

# IMPLEMENTING ENTERPRISE RISK MANAGEMENT IN A CHINESE CONSTRUCTION FIRM BASED IN SINGAPORE

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## ABSTRACT

*Despite the booming domestic construction market, an increasing number of Chinese Construction Firms (CCFs) have ventured overseas for market expansion, and thus are simultaneously exposed to higher business risks. Hence, they require not only project risk management (PRM) but also a more holistic and integrated approach to managing risks on an enterprise basis, which is known as enterprise risk management (ERM). The objective of this study is to examine ERM implementation in CCFs based in Singapore. As part of a larger research project, this current study adopts a case study approach in the first instance to understand the ERM implementation of a relatively large CCF based in Singapore. The information is collected through in-depth interviews with the senior management of the firm and document review. The empirical findings suggest that the firm has initiated an ERM program and established clear ERM ownership, a regular risk communication mechanism, and a risk-aware culture. However, the firm does not have a risk management information system, which may create inefficiency and hinder the involvement of staff at a lower level of the firm. The findings of this study provide valuable information about current ERM implementation status for practitioners and researchers.*

**Keywords:** Risk Management, International Construction, Construction Firms, Singapore.

## 1. INTRODUCTION

Construction businesses, especially those conducted outside home countries, are risky ventures. Venturing into the international construction markets involves not just the typical risks at home, but also the risks peculiar to international transactions (Han and Diekmann, 2001). Inadequate overseas environmental information and construction experience also contribute to a higher risk exposure and possibility of losses in the international market than that in the domestic market (He, 1995). Hence, risk management is critical for construction firms to survive and remain profitable in the international construction market.

The construction industry is a project-based industry where construction firms typically depend on their construction projects to earn revenues and profits. Although risks inherent in projects have been emphasised, construction firms are also exposed to the risks outside the projects, which tend to impact both project objectives and corporate objectives. Overemphasis on project risk management (PRM) tends to result in low efficiency in risk management, lack of transparency across multiple projects, inappropriate resource allocation among projects and difficulties in achieving the corporate strategic objectives. The recent trend has regarded risk management as an enterprise-wide process that collectively considers the risks that various projects face and links these events to the corporate strategy (Adibi, 2007). This approach agrees with the modern portfolio theory. This theory states that it is possible to build a reasonably safe portfolio even though it contains a number of uncorrelated or negatively correlated high-risk investments (Lam, 2003). Thus, as a holistic and integrated approach to risk management, enterprise risk management (ERM) can be adopted by construction firms (Druml, 2009).

The huge investments in infrastructure projects and urban development make the Chinese construction market continuously boom, thus enabling Chinese Construction Firms (CCFs) to have got soaring revenues in recent years. Despite the booming domestic construction market, an increasing number of CCFs have ventured overseas for market expansion. The National Bureau of Statistics of China (NBSC,

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2011) indicated that CCFs in Singapore obtained a turnover of US\$2.27 billion from contracted projects in 2010, which made Singapore the 12<sup>th</sup> largest overseas market for CCFs.

Although previous studies investigated ERM implementation in the financial, insurance, manufacturing, energy and chemical industries, there have been few studies on ERM in the construction industry. This study aims to fill the knowledge gap in ERM implementation of construction firms by adopting a case study approach to provide an in-depth understanding of the ERM implementation of a relatively large CCF based in Singapore. Thus, it will provide valuable information about current ERM implementation status in CCFs for practitioners and researchers.

## **2. LITERATURE REVIEW**

### **2.1. DEFINITION**

ERM is most frequently defined with reference to the guidance document Enterprise Risk Management-Integrated Framework published by the Committee of Sponsoring Organisations of the Treadway Commission (COSO). COSO (2004) defines ERM as “a process, effected by an entity’s board of directors, management and other personnel, applied in strategy setting and across the enterprise, designed to identify potential events that may affect the entity, and manage risk to be within its risk appetite, to provide reasonable assurance regarding the achievement of entity objectives (p.2).” The definition is adopted in this study as it is applicable to various industries, including the construction industry. Also, it reflects that ERM should be implemented by all levels across an enterprise and applied in strategy setting to assure the achievement of corporate objectives in one or more but overlapping categories, rather than an attempted eradication of the risks.

### **2.2. FACTORS AFFECTING ERM IMPLEMENTATION**

Previous studies found that ERM adoption was driven by a series of legal compliance and corporate governance requirements (Kleffner *et al.*, 2003; Liebenberg and Hoyt, 2003; Gates, 2006). These requirements are from the mandatory laws or regulations, non-mandatory reports or standards creating public pressures and benchmarks for sound management practices, and the rating agencies that included a company’s ERM system in their rating methodology. In addition, Pagach and Warr (2011) indicated that firms also carried out ERM for potential benefits. ERM implementation can improve firm performance (Nocco and Stulz, 2006; Gordon, *et al.*, 2009; Hoyt and Liebenberg, 2011) through bettering decision-making, maximising shareholder value, increasing accountability and risk reporting, improving earnings and profitability, as well as providing firms with sustaining competitive advantages (Meulbroek, 2002; Kleffner *et al.*, 2003; Lam, 2003; Gates, 2006; Nocco and Stulz, 2006). Moreover, a broader scope of risks from globalisation, market and greater risk interdependence were believed to drive firms to embrace an integrated approach to risk management (Liebenberg and Hoyt, 2003). Furthermore, technological advancement was also considered as a major external driver (Liebenberg and Hoyt, 2003) because advances in information technology (IT) enabled firms to gather better data for certain risks, model complex risks, and analyse risks faster, and better understand risk interdependence across a firm (Davenport and Bradley, 2000; Jablonowski, 2001; Segal, 2011). The above external forces would result in the request of the board and senior management for ERM implementation, which was seen as an internal driver for ERM adoption by Gates (2006).

Besides these drivers for ERM adoption, ERM implementation also faces some hindrances. Previous studies have identified a number of hindrances to implementing ERM in various industries. These hindrances include:

- (1) Insufficient resources (e.g. time, money, people, etc.) (Bowling and Rieger, 2005; Gates, 2006; Roth, 2006; Rao, 2007; AON, 2010; Beasley *et al.*, 2010; KPMG, 2010);
- (2) Lack of a formalised ERM process (Rao, 2007);
- (3) Lack of risk management techniques and tools (Rao, 2007; Segal, 2007; Muralidhar, 2010);

- (4) Lack of internal knowledge, skills and expertise (Rao, 2007; AON, 2010; KPMG, 2010);
- (5) Lack of a risk management information system (RMIS) (Ross, 2005; Muralidhar, 2010);
- (6) Unsupportive organisational structure (Kleffner *et al.*, 2003; Rao, 2007);
- (7) Unsupportive organisational culture (Merkley, 2001; Kleffner *et al.*, 2003; de la Rosa, 2006; Rao, 2007; Kimbrough and Compton, 2009; Muralidhar, 2010);
- (8) Lack of a common risk language (Nielson, *et al.*, 2005; Muralidhar, 2010);
- (9) Lack of risk awareness in the organisation (de la Rosa, 2006; Muralidhar, 2010);
- (10) Confidence in the existing risk management practices (Roth, 2006; Beasley *et al.*, 2010);
- (11) Perception that ERM adds to bureaucracy (Beasley *et al.*, 2010);
- (12) Inadequate training on ERM (Gupta, 2011);
- (13) Lack of an ERM business case (Aabo *et al.*, 2005; AON, 2010; KPMG, 2010);
- (14) Lack of perceived benefits (Roth, 2006; AON, 2010; Beasley *et al.*, 2010; KPMG, 2010);
- (15) Lack of commitment from the top management (Roth, 2006; AON, 2010; KPMG, 2010).

Because of these hindrances, only 11% of the US respondents possessed a complete formal ERM management system (Beasley *et al.*, 2010). Nonetheless, the status was better in Singapore as another survey indicated that 81% of the 203 respondents had ERM programs in place, and that approximately 53% had implemented ERM for more than three years (KPMG, 2010).

### **2.3. ERM OWNERSHIP**

Due to the centralised nature of ERM, ERM needs a risk oversight of an enterprise's entire risk profile at a high level rather than different overseers managing specific risks (Banham, 2004). A chief risk officer (CRO) position can be created to take responsibility for risk oversight, and thus signals the firm's emphasis on ERM to its employees and investors (Cendrowski and Mair, 2009). Some firms may choose to form a stand-alone risk management committee at the board level, or include the ERM responsibility in the C-level executives, such as chief executive officers (CEOs) and the chief financial officers (CFOs). Gregory (2003) claimed that it would be appropriate for small organisations to have the CEO function as CRO, but this was not practical for larger ones.

### **2.4. RISK-AWARE CULTURE**

A supportive culture is crucial to the success of ERM efforts (Cendrowski and Mair, 2009; Brooks, 2010). Such a culture is called a risk-aware culture (Brooks, 2010), risk management culture (Santori *et al.*, 2007), or risk culture (Collier, 2009; Zou *et al.*, 2010). A risk-aware culture improves vigilance of employees (Cendrowski and Mair, 2009) and enables employees to speak up and then be listened to by decision makers (Brooks, 2010). Explicit expression and deliberation about the expected behaviours within the organisation is also required to create and sustain a strong risk-aware culture (Brooks, 2010). In addition, as recommended by the UK Health and Safety Executive (HSE), the components of a risk-aware culture encompass leadership, involvement, learning, accountability and communication. Lastly, the risk-aware culture should be embedded into the corporate culture, which can encourage management at all levels to be aware of the potential project and enterprise risks. Hence, due to the pervasiveness of risk awareness throughout the firm, risk management becomes a critical part of the corporate culture (Barton, Shenkir and Walker, 2002; Kimbrough and Compton, 2009).

### **2.5. RISK COMMUNICATION**

Risk information obtained from various sources should be communicated transparently across multiple projects and departments of a firm. Transparent risk communication allows and encourages individual comments and expert views during the development of cross-functional understanding of risks and risk

management strategies (AON, 2010). There should be a mechanism in place to ensure that critical risk information is reported to the top management (Dafikpaku, 2011), and clear communication lines to ensure that line managers, project managers and staff are promptly notified of critical information (Barton *et al.*, 2002). In addition, a RMIS can improve risk communication through providing an information platform for risk information distribution across an enterprise, and facilitate data-based risk reporting, which leads to rapid and accurate evaluation of risk and timeliness of reporting (Duckert, 2011). Furthermore, a common language, which clearly explains terminologies and methods to be used universally in the organisation, can save time of risk management staff in resolving communication issues at the expense of their primary responsibilities (Espersen, 2007).

### **3. RESEARCH METHODOLOGY**

The case study approach was adopted in this study to understand the current ERM implementation in a CCF based in Singapore. A large CCF operating in Singapore (hereinafter referred to as Firm A) whose management staff agreed to participate in the interview was selected. The data was collected through reviewing past documents and semi-structured interviews. Prior to conducting the interviews, a number of past documents, including non-confidential internal documents about ERM and reports in the mass media, were reviewed. The semi-structured interviews were conducted in March and November 2011, and guided by a questionnaire consisting of six groups of questions. The first group was used to collect the basic information relating to the firm and interviewee. The following five groups of questions were used to collect the information regarding the factors affecting ERM implementation, ERM ownership, risk communication, the risk-aware culture, as well as the ERM process in the interviewees' firm, respectively. Most questions in the questionnaire were open-ended for the interviewees to supply their own answers without being constrained by a fixed set of possible responses. New questions were also allowed to be raised during the semi-structured interviews.

### **4. CASE STUDY**

#### ***4.1. PROFILE OF THE FIRM***

Firm A was a Singapore-based subsidiary of Firm B. By the end of 2010, Firm B had established 16 overseas subsidiaries. Besides them, other domestic subsidiaries can also contract overseas projects. Firm B was a state-owned central enterprise, and has been a listed corporation in the Shanghai Stock Exchange since 2009.

Since its foundation in 1992, Firm A has completed approximately 150 projects in Singapore. Firm A has been registered under CW01 with a financial grade of A1, and under CW02 with a financial grade of B1 with the BCA. Hence, this firm enjoyed unlimited tendering capacity in all types of building projects, and had a tendering limit of S\$40 million in civil engineering projects. Firm A has become the largest building contractor in Singapore in terms of turnover value. It attained a turnover of S\$561 million in 2008, S\$569 million in 2009 and S\$677 million in 2010. Its net profits had doubled from S\$10 million in 2008 to S\$20 million in 2010. At the time of this study, Firm A had over 700 staff and over 4,500 skilled workers. A matrix organisational structure was adopted by Firm A. The board of Firm A consisted of six members, including the Managing Director, who actually took charge of the business and operations of Firm A. The Chairman of Firm A was also the Vice President of Firm B, and the General Manager of the Overseas Business Department in the headquarters of Firm B, which meant he took charge of the entire overseas business of Firm B.

#### ***4.2. FACTORS AFFECTING ERM IMPLEMENTATION***

ERM implementation in Firm A was closely related to directions from its parent company. As a listed enterprise, Firm B had to comply with the internal control rules in the Shanghai Stock Exchange. As a state-owned central enterprise, Firm B had to comply with the Guidance to ERM for Central Enterprises,

which was issued by the State-owned Assets Supervision and Administration Commission (SASAC) of the State Council of China in 2006 after a great loss by China Aviation Oil (Singapore) due to futures trading. The SASAC is responsible for the supervision and administration of the existing state-owned central enterprises and has already taken ERM implementation into the performance evaluation system of central enterprises. To comply with the requirements from SASAC, Firm B took the following steps:

- (1) In March 2008, Firm B established an ERM leadership group;
- (2) In December 2008, Firm B issued the Firm B Guidance to ERM Implementation;
- (3) In 2009, Firm B issued the Guidance to ERM Implementation in Subordinate Enterprises;
- (4) In 2009, ERM implementation was included in the Firm B Internal Control Manual, and its annual Sustainability Report.

These steps also drove the ERM implementation in Firm A, because the Firm B Guidance to ERM Implementation requires all its subsidiaries to adopt ERM and report implementation status to the headquarters of Firm B in Beijing at the end of each year. Based on the ERM implementation in its subsidiaries, Firm B developed a comprehensive annual report and submitted it to the SASAC. Hence, the ERM implementation in Firm A was directly driven by the compliance requirements from Firm B, and indirectly driven by the requirements from the SASAC.

Increasing and more complicated risks that Firm A faced was another factor that drove its ERM implementation. The recent uncertain political situation in the Middle East and North Africa, the devastating earthquake, tsunami and nuclear meltdown in Japan, as well as the post-war reconstruction in Libya would increase the volatility of prices of raw materials, and bring about some uncertainties to the international construction market. The risks whose origins were perceptibly far away from Singapore might also threaten the profitability and even the survival of the firms in Singapore. Although Singapore has a stable political situation, the firms should still emphasise risk management with the management having a strong risk-aware culture. Hence, Firm A implemented ERM to proactively control the risks within its risk appetite.

The compliance requirements from Firm B and a broader scope of risks caused the board and senior management to encourage ERM implementation in Firm A. The Chairman of Firm A was a member of the ERM leadership group in Firm B, and thus had to commit to ERM implementation. Influenced by the Chairman, other senior executives were therefore committed to ERM implementation. The request and encouragement from the board and senior management drove the ERM implementation and ensured that risks were considered in strategic decision-making within the firm.

Lack of perceived benefits of ERM would hinder ERM implementation in Firm A. According to the interviewees, employees needed to perceive the underlying benefits to themselves and the enterprise, before the firm adopted ERM as a new risk management paradigm to complement the existing PRM practice. Otherwise, they would regard ERM implementation as an additional burden. In addition, although the Chairman did not stay in Singapore, the lack of the leadership of the Chairman appeared to have little negative influence on ERM implementation in Firm A.

### **4.3. ERM OWNERSHIP**

In Firm A, the Chairman was ultimately responsible for ERM, but the Managing Director actually took charge of ERM. The top management made decisions concerning ERM. Because projects were the only revenue source, the top management was involved in risk management at all stages of the projects of Firm A, especially the large-scale ones. The decisions relating to tendering strategies, material procurement and measures to deal with cost overrun were made by the board because these decisions were related to both project revenue and the profitability of the firm.

There was not a position dedicated to ERM in Firm A. The ERM responsibility was actually included in the function of the Managing Director. In addition, there was no specialised risk management department or risk management committee of the board in Firm A, even though the Firm B Guidance to ERM Implementation suggested establishing such a department or committee in the subsidiaries. In reality, in

the operations of Firm A, the board itself had served as a risk management committee, and was involved in critical decision-making at both project and firm levels. The board also oversaw the entire risk profile of the firm, and centralised the risk management practice of each project team. Moreover, it is worth reiterating that construction firms are project-based and the construction projects that they are engaged in are their only revenue source. PRM was still emphasised in Firm A and was considered as a critical part of ERM. Each project has its own project team comprised of people with the necessary management skills and experience.

#### ***4.4. RISK-AWARE CULTURE***

The Firm B Guidance to ERM Implementation emphasised creating the risk-aware culture and incorporating the culture into the corporate culture. Hence, the senior management should be committed to cultivating the risk-aware culture throughout the firm. According to the interviewees, Firm A had cultivated a risk-aware culture through training and instituting clear accountability.

Firm A emphasised training its staff and workers. The staff from middle management (e.g. project directors and managers) to frontline managers (e.g. quantity surveyors, and engineers) needed to attend various training courses held inside or outside Firm A. The workers employed by Firm A needed to accept safety training before working on site. These training programs, which also served as an organisational learning mechanism, involved the staff at middle and lower levels and the workers on site, and helped to embed risk awareness into the minds of the staff and workers.

Besides training programs, accountability also facilitated cultivating the risk-aware culture in Firm A. ERM implementation was included in the key performance indicators (KPIs) of the senior management. To attain the KPIs, the senior management had high-level risk awareness. At the middle level, project directors and managers signed accountability pledges, which clearly announced their responsibility for achieving safety, cost, quality, and schedule objectives, and linked their bonuses to these objectives. Failure to attain these objectives would lead to reduction in bonuses, while surpassing the objectives or getting BCA rewards can bring about additional performance bonuses. Thus, the accountability pledges made project directors and managers aware of potential risks, and contributed to relatively high-level risk awareness among the middle management. Hence, the accountability established in Firm A motivated the management at senior and middle level to be vigilant against risks and to consider risks in decision-making.

#### ***4.5. RISK COMMUNICATION***

Within Firm A, the monthly Operating Meeting acted as a platform for communicating risk information. The Managing Director presided over such meetings. The board members, heads of all the departments, as well as project directors and managers of all the on-going projects attended this meeting at the headquarters of Firm A. At this meeting, the progress status of the on-going projects was reported to the board, which could thus have a clear perspective of the entire risk profile of the firm. Risk information collected from various sources was communicated at this meeting, and the decisions made by the board were notified to the leaders of the departments and projects. Besides the regular meetings, emails and telephone calls were the main communication methods across projects and departments in Firm A. Although every computer in Firm A can access the Internet, there was neither an intranet in Firm A, nor a RMIS in place. In each project team or department, there was a local area network (LAN) for sharing documents, but communication between projects and departments greatly depended on emails and telephone calls.

Firm A was supervised by Firm B and had to report its operational status to Firm B to account for all its losses or profits every year. In order to ensure the accuracy of the annual reports and to implement internal control, Firm B audited Firm A twice a year. Such internal audits from Firm B began in 2006, just after SASAC issued the Guidance to ERM for Central Enterprises. Actually, the control of Firm B over Firm A was relatively strong because the Chairman of Firm A was also the Vice President of Firm B. In addition, Firm B identified the macroeconomic risks by cooperating with consulting companies and collected the

risks identified by all its subsidiaries. Based on all the available information, Firm B identified the major risks and issued them to all the subsidiaries, including Firm A.

To ensure the effectiveness and efficiency of risk communication, Firm B provided a glossary of risk terms in the Guidance to ERM Implementation. This glossary included explanation of 27 risk terms that would frequently be used in risk communication, and would facilitate forming a common risk language. As the interviewees revealed, these risk terms was understood by the middle and senior management, and widely communicated at Operating Meetings. However, the staff at lower levels may be unfamiliar with the risk language.

#### **4.6. ERM PROCESS**

Firm A adopted an ERM process recommended in the Firm B Guidance to ERM Implementation, which consisted of initial risk information collection, risk identification and evaluation, response plan for major risks, risk response plan implementation, and review and improvement.

Firm A collected risk information from all available sources, which helped to identify potential risks. Firm A had a risk checklist, which listed the potential risks they had identified in previous projects. This risk checklist was reviewed and updated every year. The renewed risk checklist was then reported to Firm B. After collecting risks identified from its subsidiaries, Firm B identified the major risks. By the end of 2010, Firm B had identified 1,314 risks and six major risks in 2010: macroeconomic risks, strategic management risks, investment risks, receivables risks, overseas operational risks, and quality and safety risks. Firm B also issued the risks identified, the response plans for the major ones, and the lessons learned to all the subsidiaries in the forms of the Annual ERM Report of Firm B (confidential) and the Risk Monitoring and Analysis Report. Then, Firm A updated its checklist by using the information from Firm B at the beginning of the year.

Firm A depended on experience and subjective judgments, rather than software, to evaluate risks. However, Firm A had to be more serious in safety and health risks for compliance with the Workplace Safety and Health (Risk Management) Regulations in Singapore, which stipulated that a record of risk assessment should be kept for at least three years from the data of the assessment.

The top management, who was very experienced in dealing with risks in the international construction market, made decisions for developing and implementing risk response plans. In addition, Firm B provided guidance to risk response, thus contributing to better-informed decisions in Firm A. For instance, Firm B issued the Guidance to Engineering Contract Review Risk Management in 2010, which identified the potential risks in contract review and tendering decision-making, provided applicable risk response measures, and thus improved decision-making in tendering.

Firm A reviewed its ERM practice every year and reported the review results and plans for improvement to Firm B. ERM implementation in Firm A was also reviewed and audited by Firm A twice a year. The Risk Monitoring and Analysis Report issued by Firm B also provided lessons of some successful risk management practices in other subsidiaries, which would help Firm A to improve its ERM implementation.

#### **4.7. DISCUSSION**

Firm A had effective PRM practice in place, which appeared to be supported by the increasing annual turnover and net profits in recent years. The effective PRM practice also set a foundation for ERM implementation. In terms of time, ERM implementation in Firm A was still at its infancy stage because the ERM initiation in Firm A was only announced at an Operating Meeting in early 2010 after its parent company issued a series of guidance relating to ERM.

ERM implementation in Firm A was directly driven by the compliance requirements from its parent firm, indirectly driven by the compliance requirements from the SASAC. ERM adoption was also externally driven by the increasing and more complicated risks, and was internally driven by the request and encouragement from the board and senior management. The findings were consistent with the previous studies that recognised legal and regulatory requirements as a major external driver (Kleffner *et al.*, 2003;

Liebenberg and Hoyt, 2003; Gates, 2006), that found complex risks as an external driver (Lam and Kawamoto, 1997; Liebenberg and Hoyt, 2003), and that regarded the board request as a primarily internal driver for ERM implementation (Kleffner *et al.*, 2003; Gates, 2006). In Firm A, the benefits from ERM implementation were not evident enough to the interviewees. Lack of perceived benefits of ERM would hinder ERM implementation (AON, 2010; Beasley *et al.*, 2010; KPMG, 2010). A significant increase in benefits can be achieved as firms move along the maturity continuum of ERM (KPMG, 2010). Thus, top management may adopt training programs to emphasise the short-term benefits of ERM implementation, such as more turnover and less losses.

In Firm A, the Managing Director actually took charge of ERM and the board itself acted as a risk management committee to oversee the entire risk profile and centralise the risk management practice of each project team and departments. The effectiveness of such ERM ownership was backed by the increasing turnover and profit even though there was not a CRO position in Firm A because firms without CROs could also have successful ERM programs (Barton *et al.*, 2002).

The traditional communication methods, such as regular meetings, emails, and telephone calls, were used for risk communication and were considered to be convenient and effective. However, lack of a RMIS may lower the efficiency of ERM implementation, and hinder the involvement of staff at a lower level of the firm for ERM implementation. Thus, lack of a RMIS would hinder ERM implementation (Ross, 2005; Muralidhar, 2010). The low level of IT applications for construction management or decision-making was seen as a weakness of CCFs, which would constrain them from achieving better performance outside of China (Lu *et al.*, 2009). According to the Firm B Guidance to ERM Implementation, a RMIS is highly recommended. Firm B has set out to establish such a system for ERM implementation and its subsidiaries can also benefit from this RMIS.

In addition, risk-aware culture was created in Firm A through training programs and accountability. The findings agreed with Hopkin (2010) who identified involvement of organisational individuals and organisational learning as approaches to creating risk-aware culture, and with AON (2010) that found instituting clear accountability as a successful approach to creating a risk-aware culture.

Furthermore, the management staff in Firm A highly depended on their experience, knowledge and subjective judgments to identify, evaluate and respond to risks, which was recognised as a common practice in risk management in the construction industry (Kartam and Kartam, 2001; Raz and Michael, 2001; Thevendran and Mawdesley, 2004; Wang and Yuan, 2011). However, the subjectivity in risk management has limitations and would lower risk management effectiveness. The RMIS to be established in Firm B may contribute to the effectiveness of risk management in all its subsidiaries, including Firm A.

## 5. CONCLUSIONS AND RECOMMENDATIONS

This study presents a case study to demonstrate how a CCF in Singapore implemented ERM. The findings indicated that this firm had initiated an ERM program, and had clear ERM ownership, a regular risk communication mechanism, and risk-aware culture. However, the lack of a RMIS would lower the efficiency of the risk communication and hinder the ERM implementation. ERM practice is an on-going process (Bowling and Rieger, 2005; Simkins, 2008), and will demonstrate more benefits when it becomes mature (KPMG, 2010). Therefore, Firm A still has a long way to go before achieving a mature ERM program, which echoes the “step-by-step principle” in the Firm B Guidance to ERM Implementation.

Although the objective of this study was achieved, there are some limitations. One of them is that this study investigates the ERM implementation in a large firm because ERM implementation would be different in small and medium construction firms. This is because firm size has been identified as a variable positively related to ERM adoption (Beasley *et al.*, 2005; Hoyt and Liebenberg, 2011) and significantly affecting ERM system design (COSO, 2004) and the improvement of firm performance (Gordon *et al.*, 2009). Nevertheless, this study still contributes to filling the knowledge gap in ERM implementation in the construction industry by conducting a case study on how a specific construction firm implemented ERM, and sets a foundation for further studies in this area. Further studies would be conducted to develop a set of ERM best practices and an ERM maturity assessment model for construction

firms, and to identify the critical factors that drive and hinder ERM implementation in construction firms. This is because an ERM maturity model is required for construction firms to assess their current ERM maturity and based on which, the firms can improve their ERM implementation, using a set of ERM best practices as a benchmark.

## 6. REFERENCES

- Aabo, T., Fraser, J. R. S., and Simkins, B. J. (2005). The rise and evolution of the chief risk officer: Enterprise risk management at Hydro One. *Journal of Applied Corporate Finance*, 17(3), 62-75.
- Adibi, S. (2007). *Industry should embrace risk management tools*. Retrieved from <http://newyork.construction.com/opinions/bottomline/archive/2007/06.asp>
- AON. (2010). *Global risk management survey 2010*. Chicago, IL: AON Corporation.
- Banham, R. (2004). Enterprising views of risk management. *Journal of Accountancy*, 197(6), 65-71.
- Barton, T. L., Shenkir, W. G., and Walker, P. L. (2002). *Making Enterprise Risk Management Pay Off*. Upper Saddle River, NJ: Financial Times Prentice Hall.
- Beasley, M. S., Branson, B. C., and Hancock, B. V. (2010). *Report on the current state of enterprise risk oversight* (2nd ed.). Raleigh, NC: American Institute of Certified Public Accountants (AICPA) Business, Industry & Government Team, and the ERM Initiative at North Carolina State University.
- Beasley, M. S., Clune, R., and Hermanson, D. R. (2005). Enterprise risk management: An empirical analysis of factors associated with the extent of implementation. *Journal of Accounting and Public Policy*, 24(6), 521-531.
- Bowling, D. M., and Rieger, L. A. (2005). Success factors for implementing enterprise risk management. *Bank Accounting and Finance*, 18(3), 21-26.
- Brooks, D. W. (2010). Creating a risk-aware culture. In J. Fraser, & B. J. Simkins (Eds.), *Enterprise Risk Management*, 87-96. Hoboken, NJ: John Wiley & Sons.
- Cendrowski, H., and Mair, W. C. (2009). *Enterprise Risk Management and COSO: A Guide for Directors, Executives, and Practitioners*. Hoboken, NJ: John Wiley & Sons.
- Collier, P. M. (2009). *Fundamentals of Risk Management for Accountants and Managers*. Oxford: Butterworth-Heinemann.
- COSO. (2004). *Enterprise risk management—Integrated framework*. New York, NY: The Committee of Sponsoring Organizations of the Treadway Commission.
- Dafikpaku, E. (2011). *The strategic implications of enterprise risk management: A framework*. Paper presented at the 2011 Enterprise Risk Management Symposium, Chicago, IL.
- Davenport, E. W., and Bradley, L. M. (2000). Enterprise risk management: A consultative perspective, 2000 *Discussion Paper Program on Insurance in the Next Century*, 23-42. Arlington, TX: Casualty Actuarial Society.
- de la Rosa, S. (2006). Cultivating the best board. *Internal Auditor*, 63(4), 69-75.
- Druml, D. (2009). *Contractors: Are You Adopting ERM or Still Stuck in the Mud?* Retrieved from <http://www.druml.com/about/articles2009/04/contractors-enterprise-risk-management-adoption-construction-risk-management/>
- Duckert, G. H. (2011). *Practical enterprise risk management: A business process approach*. Hoboken, NJ: John Wiley & Sons.
- Espersen, D. (2007). The language of risk. *Internal Auditor*, 64(3), 69-73.
- Gates, S. (2006). Incorporating strategic risk into enterprise risk management: A survey of current corporate practice. *Journal of Applied Corporate Finance*, 18(4), 81-90.
- Gordon, L. A., Loeb, M. P., and Tseng, C. Y. (2009). Enterprise risk management and firm performance: A contingency perspective. *Journal of Accounting and Public Policy*, 28(4), 301-327.
- Gregory, C. A. (2003). *Minimizing Enterprise Risk*. London: Financial Times Prentice Hall.
- Gupta, P. K. (2011). Risk management in Indian companies: EWRM concerns and issues. *Journal of Risk Finance*, 12(2), 121-139.

- Han, S. H., & Diekmann, J. E. (2001). Approaches for making risk-based go/no-go decision for international projects. *Journal of Construction Engineering and Management*, 127(4), 300-308.
- He, Z. (1995). Risk management for overseas construction projects. *International Journal of Project Management*, 13(4), 231-237.
- Hopkin, P. (2010). *Fundamentals of Risk Management*. London: Kogan Page.
- Hoyt, R. E., and Liebenberg, A. P. (2011). The value of enterprise risk management. *Journal of Risk and Insurance*, 78(4), 795-822.
- Jablonowski, M. (2001). Thinking in numbers. *Risk Management*, 48(2), 30-35.
- Kartam, N. A., and Kartam, S. A. (2001). Risk and its management in the Kuwaiti construction industry: A contractors' perspective. *International Journal of Project Management*, 19(6), 325-335.
- Kimbrough, R. L., and Compton, P. J. (2009). The relationship between organizational culture and enterprise risk management. *Engineering Management Journal*, 21(2), 18-26.
- Kleffner, A. E., Lee, R. B., and McGannon, B. (2003). The effect of corporate governance on the use of enterprise risk management: Evidence from Canada. *Risk Management and Insurance Review*, 6(1), 53-73.
- KPMG. (2010). *Charting a safe and sustainable growth journey: Singapore enterprise risk management survey 2010*. Singapore: KPMG in Singapore.
- Lam, J. (2003). *Enterprise Risk Management: From Incentives to Controls*. Hoboken, NJ: John Wiley & Sons.
- Lam, J. C., and Kawamoto, B. M. (1997). Emergence of the chief risk officer. *Risk Management*, 44(9), 30-35.
- Liebenberg, A. P., and Hoyt, R. E. (2003). The determinants of enterprise risk management: Evidence from the appointment of chief risk officers. *Risk Management and Insurance Review*, 6(1), 37-52.
- Lu, W., Li, H., Shen, L., and Huang, T. (2009). Strengths, weaknesses, opportunities, and threats analysis of Chinese construction companies in the global market. *Journal of Management in Engineering*, 25(4), 166-176.
- Merkley, B. W. (2001). Does enterprise risk management count? *Risk Management*, 48(4), 25-28.
- Meulbroek, L. (2002). A senior manager's guide to integrated risk management. *Journal of Applied Corporate Finance*, 14(4), 56-70.
- Muralidhar, K. (2010). Enterprise risk management in the Middle East oil industry: An empirical investigation across GCC countries. *International Journal of Energy Sector Management*, 4(1), 59-86.
- NBSC. (2011). *China Statistical Yearbook 2011*. Beijing: China Statistics Press.
- Nielson, N. L., Kleffner, A. E., and Lee, R. B. (2005). The evolution of the role of risk communication in effective risk management. *Risk Management and Insurance Review*, 8(2), 279-289.
- Nocco, B. W., and Stulz, R. M. (2006). Enterprise risk management: Theory and practice. *Journal of Applied Corporate Finance*, 18(4), 8-20.
- Pagach, D. P., and Warr, R. S. (2011). The characteristics of firms that hire chief risk officers. *Journal of Risk and Insurance*, 78(1), 185-211.
- Rao, A. (2007). Evaluation of enterprise risk management (ERM) in Dubai: An emerging economy. *Risk Management*, 9(3), 167-187.
- Raz, T., and Michael, E. (2001). Use and benefits of tools for project risk management. *International Journal of Project Management*, 19(1), 9-17.
- Ross, A. (2005). *The evolving role of the CRO*. London: The Economist Intelligence Unit.
- Roth, J. (2006). An enterprise risk catalyst. *Internal Auditor*, 63(2), 81-87.
- Santori, L., Bevan, K., and Myers, C. (2007). *Summary Of Standard & Poor's Enterprise Risk Management Evaluation Process For Insurers*. New York, NY: Standard & Poor's.
- Segal, S. (2007). Value-based enterprise risk management: The key to unlocking ERM potential. *Corporate Finance Review*, 10(4), 16-26.
- Segal, S. (2011). *Corporate Value of Enterprise Risk Management*. Hoboken, NJ: John Wiley & Sons.

- Simkins, B. (2008). Enterprise risk management: Current initiatives and issues Journal of Applied Finance Roundtable. *Journal of Applied Finance*, 18(1), 115-132.
- Thevendran, V., and Mawdesley, M. J. (2004). Perception of human risk factors in construction projects: an exploratory study. *International Journal of Project Management*, 22(2), 131-137.
- Wang, J., and Yuan, H. (2011). Factors affecting contractors' risk attitudes in construction projects: Case study from China. *International Journal of Project Management*, 29(2), 209-219.
- Zou, P. X. W., Chen, Y., and Chan, T. Y. (2010). Understanding and improving your risk management capability: Assessment model for construction organizations. *Journal of Construction Engineering and Management*, 136(8), 854-863.