

A review of application of risk management in Malaysia construction industry

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Abstract. Risk management is project management tools that provide a very significant information about risk and uncertain event during perform the construction project. This management tool must be applying to all project life cycles stages in order to get high performance of achievement in completing project objective. However, in Malaysia construction industry this project management tools were very new in implementation among construction players. In construction industry, project risk and uncertain event are very unique activity to manage because of the project itself have a different type agreement, project environment and stakeholder. In this review paper, information on how the process in risk management in Malaysia is obtained from various writings and what is the methodologies that are actively being used in Malaysia construction industry. Furthermore, effectiveness of implementation of risk management in Malaysia construction are discussed thoroughly in this paper. From that the main aim is to review whether this risk management is a successful tool applied in Malaysia construction industry or not. For that purpose, one method are primarily use in conducting this review is by obtaining data and information from literature review, books and standards. The major risk is differed between each type of performing the construction project. The result show most of research work are relating to agreement of contract, partner selection, financial problem, economic condition and variation order in execution of project. Therefore, conducting risk management starting in early of performing project and continue in every project life cycle will give very low negative impact to accomplish the objective and scope of project.

1. Introduction

In order to apply the risk management tool in Malaysia construction industry everyone in construction parties must get clear understanding about how important the risk management tool in provided very significant information and data during performing construction project. Although risk is similar in varies project but differ in the way to solve it because of every project involve with differ parties, stakeholder and different site condition. By conducting risk management tool in construction industry, all risk and uncertainty factor can be manageable with systematic procedure while construction activity can execute more efficiently.

In other situation, companies from many industries have realise the cruciality of risk management, and many firms have already trying to manage the risk by establishing risk management department in their firms. The matters happen unexceptionally to construction industry and its players which are very related to eminent degree of risk. Studies show that construction industries are more exposed to risks



and uncertainties than other industries. The reason for that is highly due to its nature of construction business activities, processes, environment and organization.

According to Smith et al. (2004), risk is an unexpected event that occurs during the process of construction projects. Risk can not only affect the achievement of project objectives but also influence the event of one another. The perception of risk differs at both individual and organisational levels because different perspective views are held by every different person at one specific point of risk, documentation, prospect, after-effects and favoured decision (Loose more et al. 2006).

Risk however, does not necessarily involve only bad outcomes and negative consequences, it can also refer to the chances of positive effects (Hilson, 2002). Based on Australia/ New Zealand's Standard (2004), both negative risks(threats) and positive risks (opportunities) are in the definition of risks. Loose more et al. (2006) also having the same opinion that positive and negative impacts are interrelated to each other due to the nature of risks.

Risk can also be defined as the uncertain possible future event, the phenomenon or the consequences and can affect the company's ability to achieve its project objectives Lee et. al (2012). For many years, risk management in construction projects has been approached using a minimum effort that produces poor results and limits the quality of project management. A lack of project information, especially in the preliminary or early stage of a construction project usually lead to higher negative impacts from the aspects of time, cost of financial and quality of workmanship than the preparation to prevent the risk itself. Risk management is an essential part of construction projects which aims at identifying the potential risk associated with a project and responding to those risk to reduce them to an unacceptable event.

So, for this review paper it will define what method performing construction project that have implementing risk management tool and the methodology of researchers use to get the information or data in order to verify major risk factor occur in Malaysia construction industry. For this purpose, the application of risk management in Malaysia Industry can be determine clearly of the use of this project management tool in project management system among Malaysia construction players.

1.1 Process and Steps in Risk Management

Buchanan(1994) stated that there are three different steps that needed to be taken into consideration for risk managing which are; risk documentation, risk examination and risk response. However, organizations have their individual opinion and perspective on risk, therefore the steps can ever-changing and dependent. Nevertheless, in this review paper, five steps process of risk management is discussed stated by Eloff *et al.*'s (1993), increment to the three-step process mentioned by Buchanan (1994). Besides, as following to our nation wide practice code that is British Standards BS 8444 procedural provides five steps for risk managing program. The five risk management procedure based on BS 8444 would be the risk identification, risk estimation, risk evaluation, risk response and risk monitoring.

- a. *Risk Identification:* Risk identification is the need an in depth of understanding of the classification and consequences of the risks that are created to give negative impact on the company itself. Risk identification or can also be known as risk recognition, pointing out any potential risks by realising, sorting and prioritising the risks in a risk profile Kang et al (2015). This steps is important as the company might be opposing many kind of risk and it is very important for the company to prioritize which is the most critical to be responded. Therefore it is very important for risks to be classified accordingly. According to Zou et. al(2007), risk classification is an essential part of risk identification. Risks of different types are placed in different categories by considering their known characteristics (Aleshin, 1999). Table I provides typical risks that are possible to happen or face during a construction in any Malaysias' projects.

Types of risks	Examples of risks
Financial	-price of construction materials increased -underprice quotation by quantity surveyor -late finance claim by contractors -late finance claim approval by client
Technical	- lack of skill workers -architects/engineers change design -error of designs due to human error -error in material specification fulfillment (can be from contractor/supplier)
Operational (Logistics)	-loss from safety failures/accidents -loss or failure of transport
Time	-late delivery from supplier -late completed construction -late design by architecture/engineer
Environmental	-improper planning causing flash flood -construction disruption from bad weather -acts of god- rain, heat, winter.
Political	-policies changes which can affect project -corruption and bribery -relation of clients to any politicians

Table 1. Risk that are common found in construction in Malaysia's' project (Sambasivan et al, 2007)

Risk identification is very important to risk management, without risk identification, performing risk management is impossible to be completed. Furthermore, documentation of risk would help to further enhancement of risk management and recognition. Thus this requires comprehensive information on the variable and the way of their behaviour, otherwise if risks have not been identified, performing risk management would be impossible. Moreover, Schumacher *et al.* (2006) claimed that favourable risk management lies in the enhancement of risk identification, and hence risks can only be controlled if the risks are identified in the first point.

- b. *Risk analysis:* Risk analysis, which is the 2nd step of risk management, can be performed by capturing all viable options and evaluate the variety products (Flanagan and Norman, 1993). Qualitative risk analysis, semi quantitative risk analysis and quantitative risk analysis are the three risk analysis approaches (Loosemore et al., 2006). size and type of the project are the qualitative parameters dependent on embark options, information available, the cost and time available, the competence of the investigators, the scope of innovation and the endmost use of the outcomes (Smith et al., 2006).

Qualitative practice commonly consist of detecting possibility of a developing hazards and the emergencies of the hazards in a linguistic embarkment. Such approaches is usually implemented in initiation of risk to classify and characterize the hazard. Qualitative methods are mostly utilised subjectively and depends a lot on the proficiency of the investigator, dependent on engineering point of view, therefore it is susceptible to be subjective. In order to boost the assessment level and describe risks in linguistic, qualitative risk analysis would be used, or it may be of specific use in identifying attitudes to risk (Morledge, Smith and Kashiwagi, 2006; Godfrey, 1995) Thus, these methods are vulnerable to various of result as well as being reliable as an interpretive development in the early stage or as a managing aspects of a project. Upon finding of few risk data, qualitative analysis are very prone to variations, however, qualitative analysis are able to produce more quantitative detail when more valuable information can be obtained. Vice versa, quantitative analysis frequently apply mathematical or statistical methodologies to provide probabilities or repetition of the dangers of the classified dangers.

The information and data utilised in quantitative analysis are usually obtained from either past reports or closeness. For example, the high recurrence of the same risk from different projects can be calculated into statistical probability and further can be included as one of the items in quantitative analysis. However, this method can still consist of something like unreliability because of using subjective ways of collecting information.

- c. *Risk evaluation*: Subsequently, with qualitative analysis of risks, evaluation of the hazards is the further step in process of risk management. In this third step, information and findings of related companies which experienced risk are accumulated and assessed. Subsequently, based on the degree of the outcome and repetition of the possible risks, they are grouped into different categorisations so that risk involved in the related projects can be classified high or low risk. Few criteria are used in evaluating whether the level of risk is high or low, such as the probability of an unfavourable occurrence, the degree of seriousness, and the subsequent impact if it does occur. Using a mathematical description, a risk can be described as follows:

$$R=P \times I$$

Where R is the degree of risk, within [0,1], P is the probability of the risk occurring, within [0,1], I is the degree of impact of the risk, which is described as being within [0,1], (the more severe the impact is, the greater the figure). From the above risk equation, it can be seen that risk factor has either little influence or little probability of incident if the degree of risk is near or almost 0. Vice versa, if a risk factor has a high impact and a high probability of occurrence, its degree of risk is very high, near 1, (Zhi 1995).

- d. *Risk response strategy*: The theory behind risk management can be easily misdescribed due to its complex nature. Therefore, when responding to certain risks, it is a must to describe what kind of methods to be used. Four common risk responses are avoidance, transfer, reduction, retention (Loosemore et al., 2006; Kerzner, 2003).
- i. *Risk Avoidance*: So called risk elimination is consist of not undertaking an activity, which may carry risk. However, avoiding risks may carries with losing out the potential gain on accepting the allowed risks. In a simple words, that risk elimination is easiest way of risk response, however sometimes it may comes with positive uncertainty being eliminated along the way.
 - ii. *Risk Transfer*: Risks are shifted to parties with aim of contracts or insurances. Risk transfer removes and sends away risks, along with owner responsibility, from one party to another third party, without affecting the total risk or reducing the cruciality of risk origin (Smith, Merna and Jobling, 2006; PMI, 2004).
 - iii. *Risk Reduction*: Risk reduction is a method used to ensure the probability and influence of the risk low under an acceptable threshold (Loosemore et al., 2006). Meaning that, the risk is still giving impact to the organisations but not high or critical as it can usually be.
 - iv. *Risk Retention*: The loss/benefit of gain of a risk is accepted when it occurs. Risk preservation requires the full conscious of the hazards exists and to accept the related level of risk, without appealing any extra effort to control it. (Kerzner, 2003)
- e. *Risk monitoring*: risk monitoring is the last step in risk management process. Succeeding after the risks have been identified, estimated, evaluated and responded to, risk monitoring will be taken into action and become a significant role in inspecting the status of the risks. In the risk monitoring and control stage, it is compulsory to ensure that the favoured impacts of the implementation of risk responses are achieved throughout the project duration. Risk management documentation is reviewed and updated from time to time and the outputs of risk

monitoring and control can provide lessons for future decision makers (Morledge, Smith and Kashiwagi, 2006). This step ends the risk management process (i.e. given that the risks analysis are accepted and do not require re-analysing). The controlling stage must be constantly carried out and often be continuously reviewed that can enhance communication among employee and department, boost catastrophe recovery and develop efficient budget planning and management.

The effectiveness of risk response is reviewed continuously (monthly/annually) in order to evaluate the application of risk management strategy Algahtany et al(2016). This is to help the company in managing risk, further to achieve company objective. Feedback and criticism is mandatory and cannot be overlook to assess the management plan.

1.2 Implementation of Risk Management in Malaysia Construction Industry

For further review, there are three type projects performing in Malaysia construction industry involve in appliance risk management tool, which is conventional, joint venture (JV) and design and build (D&B) project. Risk management, can applied in any type of performing the project because it will provide efficiency during practise and a value to project (Alkaf, Karim, Rahman, Memmon, & Jamil, 2012). For conventional project risk management had apply with systematic and unsystematic procedures. Some Site Engineer conduct risk management purely in site meeting or technical meeting. In order to identify the risk, they use Critical Path Method (CPM) and S-Curve that had present in monthly site meeting. For more understanding, CPM is the one of management tool that include all the activity breakdown in sequence and it help project manager control and monitor progress at the site easily (Abdul-Rahman, Wang, & Sheik Mohamad, 2015). From that CPM, they also can identify the major risk that will result in project delay through combination of risk identification and risk analysis principle. Other than that S-curve helps them to analysis project in progressing can be completed within time and budget limitation or not. Normally S-curve can display cumulative costs, labour hours, or any other quantities plotted against time.(Abdul-Rahman et al., 2015).

Some project manager they use SWOT analysis for identify the risk. SWOT analysis is simple but framework thinking tool for analysing the strength and weakness, opportunities and threats in any situation we have. And they conduct every week meeting to examine the SWOT analysis for every activity in the construction progress. From that they monitor the activity planned can be execute on the site or will be any obstacles disturb from that activity being done. Other than that, some project manager, do not perform risk management directly in the process of manage the project. The project manager uses checklist and guideline that have been certified by International Standard Operation (ISO) 9000 and claim had been conduct risk management technique unwittingly. However, that project had facing delay for three months and project manager believe if they have formal risk management planning maybe the project can reduce the problem that drag them to project delay.

One of the projects, which is government project, implementing risk management tool very successfully. They use workshop approach to conduct the risk management technique. The workshop had involved all stakeholder for that project, including client, contactor, consultant, utility service provider, local authority and others. Risk had identified in every phase of project life cycle. Usually project life cycle had been used in construction project is planning stage, design stage, procurement stage, execution stage and hand over stage. From that all risk that have been identify was analysis through cause of risk, how to treat the risk and prioritise the risk. From that they can control and monitor all the risk especially the critical risk and prevent them to become disaster. From that workshoOp they produce the Risk Management Plan (RMP), it is the documented risk management process use for monitoring the project and always make sure the critical risk reduced to acceptance level of risk before the risk event come to the construction activity.

It different in JV or partnering project. If for conventional project most of the research focus on the application risk management in the project management approach while performing the project. For JV and partnering project the researchers focus on risks faced while applying JV and partnering contract between two or more companies. In Malaysia, political stability, economic growth, low cost of labour

and other resources resulting in increasing JV both in multinational construction firms and local government (Hamimah, 2008). JV in construction industry Malaysia can be say as new market opportunity particularly for small company in construction industry. In order to perform JV and partnering agreement there are can be categories in three group which is, internal risk factor, project-specific factor and external factor.

The researchers listing nine internal risk factors for their questionnaire, but this paper explain about three major risk in internal risk factor. Review find that only three as critical factors because result of researchers showing this top three risk slightly high mean from other. The major risk factor in internal risk group are financial problem, management and company policy. The researcher found that this three-major factor eventually happen in performing JV agreement. Financial problem leads the major risk because both companies involve are very particular in making decision for expense for the project. Lack of competent management or human resource resulting second major risk factor which is management risk. Third risk factor is company policy, (Hamimah, 2008) say importance role should be play from parent companies, good JV agreement will prevent the conflict and trouble between both parties while progressing the project.

For the project specific factor, this review explains three of five factors contribute, led by cash flow problems. Seen like this factor relating with above factor. But this refer to client cash flow for the project. Second is poor project relationship, this can specific about lack of communication flow. This review finds that someone in stakeholder of group directly discuss about any problem to client without informing the issue to owner of the problem, make disturbed to progress of the project. The third, factor for project specific factor is incompetence supplier. This statement refers to subcontractor or supplier that doing some activities in project scope.

The last risk group is external risk, researcher's categories eleven type external risk, led by economic fluctuation. When the economic slowdown, may result construction industry suffer due to currency exchange, price of material increases and so on. From the national economic crisis, it also can result to inflation which is second risk in this group. More complexity of project gives more challenging in managing the project execution and it also have more consideration on policies, laws and regulation, which is third risk is external group.

This review also discovers that, the initial steps for JV agreement it is selecting the partnership important part JV agreement. It finds that before make feasibility study for project done, the partnering company become first issue need be study in primary stage. It Is because strong partner, will lead to successful of project otherwise, partnering problem will lead to failure of the project. In this country there are legal linkage between client and contractor, so both partnering should have negotiation and amendment of contract condition as well. (Adnan, Rahmat, Fatanah, & Mazali, 2008).

This review finds a similarity in D&B project with partnering project. Most researchers focus on what the risk factor in performing design and build type of construction. In D&B project especially private project, the application of the risk management is conducting in pre-systematic process without Implementing the fundamental of the risk management process itself. Researchers found that most of D&B project in Malaysia construction industry use an analysis of historical data for similar project in identified risk factor. Followed by brainstorming and industrial checklist for the same reason (Azizan & Ibrahim, 2015).

In discussing the major risk involve in D&B project, the first place is variation order. It is because mostly risk appear in few stages of D&B project is variation order. Although the design must be acceptance before continuing with exaction of project, variation order will cross the progress of construction due to client requested. Other than that, cost and time overrun usually appear during performing D&B project. The cost overrun appear related with change in design and construction method, technical issue during construction, environmental and government issue (H. Adnan, K. Jusoff, 2008).

In this review, found that, of the risk that only appear in D&B project, but give moderate affect to project progressing, it is conflict and interest risk. For D&B contract, main contractor is the person

produces the construction drawing because of all the technical disciplines under main contractor responsibility it all base on project brief. In otherwise, client also have a right to throw the idea for their own project during execution of the project. This will result to main contractors use their role to refuse some client need. H. Adnan, K. Jusoff, (2008) say there is a need to appoint the independent checker in order to verify the design proposal but will result the additional cost to the project.

Other than that, for D&B project there is risk that client give a lack of information in project brief. Project brief should have an information, as complete as can. This is because, from this project brief the design, special material or requirement from the client must be consider in the providing project scope and design scope. Cause lack of information will lead to many disturbances in performing progress of project and the common issue is design changing will affect to many bad situations like cost over budget and time overrun.

The concept behind D&B agreement also must be understand by all stakeholder in the type of performing the project. Client who a new in this type of agreement, always prefer to have their on-monitoring team into deep progressing about a technical issue. Some of this action may contribute to overlapping role and responsibility to the project. Because of the lapping in role and responsibility some consultant also will provide more supervision on site which is that have already done by in house supervision of the contractor.

2. Conclusion

It discussed, the hazards in Malaysia construction projects can be considered countless and spreading. To accomplish them proficiently, competent method for managing risks during the construction process, especially in the preliminary stages and in-construction stages, should be implemented. The techniques explained in this paper may supplement contractors with any expertise guidance for the risk management of many local projects. The process of risk management supports a systematic thinking process that classifies risks, identifies risks, assesses risks, and monitors risks. In relation to the risk identification and classification processes for Malaysia projects, the necessity for a global view have to be considered and must be paid attention, not in the project manners, but also in terms of every levels of possible risk that may happen in construction.

This review found that, by applying risk management process, it can give value added to project management application. For conventional type of performing project, many researches focuses on methodology and value of risk management for the project, other type which is JV and D&B research focus on the type of agreement itself, by finding the major risk contribute and give obstacle in efficiency performing the project. Most of the major risk found is related to the finance that must have incentive in early stage to overcome this.

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