Medium	X ₃₃	0,531	Medium
X ₁₇	0,460	Medium			

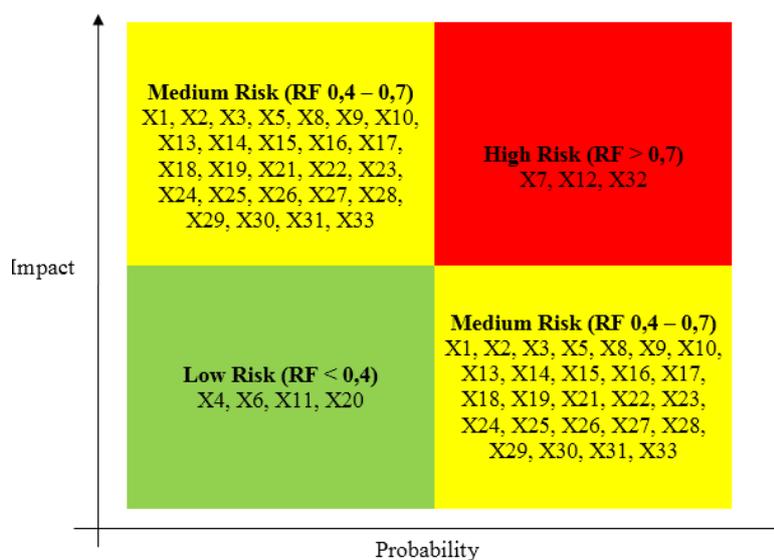


Figure 4. Risk factor category

6. Conclusion

Based on the risk factor category there are 3 risk factors that are identified as high risk, those risk factors are:

- a. Improper quality management procedures
- b. Much of the work that must be repaired/repeated due to defects or incorrect
- c. Period of payment not in accordance with the contract

These 3 factors will need to be lowered down to medium risk or low risk. Risk can be avoided, transfer or mitigated [5]. Similar research has been done in Swaziland South Africa and found 2 major factors affecting the quality of construction projects. Those factors are the use of unskilled, untrained and inexperienced trade subcontractors, sub-suppliers consultants and workforce with little or no skills and knowledge [9]. Project manager's competence, top management support and their competence, interaction between project participants, owner's competence and monitoring and feedback project participants have positive contribution to achieve desired quality level of the construction project [10].

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