The Mediating Effect of Knowledge Management on the Relationship between Risk Management and Project Performance

2020 6th International Conference on Information Management (ICIM) 978-1-7281-5770-2/20/$31.00 ©2020 IEEE 10.1109/ICIM49319.2020.244719

Andy Zhi Rong Chin
Azman Hashim International Business School,
Universiti Teknologi Malaysia, Johor, Malaysia
e-mail: czrandy2@live.utm.my

Tang Hui Yi
Azman Hashim International Business School,
Universiti Teknologi Malaysia, Johor, Malaysia
e-mail: hytang2@live.utm.my

*Norhayati Zakuan
Azman Hashim International Business School,
Universiti Teknologi Malaysia, Johor, Malaysia
e-mail: norhayatimz@utm.my

Zuraidah Sulaiman
Azman Hashim International Business School,
Universiti Teknologi Malaysia, Johor, Malaysia
e-mail: zuraidahs@utm.my

Muhamad Zameri Mat Saman
School of Mechanical,
Universiti Teknologi Malaysia, Johor, Malaysia
e-mail: zameri@fkm.utm.my

Thoo Ai Chin
Azman Hashim International Business School,
Universiti Teknologi Malaysia, Johor, Malaysia
e-mail: acthoo@utm.my

Abstract— Risk management is the fundamental part of project management where it aims to discover the potential risks affiliated with a project and take suitable actions against those risks. Risk management is a comprehensive and systematic way to manage risks, which is implemented continuously throughout the construction project in order for a construction company to achieve their project objective. The purpose of this paper is to study the mediating effect of knowledge management (KM) on the relationship between risk management (RM) and project performance (PP). This paper is a quantitative research whereby questionnaire survey is used. The population of this research is the construction industry (CI) in Malaysia. This paper had proposed a framework of the relationship between RM, KM and PP. The results of PLS-SEM showed that (1) there is a positive and significant relationship between RM and PP; (2) there is a positive and significant relationship between risk management and knowledge management; (3) there is a positive and significant relationship between KM and PP; (4) KM has partially mediated the relationship between RM and PP. Hence, this paper concludes that implementation of RM will drive the implementation of KM in construction companies, which eventually improve the PP.

Keywords-construction industry; knowledge management, malaysia; project performance; risk management

I. INTRODUCTION

Risk is a common element that exists in every industry which are generally understood as a loss to a company but in fact, risk is not a loss but it is a possibility of loss. Majority of the company failed to realize that risk can also have positive impact to a company's objective. Risk is a positive or negative deviation of a variable from its expected value [1]. Reference [2,] stated that risk will be affected mainly by organisational factor and human decision processes. This means that risk can either be an opportunity to a company or it can also be a threat to them, it all depends on how a company manages risk. Risk takes on many different forms which they are cost related risk, time related risk, quality related risk, safety related risk, and also environmental related risk [3].When risks come to fruition, they will affect the performance of a particular project in the aspect of cost, quality and time which will lead to postponements and disputes down the road. However, with proper planning and good project management, companies can manage and alleviate these risks so that they can transform these risks into opportunities that favours them, thus improving the performance of their company. Risk management (RM) is important in any industry, especially in the construction industry (CI). This is because the construction projects from this industry are always distinctive and the risk comes from different sources [4]. A temporary project team that is grouped together from different construction companies is one of many sources that risks come from [5]. The size and complexity of a construction project is not the only factor that increases the risk, the current political economic and social condition also affect the occurrence of risk in a construction project [6].

According to Department of Statistics Malaysia, although the growth rate of construction activities was positive, it had shown a declining trend from the first quarter to the fourth quarter of 2018. This decrement in positive growth had hinted that the construction companies might be facing issues

within the construction projects, thus embarks the need to study the relationship between risk management and project performance of construction industry in Malaysia.

Numerous studies had been conducted in other countries on the topic of RM and its effect on business performance, however researches on the impact of RM on project performance (PP) in Malaysia's CI is not as much. Lack of study in this subject in Malaysia has drawn the attention to carry out researches of the relationship between RM and PP of CI in Malaysia. Furthermore, this study has added knowledge management (KM) to test its indirect effect on the relationship between RM and PP of CI in Malaysia.

II. LITERATURE REVIEW

A. Construction Industry

CI is one of the many sectors of national economy that is involved in the development of land, constructing, altering and repairing buildings, infrastructures and other real property. Reference [7] categorised CI into residential construction which is housing, non-residential construction, heavy, civil and roads, utility and industrial. They also noted that construction projects comprise of new construction, renovation and demolition for both residential and non-residential projects. Construction projects also include public works projects such as streets, roads, highway, utility plants, bridges, tunnels and overpass. CI is an industry that requires intense knowledge because the execution of the construction activities needs specialised expertise along with problem solving skills [8]. Therefore, for any construction projects carried out by the CI, it involves several professionals from different fields such as architects, civil and structural engineers, land surveyors, quantity surveyors, electrical engineers, mechanical engineers, contractors and others. Reference [9] stated that the construction industries are constantly faced with various situations involving uncertainties, whether they are desirable or undesirable by the construction companies.

B. Risk Management

Since the past few decades, the importance of RM has been slowly recognised by organisation from different industries and these organisations, especially the one in CI, has begun to establish RM departments in order to carry out RM practices [9]. According Reference [3], RM is a practical method to identify the sources of risks from different areas, assessing their impact and treat these risks accordingly. RM is a repetitive process of defining the sources of risk, assessing the consequences of risk, strategize plans to cope with risk and finally collect opinion from different parties to improve the plans to respond to risk [6]. Reference [7] suggested that RM does not just stop after it is applied once but it is an iterative process which is systematically implemented in the lifecycle of a project, from the planning phase to the completion phase. The adoption of RM in the early stage of a project is particularly important as it helps project managers to make decisions on the alignment and selection of construction methods.

C. Project Performance

Reference [12] noted that performance is important because it provides a guideline to let managers know where they are and where they are going to be. This guideline leads managers to a steady progress towards the established goal and at the same time alert the manager if there any shortfall or stagnation. The authors then defined performance measurement as the process of assessing performance relative to a predefined goal. Even though different people measure performance differently, the fundamental measurements of a project's performance are the cost performance, time performance and quality performance [12]. Indicator of a successful project is affected by the cost performance, time performance and quality performance [13]. Reference [14] reported that PP can be measured by three dimensions which are time, cost and quality. The three dimensions are the most common indicator to measure a project's overall performance. Furthermore, a successful project usually achieves the time, scope and cost criteria [15]. This means that cost, time and scope criteria are used to measure the performance of a project.

D. Knowledge Management as Mediator

Reference [16] pointed out that KM is not just storing and manipulating information gathered, but also a process that create and disseminate knowledge throughout the organisation. The authors then defined KM as a systematic process of generating, using and applying knowledge of an organisation to improve their performance. KM are usually affected by the company's culture. Managerial level employees who involved themselves in KM will influence and encourage other employees to practise KM [17]. Reference [18] reviewed that KM had been increasingly considered as a strategic resource to improve a firm's performance. The authors stated that firms that implements KM gains competitive advantage compared to firms that does not implement KM. KM is a management system that helps a company to provide the right information in the right format at the right time to the right employee. Organisations that practise KM are more innovative and more capable to explore new directions [19].

E. Research Framework

The independent variable for this study is RM and the dependent variable for this study is PP. KM acts as a mediator for the above variables. The relationship of each variables will be shown in Fig. 1.

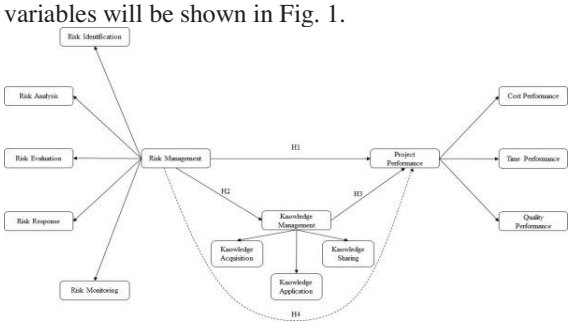

Figure 1. Research framework

III. RESEARCH METHODOLOGY

This research was conducted using quantitative method by distributing structured questionnaires via email. This method was employed because the nature of this research focuses on identifying the relationship among three variables ratherthan exploring phenomenon.

The population of this study is the CI in Malaysia and the target population is the 2,350 construction companies that holds grade G7 license in Kuala Lumpur. The sampling frame was acquired by downloading the list that contains all contact information of all grade G7 construction companies in Kuala Lumpur from Construction Industry Development Board (CIDB). The minimum sample size required for a population size of 2,350 is 331 [20], however due to time and cost constraints, this study only select a minimum of 50 respondents. The unit of analysis in this research is the construction projects in Malaysia.

IV. RESULTS

Structural models are used to systematically evaluate whether the studied hypotheses when converted into structural paths are supported by the study findings or not [27]. Structural model can only be analysed after successful validation of measurement model. Structural model in PLS-SEM can be examined to find the statistical significance of all path coefficients between exogenous and endogenous constructs. Structural model in PLS-SEM can also be used to evaluate the explained variance (R^2). Fig. 2 shows the result of PLS estimation (direct effects), which includes R^2, statistical significance and path coefficients. The R^2 value for KM is 0.673, which indicates that 67.3% of the variation in KM can be explained by RM. Similarly, the R^2 value for PP is 0.778, this means that 77.8% of variation in PP can be explained by RM.

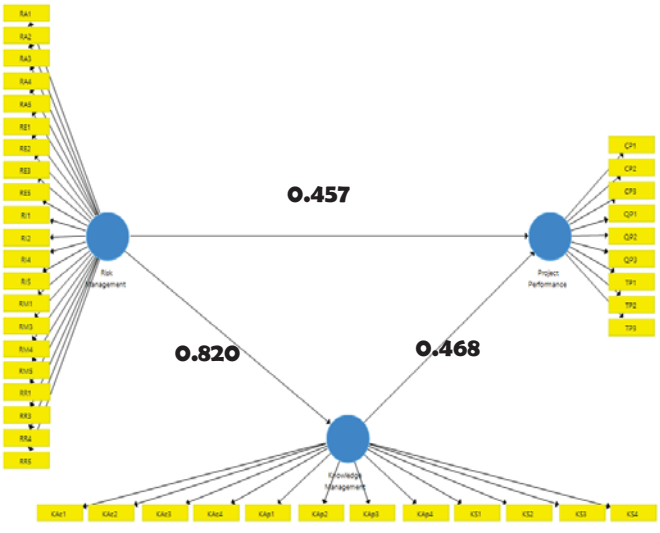

Figure 2. PLS results for direct effect

It was ascertained that RM has a positive and significant relationship with both PP (H_1: $\beta = 0.457$; $p < 0.05$, $t = 3.111$) and KM (H_2: $\beta = 0.820$; $p < 0.05$, $t = 35.020$). Furthermore, there is also a positive and significant relationship between K and PP (H_3: $\beta = 0.468$; $p < 0.05$, $t = 2.823$), thus supporting H_1, H_2 and H_3.

Next, in PLS-SEM Variance Accounted For (VAF) is used to validate a mediating relationship among the studied variables. A VAF value between 20% and 80% is considered partial mediation. VAF value less than 20% is considered no mediation and VAF value that is more than 80% is considered full mediation [16]. VAF can be calculated as:

$$VAF = \frac{\text{Indirect Effect}}{\text{Total Effect}}$$

Table I shows the direct effect, indirect effect and total effect when KM is added as a mediator into the relationship between RM and PP. The value of VAF calculated is 45.66%, which signifies partial mediation effect of KM on the relationship between RM and PP. Therefore, there is sufficient evidence to support that KM has a mediating effect on the relationship between RM and PP of CI in Malaysia (H_4).

TABLE I. MEDIATING EFFECT OF KNOWLEDGE MANAGEMENT

Relationships	Path Coefficient	T-statistics	R 2
RM -> PP	0.457*	3.111	0.778
RM -> KM	0.820*	35.020	0.673
KM -> PP	0.468*	2.823	
Indirect Effect (a)	0.384*		
Direct Effect (b)	0.457*		
Total Effect (a+b) = c	0.384 + 0.457 = 0.841*		
VAF = a/c	3.387 / 0.841 = 0.4566 × 100% = 45.66%		
Note: * represents 1% level of significance.			

V. DISCUSSION AND CONCLUSION

Theoretically, the results of this study provide new information and evidence with a clear picture of RM and its benefits to PP of CI in Malaysia. This encourages further researches on this topic of study because in any developing countries, like Malaysia, many companies tend to put less effort in RM and KM as they see these practices as unnecessary due to limited knowledge and expertise in this field of study, thus more studies can be conducted to prove the importance and enhance the understanding of RM and KM on PP.

Practically, the increase in the understanding of RM and KM can help to create a ripple effect not only in the CI but also in other industries in Malaysia as well. Organisation may not realise the importance of RM even though appropriate implementation and application of RM will contribute in better PP. On the other hand, it is undeniable that proper KM

is one of the critical success factors in implementing RM and vice versa. This study had provided sufficient knowledge and evidence of the potential benefits of practising RM and KM. With these solid evidence and knowledge to prove the positive impact of implementing RM and KM, companies in Malaysia, especially the CI that are not practising RM and KM may start to implement these practices in order to improve the PP of their companies. Lastly, the results of this study implicate that RM and KM can be a new management philosophy as well as strategy for Malaysia's construction companies in order for them to compete in today's business environment. This is because a consistent and successful implementation or RM and KM will improve their PP and sustain their competitive advantage. In short, it is important for companies to realise that RM and KM is correlated and will have a positive impact on the PP.

To put it briefly, this research studied the relationship between RM and PP of CI in Malaysia, with KM as a mediator. This study was mainly to discover the relationship between RM, KM and PP. The research framework proposed was validated, which proved that the implementation of RM and KM in construction companies improve the PP. All the research objectives of this study were met and the findings suggested the following: (1) there is a positive and significant relationship between RM and PP; (2) there is a positive and significant relationship between RM and KM; (3) there is a positive and significant relationship between KM and PP; and (4) KM has partially mediated the relationship between RM and PP.

ACKNOWLEDGMENT

The authors wish to thanks the Malaysian Ministry of Education (MOE), Azman Hashim International Business School, Universiti Teknologi Malaysia (UTM) and Research Management Centre (RMC) for financial support to this work through grants funding number 01M87.

REFERENCES

[1] Schieg, M. (2006). Risk management in construction project management. Journal of Busines Economics and Management, 7(2), 77-83.

[2] Taillandier, F., Taillandier, P., Tepeli, E., Breysse, D., Mehdizadeh, R., & Khartabil, F. (2015). A multi-agent model to manage risks in construction project (SMACC). Automation in Construction, 58, 1-18.

[3] Leong, T.K., Zakuan, N., and Saman, M.Z.M. (2014), Review of quality management system research in construction industry. International Journal of Productivity and Quality Management, 13(1), pp 105-123

[4] Mhetre, K., Konnur, B. A., & Landage, A. B. (2016). Risk management in construction industry. International Journal of Engineering Research, 5, 1-153.

[5] Rehacek, P. (2017). Risk Management in Construction Projects. Journal of Engineering and Applied Sciences, 12(20), 5347-5352.

[6] Aarabi, M., Saman, M.Z.M., Wong, K.Y., Azadnia, A.H., Zakuan, N. (2012). A comparative study on critical success factors (CSFs) of ERP systems implementation among SMEs and large firms in developing countries. International Journal of Advancements in Computing Technology 4(9), pp.226-239

[7] Banaitiene, N., & Banaitis, A. (2012). Risk management in construction projects. In Risk Management-Current Issues and Challenges. IntechOpen.

[8] Serpella, A. F., Ferrada, X., Howard, R., & Rubio, L. (2014). Risk management in construction projects: a knowledge-based approach. Procedia-Social and Behavioral Sciences, 119, 653-662.

[9] Akintoye, A. S., & MacLeod, M. J. (1997). Risk analysis and management in construction. International journal of project management, 15(1), 31-38.

[10] Risk. (n.d.). Lexico, powered by Oxford. Retrieved from https://www.lexico.com/en/definition/risk

[11] Hay-Gibson, N. (2008). A river of risk: a diagram of the history and historiography of risk management. Interdisciplinary Studies in the Built and Virtual Environment, 1(2), 148-158.

[12] Ahmad, M.F., Zakuan, N., Jusoh, A., Takala, J. (2013). Review of relationship between TQM and business performance. Applied Mechanics and Materials, 315, pp.166-170

[13] Kissi, E., Agyekum, K., Baiden, B. K., Tannor, R. A., Asamoah, G. E., & Andam, E. T. (2019). Impact of project monitoring and evaluation practices on construction project success criteria in Ghana. Built Environment Project and Asset Management.

[14] Wu, G., Zhao, X., Zuo, J., & Zillante, G. (2019). Effects of team diversity on project performance in construction projects. Engineering, Construction and Architectural Management, 26(3), 408-423.

[15] Sirisomboonsuk, P., Gu, V. C., Cao, R. Q., & Burns, J. R. (2018). Relationships between project governance and information technology governance and their impact on project performance. International journal of project management, 36(2), 287-300. 20

[16] Devi Ramachandran, S., Choy Chong, S., & Ismail, H. (2009). The practice of knowledge management processes: A comparative study of public and private higher education institutions in Malaysia. Vine, 39(3), 203-222.

[17] Hussinki, H., Kianto, A., Vanhala, M., & Ritala, P. (2017). Assessing the universality of knowledge management practices. Journal of Knowledge Management, 21(6), 1596-1621.

[18] Durst, S., & Evangelista, P. (2018). Exploring knowledge management practices in third-party logistics service providers. VINE Journal of Information and Knowledge Management Systems, 48(2), 162-177.

[19] Abbas, J., & Sağsan, M. (2019). Impact of knowledge management practices on green innovation and corporate sustainable development: A structural analysis. Journal of Cleaner Production, 229, 611-620.

[20] Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. Educational and psychological measurement, 30(3), 607-610.