Analyzing The Risks Associated With The Delay in Completing the The Construction of Flyovers In Tanjungpinang, Indonesia

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Abstract. A flyover is simply a bridge carrying one railway line or road over another. The process of constructing these types of bridges in cities is accompanied by many obstacles, which causes delays in the completion time. One of these obstacles includes the acquisition of lands belonging to the affected residents. Therefore, the aim of this research is to examine the risks involved during the construction of flyovers in cities. The primary data was further obtained from questionnaires administered to 45 respondents consisting of directors, site managers, and several experienced supervisors. The results obtained from the questionnaires showed that 33% of the risks were unacceptable and must be eliminated, 48% were undesirable, meaning that they are unexpected risk and should be avoided, 16% of the risks were acceptable, while 3% were considered negligible. Following this, 13 and 19 risk mitigation measures were put in place for Unacceptable and Undesirable risks, respectively. The integration of these mitigation measures is expected to be on record since they can aid the management and avoidance of risks associated with flyover construction, raise awareness of disastrous risks, as well as serve as mitigation plans.

Keywords: Obstacle, Delay, Mitigation, Risk

1 Introduction

Infrastructural development, especially flyovers in Tanjungpinang City, are projects that are still rarely carried out. This is one of the work programs usually performed by the local government to accelerate community mobility. Furthermore, the existence of flyovers will greatly help the community, especially for logistics delivery. This infrastructural project must be carefully attended to, because the bigger the construction project, the higher the failure rate (Gunawan, 2015). Therefore, several measures must be put in place to help minimize failure, and one of these measures is the implementation of a risk management system.

Failure to meet the deadline that has been previously agreed upon by the relevant parties can cause delays in the completion of the project. Generally, flyover projects are accompanied by a high level of difficulty and this because of the tight scheduling linkages between the contractors, project owners, consultants and external factors. It is, consequently, necessary to carry out risk management to identify the risks that may arise and also to avoid losses.

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Some of the objectives to be achieved in this study include: (1) obtaining a risk map, (2) providing several mitigation options for risks associated with flyover construction infrastructure projects, and (3) detecting risk owners and allocating the dominant risks (major risk).

2 Literature Review

The project is a series of investment activities that use production factors to produce goods or services that are expected to be profitable within a certain period (Bappenas TA-SRRP, 2003). The project management goes through several stages, namely initiating, planning, executing, monitoring, controlling, and closing. In general, every project activity often encounters obstacles, if quality is to be improved, there will be additional costs. According to (Kerzner and Harold, 2003) some project achievements require time, cost, and scope of work that utilize available resources.

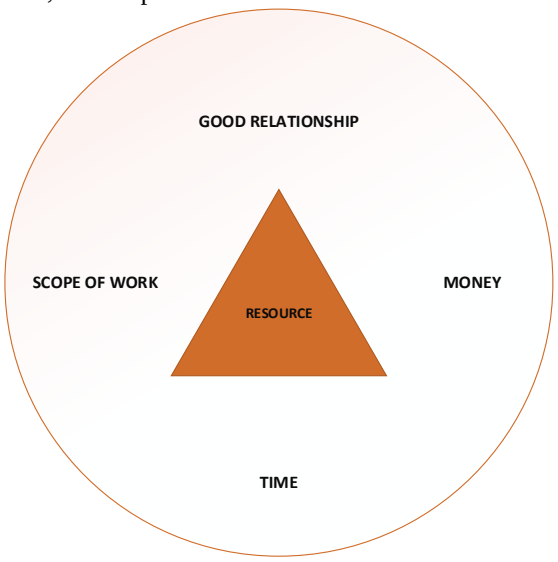

Fig. 1. Barriers in project implementation

2.1 Project Delay

Project delays can be defined as the project implementation time that goes beyond planning (Trauner et al., 2009). When viewed from the division of project delays, there are 3 types of project delays (Hamzah et al., 2011), namely: (1) Non-Excusable Delay, delays caused by service providers, (2) Excusable Delay, defined as delays caused by service users and service users. In addition, excusable delay is also defined as a delay caused by a third party or an incident that occurs outside the control of both parties or commonly called a Concurrent Delay, Concurrent delay is defined as a delay caused by several series of jobs that experience delays simultaneously.

Some infrastructure projects have the possibility of profit or loss, this creates the opportunity for something to happen that has an impact on the project's ultimate goal. Risk is defined as an event that causes losses over a certain period of time (Browden et al., 2001). So that all these construction project activities have a risk impact on costs

and work schedules.

Risk management is a step to analyze and operate risks for all construction project activities. Several steps of the risk management process starting from the initial communication stage to the monitoring stage can be seen in Figure 2.

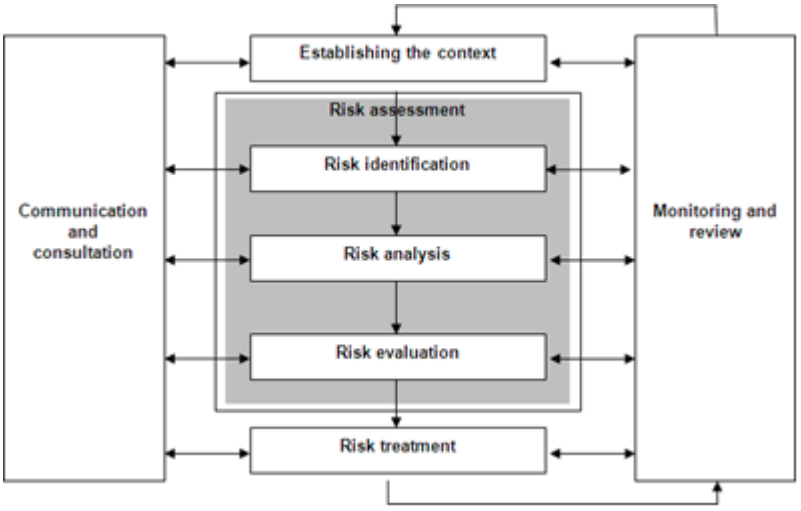

Fig. 2. Risk Management Overview (Australia, 1999)

3 Research Method

The method used for the collection of data in this study is the quantitative descriptive approach. The primary data was obtained through the administration of questionnaires. Furthermore, the respondents were selected using a sampling method based on the criteria that each of them had an important role to play in the flyover construction project at Tanjungpinang. Seven respondents were selected from each of the five ongoing road construction projects at the time, hence, the total number of respondents were 35 in number. Following this, the respondents in this study included some personnel such as a director, a project manager; a site manager, three supervisors; and three quality control. The data collected from the administered questionnaires were then tabulated, after which the distribution frequencies for each risk and their consequences based on the description of the risks associated with the construction project delays were analyzed.

3.1 Result and Discussion

The results of the research include the obtained findings from the instrument test, analysis of the frequency, consequences and the mode of risk elaboration, as well as the findings from the assessment and acceptance of the risk analysis. The risk assessment and acceptability analysis focus on the dominant risk (principal risk), after which it was followed by mitigation analysis. Furthermore, the majority of the research respondents have high work experience and about 57.69% of them have worked for 8-12 years. In

terms of education, it was found that 77.40% of the respondents are undergraduates.

a. Research Instrument Test

From the calculation results of the 40-question questionnaire, the validity test value was obtained above the significant outer loading value, which was greater than 0.70. Furthermore, the reliability test was calculated using the following formula:

$$r = \left(\frac{n}{n-1}\right)\left(1 - \frac{\sum \sigma_{t^2}}{\sigma_{t^2}}\right)$$

The obtained Cronbach's alpha value, which was greater than 0.6, indicated that the results of the questionnaire are reliable or consistent. The findings from the comprehensive examination of the research instruments are shown in Table 1.

Table 1. Instrument Test Results

Indicator	Score
Questionnaire Type	Semantic differential scale
Scale Level	1-5
Validity test	0.792
Reliability Test	0.698

b. Results of Data Distribution Frequency Analysis Risk Description

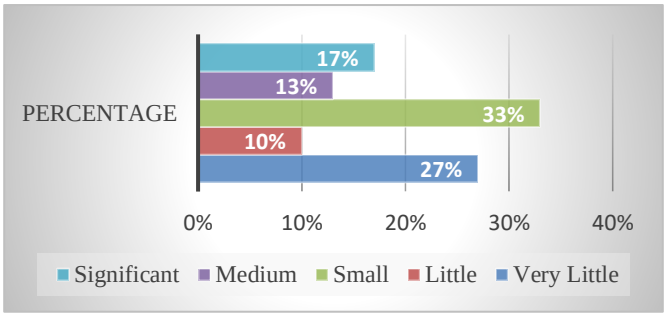

Fig. 3. Percentage of Occurrence of Risk

Figure 3 shows the percentages of the obtained answers from respondents regarding the possibility of risks. A total of 33% of the respondents noted that the possibility is small, 27% indicated that it was very little, 17% significant, 13% medium and 10% stated that the possibility was little.

c. Result of Data Dissemination Consequence Analysis Risk Description

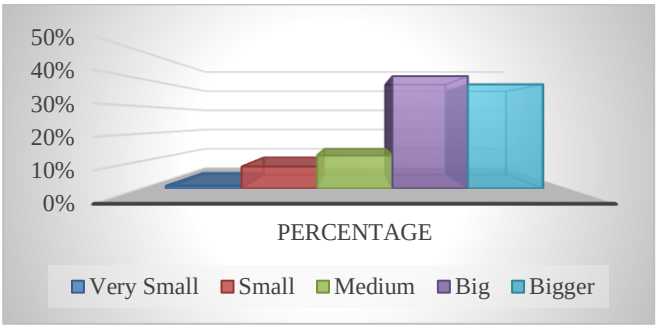

Fig. 4. Percentage of Consequences Occurrence

Figure 4 is a graphical representation of the obtained answers from respondents with respect to the consequences associated with a risk. Approximately 41% of the respondents noted that the consequences would be big, 38% answered bigger, 12% medium, 8% small, while 1% said it would be very small. Hence, the answers, as depicted by Fig. 4 are classified on a scale of 4 (large).

d. Acceptance Results and Risk Assessment

Analysis of the results of acceptance and risk assessment according to the provisions of Godfrey (1996) by dividing the level of risk acceptance into four levels as shown in table 2 below:

Table 2. Risk Acceptance

Risk Assessment	Percentage
Unacceptable	33%
Undesirable	48%
Acceptable	16%
Negligible	3%

Based on Table 2, risk acceptance can be categorized as 33% Unacceptable (risks that are unacceptable and must be eliminated). 48% Undesirable (unexpected risk and should be avoided). 16% Acceptable (acceptable risk). 3% Negligible (negligible risk). Then in this study an important note is the level ofUnacceptableand Undesirable which is still high. So it is necessary to mitigate the risk of 13 Unacceptable categories and 19 Undesirable categories as shown in table 3 and table 4 below:

Table 3. Unacceptable Risk Mitigation Steps

Variable	Risk Description	Risk Acceptance	Mitigation Steps
Scheduling and Planning	Determination of a tight project schedule	*Unaccepatable*	Preparation of a more thorough schedule of activities according to the schedule
	Improper construction method	*Unaccepatable*	Fair timing of all workers Improvement of work methods so that the work can be completed properly Ask for advice from more experts
	Types of Jobs that have not been categorized	*Unaccepatable*	Job category improvement Review the project schedule every day
	The work steps are not neatly arranged	*Unaccepatable*	Improvement of work steps from start to finish
Resource	Resource Mobilization (materials, tools, labor)	*Unaccepatable*	Reviewing Bill of Quality Construction management has a meeting coordination with contractors.
	Unavailability of materials as needed	*Unaccepatable*	Calculation of material requirements
	The workers still don't show their skills	*Unaccepatable*	Replacement of more qualified personnel/labor
	The contractor is not paid properly	*Unaccepatable*	Stopping work unilaterally
Implementation and Work Relations	Technical qualifications and bad management	*Unaccepatable*	Replacement of personnel by contractors
Work Documents and Contracts	Changes in the scope of work at the time of implementation	*Unaccepatable*	Carry out team coordination meetings

Table 4. Undesirable Risk Mitigation Steps

Variable	Risk Description	Risk Acceptance	Mitigation Steps
Scheduling and Planning	Determination of the duration of the work	*Undesirable*	Make a clear working time mapping Make a warning if there is a delay in coming to the work site
Work Documents	Improper design of drawings and specifications	*Undesirable*	Improvement of drawing planning by consultant Make a review from Bill of Quality
	Changed Job Details	*Undesirable*	Repair work details Make a review from Bill of Quality
	Approval of working	*Undesirable*	Making working drawing

	drawings		approval SOP
	Work drawing change request	*Undesirable*	Create a new schedule from the Bill of Quality Reviewing work contract attachments
	Limited authority in decision making	*Undesirable*	Owners need to know the rules regarding Bill of Quality Set meeting schedule for team coordination
Implementation and Work Relations	Bureaucratic job inspection and control	*Undesirable*	Make clear agreements between contractors and local government.
	Coordination and handover of land is still problematic.	*Undesirable*	Local governments should have legal experts and ask for cooperation to make regulations.
		Undesirable	Reschedule caused by delays in land handover.
Implementation and Work Relations	The occurrence of a work accident	*Undesirable*	Evaluation of personal protective equipment Check the condition of the equipment that is not feasible Coordination before carrying out work Carry out work according to SOP
Resource Coordination	Funding for project activities that are still problematic	*Undesirable*	Funding must be in accordance with the agreement between the local government and the contractor

4 Conclusion

The results of the risk calculations show that 33% of the risks were unacceptable while 48% were Undesirable and must be avoided. After the risk classification process was completed, 31 risk mitigation measures were then put in place. Furthermore, 13 of these measures were for unacceptable risks while the remaining 19 were for curbing undesirable ones. Based on the problems contained in the construction project, the main source of risk is in the implementation and working relationship, which can be mitigated in 9 different ways. This indicates that more attention must be paid to mitigate the impact of these risks.

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