Study of Failure Risk Factors for Residential Infrastructure Buildings

Dedy Suryadi, Manlian R. A. Simanjuntak, Basuki Anondho
Graduate Program, Doctor of Civil Engineering, Universitas Tarumanegara
suryadi_cbr@yahoo.co.id

ABSTRACT

Purpose: The risks and uncertainties of construction projects have the potential to cause damage to construction projects. Risk analysis and management are the main features of construction project management to effectively deal with uncertainties and unexpected events to achieve project success.

Design/methodology/approach: Some pertinent risk variables for each classification are six internal, four project risk factors, and four external. Researchers detected 14 external risk factor reasons, 36 internal risk factor causes, 16 project factor causes, and 36 external risk factor causes.

Findings: Researchers suggest project risk management through this study by implementing overall risk management. A properly executed project plan and identified risks as early as possible at a later stage turn into success. Managing risks does not mean avoiding them but identifying them correctly to determine all associated opportunities and hazards for project success.

Research limitations/implications: A good risk management approach anticipates the risk of building failure. It can happen in residential infrastructure projects. The first step in risk management is to study the risk factors for the loss of residential infrastructure buildings. Following an analysis, the project manager generates recommendations or plans for risk reduction in response to the primary risks in infrastructure projects.

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Paper type: Research paper

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I. INTRODUCTION

Construction projects have unique criteria where the criteria for some jobs are very complex and full of uncertainty. Such risks and uncertainties have the potential to have damaging consequences. Therefore, risk analysis and management are essential components of successful project management. There are five most crucial project failure risks: poor quality of work, premature failure of facilities, safety, faulty design, and finances.

Yushar, (2019) finds out who caused the failure of the previous building. He states that the loss of the building had to be re-examined, whose fault it was. However, the contractor bears all risks if the type of contract is a lump sum. The contractor must be responsible for building failures following Article 27 paragraph (3) of Presidential Regulation 16 of 2018 concerning Government Procurement of Goods/Services.

Several other studies identify the causes of building failure. Oyfer (2002) states that construction failures, including quality defects, may stem from not only single but also multiple sources. Meanwhile, Pranoto in Saputra et al., (2016) says that natural factors and human behaviour often influence the basis of building failure. Biological factors are failures due to dynamic changes in nature, such as volcanic eruptions, floods, ocean waves, and earthquakes. Human behaviour also plays a significant role in construction failure.

Vickynason in Saputra et al., (2016) explains that human factors may cause 80% of the total project risk in construction. Oyfer in Saputra et al., (2016) states that the causes of construction defects in America are human
factors (54%), design (17%), maintenance (15%), materials (12%), and unexpected things (2%). Abdul Hamid, (2015) points out that the top-ranking factors critical to project failure reflect typical criteria of unrealistic schedules, inadequate funds and resources, and unclear goals of senior management.

Khalifat et al., (2019) also states that failure factors can be categorized based on the environment into internal and external factors. Financial difficulties faced by contractors and poor planning and scheduling of projects by contractors as the most critical factors of failure. In addition, seven causes of project failure occur mainly due to the inherent shortage of contractors and the inability of the contractors.

Yustinus Eka Wiyana, (2012) states that one indication of the cause of construction and building failure is the contract value which is less than 70% of the budget ceiling value. The difference between the contract value and the ceiling that is too large and tends to be irrational will result in potential disruption of the implementation process and non-fulfilment of project technical specifications. The lack of human resources with certificates of expertise and skills relates to several districts' complex projects.

According to Zhi, (1995) the risks in construction projects can be enormous. Applying comprehensive methods to manage risk during construction is necessary, especially pre- and post-contract. Nguyen & Chileshe, (2015) found that almost half of the survey respondents admitted having a department or individual responsible for risk management. Interestingly, despite this acknowledgement, most interviewees were unable to describe systematically the processes associated with risk management over the project. Some attribute the failure to senior management's mistakes about the lack of recognition of the benefits of risk management. It makes them execute the project until the extreme risk occurs, causing it to fail and not meet some project objectives.

Although there are different perceptions of some of the risk factors, all groups share a standard view of the severity of most projects. This study aims to identify several factors causing the failure of residential infrastructure buildings based on existing literature studies as one of the stages of identifying risk factors in project risk management.

II. RESEARCH METHOD

Researchers make methods to determine the course of a research process, starting from data collection, data processing, analysis, and conclusions. This research is a descriptive study, where the methodology and data analysis are exploratory from relevant previous studies to describe a phenomenon. This study aims to determine the failure of residential infrastructure buildings that has an impact related to several things, including causes, work methods, actors, materials, and work results.

This study aims to identify the risk factors for the failure of residential buildings. Asriyanto, (2010) explains three dimensions of risk, namely the general dimension, which applies to all fields of activity/business. Second, the narrower size only applies to specific activities or business fields (e.g., contractors). The third dimension applies only to specific areas and certain companies.

Here, the first step is identifying the main problems that lead to construction failure. Researchers identify the issues of each incident and systematically arrange them as the basis for making the right decisions.

III. RESULTS AND DISCUSSIONS

Research on the failure of residential infrastructure buildings is minimal. So, it's necessary to do further so that it doesn't happen again. Good risk management will provide appropriate recommendations so the wider community can enjoy the building. The study of the risk factors for the failure of residential infrastructure buildings is the first step in risk management to obtain a mitigation plan to respond to the dominant risks that may occur.

Jhingan (2004) argues that infrastructure is an essential complementary good for private investment and a determinant of long-term growth. It is a means that refers to the physical system that provides transportation, water, buildings, and other public facilities to meet basic human needs economically and socially. Every residential environment requires basic facilities to meet the community's various needs and support multiple activities. The facilities that must be available in the residential environment include (1) environmental infrastructure and (2) environmental facilities.

Koestoor, (2012) states that settlements' boundaries are related to the environment and spatial planning concept. Settlement is an area of land used as a living or residential setting and a place for activities that support life. It is part of the environment outside the protected area, both in the form of urban and rural areas. Kuswartojo, (2005) says that the concept of settlement is part of the environment outside the protected area that
functions as a place to live or live and a place for daily activities. While housing is a group of houses that serve as a place to live or a residence plus environmental infrastructure and facilities.

Correct implementation of the project plan by identifying risks as early as possible at a later stage turns into success. Managing risks wisely does not mean avoiding them but identifying them correctly and determining all associated opportunities and hazards. It is where the need for suitable risk identification comes up to achieve project objectives.

Risk Identification is the first and foremost step of the risk management process. Zavadskas et al., (2010) divides project risks into three groups: external, project, and internal. External threats are beyond the control of the project management team. The internal risk depends on the parties that may be the originator of risk events, such as stakeholders, designers, and contractors. Project risks include quality, cost, time, and others. External hazards include political interests, inflation, economics, and society. The risk allocation structure for construction projects, according to Zavadskas et al., (2010) can be seen in the picture below.

Figure 1. Risk Allocation Structure In Construction Project
(Source: Zavadskas et al., 2010)

Several studies to identify the causes of building failure are available. Khlaifat et al., (2019) states that failure factors can be categorized based on the environment into internal and external factors. The contractor’s financial difficulties and poor planning and scheduling are of the utmost importance. William (2010) states that the seven causes of project failure were due to contractors’ inherent shortage and incompetence.

Nerija (2012) states that construction projects can be very complex and full of uncertainty. Risk and uncertainty have devastating consequences. Therefore, today's risk analysis and management are essential to dealing effectively with uncertainty and unforeseen events. According to Wenzhe (2007), the five most crucial project risks are poor quality of work, premature failure of facilities, safety, faulty design, and finances. Although there are different perceptions of some risks, all groups share a standard view of the severity of most projects. Based on other research on project risk by Akintoye & MacLeod, (1997), the elements of risk associated with the impact of construction projects are time, cost, and quality of project performance. In general, there are risk factors for building failure in the table below.

Table 1. Building Failure Risk Factors

<table>
<thead>
<tr>
<th>No</th>
<th>Risk Classification</th>
<th>Risk Factor</th>
<th>Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Internal Risk</td>
<td>Human Resources Risk</td>
<td>Incompetent contractor or subcontractor (source: Enderzon, 2020)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Low worker productivity (source: Wahyuningsih, 2020; Enderzon, 2020; Ashad, 2019)</td>
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<td></td>
<td></td>
<td></td>
<td>Labour disputes (source: Wahyuningsih, 2020)</td>
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<td></td>
<td></td>
<td></td>
<td>Fatigue due to a lot of work done over time (Source: Rahmawati, 2020)</td>
</tr>
</tbody>
</table>
Lack of communication/coordination (source: Enderzon, 2020)

Migration of workers is not following the planned schedule (Source: Ashad, 2019)

Project Teamwork (Source: Ashad, 2019; Rehacek, 2017)

The lack of human resources with certificates of expertise and skills (Source: Yustinus Eka Wiyana, 2012)

Project Administration Risk (source: Rehacek, 2017; Zavadskas et al., 2010)

Important work documents that are not adequately archived (Source: Wahyuningsih, 2020)


Lack of management experience (Source: Enderzon, 2020)

Poor documentation and reporting (Source: Enderzon, 2020)

Risk of Procurement of Goods/Services (Source: Amry, 2020; Yashar, 2019)

Inappropriate/incomplete contract documents (Source: Enderzon, 2020; Sutjahjo et al., 2016)

The project does not pass due diligence (source: Enderzon, 2020)

Inaccurate planning data/wrong planning (Source: Enderzon, 2020)

Corruption (Source: Amry, 2020)

Companies lose opportunities/markets due to products/services that do not meet the requirements (Source: Ashad, 2019)

Unfair competition, corruption, collusion, nepotism, and bribery to win the tender for the procurement of goods and services (Source: (Saputra et al., 2016)

There is a conspiracy with the owner to set the bid price outside the procurement procedure (Source Saputra et al., 2016) Owner's desire to achieve abnormal profits (Project Fees) by suppressing service fees from Planning consultants / Contractors outside the agreed contract (Source: Saputra et al., 2016)

The difference between the contract value and the ceiling that is too large and tends to be irrational will result in potential disruption of the implementation process and non-fulfilment of project technical specifications (Source: Yustinus Eka Wiyana, 2012)

Project Site Risk (Source: Rehacek, 2017; Zavadskas et al., 2010)

Obstacles in land acquisition (Source: Rahmawati, 2020)

Unfavourable field conditions (Source: Enderzon,
Some utilities interfere with project implementation (Source: Enderzon, 2020)

Work Safety Risk (Source: Rahmawati, Enderzon, 2020; Kalangit, 2019)

Lack of awareness of project workers on workplace safety and security (Source: Rahmawati, 2020)

An accident occurred due to employee negligence/discipline (Source: Ashad, 2019)

Risk of Provision of Resources (Source: Rahmawati, Enderzon, Hazriyanti, 2020)

Loss of materials and equipment during project implementation (Source: Rahmawati, 2020)

Materials are of a low quality/not according to specifications (Source: Enderzon, 2020; Sutjahjo et al., 2016)

Inadequate equipment (Source: Enderzon, 2020; Ashad, 2019; Sutjahjo et al., 2016)

Difficulty in transporting heavy equipment to the project site (Source: Hazriyanti, 2020)

Inability to make alternative equipment prices between rental, leasing, and equipment purchases (Source: Ashad, 2019)

The use of equipment facilities (attachment) is not following the guidelines (Source: Ashad, 2019)

Equipment used in heavy workloads/equipment used beyond its capacity (Source: Ashad, 2019)

Poor equipment maintenance (Source Rosania, 2019)

Project Risk (Source: Zavadskas et al., 2010)

Technology Risk (Source: Rahmawati, 2020; Kalangit, 2019)

The implementation method is not following the procedure (Source: Enderzon, 2020; Ashad, Rosania, 2019; Sutjahjo et al., 2016)

The engineering approach is not used in the work method (Source: Ashad, 2019)

Not using natural Risk Management for work method analysis (Source: Ashad, 2019)

Field survey errors (Tsai and Yang in Rahacek, 2017)

Quality of Work Risk (Source: Rahmawati, 2020; Kalangit, 2019)

The mismatch between the volume of work in the contract and conditions in the field (Source: Rahmawati, 2020)

There is a design change or Change Order (Source: Enderzon, Hazriyanti, 2020; Rosania, Ismiyati, 2019; Rehacek, 2017; Sutjahjo et al., 2016)

Poor project supervision (Source: Enderzon, 2020; Yustinus Eka Wijana, 2012)

The quality of work is not achieved (Source: Enderzon,
<table>
<thead>
<tr>
<th>Failure Risk Factor</th>
<th>Risk Description</th>
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<tbody>
<tr>
<td><strong>Project Financing Risk</strong> (Source: Rahmawati, 2020)</td>
<td>Low implementation of Quality Management (Source: Kalangit, 2019)</td>
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<td>Contractors ignore the director’s instructions and defects, cracks and damage to facilities before the final handover (Source: Norken, 2012)</td>
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<td>Late payment of terms by the owner to the contractor (Source: Rahmawati, 2020)</td>
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<td>Financing high overhead operating costs (Source: Rahmawati, 2020) Adam</td>
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<td></td>
<td>Cost estimation error (Source: Enderzon, 2020)</td>
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<td></td>
<td>Unprofessional contractor financial management (Source: Norken, 2012) Adam</td>
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<tr>
<td><strong>Project Scheduling Risk</strong> (Source: Enderzon, 2020)</td>
<td>Time estimation error (Source: Enderzon, 2020)</td>
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<td>Project delays (Source: Enderzon, 2020)</td>
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<tr>
<td><strong>External Risk</strong> (Source: Zavadskas et al., 2010)</td>
<td>Obstacles in land acquisition (Source: Rahmawati, Enderzon, Hazriyanti, 2020)</td>
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<td>Land that is still in dispute (Source: Fanhar, 2017)</td>
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<td><strong>Social Risk</strong> (Source: Kalangit, 2019)</td>
<td>Community dissatisfaction demonstration (Source: Enderzon, 2020)</td>
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<td>The unique characteristics of the community (Source: Hazriyanti, 2020)</td>
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<td></td>
<td>Disturbance of residents around the project site (Source: Hazriyanti, 2020)</td>
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<td></td>
<td>Damage to facilities due to lack of awareness and sense of belonging to users in maintaining facilities (Source: Norken, 2012)</td>
</tr>
<tr>
<td><strong>Economic Risk</strong> (Source: Enderzon, 2020)</td>
<td>Interest rate hike (Source: Enderzon, 2020)</td>
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<td>Inflation (Source: Enderzon, 2020)</td>
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<td></td>
<td>Increase in material prices (Source: Enderzon, 2020) kenaikan upah tenaga kerja (source: Enderzon, 2020)</td>
</tr>
<tr>
<td><strong>Political Risk</strong> (Source: Rahmawati, Enderzon, Hazriyanti, 2020)</td>
<td>Changes in the structure/responsibility of government agencies in handling ongoing projects (Source: Rahmawati, 2020)</td>
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<td></td>
<td>Disputes between elites and negative print and electronic media news (Source: Enderzon, 2020)</td>
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<tr>
<td></td>
<td>Delay in licensing/bureaucracy (Source: Hazriyanti, 2020) Adam</td>
</tr>
</tbody>
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The reasons behind the possibility of internal risks include the incompetent condition of the contractor or subcontractor's ability, lack of competent personnel, low worker productivity, labour disputes, fatigue due to a lot of overtime work, lack of communication/coordination, and labour transfer not following the planned schedule. Low project teamwork, lack of human resources with certificates of expertise and skills, essential work documents that are not properly archived, errors in understanding technical matters regarding construction and work methods, lack of thoroughness and understanding of the contents Articles of contract rights and obligations, lack of management experience, poor documentation and reporting, inappropriate/incomplete contract documents, inaccurate planning data/wrong planning and other causes. The reasons behind the possibility of the risk of building failure in terms of the construction project itself include the implementation method not according to procedures, engineering approaches that are not used in work methods, not using actual risk management for work method analysis, field survey errors, mismatches between the volume of work in the contract and conditions in the field, changes in design or change orders, project supervision is not good, work quality is not achieved, low-quality management implementation, late payment of terms by the owner to contractors, high overhead operating costs financing, cost estimation errors, contractor financial management unprofessional and other causes. Meanwhile, external risk factors include obstacles in land acquisition, land that is still in the process of dispute, demonstrations of community dissatisfaction, unique characteristics of the community, disturbance of residents around the project site, damage to facilities due to lack of awareness and sense of belonging to users in maintaining facilities, rising interest rates, inflation, material price increases, labour wage increases, changes in the structure/responsibility of government agencies in handling ongoing projects, inter-elite disputes and negative print and electronic media news, delays in licensing/bureaucracy, and political interests in determination of project priorities.

IV. CONCLUSIONS

Project risk can be prevented by conducting comprehensive risk management. Correct implementation of the plan and identification of risks as early as possible at a later stage turns into success. There are three classifications of residential building failure risk factors: internal, project, and external, where each category has several relevant risk factors: six for internal risk and four each for project and external. For each factor, there are 36 causes of internal risk factors, 16 causes of project risk factors, and 14 causes of external risk factors. Identifying these risk factors can be the foundation for further study in implementing sound risk management.

REFERENCES


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