Adopting Contractors' Risk Management (CIRIM) Framework using Multi Dimensional Theories

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Abstract- In general, many contractors in Malaysia are found to have a limited expertise in developing an appropriate strategy to mitigate project risks. Consequently, this has led contractors struggling to complete the project on schedule, within the client's budget and quality parameters. This was proven by the current issues on the delayed projects reported in the Ninth Malaysian Plan. Currently in Malaysia, there is no existing risk management framework specifically designed for contractors. Thus, the idea of introducing CIRIM among the Malaysian contractors is a proactive approach to achieve better project objectives. This paper therefore proposes to introduce the CIRIM framework to be adopted by the Malaysian contractors. The research methodology applied in the main research includes literature reviews, questionnaires and interviews. It is found that although there are some forms of risk management systems being used in the Malaysian construction industry, most of them are not well structured, documented and implemented in a formal manner. Therefore, the idea of establishing the CIRIM framework among Malaysian contractors is paramount and justified.

Keywords: Risk Management, Contractors, CIRIM, Construction, Malaysia

I. INTRODUCTION

CIRIM stands for Contractors' Risk Management. CIRIM is the proposed framework designed for Malaysian Contractors. The idea of establishing CIRIM is essential to encourage Malaysian Contractors to achieve better project objectives. CIRIM provides a logically consistent framework for managing project risks (i.e. political, financial, technical and social risks).

II. LITERATURE REVIEW

Recently, the Construction Industry Development Board (CIDB) expected RM82.3bil and RM70bil worth of construction and infrastructure projects to be implemented in the years 2010 and 2011 respectively. The project implementation during the Tenth Malaysia Plan is expected to face a delay caused by the procurement and construction process, while the economic momentum is expected to slow down due to the impact of the European and US economy [13]. Thus, Risk Management (RM) is recognized as a vital integrated project management tool to address those scenarios. This is proven by the main elements of risk management that cut across the entire project, incorporating and interrelating cost, schedule and performance risks. Besides, the Project Management Methodology Matrix (PMMM) used by certain government organizations identifies a number of instances in a project's life cycle where specific RM activities must occur [7].

In the UK, managing risk is one of the major processes and core discipline that assists managers at all levels to make correct and informed decisions as well as provide a process for organized assessment and control of risk. Good risk identification requires 'negative thinking' and looking for potential problems. Ignoring risks can lead to increased costs and unsuccessful outcomes for projects [4]. In Canada for instance, risk assessment shows the robustness in the industry [19]. Thus, a fuzzy risk assessment model for construction projects has been introduced to procure a target cost contracts (TCC) and guaranteed maximum price (GMP) contracts using factor analysis (FA) and fuzzy synthetic evaluation methods, based on an empirical questionnaire survey with relevant industrial practitioners in Hong Kong [6].

The task demand assessment (TDA) on the other hand is a new technique for measuring the safety risk of construction activities and analyzing how changes in operation parameters can affect the potential for accidents. TDA is similar to observational ergonomic methods. It does not produce estimates of probabilities of incidents, but it quantifies the "task demand" of actual operations based on the characteristics of the activity and is independent of the workers' capabilities. The task demand reflects the difficulty to perform the activity safely [10]. Besides, Risk-based decision making (RBDM) is critical in successful construction project management, in which decision makers' attitudes towards risks play an important role [15]. Furthermore, a dynamic model for risk measurement of construction project based on the relationship of risk factors is paramount to analyze the content and the process of risk measurement [20].

In the case of the chemical industry, its concerns for the environment have resulted in greater scrutiny on the protection for both old and new chemical plants as well as products. Increased in efforts have been directed to develop more rigorously but with more realistically procedures for the ecotoxicological risk characterization of agrochemicals. These techniques include a better understanding of the ecological role of organisms and the probabilistic analyses of toxicity and exposure data. Subsequently, the use of probabilistic approaches has improved the ability to combine toxicity data for many species into ecological risk assessments to be adopted in the construction projects. The adaptation of this theory into construction projects is quite relevant. This is based on the distributional analysis of exposure data from the US Geological Survey analyses of surface waters and other sources in a number of watersheds which allowed estimations

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of probabilities and generally showed low risks from these triazine herbicides, even in the more sensitive groups of organisms. These include specificity towards plants rather than towards animals, the reversibility of mechanism of action, and the ability of many plant species to recover rapidly [11].

In business, the high cost in obtaining overseas contracts, the culture of bad payments and too much uncertainty lead to how certain theories and Acts can be applied and enforced. Business ventures need certainty in relation to the law and practice, and at present these are quite difficult to determine. Legislation is necessary, but in this form it fails to recognise the reality of doing business in many countries [9].

Apart from that, financial institutions could help by setting up a centralized pricing mechanism for credit to reduce the systemic risks in the domestic financial sector. The Chinese initiative however, is mainly aimed at standardizing loan trading between banks [15]. Barbara Bolton, an associate at Tods Murray, is also concerned about the lack of any mechanism in managing risk especially corruption. The Serious Fraud Office (SFO) has a whole policy of self-reporting bribery and corruption and can reach settlements with companies. With the wide spreading subprime crisis, more and more people are paying attention to risk management in order to enhance the mechanism, techniques and skills of risk identification and forecasting. Therefore, an integrated RM model consists of three stages of risk mechanism, quantification analysis system, and optimizing decision-making needs to be introduced [17].

Besides, information technology (IT) projects are susceptible to changes in the business environment, and the increasing velocity of change in global business is challenging the management of enterprise systems such as enterprise resource planning (ERP) [1]. At the same time, the system's success depends on the rigor of the project management processes. Poor risk management, inadequate allocation of human resources over time, and vendor management are some common problems associated with the implementation of an enterprise system. These issues pose threats to the success of a large-scale software project such as the ERP [1].

In geology, erosion and flooding are geohazards that pose a significant problem in eastern Québec, as they do elsewhere throughout the world. To manage such risks, zoning to set limits on new construction projects is generally the first adaptation solution introduced in an area. However, very few studies have evaluated the effectiveness of zoning in terms of risk reduction [3].

Due to the differences of preference, the multi-attribute utility function is established as the objective function of the owner to reflect the owner's subjective attitude. With the principle of risk and profit sharing, risk coefficients are measured in order to calculate the cost incentive coefficient, and the Particle Swarm Optimization (PSO) algorithm is applied to obtain a balanced solution. Such incentive mechanism is shown, through an example, to achieve the Pareto improvement of the owner's utility and the contractor's profit [15].

The integration of cyberspace and space system development and operation activities have become essential to the successful achievement of the Air Force Space Command (AFSPC) Net-Centric mission requirements. The importance of proactively addressing the risks associated with space/cyberspace integration at any point in the system development lifecycle (SDLC) and iteratively re-addressing those risks throughout the SDLC has become even greater in the face of continually evolving cyberspace threats [5].

There are many critical project management factors that may contribute to the failure and success of a company's ERP system. The main research attempts to explore and identify critical elements of project management that will contribute to the success of the ERP implementation. For those organizations adopting the ERP, the findings could provide a roadmap to follow to avoid making critical, but often underestimated budgets due to project management mistakes [1].

In construction, the logical process of RM may be defined as follows: [4].

1. Risk identification – identify the source and type of risk.
2. Risk classification – consider the type of risk and its effect on the person or organization.
3. Risk analysis – evaluate the consequences associated with the type of risk, or combination of risk, by using analytical techniques. Assess the impact of risk by using various risk measurement techniques.
4. Risk attitude – any decision about risk will be affected by the attitude of the person or organization making the decision.
5. Risk response – consider how the risk should be managed by either transferring it to another party or retaining it.

Figure 1 shows the RM framework process to be adopted in the construction industry. RM is a planning tool that provides information in advance about what and when events can cause damage to the project outcomes. The implementation of RM practices will lead to more creative and efficient planning of projects and provide benefits to the organizations [8].

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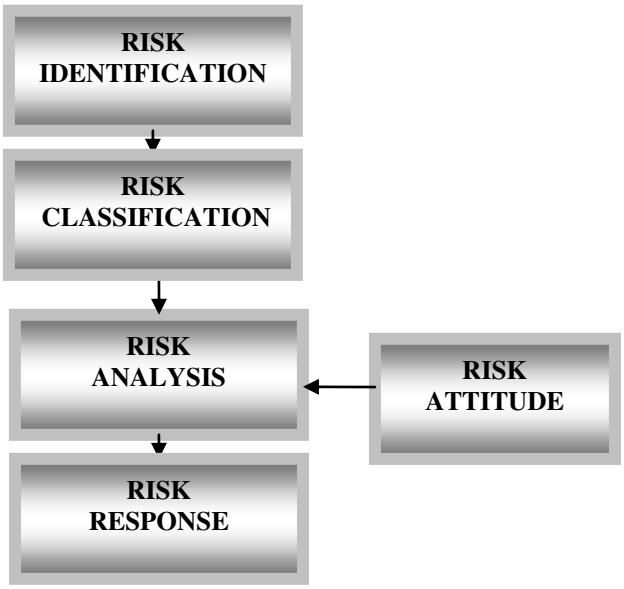

FIGURE 1: THE RISK MANAGEMENT FRAMEWORK IN CONSTRUCTION INDUSTRIES
(Source: [4]).

The following Figure 2 identifies the stages that RM should be undertaken.

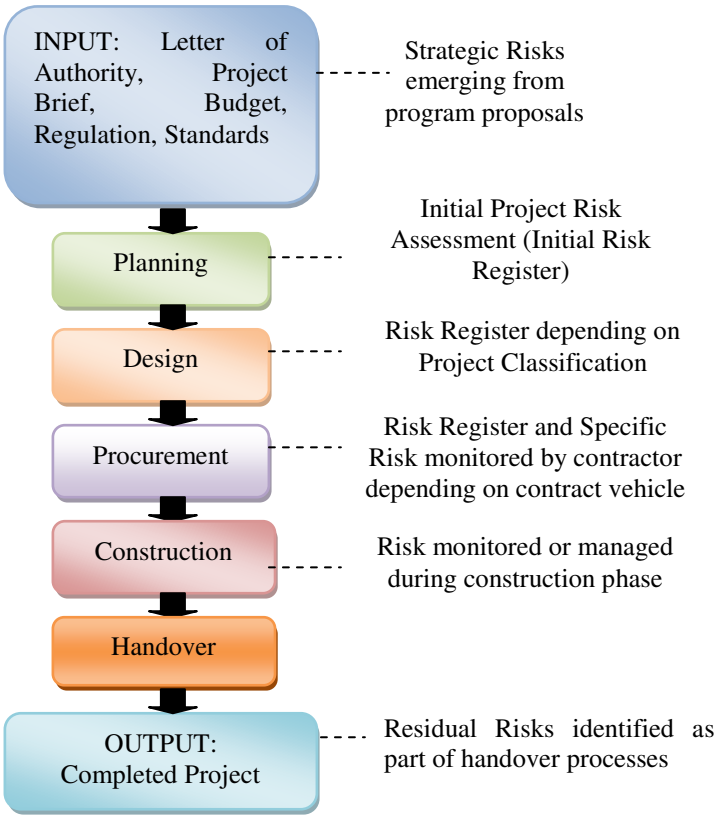

FIGURE 2: RISK MANAGEMENT STAGES
(Source: [8]).

It is crucial for the owner of a construction project to design an incentive contract to adjust the conflicting interest relation with the contractor and hopefully this incentive will inspire the contractor to carry out an effective management system. The cost, time and quality incentive coefficients are taken into account in an incentive contract design [15]. Based on the analysis from the various disciplines, it is proven that the implementation of RM in the Malaysian construction industry is paramount and justified.

III. PROBLEM STATEMENT

RM has been widely used in politics, economy, environment, and engineering to reduce the probability of risk and the damage [16]. However, in construction, contractors still have a limited expertise to develop strategies to mitigate project risks. Furthermore, Malaysian contractors are not familiar with RM activities introduced by the Public Works Department or with the guidelines from the various countries due to their limited knowledge while failing to see the importance of the matter [18]. Besides, the current RM techniques are still inadequate to manage project risks due to the lack of joint RM mechanisms [12]. Moreover, RM has a major weakness in terms of tools for risk rating process and the unwillingness of people to impart significant information about the reasons of failure [2]. Consequently, contractors fail to complete projects on schedule, and the within client's budget and quality parameters. As the case in Malaysia, this is quite pertinent whereby the report on the construction issues of delayed projects under the Ninth Malaysia Plan indicates that the delays are mostly caused by the contractor [14]. **Hence, the idea of establishing a methodological development of CIRIM and a proposed CIRIM framework to be adopted by Malaysian contractors is timely and significantly important.**

IV. METHODOLOGICAL DEVELOPMENT OF CIRIM

Figure 3 describes the methodological development of CIRIM from the pre-development of CIRIM until validation by the industry.

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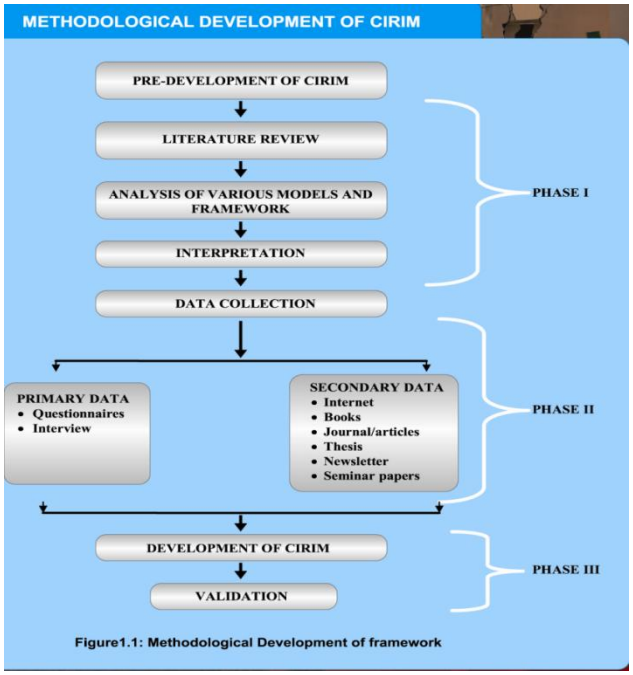

FIGURE 3: METHODOLOGICAL DEVELOPMENT OF CIRIM

V. ANALYSIS

Figure 4 describes the CIRIM framework procedures.

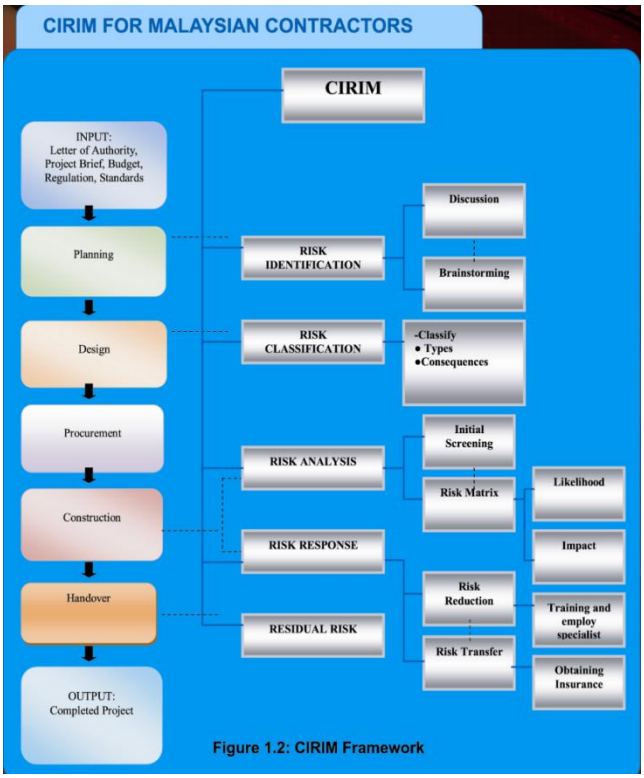

FIGURE 4: CIRIM FRAMEWORK

A. Risk Identification

Risk identification is the first step of the RM process. It starts with a full understanding of the project background and comprehensive project plan. The purpose of risk identification is to identify and define the positive and negative risks that may affect the project or program. Tools for risk identification include brainstorming, discussion, interviewing, checklists, assumptions and process diagramming techniques. Another approach to risk identification is to list definition, potential impact, probability of impact, response plan and monitoring plan.

CIRIM proposes brainstorming and discussion as the effective tools for risk identification and these should be conducted at the planning stage. Brainstorming and discussion are excellent ways of developing many creative solutions to project risks. It works by focusing on a problem and then comes up with a range of solution addressing that problem. During the brainstorming sessions there should be no criticism of ideas. Ideas should be evaluated after the brainstorming sessions. Participants in the brainstorming sessions should come from various disciplines so that it brings a broad range of experience to the sessions and helps to make it more creative.

B. Risk Classification

CIRIM proposes two ways of classifying risk which are:

a) Classifying type (i.e. people risk, external risk, strategic risk, financial risk and etc.)
b) Consequences (i.e. time, cost, quality, environment, health and safety)

These steps should start at the design stage.

C. Risk Analysis

The techniques available for risk analysis include Sensitivity Analysis, Monte Carlo Simulation, Mean End Chain, Fault Tree, Root Cause, SWOT and Decision Trees. However, CIRIM proposes the Risk Matrix for Risk Analysis. Risk Matrix should start after the initial screening of the type of risks and consequences. Risk Matrix can be analysed according to the likelihood and the level of impact risks will have if they do occur. Subsequently, based on the likelihood and impact, risk rating is introduced to prioritize the risk exposure. It is proposed that Risk Analysis should start at the procurement stage.

Likelihood is classified as:

i) Remote
ii) Unlikely
iii) Moderate
iv) Likely
v) Common

Impact is classified as:

i) Insignificant
ii) Minor

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iii) Moderate
iv) Major
v) Catastrophic

Rating is classified as:

i) Very Low
ii) Low
iii) Moderate
iv) High
v) Very High

D. Risk Response

Once the risks of a project have been identified and analysed, appropriate methods of treating the risk must be adopted. CIRIM proposes three main types of responses, namely risk reduction, risk transfer, and risk acceptance. Risk response should start at the construction stage.

E. Residual Risk

Residual risk is an exposure to loss after managing the project risks. Some residual risks may not be known during risk analysis. Therefore, Malaysian contractors need to decide whether to mitigate residual risks further by considering additional benefits or accept the risk due to extra costs.

VI. CONCLUSION

This paper has discussed the overall methodological development of CIRIM and the CIRIM framework based on the outcomes gathered from the literature review, questionnaires and interviews from the main research. The interim findings thus indicate that the level of exposure to implement RM in the local construction industry clearly illustrates it is placed at a moderate level. Therefore, the establishment of CIRIM as a proposed framework in the local construction industry is fully justified and appropriately critical under the current circumstances.

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