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The Identification and Management of Major Risks in the Malaysian Construction Industry

*Cheng Siew Goh and Hamzah Abdul-Rahman

Abstract: Effective risk management can bring greater rewards to project performance by enhancing productivity. The objectives of this study are to identify the major risks associated with the Malaysian construction industry and to evaluate the practical measures that the various local construction industry players would take to respond to those risks. A mixed method of questionnaire and interviews was used to investigate the current trend of risk management implementation in the Malaysian construction industry. Financial risk and time risk are found to be the major risks in terms of the occurrence frequency and the impacts. A lack of knowledge and the associated costs of risk management application are the main reasons given by local contractors who lag behind in implementing risk management in their practices. It can be deduced that risk management is still at an early stage of development in the Malaysian construction industry.

Keywords: Risk, Risk management, Construction industry, Malaysia

INTRODUCTION

The Nature of Risk

Risk often varies in the likelihood of its occurrence and its impacts from one project to another and risk changes its nature during the project life cycle (Smith, Merna and Jobling, 2006). A lack of project information, particularly in the early stage of a construction project, always leads to a higher degree of risk associated with cost, time and quality. The level of risk, however, may decrease with the project development. When risks are being realised as the project progresses, the increased level of certainty reduces the level of risk in the project.

Project risks often tend to be interrelated, but they can sometimes be considered in isolation. Risks can not only affect the achievement of project objectives but also influence the occurrence of one another. According to Loosemore et al. (2006), the perception of risk varies at both individual and organisational levels because different people hold different views and have different understandings of a particular risk's components, sources, probabilities, consequences and preferred actions. People's beliefs, attitudes, judgments and feelings are believed to influence risk perception to a certain extent (Akintoye and Macleod, 1997).

Risk, however, does not necessarily involve only bad outcomes and negative consequences; it can also refer to the chances of positive events (Jaafari, 2001; Hillson, 2002; Baloi and Price, 2003; Project Management Institute [PMI], 2004; Standards Australia/Standards New Zealand, 2004; Loosemore et al., 2006; Jannadi, 2007). PMI includes both threats (negative risks) and opportunities (positive risks) in the definition of risk. Loosemore et al. (2006) also holds the view that risks and opportunities are complementary in their nature, i.e., every risk can

Faculty of Built Environment, University of Malaya, MALAYSIA
*Corresponding author: gohkeanu@yahoo.com

be regarded as an opportunity and every opportunity has an associated risk. Bunni (2003) also advocates that risk in Chinese, *wei ji*, combines the meanings of "danger" and "opportunity", thus confirming the interchangeable nature of risk between threat and opportunity. Risk is hence defined as a possible future event, the occurrence and consequences of which are uncertain, but which could affect the company's ability to achieve its project objectives (Loosemore et al., 2006). Risk is regularly expressed in terms of probability of occurrence and magnitude of the consequences for loss or gain, i.e., risk is equal to the probability of occurrence multiplied by the consequences (He, 1995; Ward, 1999; Kerzner, 2003; Jaafari, 2001).

This study includes both opportunity and threat explicitly in the definition of risk. By taking into account the maturity of risk management in the local construction industry, the scope of risk definition is nevertheless mostly constrained to the downside risk.

Objectives

This study identifies risks associated with the Malaysian construction industry. The three objectives in the study include the following: (1) to identify the major risks associated with the local construction industry, (2) to identify the preferred risk management tools used by the construction players and (3) to evaluate the practical measures taken by local construction industry players in response to risk.

Limitations

The sample size of the questionnaire is derived from the population of Peninsular Malaysia. Because of logistics limitations, sampling for the interviews is restricted to the Selangor, Kuala Lumpur and Johor states. The discounted response rate is approximately 7.5%, i.e., 45 surveys of 600 were returned. A failure in delivery of the questionnaire may have contributed to the low response rate. Some of the mailing addresses and email addresses obtained from the sources may be incorrect or invalid, especially when the information provided may be outdated. Moreover, some questionnaires may have been unsuccessfully delivered through email if they were considered spam, thus landing in the spam filter or trash mailbox of the recipients. This low response rate has some effects on the validity of the study, but is nevertheless sufficient to provide useful indications concerning the issues under investigation.

AN OVERVIEW OF RISK MANAGEMENT

Risks which have not been identified and managed are undoubtedly unchecked threats to a project's objectives, which in turn may lead to considerable overruns in cost and scheduling. For this reason, a systematic approach must be taken to manage risks throughout the development of a project (Mills, 2001). Risk management is a proactive decision-making process, which involves accepting a known risk and/or taking steps to mitigate the impact and likelihood of the occurrence of risks, to minimise the threats and maximise the opportunities (Loosemore et al., 2006). Despite numerous risk management processes proposed in the literature (He, 1995; Chapman, 1997; Tah and Carr, 2001; Standards Australia/Standards New Zealand, 2004; PMI, 2004; Loosemore et al., 2006), the five main steps in the risk management process are, generally, risk planning, risk identification, risk analysis, risk response and risk monitoring and control.

An effective implementation of a risk management system not only brings a higher level of awareness of the consequences of risk but also focuses on a more structured approach, more effective centralised control and better transfer of risk information between parties. It can reduce long-term loss expenses and project time overruns (Edwards, 1995). Risk management can help assess and ascertain the viability of a project to ensure that it is worthwhile (Smith, 2003). Statistical data concerning past projects can be used to model risks more effectively for future projects (Simister, 1994). However, it does not completely remove all risks from a project. It only reduces the probability of occurrence and induced impacts to ensure that the risks are managed in the most efficient and effective manner (Capper, 1995). Successful risk management should convert uncertainty to risk and convert risk to opportunity. The project and organisation would hence achieve more gains by maximising opportunity, minimising risk and reducing uncertainty.

The first stage in the risk management process, risk planning, involves planning how to approach and perform risk management to ensure that the level, type and visibility of risk management are commensurate with both the size of the risk and the importance of the project. The project objectives are established and the responsibilities are assigned to the relevant parties in the risk planning stage (PMI, 2004). Risk identification, the second stage in risk management, identifies potential risks by recognising, filtering and ranking the risks in a risk profile. According to Zou, Zhang and Wang (2007), risk classification is an integral part of risk identification. Risks of different types are placed in different categories by considering their predetermined characteristics (Aleshin, 1999).

The third step is risk analysis, which captures all feasible options and assesses the various outcomes of any decision (Flanagan and Norman, 1993). There are three approaches used in risk analysis, qualitative risk analysis, semi quantitative risk analysis and quantitative risk analysis (Loosemore et al., 2006). The choice of approach depends on the type and size of the project, information available, the cost and time available, the expertise of the analysts, the extent of innovation and the ultimate use of the results (Smith et al., 2006).

Qualitative risk analysis is a simplistic technique describing risks in linguistic variables, subjectively, making a quick assessment, or it may be of specific use in identifying attitudes to risk (Morledge, Smith and Kashiwagi, 2006; Godfrey, 1995). A risk-scoring matrix (or a probability/impact matrix) is a tool commonly used in qualitative risk analysis. Semi quantitative risk analysis makes a subjective assessment of the frequency of risk and an objective assessment of risk consequences (Mead, 2006). Additionally, quantitative risk analysis represents risks in mathematical form to quantify them in terms of performance in quality, time and cost (Morledge, Smith and Kashiwagi, 2006).

Risk response, the fourth stage of risk management, is the establishment of a strategy to mitigate the potential threats and maximise the potential opportunities (PMI, 2004). Six typical risk responses are retention, reduction, control, sharing, transfer and avoidance (Loosemore et al., 2006; Kerzner, 2003). The selection of response must be appropriate to the significance of the risk; it must be cost effective and realistic with regard to the timing of the project; it also must be agreed upon by other involved parties.

Risk retention involves acknowledging that a particular risk situation exists and making a conscious decision to accept the associated level of risk, without engaging in any special efforts to control it (Kerzner, 2003). Risk reduction is an approach used to bring the probability and impact of the risk down below an acceptable threshold and risk sharing is principally achieved through a contractual mechanism to develop a sense of collective responsibility among the project stakeholders (Loosemore et al., 2006). Risk control does not attempt to remove the source of the risk, but seeks to reduce the risk itself (Kerzner, 2003). Risk avoidance is a refusal to accept the risk, or action taken to ensure that the risk is not going to happen. Risk transfer shifts and reallocates, along with ownership, from one party to another third party, without changing the total amount of risk or reducing the criticality of risk sources (Smith, Merna and Jobling, 2006; PMI, 2004).

In the risk monitoring and control stage, it is essential to ensure that the desired effects of the implementation of risk responses are achieved throughout the project life cycle. 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). The effectiveness of risk response is evaluated on an on-going basis throughout the project to correct any inappropriateness of the implemented strategy and to re-align it with the project objectives. Feedback is necessary to review the treatment plan. It may loop back to the risk identification stage, whenever new risks arise or risks change their nature during the course of the project.

RESEARCH DESIGN AND METHODOLOGY

Pilot Testing

A pilot test was performed with the draft questionnaire using ten academics and practitioners to ensure the questionnaire was practicable and unambiguous. The pilot test can detect weaknesses in the design and instrumentation of the questionnaire; it can also provide proxy data for selection of a likelihood sample (Cooper and Schindler, 2003). The feedback from the pilot survey is important in improving the quality, finding gaps and determining the time required to complete the exercise (Fellow and Liu, 2003). The first draft of the questionnaire was derived from the literature review and documentation. Several revisions were made to construct an applicable and understandable questionnaire. The improved questionnaire was subsequently sent by mail or email to the respondents.

In addition, two preliminary interviews were conducted to explore in-depth risk management knowledge and to establish an appropriate target group of respondents. One of the preliminary interviewees was an academic from a local university with a strong background in risk management. Another interviewee was an experienced consultant who had worked in the local construction industry for more than 15 years.

The Questionnaire

A mixed approach of qualitative and quantitative methods was used in the study. According to Naoum (1998), quantitative data are not abstract but consist of measurements of tangible, countable and sensate features of the world. The questionnaire is a quantitative method used to collect data from a sample representing the potentially large population being studied (Cooper and Schindler, 2003). Approximately 600 questionnaires were sent out from January to February 2008, to members of the construction industry in Peninsular Malaysia, including developers (20%), contractors (60%), architects (10%) and engineers (10%). The sample selection was chosen based on the results of preliminary interviews and the pilot study. The construction key players were all included to avoid any bias or favouritism of the study to any particular party. The questionnaires were delivered to respondents by email or website (50%), by post (41.67%) or by hand (8.33%).

A five-point Likert scale was used to measure the frequency of risk management application, following the studies of Kwok, Then and Skitmore (2000), Rao and Mak (2001) and Lyons and Skitmore (2002). A weighting of 1, 2, 3, 4 or 5 was assigned to represent "never", "seldom", "sometimes", "frequently" and "very frequently", respectively. Using weighted average scoring (WAS), the sum of the products of the number of responses and the weighting was divided by the total number of responses. The higher WAS score would thus imply a more frequent risk response employed by the local practitioners.

Interviews

Interviews were used as a follow-up procedure to further investigate the responses of the surveys (McNamara, 2008). Interview questions were derived from the analysis results of the questionnaires. For example, the project stage with the highest risk occurrence was examined to explore its underlying causes and phenomena in depth. Face-to-face interviews with semi-structured questions were used because the observation and non-verbal communication can help to improve the quality of the information gathered. Eight interviewees were chosen from different disciplines to reduce bias and to achieve higher accuracy. They included one architect, one civil and structural engineer, two Grade 3 contractors, one Grade 7 contractor, two government representatives and one developer.

All interviewees were asked ten standardised open-ended questions, which were sent to interviewees by email in advance. Open-ended questions were used as a guide in the interview to focus the interview content more effectively, while still allowing a degree of freedom and adaptability in obtaining the information (McNamara, 1998).

RESULTS AND ANALYSIS OF FINDINGS

Some questions obtained in the surveys were left incomplete, especially in the section of open ended questions that asked for future suggestions or recommendations. A risk response table was created to examine the preferred risk treatment plan in addressing a unique risk. The respondents might have found some ambiguity and difficulty in understanding the risk response table because of the complexity of its matrix structure. The final response rate was 7.5%, i.e., 45 of the 600 questionnaires were returned.

The responses show that 73.33% of respondents are from the private sector, 15.56% are from both government and private sectors and 11.11% are from the government sector. The majority of the respondents (56%) have worked in construction for five to 15 years. Years of experience of respondents in rank order are 10 to 15 years (29%), five to 10 years (27%), more than 20 years (20%), less than five years (13%) and 15 to 20 years (11%).

Risk Occurrence throughout the Project Stages

The life cycle of a construction project can generally be divided into five stages: feasibility, design, tendering, construction and handling and maintenance. Different types of risk arise at different stages in construction. Because of the low level of certainty, higher levels of risks would normally occur at the outset of a project, yet the amount of money at stake at the initial stage is also comparatively higher than at other stages. As the project progresses, the level of risk reduces with the increasing level of certainty. At a later stage, the amount of investment at stake is low because the investment made earlier has been realised for the project development. The data in Table 1 show that the construction stage has the highest risk occurrence, with a mean of 3.80. This result is followed by tendering (2.91), feasibility (2.53), design (2.44) and handling and maintenance (2.29).

From the findings of the interviews, the construction stage is recognised as the project stage with the highest frequency of risk because it always involves many investments and takes a long time for completion. Moreover, more unexpected events generally take place in the construction stage than in the other four stages.

Table 1. Risk Frequency in Various Project Stages

Risk/Rating	Weightage	Mean	Mode	Median	Standard Deviation
Feasibility stage	114	2.533	1	2	1.471
Design stage	110	2.444	3	2	1.119
Tendering stage	131	2.911	3	3	1.145
Construction stage	171	3.800	5	4	1.217
Handling and maintenance stage	102	2.289	2	2	1.141

The Identification of Major Risks

A risk profile includes risk frequency and impacts on the achievement of project objectives. In practice, it is impossible to identify all the risks in a project (Smith et al., 2006). The effort required to consider every single risk is time consuming and it is also counter-productive in its effect. It is therefore essential to identify critical risks only and prioritise them for effective and efficient risk management. Consideration is given to risks associated with high occurrence and catastrophic impact only. High frequency risks with marginal impact should be given higher priority than infrequent catastrophic risks. Table 2 shows the frequency of occurrence of different risks in the industry and their negative impacts on project cost, time and quality.

Table 2. Risk Frequency and Its Negative Impacts on the Project Cost, Time and Quality Achievement

Risk/Rating	Risk Occurrence		Impact on Cost		Impact on Time		Impact on Quality	
	Weightage	Mean	Weightage	Mean	Weightage	Mean	Weightage	Mean
Financial risk[1]	173	3.844	146	3.244	162	3.600	139	3.089
Time risk[2]	164	3.644	139	3.089	149	3.311	135	3.000
Physical risk[3]	114	2.533	110	2.444	121	2.689	104	2.311
Personnel risk[4]	128	2.844	102	2.267	112	2.489	117	2.600
Design and technical risk[5]	125	2.778	116	2.578	121	2.689	124	2.756
Contractual risk[6]	117	2.600	107	2.378	104	2.311	104	2.311
Political and regulation risk[7]	111	2.467	103	2.289	105	2.333	92	2.044
Safety risk[8]	104	2.311	93	2.067	93	2.067	81	1.800

Notes:

1. Financial risk: Late payment by clients, cash flow problem, inflation, price fluctuation, variation, etc.
2. Time risk: Tight project schedule, inappropriate time allocation, insufficient time to prepare bid
3. Physical risk: Extremely inclement weathers, earthquakes, subsidence, corrosion, fire, flood etc.
4. Personnel risk: Risks arisen from the defaults of personnel including clients, main contractors, subcontractors, architects, quantity surveyors, engineers, labours, etc.
5. Design and technical risk: Risks caused by the design, technique, materials, equipment, site conditions, etc.
6. Contractual risk: Ambiguous provisions, misinterpretation, etc.
7. Political and regulation risk: unstable politics, policy changes, corruption, expropriation, etc.
8. Safety risk: Accidents, falls, electrocution, vehicle crashes, being struck, etc.

As Table 2 shows, financial risk and time risk are identified as the major risks in the Malaysian construction industry, with a mean of 3.844 and 3.644, respectively. Both types of risk contributed the most significant negative impacts on project performance in terms of cost, time and quality. They have overriding impacts on project achievement, i.e., if the project can keep to the predefined budget or completion time. Financial risk and time risk are therefore identified as the most significant risks associated with the Malaysian construction industry.

The drivers of financial risk and time risk are investigated in the interviews. Most local construction players believed that late payment and escalation in material costs are the main causes of financial risk. Meanwhile, the time risk is always affected by other risks, such as technical risk, risk associated with uncertain weather, personnel risks, risk caused by an uncertain political climate and changing regulations. These findings further confirmed that risks are interrelated, i.e., the incidence of one risk may trigger the occurrence of other risks.

The Level of Risk Management Practiced in the Industry

Although a variety of different risk management models and frameworks have been proposed by a range of institutions, associations and professionals, they commonly include the common features risk identification, risk analysis and risk response. The survey shows that only eight out of 45 organisations, or 17.78%, employ a formal risk management process in their practices. Most respondents practise only risk identification, without further analysis of the probability of risk frequency or impact severity.

Tools and Techniques Used in Risk Management

Although various tools and techniques are available to use for risk management, five common risk management techniques were selected for this study, checklist, sensitivity analysis, Monte Carlo simulation, risk register and brainstorming. These five techniques are selected based on the results of the pilot testing and the literature review.

Because only eight out of 45 organisations have practised formal risk management, the use of risk management tools and techniques are investigated from the perspectives of these eight organisations. Figure 1 illustrates that brainstorming is the most popular tool among the local construction industry, where seven out of eight organisations (87.5% of the organisations who apply risk management) apply it in their practices. Checklist is the second most popular risk management tool, where five out of eight organisations (62.5%) use checklist as a risk management tool. The data also show that three out of eight organisations (37.5%) apply sensitive analysis and two organisations (25%) employ risk register to manage risk. Monte Carlo simulation is not used by any of the respondents.

The results show that risk management in the Malaysian construction industry relies mostly on risk identification and qualitative risk analysis. It can be deduced that local practitioners do not make use of quantitative analytical tools such as sensitivity analysis and Monte Carlo simulation. Brainstorming and checklists are recognised as the most popular risk management tools used in the practice. In addition, local practitioners tend to implement risk management informally, without proper documentation of all risk inputs and outputs. This tendency undoubtedly reduces the effectiveness and efficiency of risk management, as the risk database is not appropriately set up to serve as a data source for similar future projects.

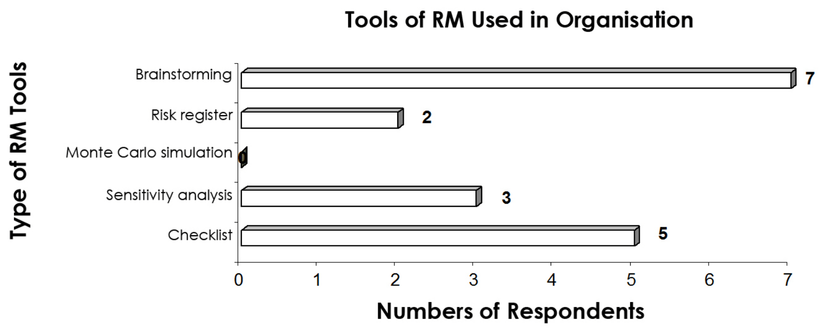

Figure 1. Risk Management (RM) Tools Applied in Local Construction Organisation

Risk Responses Employed to Manage Financial Risk

In view of the unique characteristics of different risks, it is necessary to adopt different strategies in dealing with different types of risk, to manage them more effectively. Table 3 shows that risk retention is most preferred by local construction practitioners for financial risk management, obtaining the highest frequency of 3.53. This result is followed by risk control (3.20), risk reduction (3.15), risk sharing (3.03), risk transfer (2.97) and risk avoidance (2.88).

Table 3. Risk Response for Financial Risk

Risk Response	**Weightage**	**Mean**	**Mode**	**Median**	**Standard Deviation**
Risk retention	127	3.528	3	4	1.237
Risk reducing	107	3.147	3	3	1.234
Risk sharing	103	3.029	3	3	1.193
Risk control	112	3.200	5	3	1.368
Risk avoidance	95	2.879	2	2	1.364
Risk transfer	95	2.969	3	3	1.282

There are two types of risk retention, i.e., passive retention and active retention. Passive risk retention acknowledges the existence of risk without responding further and active risk retention allocates an essential allowance to support a contingency strategy for projects whenever necessary. Both passive and active risk retention have been employed widely in the local construction industry. The interview findings reveal that the preference of risk retention in managing financial risks is largely because of uncontrollable factors; however, it is also favoured because of the closed-minded attitudes of the local practitioners. Financial risk is always regarded as uncontrollable, especially with respect to worldwide issues, such as the increasing global price of construction materials. The intrinsic attitudes and perceptions of the local players may also have a certain degree of impact on the preference of risk retention in managing financial risk.

Risk Responses Employed to Manage Time Risk

Time risk, referring to risks of tight scheduling, inappropriate time allocation and short bidding time, is frequently triggered by other risk factors such as weather risk, technical risk and design risk. The survey results reveal that most of the local construction practitioners opt to use risk control in dealing with time risk, with the highest mean of 3.28. Following risk control in relative frequency are risk reduction (with a mean of 3.00), risk avoidance (2.91), risk retention (2.58), risk transfer (2.42) and risk sharing (2.33). Table 4 shows the risk response preferences of local construction players in managing time risk.

The interview findings probe further into the underlying reasons for the preference for risk control in managing time risk. Time risk can be reduced in its likelihood of occurrence and the severity of impact through the manipulation of other resources. For example, additional resources, including human resources, equipment and money, can be allocated to reduce the delay in a project. A compromise may be required to balance the time risk and the financial risk to achieve the best situation for the project. The employees are often required to work overtime, especially in project-tendering and payment-issuing periods.

Table 4. Risk Response for Time Risk

Risk Response	Weightage	Mean	Mode	Median	Standard Deviation
Risk retention	85	2.576	2	2	1.106
Risk reducing	102	3.000	2	3	1.181
Risk sharing	77	2.333	1	2	1.190
Risk control	118	3.278	4	3.5	1.215
Risk avoidance	93	2.906	3	3	1.366
Risk transfer	80	2.424	2	2	1.200

Why Local Contractors Lag Behind

The findings show that risk management is not widely implemented in the local construction industry. Approximately 26.67% of the respondents indicate that a lack of knowledge about risk management is the major factor leading to local contractors lagging behind their foreign counterparts with respect to risk management. This result is followed by cost (24.4%), lack of awareness (15.56%), lack of exposure (8.89%) and lack of incentives from the government (8.89%).

However, the respondents' feedbacks, especially from the employers of small-sized organisations, indicate that risk management cannot be adapted fully in any case, given the current state of the construction industry in Malaysia. They feel that the implementation of risk management would consume much time and it may be unsuitable to the culture of the local construction industry, which is constantly in a state of hurriedness. The interview findings further support a lack of knowledge and the demands of cost and time as the major reasons for the contractors' lagging behind in risk management practices.

DISCUSSION OF THE ANALYSIS OF FINDINGS

In the case of the UK, the top three risks in the construction business are commercial risk, contractual risk and operational risk (Amos and Dents, 1997). Santoso, Ogunlana and Minato (2003) found managerial and design factor to be the major and most significant problems in a high-rise construction project in Jakarta, in terms of frequency and risk impacts. In China, the most significant risk events are found to be financial risks, including capital return difficulty, owners' delaying payment and owner's unreasonable upfront capital demand (Fang et al., 2004). Additionally, Zou, Zhang and Wang (2007) also identified personnel risk, such as client risk, designer risk, contractor risk, subcontractor risk or supplier risk, as major risks in the Chinese construction market.

In the Malaysian case, financial risk and time risk are identified as the major risks. The findings show that the emergence of financial and time risks is largely because of frequent late payments and poor planning that plague the performance of the local construction industry. Because risks are interdependent, financial risk and time risk could trigger the occurrence of one another, bringing cumulative effects to the achievement of project objectives.

The survey results also confirm that different types of organisations are subjected to different types of risks because they enter and engage the project at different stages. For example, contractors are prone to financial risk, time risk, physical risk and safety risk, but architects and engineers are primarily exposed to design risk, personnel risk and contractual risk. Clients and developers tend to experience more financial risk, time risk and personnel risk than other project parties.

According to Akintoye and MacLeod (1997), UK construction firms tend to treat risk differently and risk responses, ordered from the most often to the least often used, are risk transfer, risk retention, risk avoidance and risk reduction. Another study conducted by Amos and Dents (1997) showed that risk retention is the most common response in the UK construction industry, followed by risk reduction, risk removal, risk transfer and risk avoidance.

Different risk responses should be adopted for different types of risk for effective and efficient risk management because risks are characteristically unique and specific. The preferred treatment plan for financial risk and time risk are risk retention and risk control, respectively. An arbitrary allocation of a 10% contingency sum in the contract total is one of the methods of risk retention; it is simple and convenient. Time risk can be controlled through an application of advanced construction technology and/or the allocation of extra resources.

As stated by Akintoye and MacLeod (1997), formal risk management is rarely used, not only because of a lack of knowledge but also because of doubts in the suitability of risk management techniques for construction activities. From the findings, construction players in Malaysia also seldom employ formal risk management in their business practices and it may be because of a lack of knowledge and a lack of exposure to risk management. Although local organisations sometimes apply risk management, the applied risk management method typically amounts to undocumented practices, which unfortunately fail to achieve the full benefits of formal risk management practices.

CONCLUSIONS AND RECOMMENDATIONS

The findings demonstrate that financial risk and time risk are the major risks in the Malaysian construction industry. Both types of risks have a considerable impact on project performance in terms of cost, time and quality. A greater improvement in project performance is more likely to be achieved by focussing on the management of these two major risks, rather than by handling a larger number of minor risks. The construction stage has highest level of risk in its project life cycle because it involves a high investment of money, time and effort in the project completion. The lack of proper risk management practices is most likely one of the reasons the local construction projects are experiencing schedule and time overruns.

The results of the questionnaire demonstrate that many organisations in the local construction industry do not practice formal risk management. Instead, the most popular risk management tools used are brainstorming and checklists, which rely on highly subjective experiences. The sole use of checklists cannot be regarded as a formal risk management technique. A systematic risk management application is significant because informal risk management fails to provide useful risk-reporting for future project reference.

The interview findings suggest a low level of risk management knowledge among local construction practitioners as a factor for local contractors lagging behind their foreign counterparts in risk management application. In addition, the attitudes of local contractors towards risk management are not as encouraging as those in more developed countries. The lack of a positive attitude towards risk management application and a relatively low level in risk management knowledge leaves room and opportunity for improvements in the local construction industry.

In short, the awareness of risk management is still at a relatively low level in the current Malaysian construction industry. A resistance to change and the satisfaction of contractors with the current management system are believed to be the main contributors to the low level of awareness. The government should encourage the application of risk management by enforcing it as a prerequisite in tendering construction projects and in the application for the advanced grade promotion of contractors in their tendering capacity. It is suggested that an established local construction company should lead in the implementation of risk management in the Malaysian construction industry to prove the remarkable benefits of risk management practices. A proper guideline and model should be developed to steer local construction players towards a formal practice for risk management. The results of this study would not only provide an indicator for the development of risk management in the Malaysian construction industry, but they could also serve as an example for other developing countries.

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