SCHEDULE RISK ANALYSIS

IN OFFSHORE DEVELOPMENT PROJECT

BUDI HERMANTO

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To my beloved wife Diah Ningrum

and my beloved sons

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ABSTRACT

Every project has its own risks. One of the common risk during project execution is the risk associated with scheduling. The important issue facing project scheduling is the inability to incorporate uncertainty of activity duration into the schedule. Delays in completing continuous process industry projects such as oil and gas offshore development projects can cause millions of dollars of foregone income per day. The aim of this study is to investigate the implementation of schedule risk analysis in oil and gas offshore development projects. By performing schedule risk analysis, the uncertainty in activity duration as well as the implication to the project schedule can be mitigated. The methodologies adopted for this study include questionnaire survey, interview and case study. The finding of the study has identified the high risk factors that commonly contribute to the schedule delay. It is also determined that by conducting schedule risk analysis by using Pertmaster software, the schedule overrun for specific project can be predicted with some degree of accuracy which cannot be done in traditional CPM scheduling. It is hope that this study can be useful for the project team to prevent the risk occurrence by performing effective risk mitigation.

ABSTRAK

Setiap projek mempunyai risiko. Salah satu risiko semasa pelaksanaan projek adalah risiko yang berkaitan dengan penjadualan projek. Masalah utama yang dihadapi dalam penjadualan projek adalah ketidakmampuan untuk menganalisa ketidakpastian tempoh masa aktiviti dalam penjadualan. Kelewatan dalam penyiapan projek yang berterusan seperti pelantar minyak dan gas, boleh mengakibatkan kerugian berjuta ringgit setiap hari. Kajian ini dijalankan bertujuan untuk mengenalpasti penggunaan prinsip analisa risiko terhadap penjadualan projek untuk meramal kelewatan yang mungkin berlaku didalam pelaksanaan projek pelantar minyak dan gas. Dengan melakukan analisa risiko penjadualan, ketidakpastian tempoh masa aktiviti dan kesannya terhadap penjadualan projek dapat dikesan dan dapat dirancang kaedah untuk mengatasinya. Kajian ini telah dijalankan dengan menggunakan kaedah borang kajian soal selidik, temubual dan kajian kes. Hasil dari kajian ini telah dapat mengenalpasti beberapa faktor yang mempunyai risiko yang tinggi dan boleh menyebabkan kelewatan jadual projek. Juga didapati dengan membuat proses simulasi penjadualan menggunakan perisian Pertmaster telah dapat membantu proses meramal kelewatan yang boleh berlaku pada kadar yang hampir tepat. Diharapkan kajian ini dapat dirujuk oleh pelaksana projek dimasa hadapan.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

The construction industry has been using quantitative network modeling techniques to simulate the construction schedule since the late 1950s. Network diagram techniques have helped in clarifying activities relationships and have assisted in the establishment of durations of construction projects. However, one of the problems is that the critical path method (CPM) such as using diagram modeling technique (PDM) approach are deterministic in nature, the process ignores the effect of uncertainty by using a single value for the time estimate of each activity and even the entire construction project (Birrell, 1980).

1.2 Problem Statement

The important issue facing project scheduling is the inability to incorporate uncertainty of activity duration into the typical CPM and PDM schedule. Activity duration estimate is based on assumptions that may prove untrue, and in many cases, the duration will differ from its estimation. Schedule delays cause problems for the project owners and contractors. Delays in completing continuous process industry

projects, such as oil and gas offshore development project can cause millions of dollars of foregone income per day.

A 1992 worldwide survey reported that the majority of construction projects failed to achieve the objectives of the schedule (Cooper, 1994). On many of these projects, a schedule overrun did not seem probable at the beginning of the project. Sometimes schedule targets were missed because of unforeseen events that even experienced construction managers could not have anticipated. However, schedule target dates were more often missed because of issues, such as design problems, delivery of equipment and industrial disputes, that were predictable but their likelihood and effect were difficult to predict with any precision because no two construction projects are the same (Thomson and Perry, 1992).

Uncertainty can affect the prediction of scheduling processes. To provide a framework for a systematic and structured assessment of schedule uncertainty, four dimensions of schedule uncertainty were established. The following first three dimensions relate to the uncertainty in the project life cycle phases: engineering design, procurement, and site construction. The uncertainty in each phase is driven by its own unique set of variables and is differentiated from the other phases by work content. The fourth dimension involves uncertainty in the effectiveness of the project management function (Diekmann *et al*., 1988).

In the engineering design phase, uncertainty problems are encountered that include designers with varying degrees of experience, the fragmentation of engineering and construction processes, the trend of lump sum bidding, economic and liabilities issues, constructability, and changes in design.

Sequential steps are involved in the procurement phase, and although simple in nature, the procurement process is more complex that it appears. There are a numerous activities at various locations in which many widely dispersed personnel are required in the execution of the procurement process. High risk factors in the procurement phase include vendor selection processes and punctuality in delivering materials.

The critical factor for success during the construction phase is the need to develop an effective contracting strategy that fairly assigns risk and thereby encourages owner and contractor teamwork. One reason for failure in construction projects is the selection of a contracting format that does not fit the risk characteristics of the project.

Poor management practices also create problems. The effective function of project management significantly influences whether the planning project schedule duration will be achieved successfully.

Traditional planning and scheduling methods such as CPM are limited by the assumption that each activity has only one possible outcome and will be completed successfully. In reality, there are multiple possible outcomes for an activity with different consequences; and this is something that a schedule risk analysis can model. Therefore, to produce an effective schedule, a more thorough scheduling process is required with a formal recognition and assessment of project uncertainty.

The Schedule risk analysis at its most fundamental is essential to investigate the uncertainty in activity durations and to derive the implications for the project schedule. Schedule risk analysis takes account of the fact that in the uncertain art of schedule estimating the best way is to estimate the degree of uncertainty associated with each possible duration.

1.3 Aim and Objectives

The aim of this study is to investigate the implementation of schedule risk analysis in oil and gas offshore development project. To achieve the aim, the following objectives have been delineated:

a. To identify the sources of risk that affect schedule delay in oil and gas offshore development project.
b. To investigate the schedule risk analysis process in oil and gas offshore development project.
c. To identify the mitigation of schedule risk in oil and gas offshore development project.

1.4 Scope of Study

The study is limited to the identification of risks in oil and gas offshore development project. It is focus on the schedule risks associated during engineering, procurement, construction / fabrication and installation phase. The risks of project management function and the implementation of schedule risk analysis to mitigate the schedule delay are also investigated in this study.

1.5 Brief Research Methodology

In order to achieve the objectives, Figure 1.1 illustrates the schematic of research methodology for this study.

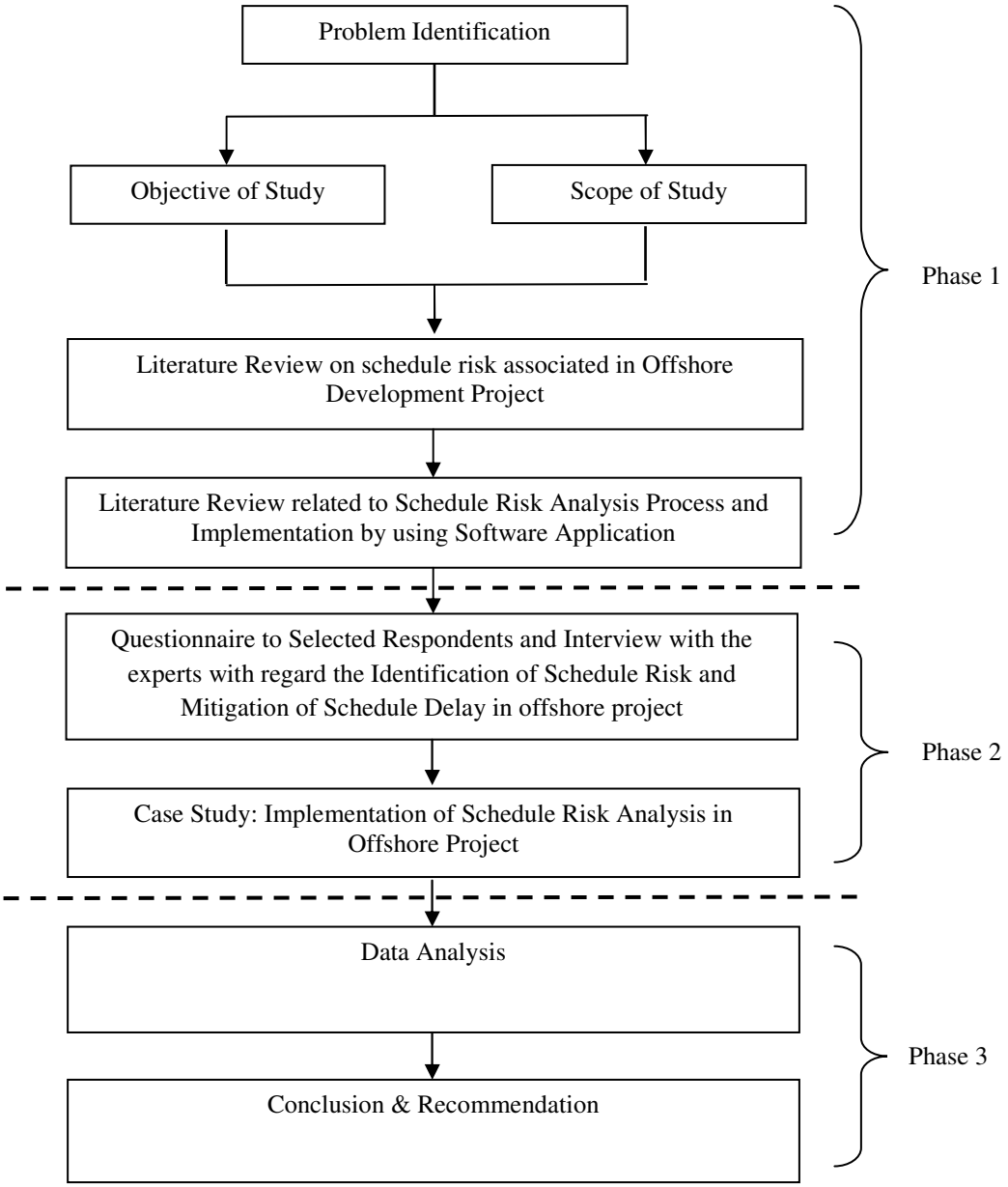

Figure 1.1 Research Methodology

Phase 1: Literature review from previous studies and references had been carried out to obtain depth understanding related to the topic. Further literature review had been performed regarding the Schedule Risk Analysis process and probabilistic software application which is used to determine the contingency and risk response plan as well as the project completion confidence level.

Phase 2: Questionnaire to the selected respondents and interview with the expertise had been conducted with regard the identification of schedule risk and mitigation of schedule delay in offshore project. A case study was performed to review the implementation of schedule risk analysis in oil and gas offshore development project.

Phase 3: Those data and information had been analysed by using quantitative approach such as frequency analysis and average index analysis. The result and finding had been discussed to obtain the sources of risk in schedule delay and recommendation to mitigate the schedule delay in oil and gas offshore development project.

1.6 Structure of Report

The report is outlined following the structure below:

Chapter 1: Discussion on the problem statement, aim and objectives, scope and limitation of the study and brief methodology to be adopted, in order to achieve the objectives of study.

Chapter 2: Literature review on schedule risks associated in offshore development project.

Chapter 3: Literature review on schedule risk analysis technique and process and the implementation by using software application.

Chapter 4: Research Methodology adopted to achieve the objectives of the study which includes the questionnaire survey, interview to expertise, and project case study related to the implementation of schedule risk analysis in oil and gas offshore development project.