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نموذج لعوامل النجاح الحرجة للتنفيذ الفعال لعملية إدارة المخاطر في صناعة البناء والتشييد

***أماني صالح بوقماز و**رفيدة نعمان**
*قسم الهندسة المدنية – كلية الهندسة والبترول، جامعة الكويت
**قسم هندسة النظم الصناعية والادارية، كلية الهندسة والبترول، جامعة الكويت

الخلاصة

يدرك خبراء التشييد المخاطر المرتبطة بصناعة التشييد. يمثل تفرد المشاريع المطلوب إنجازها أحد التحديات الرئيسية أثناء إدارة الأعمال في هذه الصناعة. لذلك ولتحقيق النجاح، تحتاج مؤسسات الإنشاءات إلى تحسين استخدام مواردها وتقليل المخاطر المرتبطة بها. يمكن تنفيذ إدارة المخاطر المتوقعة بشكل حدسي أو منهجي بناءً على خبرة مؤسسات الإنشاءات ووعيها بالمخاطر. بغض النظر عن وجود أساليب متنوعة للتعامل مع المخاطر المتوقعة، هناك توافق في الآراء حول الحاجة إلى القضاء على عواقبها السلبية لتحقيق نجاح المشروع. علاوة على ذلك، يمكن القول أنه لزيادة احتمالية تحقيق النتائج المرجوة من تطبيق نهج إدارة المخاطر، يجب أن تتوافر عدة عوامل. تُعرف هذه العوامل بعوامل النجاح الحرجة (CSFs) للتنفيذ الفعال لعملية إدارة المخاطر في صناعة البناء والتشييد. ويُعتقد أنه بدون خلق بيئة ملائمة لعملية إدارة المخاطر، فإن فعاليتها ستقل إلى أدنى حد وقد يتم القضاء عليها نهائياً. وعلى الرغم من أن هناك العديد من الدراسات المخصصة لدراسة المخاطر وإدارتها في صناعة التشييد، إلا أنه هناك نقص في الأبحاث التي ركزت على عوامل النجاح الحرجة لإدارة المخاطر، خاصة خلال مرحلة التشييد. ولذلك، فإن الهدف من هذه الدراسة هو استعراض العديد من الدراسات التي ناقشت عوامل النجاح الحرجة ومن ثم تطوير نموذج مصمم خصيصاً لنجاح إدارة المخاطر خلال تنفيذ المشاريع الإنشائية. تم تصميم هذا النموذج لتقديم إطار يوضح دور العوامل المدروسة في تحقيق النتائج المرجوة من التنفيذ المنهجي لعملية إدارة المخاطر في صناعة التشييد.

A critical success factors model for effective implementation of risk management process in the construction projects

Amani S. Bu Qammaz* and Rufaidah Y. AlMaian**

*Department of Civil Engineering, College of Engineering and Petroleum– Kuwait University
**Department of Industrial & Management Systems Engineering, College of Engineering and Petroleum– Kuwait University
Corresponding Author: amani.buqammaz@ku.edu.kw

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ABSTRACT

Construction experts are aware of the risk associated with the construction industry. The uniqueness of the delivered projects represents one of the main challenges while conducting business in this industry. Therefore, to succeed, construction organizations need to optimize the utilization of their resources and minimize the associated risks. Managing the anticipated risks may be implemented intuitively or systematically based on the construction organizations' experience and awareness of the risks. Regardless of the existence of the diverse approaches towards dealing with the expected risks, there is consensus on the need to eliminate its negative consequences to achieve project success. Moreover, it can be argued that, to maximize the likelihood of achieving the promised rewards from applying the risk management process, several factors must occur. These factors are recognized as the Critical Success Factors (CSFs) for effective implementation of risk management process in the construction projects. It is believed that, without creating the adequate environment for the risk management process, its effectiveness would be minimized, if not eliminated. Although the literature is rich with studies that are dedicated to study risk and its management in the construction industry, there is a shortage in the researches that focus on the CFSs of the risk management in the construction industry, particularly during the construction phase. Therefore, the aim of this study is to review several available studies in the literature that have discussed the CSFs for successful management processes and then to develop a CSFs model that is specifically designed for risk management success. The model is designed to deliver a framework that depicts the role of the considered factors in achieving the promised rewards from systematic implementation of risk management process in the construction industry.

Keywords: construction risk; critical success factors; project success; risk management.

INTRODUCTION

The construction industry is a very risky endeavor (Taroun, 2014). It can be claimed that there is a consensus among construction experts regarding the high risk associated with the construction industry (Hastak and Shaked, 2000; Nieto-Morote and Ruz-Vila, 2011; Zavadskas *et al.*, 2010; Diab *et al.*, 2017). While conducting business in the construction industry, experience represents an essential asset for success. However, the unique characteristics of the delivered facilities may limit the ability to utilize previous experience in the forthcoming projects, which could create more risks. Because of the risks associated with the construction business, the tendency towards eliminating its

sources or manage the expected consequences when it occurs would always exist. The processes to manage risk may be implemented intuitionally or systematically. Intuition may be considered as an accepted approach for responding to risk. However, it is believed that having a systematic approach for implementing the risk management process in the construction industry would maximize the chance of achieving project success (Imbeah and Guikema, 2009). Nevertheless, to obtain the anticipated benefits from applying the risk management process, certain factors must exist. These factors are considered as the Critical Success Factors (CSFs) that would facilitate the effective application of risk management process in the construction industry. It is believed that, without creating the adequate environment for the risk management process, its effectiveness will be minimized, if not eliminated. This study aims to reveal the CSFs and to highlight the role of these factors in achieving the promised rewards from applying the risk management process systematically and its integral role in the overall success of the construction project management framework.

RISK MANAGEMENT IN THE CONSTRUCTION INDUSTRY

Risk management (RM) is known for being the management disciple that provides tools to assist the project team to do all that can be done to minimize the negative risk and to maximize the positive risk. It is known that one of the main sources of variability of the project outcomes is the interaction between risk and uncertainty with project objectives. Therefore, it is fair to argue that the RM tools and risk response strategies would increase the likelihood of meeting the predefined objectives. However, the sustainable success of the proposed tools and response strategies would be dictated by many factors. Accordingly, the need to understand the required environment for the RM to succeed in the construction industry is inevitable (Chileshe and Kikwasi, 2014).

Construction projects are becoming more complex and with this complexity, advanced tools and further efforts would be required to achieve project success. Risk management would be a valuable tool that can assist the project through its lifecycle from inception to turning over. The fact of the importance of implementing the risk management in the construction industry was perceived by several researchers. Accordingly, in literature, there are many studies dedicated to providing risk-based decision support tools for construction practitioners (Gunhan and Arditi, 2005; Dikmen and Birgonul, 2006; Yildiz *et al.*, 2014). Nevertheless, reviewing the available literature would reveal that the conception of construction risk management is not commonly implemented to assist the project team during the construction phase. A comprehensive and systematic approach to manage the risks during the construction phase has not been yet applied in most of the construction projects in Kuwait (Bu-Qammaz, 2015). This fact was revealed through individual interviews with five experts in Kuwait who have more than 20 years of experience in the construction industry with diverse scope of works that represent different perspectives according to their working environments including both private and public sectors. Three experts from the private sector have their own project management organizations and are involved in many medium- and large-size construction projects, while two experts represented the public sector and were also involved in medium- and large-size construction projects. The experts were first asked if they were aware of the RM concept, and all experts revealed that they understand the RM process and when asked if these process were adequately comprehended, there was consensus among the experts that most construction practitioners perceive risk according to its traditional definition, which defines risk as a threat or risky incident that may take place at a construction site. Moreover, when the experts were asked if, according to their experience, the RM was systematically implemented in the construction industry, all five experts have agreed that systematic risk management is an unusual approach in Kuwait. Therefore, the interviewed experts concluded that the Kuwaiti construction industry is missing the evident essentiality of implementing the RM process. Having said that, it is important to reveal that the RM tools are usually used intuitionally by the construction practitioners Anticipating the project performance and potential barriers for project success is an example of such practices. However, it is worth mentioning that, without systematic approach, the effectiveness of such efforts is minimized.

Typically, implementing new tools and practices in an industry needs their acceptance from three different business-related environments, namely, governmental authorities, business practitioners, and academic institutions. The integration between these environments can facilitate the merge of risk management practices with other management practices. Therefore, to promote implementing the risk management process within the construction industry and to receive the promised RM rewards, it must be seen as a critical aid for project success. The main barrier for perceiving RM as an important management discipline is the absence of understanding of the advantages that can be obtained from implementing its practices. Creating risk-controlled environment is very rewarding for construction projects, which are known for being very risky. Thus, the objectives of this study can be listed as the follows:

- Highlight the indispensable need of the RM process in the construction industry, particularly through the construction phase of a project lifecycle.
- Reveal the CSFs for effective implementation of the RM process through the construction phase of the project lifecycle.
- Propose a comprehensive CSFs Model for project risk management success to depict the role of RM in achieving overall project success.

CONSTRUCTION PROJECT AND PROJECT RISK MANAGEMENT

A construction project is an endeavor that integrates human, material, technical, and financial resources to create a unique product. Construction projects have often the constraints of specific time and budget. Each construction project consists of a series of activities that have predefined objectives and assigned start and end dates. The unique characteristics of the construction industry and its products make it very risky. Moreover, the demand in the industry is driven by the need of new facilities, which in most of the cases are novel products. Project risk management is a continuous process to systematically identify, evaluate, respond to, and control risks associated with the project to minimize its negative consequences and to create a risk-controlled environment. An effective RM is a dynamic process. Therefore, a successful RM requires the involvement of all parties throughout the life-cycle of the project. In this study, the Critical Success Factors (CSFs) refer to the considerations related to the project's specific and external environments that if existed would facilitate the successful implementation of the risk management process.

PROJECT RISK MANAGEMENT SUCCESS MODEL

Critical success factors are the aspects needed to ensure the success for an organization. It includes critical issues that may influence the activities of the organization and its future success (Boynton and Zmud, 1984). This study aims to emphasize that there are several critical success factors (CSFs) that must exist to assure an effective implementation of a systematic RM process that would deliver its promised advantages. It can be stated that, without these factors, the effectiveness of the RM would be jeopardized, which would increase the unwillingness of the construction teams to accept the RM process in their projects. Therefore, it is essential to not only promote for the vital need for implementing the RM in the management process of the construction projects, but also expose the CSFs for the RM implementation. The CSFs are indispensable to create the required environment for adequate application of the RM framework. Some of the CSFs are related to the business culture of the stakeholders, and others would be associated with the proposed RM process itself. There are some studies that were conducted to reveal the CSFs that would facilitate the risk management practices within the construction organization (Ahmed and Manab, 2016; Yaraghi and Langhe, 2011). Business culture is very difficult to change, particularly within the construction industry due to its unique nature. Therefore, the existence of a team that is willing to embrace the

RM process is a great asset for its success. Moreover, the involvement of the higher management in the process is very important. Additionally, the need for reliable documentation and communication systems is indispensable. The integration and the involvement of all relevant parties is a must. With respect to the RM process, it must be simple and not complicated to facilitate its execution and to allow for creating a feedback mechanism that can be comprehended by the team. It is believed that risk awareness is the key to achieve the CSFs and to generate the required environment for a successful risk management framework, which would maximize the performance of the construction organization and promote its success. Figure 1 depicts the proposed CSFs Model for Successful Risk Management that is created for the construction projects during the construction phase. The model defined the risk management process as follows: risk identification, classification, evaluation, response, control, and monitoring. This process is in line with the well-established PMBOK Guide (2017), which defines the process as risk management planning, identification, qualitative/quantitative risk analysis, risk response, and risk monitoring and control (PMBOK Guide, 2017). To adequately define the CSF for RM success, it is important to understand the scope of each step of the process, the needed inputs, and the anticipated output of the step. The PMBOK (2017) Guide provides a comprehensive RM model that gives detailed description to each step of the process. The CSFs were established based on the anticipated outcomes of the RM process.

Figure 1. Critical success factors model for project risk management success.

PROJECT SUCCESS VS. PROJECT RISK MANAGEMENT SUCCESS

The proposed model embraced the fact that project success and risk management success are completely different concepts. Project success is measured against the overall objectives of the project, while risk management success is measured against the effectiveness of the implemented process to achieve the risk management objectives related to performance against cost, time, safety, and quality. Project success is related to the overall project management success, not only project risk management, and as defined in PMI's "Guide to the Project Management Body of Knowledge®" there are eight other management disciplines (PMBOK Guide, 2017). Moreover, differentiating between project

success and project management success is critical and must be comprehended adequately (Cooke-Davies, 2002). Project success is more comprehensive and difficult to achieve compared to project management success. Project success is usually measured against performance measures including cost, time, quality, and safety. Figure 2 clarifies the relationship between the overall project management and project risk management and their contribution to project success. Accordingly, it is believed that the success of the project risk management process would aid the project to succeed. However, it does not guarantee the success of the construction project. Additionally, the objectives of both risk management and the construction project are different as it may be seen through their definitions. Project risk management aims to control the factors that may affect project success criteria such as time and progress, cost, quality, and safety. Therefore, meeting the risk management objectives and the successful implementation of the project's specific risk management framework should not be confused with measuring the project success. On the other hand, an essential fact must be highlighted. The CSFs that would facilitate the risk management success are directly related to the risk management objectives. What is more, the scope of the proposed risk management model is the main factor that would generate the need for specific CSFs; these factors would change with a different risk management model and scope. This study targeted the risk management models that would be proposed for the success of the construction projects during the construction phase.

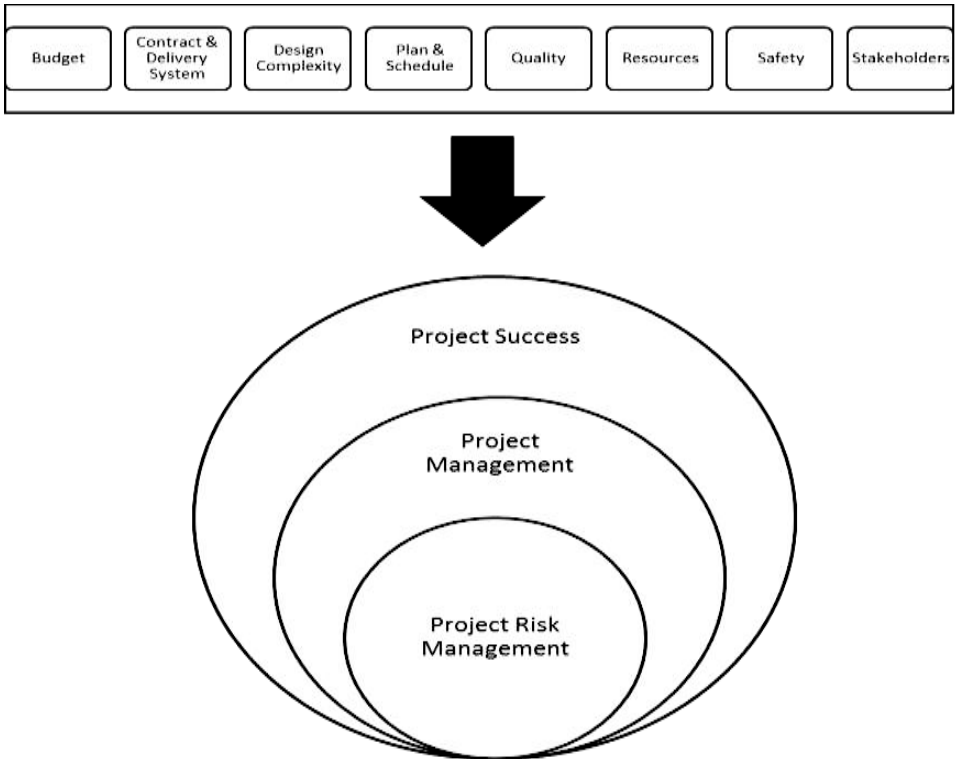

Figure 2. The relationship between RM and project success.

RISK MANAGEMENT CRITICAL SUCCESS FACTORS

To further understand the depicted "Project Risk Management Success Model," it is essential to discuss the proposed critical success factors and their role in creating the proper environment for the success of risk management. Therefore, this section elaborates the proposed CSFs as cited in literature. In addition, and due to the specific objectives

of the developed model, some of the listed factors were considered into the model based on hypotheses set by the authors of this research. Hypothetically critical factors that were in only few references but were believed to be imperative were considered into the model after discussing them with five construction experts and practitioners through interviews that took place individually. The interviewed experts represented diverse perspectives including public sector, contractors, construction managers, and claim experts. During the interviews, the factors were explained to the experts, and their feedback was requested regarding the defined critical factors importance and its anticipated effects on the RM success. There was a consensus among all experts regarding the importance of the proposed factors; thus it was considered into the model.

Chileshe and Kikwasi (2014) stated that there exist several approaches to categorize the CSFs in the project management literature. To discuss the available classifications of the CSFs, Chileshe and Kikwasi (2014) reviewed the work of many authors in the literature. In their review, Chileshe and Kikwasi (2014) revealed that Belassi and Tukel (1996) defined the CSFs as follows: project-related factors; project-team related factors; organization-related factors; and external environment related factors. On the other hand, they found that Chua *et al.* (1999) implemented the analytical hierarchy process technique to analyze 67 factors that were clustered into project characteristics; contractual arrangements; project participants; and interactive processes. Even though there were many studies that discussed the CSFs, these studies did not focus on the risk management practices. On the other hand, some of these studies such as the one that was done by Larsen and Myers (1999) questioned the real definition of "success" and discussed how "successful implementation" can lead to failure (Chileshe and Kikwasi, 2014).

Famakin *et al.* (2012) investigated the joint ventures construction projects in Nigeria; their study focused on the factors that may influence the performance of the partners in a joint venture. They determined factors including the communication, compatibility of objectives, and mutual understanding between partners as critical success factors. Agyakwa-Baah and Chileshe (2010) conducted a study that aimed to identify the CSFs of Risk Analysis and Management for Projects (RAMP) application within the medium and large Ghanaian construction organizations. They identified several CSFs that can be grouped into these categories: management; technical know-how; business culture and strategic objectives; and external environment. Another study was undertaken by Wang and Yuan in 2011; they utilized factor analysis to investigate contractors risk attitudes in construction projects in China. Wang and Yuan (2011) grouped the CSFs into the following: know-how and experience; contractors' characteristics; personal perception; and economic environment.

The current study considered both the reviewed literature and experience to develop the Project Risk Management Success Model; it includes 19 CSFs distributed on four clusters, namely, construction industry; project specific; project team; and external factors. The following is a brief description for the CSFs factors that are listed under each type.

1. Construction Industry Factors

The factors considered under this category are those factors that are related to the macro environment of a construction project. Although they are not directly related to the performance of the project, it is anticipated that those factors would have an indirect influence on the project. Table 1 lists all the CSFs that were considered under this category, and the references were these factors cited in the literature.

Table 1. CSFs under the construction industry category.

Construction Industry Factors				
Competitiveness in the industry	Practitioner awareness and acceptance of RM	Business Culture	Availability of reliable subcontractors	Success of RM in the industry
Diab *et al.* (2017); Yildiz *et al.* (2014); Dikmen and Birgonul (2006); Han and Diekmann (2001)	Chileshe and Kikwasi (2014); Wu *et al.* (2017)	Hofstede (1980); Bu-Qammaz *et al.* (2006); Ajmal *et al.* (2010); Chase (1997); Long (1997); Alavi & Leidner (2001)	Zou *et al.* (2007); Tam *et al.* (2011); Interviewed Experts	Besner and Hobbs (2012); Chileshe and Kikwasi (2014); Nieto-Morote and Ruz-Vila (2011); Santoso *et al.* (2003)

1.1. Competitiveness in the industry

The construction industry has a very competitive business environment. Scarcity of business opportunities and the escalating complexity of the owners' requirements shaped the demanding nature of the industry. Its competitive characteristics mean that it is vital for a construction organization to have several advantages over its competitors. What is more, most business opportunities in this industry are through competitive bidding, which makes it even more risky in terms of estimating the optimum price to bid. The ability to handle the associated risks systematically represents an important asset for the organization's successful endeavors. Therefore, many risk practitioners were driven by the severe nature of the construction business to develop risk-based decision support tools to facilitate the bid-no-bid and bid markups decision making process. To this end, Diab *et al.* (2017) conducted a study for modeling the construction risk ratings to estimate the contingency in highway projects. On the other hand, Yildiz *et al.* (2014) developed a knowledge-based tool to map international construction risk while estimating the construction cost. In another study, Dikmen and Birgonul (2006) developed an analytic hierarchy process-based model for risk and opportunity assessment of international construction Projects. Earlier Han and Diekmann (2001) studied the approaches for making risk-based Go/No-Go decision for international projects. These are only example studies to emphasize the importance of considering the risky nature of the construction industry to develop risk models and decision support tools that would help the construction organizations make educative decisions. Therefore, it can be argued that bearing in mind the effects of the competitiveness of the industry and the related risks that would stem from the decisions that were made at the early stages of the project lifecycle (e.g., project budget) can help the project team successfully manage the identified risks.

1.2 Practitioner awareness and acceptance of RM

In this study, the proposed model argues that the acceptance of RM in the construction business environment has a direct relation with the business practitioner awareness of its rewards. Implementing RM requires embracing several tools and reporting systems that would initiate the need to dedicate some project resources to achieve its objectives. To invest in these resources towards RM, the awareness of the team is critical.

In the literature, several studies have proven that the implementation of RM and its associated assessment processes would have a direct influence on the project performance; many studies were the subject of review in this study.

Notwithstanding this fact, there is a shortage of studies that would study the levels of awareness and anticipated rewards of systematic implementation of RM. Chileshe and Kikwasi (2014) found that despite the existence of many researches on RAMP, there is an evident need for practical studies that aimed to evaluate the levels of realization, usage, and benefits of RAMP particularly on its influence on the project results within the Tanzanian construction industry undertaken by the medium to large-sized construction organizations. Another study by Wu *et al.* (2017) was conducted to reveal the risk factors for project success in the Chinese construction industry. The authors collected responses from construction practitioners and when the respondents were requested to share their understanding of the concept of risk management in projects, the results indicated that 10% of the respondents revealed that they were not familiar with risk management. The authors suggested that the respondents may not be familiar with the term risk, but it may be possible that they are practicing risk management using their own experience even though they are not following formal RM processes. Wu *et al.* (2017) then asked the respondents about their understanding of the term "identifying risk factor" in the construction industry. The results showed that most participants have knowledge about identifying risk factors in the Chinese construction industry. According to the results, Wu *et al.* (2017) concluded that construction practitioners in the Chinese construction industry are familiar with project risk and identifying risks. Nevertheless, they further suggested that familiarity does not imply systematic implementation.

In conclusion, being familiar with the concept of RM and its process can be a critical factor that would enable the successful implementation of a systematic approach towards RM. It is evident that a structured and organized implementation would allow for adequate evaluation and control, which would help the team achieve the predefined RM objectives.

1.3 Business culture

Business culture is very hard to change; each industry develops its own culture based on the specific characteristics that define it. In the construction industry, business culture can be defined as the beliefs, customs, habits, and the ways of conducting business in a society that will have an impact on how a construction project is conducted and managed (Bu-Qammaz *et al.* 2006). At the microlevel, each construction organization would embrace different business habits, which would reflect its strategies and beliefs that would differentiate its culture from other organizations. According to Hofstede (1980), every organization's culture is distinctive, and this distinctive organizational culture distinguishes the members of one group from another. Hofstede (1980) emphasized that the concept of a distinctive organizational culture is particularly critical in project-based organizations since project teams usually involve professionals from different cultural backgrounds. Considering the limited duration for the construction projects and since it is a project-based industry, the different culture can cause many conflicts between project parties who comes from diverse cultural environments.

Ajmal *et al.* (2010) ascertained that many studies have argued that culture is a significant factor in determining the effectiveness of knowledge sharing (Chase, 1997). Long (1997) explained that the culture of an organization determines not only the type of managed knowledge, but also the value of that knowledge in providing a competitive advantage for the organization. Alavi and Leidner (2001) conducted a survey of knowledge management initiatives; they concluded that most successful initiatives were supported by an organizational culture that was beneficial to the collection and sharing of knowledge among the members of the organization. Accordingly, having a culture of trust and assistance between team members would create a collaborative team with members depending on each other and having no fear of sharing critical information. This culture would allow an open and effective communication that would lead to achieving the team goals (Ajmal *et al.*, 2010).

Risk management process involves the identification and assessment of many risk factors that would trigger

negative events and consequences; the openness and collaboration between all team members is a critical factor that would help identify the relative risks and manage them effectively. On the other hand, embracing a culture that accepts RM as part of the overall management process would eliminate the implementation barriers, mainly resistance to new business culture.

1.4 Availability of reliable subcontractors

One of the most distinguished characteristics of the construction projects is the involvement of several stakeholders through projects' lifecycle. Subcontractors represent one of the main stakeholders during the construction phase. The specialized subcontractors contribute with their knowhow to perform activities that require certain expertise that may not be available within the main contractor. Typically, assigning the work to subcontractors would be a contractual requirement, and the owner usually has the final decision to approve the submitted subcontractors under different trades such as mechanical work, electrical work, and many others. Zou *et al.* (2007) adopted a stakeholder's point of view to classify 25 major risk factors related to construction projects; they defined three clusters including risk related to contractors; risk related to government agencies; and risk related to subcontractors/suppliers. Under risk related to subcontractors, Zou *et al.* (2007) considered low management competency of subcontractors as one of the critical factors. Other risks related to subcontractors may include inadequate selection of subcontractors, unavailability of qualified subcontractors, poor scope definition or scope overlap between several subcontractors, and high workload that stems from working on multiple projects concurrently. On the other hand, Tam *et al.* (2011) discussed the risk of using subcontractors who offer the lowest price, which is something common in the construction industry. Additionally, based on data from recent study in Hong Kong, Tam *et al.* (2011) argued that adopting a multilayer subcontracting system creates significant risks affecting time, quality, communication, and coordination performance.

Based on the type of the project and owner's requirement, the work performed by subcontractors may be equivalent to 70% of the total project value. Subcontractors contribute to the project team according to their scope and workload. The involvement of the subcontractors into the RM process is very critical since they contribute greatly into the construction process, and most of the risks may be triggered from sources that are under their scope of work Consequently, it is evident that the reliability of the subcontractors is an asset for successful RM.

1.5 Success of RM in the industry

The construction industry is known for the struggling of its practitioners to achieve and maintain success. Chileshe and Kikwasi (2014) claimed that several studies were unable to link the implementation of risk management practices with improved project performance. Additionally, Besner and Hobbs (2012) noted that uncertainty and project failure are believed to be interrelated, yet they emphasized the vagueness of the relation between the risk management and project success. Notwithstanding these arguments, Santoso *et al.* (2003) recommended that awareness of risk management practices is essential to reveal and manage the associated risks and to reach success. Moreover, Nieto-Morote and Ruz-Vila (2011) argued that, in many cases, the application of conventional risk assessment methodologies may not have satisfactory outcomes due to the unreliability of risk data. Therefore, Nieto-Morote and Ruz-Vila (2011) suggested that it is essential to develop customized risk analysis models to deal with risks in projects where classical methods cannot be efficient. On the other hand, implementing the project risk management systematically from planning to project completion is beneficial. The unsystematic and arbitrary nature of risk management would jeopardize the success of the project due to the dynamic nature of the risks through the project lifecycle (Nieto-Morote and Ruz-Vila, 2011). Embracing the idea of the vital need for systematic RM and reviewing success stories for its implementation within the industry is significant.

2. Project Specific Factors

The factors considered under this category are the ones that stem from the specific characteristics of the project under construction. It is a common knowledge that construction projects are unique, and each project in the construction industry has different features, which differentiate it from any other project. The uniqueness of the construction project stems from the fact that each project is initiated by an owner's need. Therefore, a construction project is a temporary endeavor that has a definite start and end dates with defined quality requirements and specific budget to perform under it. Additionally, project team is consistent of diverse parties having different culture. Consequently, construction projects would be vulnerable to many subjective and objective factors that would have direct impact on its quality and performance. Moreover, construction projects cannot be undertaken in a controlled environment at both the micro- and macrolevels. Accordingly, it is anticipated that the specific characteristics of a given project would have a direct impact on the implemented RM process and its success. Table 2 shows the CSFs under this cluster and the studies where these factors were cited.

Table 2. CSFs under the project specific category.

Project Specific Factors				
Project size and complexity	Adequate communication	Adoptability and effectiveness of the RM process	Control and reporting mechanism	Contract requirements
Abderisak and Lindahl (2015); Interviewed experts	Bu-Qammaz and AlMaian (2018); Amoatey and Hayibor (2017); Weaver (2007)	Tah and Carr (2000); Interviewed experts	Dikmen *et al.* (2008); Zavadskas *et al.* (2010); Nieto-Morote and Ruz-Vila (2011)	Chileshe and Kikwasi (2014); Gupta *et al.* (2013); Zhang *et al.* (2016)

2.1 Project size and complexity

Project size factor considers the monetary and physical size of the project. It can be argued that as the size of a construction project increases, the complexity is expected to intensify. Therefore, large and complex construction projects are more likely to face severe risks compared to smaller size projects (Abderisak and Lindahl, 2015). To achieve effective RM, the involvement of the project team is required. If the construction project was large and complex, then it is likely that it would involve many risks; thus the barriers for RM to be implemented would be minimized. On the other hand, investing adequate budgeting would allow for providing the necessary resource for RM. According to the interviewed experts, in Kuwait, only few large and mega projects were involved in some of the RM practices, while small-to-medium-size projects were never involved in a systematic RM process. The experts related this fact to the owner's requirements and the complexity of the large projects, which initiated the need to understand the associated construction risks.

2.2 Adequate communication

Adequate communication between the diverse project parties is an important asset for project success. Amoatey and Hayibor (2017) found that adequate communication between stakeholders is one of the CSFs for stakeholder management at the local government level in Ghana. To deliver the right message and receive the needed information in a timely manner, it is vital to choose communication media accepted and understood by all team members. There

are many communication tools that can promote a successful and effective communication. The construction team includes parties embracing different cultures, which creates many communication barriers. Therefore, Bu-Qammaz and AlMaian (2018) have suggested that it is inevitable for a project team to structure standardized communication media for sharing and saving the processed information efficiently and in a safe manner. The discrete nature of the project team and the involvement of several stakeholders make the reliability of the communication skills of the project managers an important advantage towards RM success. Weaver (2007) emphasized that project managers must understand the characteristics of the involved stakeholders and must be capable of communicating and negotiating effectively to manage the individual stakeholder's expectations.

2.3 Adoptability and effectiveness of the RM process

Construction projects are exposed to many risks during the construction phase, most of which may not be under the direct control of the project team. Moreover, the uniqueness of construction projects means that, with every new endeavor, new types of risks may be encountered. Nevertheless, the tendency towards eliminating and managing the associated risks always exists. Implementing systematic RM process would maximize project's team abilities to manage risk. However, for a project team to accept the RM process, it must be simple and easy to comprehend. It is anticipated that the project team would perceive the RM process as a valuable management approach only if its effectiveness was evident. The effectiveness of implementing the RM process can be measured against the predetermined RM objectives. The proposed RM process must be parallel to the existing management process and implement tools and assessment techniques that can be comprehended by project team. The process needs to provide promised values that are higher than or equivalent to the initial investments required to implement RM into the management process. Most stakeholders would discard the process due to the implementation difficulties they would encounter.

Tah and Carr (2000) conducted a study to examine the unformalized approach for carrying RM in the construction projects. They found that the unformalized approach towards RM would lead to implementing diverse methodologies and terminologies while using risk management. The success of such approach would be reliant on the knowledge and experience of the project team. Therefore, Tah and Carr (2000) highlighted the inevitable need for standard language in describing risk as a basis for implementing RM. On the other hand, this critical factor was discussed with the interviewed experts, and it was agreed that the need for adoptable and effective RM process shall be considered as one of the CSFs for RM, particularly when less risk aware stakeholders are involved.

2.4 Control and reporting mechanism

Nieto-Morote and Ruz-Vila (2011) have stated that the unsystematic and arbitrary risk management can endanger the success of the project since most of the risks are very dynamic throughout the project lifetime. Accordingly, for the RM process to be effective, it must be systematic and dynamic. Risk management processes of construction project cover the whole project's life cycle. The objectives of the project would change during the lifecycle, and the RM objectives must be updated accordingly. Consequently, the continuous implementation of the RM process that includes identification, analysis/assessment, and response must be carried out throughout the lifecycle of the project would ensure meeting project objectives (Dikmen *et al.*, 2008; Zavadskas *et al.*, 2010). The team must define periodic control and evaluation intervals based on the characteristics of the project and the RM objectives. Typically, the evaluation should take place in parallel with the assessment of other project's Key Performance Indicators (KPI) (e.g., project progress/schedule, budget, quality, and safety) to allow adequate evaluation of the project performance and the effectiveness of the response strategies set by the RM model.

2.5 Contract requirements

Contract requirements represent the agreed upon rights and duties between contract parties. They regulate the relationship between the parties. Therefore, if the contract requirements include the need for implementing the risk management process, then many barriers against RM success would be eliminated. The team must fulfill this requirement and based on their experience implementing, the RM process can be undertaken internally or by outsourcing experts or consultation. Chileshe and Kikwasi (2014) found that some studies emphasized the need for external experts to deal with the risk and complexity of the construction projects, while others adopted the idea that project teams are more likely to be used for risk analysis. In this study, the source of the knowledge is not examined as it is believed that each project has its own circumstances and based on the requirements and project team knowledge, the decision for developing and implementing the RM process may be made. In their study, Chileshe and Kikwasi (2014) did not categorize the types of assistant that the contractors and clients could receive in implementing RM. This approach proposes that, in assessing project risks, the contractors would need assistance from risk specialists to train their teams and help them understand the available tools and process. Chileshe and Kikwasi (2014) suggested that the reason for not favoring the risk specialists' assistance could be financial reasons and lack of financial resources to utilize the experts' knowledge.

Gupta *et al.* (2013) conducted a study to identify and rank of critical success factors for Building Operate and Transfer (BOT) projects in India. In their study, they stated that the BOT model for financing of the infrastructure has been a viable alternative for the developing countries due to lack of funds. However, Gupta *et al.* (2013) defined several problems that were encountered in infrastructure development through BOT. They found that the slow progress in the execution of BOT is one of the main problems encountered. The BOT approach has many other associated risks such as legal, political, and environmental risks, which caused the BOT projects to fail globally. Gupta *et al.* (2013) explained that the difficulties faced by the BOT projects are expected due to the diverse types of risks and uncertainties that would be faced in long-term Public Private Partnership (PPP) contracts, the multiple participants involved, and the lack of PPP experience and expertise in many countries and regions. On the other hand, Gupta *et al.* (2013) emphasized that the PPPs are not simply a tool for governments to develop infrastructure projects through transferring all the risks and shifting their own responsibilities to the private sector. The success of such partnership requires appropriate allocation and management of risks. To close with, a recent study on the construction industry in China argues the importance of reasonable allocation of risks between the client and its contractors, to avoid the unfair conduct of the client in shifting excessive risk to contractors, which would lead to higher premiums by the contractors to protect themselves from the associated risks Zhang *et al.* (2016). Accordingly, drafting a contract that allocates the associated risks fairly and requiring the implementation of systematic RM process are an important CSF for RM in the construction industry.

3. Project Team

In the construction industry, a project team can be defined as the representatives of the diverse contract parties that are grouped together for a specific period to provide the required knowledge and expertise to undertake a construction project. Construction project team members come from diverse business cultures and backgrounds, yet to succeed in a given project, they must embrace the same business strategies and perform under the same business standards. It is known that adequate teamwork is vital for project success. Chileshe and Kikwasi (2014) argued that the effect of teamwork is clear in Tanzanian construction industry; they stated that there are cases where when a job is advertised by a certain client, some consultants and even contractors would not decide to tender because of the known or anticipated behaviors of the parties. Chileshe and Kikwasi (2014) concluded that their findings are reinforced by the findings of earlier works such as the study done by Lynos and Skitmore (2004), which revealed that the "project teams" are

the most frequent group to be used for risk analysis, and by Toor *et al.* (2012), who emphasized the complexity of construction project teams. The complexity of divergence of the construction team would create critical communication and coordination problems. It is agreed among all experts that the consistency of the team member and their willingness to work together are very critical for the success of the construction project. Decision-making process can be affected by the performance of the project team. Decision may be poorly made, or alternatives may not be adequately evaluated due to poor communication between the project team. Sharing knowledge and the acceptance of discussing different perspectives are very critical in making reliable decisions in a timely manner. The experience of the team is very important for implementing the required tools and techniques in a given project. This cluster discusses the CSFs that are related to the project team performance. Table 3 lists the CSFs under project team and their references

Table 3. CSFs under the project team category.

Project Team Factors				
Management involvement in the process	Experience and familiarity with the process	Willingness and commitment	Integration of Stakeholders	Adequate risk ownership
Chileshe and Kikwasi (2014); Zwikael (2009); Pinto and Covin (1989); Belassi and Tukel (1996); Mok *et al.* (1997); Baloi and Price (2003)	Pakseresht and Asgari (2012); Nieto-Morote and Ruz-Vila (2011)	Chan *et al.* (2004); Xia *et al.* (2018)	Chileshe and Kikwasi (2014); Almaian and Bu-Qammaz (2018)	Cooke-Davies (2002); Almaian and Bu-Qammaz (2018)

3.1 Management involvement in the process

The strategic management of the construction organization can directly affect how a construction project is managed. Therefore, it can be stated that the management approach embraced in any organization would influence the implemented strategies to manage risks (Chileshe *et al.*, 2014).

Adequate planning requires the comprehensive understanding of project scope, which allows the project team to identify all project activities. According to Zwikael (2009), construction project managers should focus on the reliable identification of project activities to improve project performance. Moreover, Zwikael (2009) investigated the relation between project planning and project success criteria including schedule overrun; cost overrun; project performance; and customer satisfaction. The findings affirmed that the management involvement in the project strategic planning is evident. Moreover, adequate support from the management to have a successful implementation for any management tools or strategies is inevitable. There is a consensus between these arguments and the earlier study of Pinto and Covin (1989), which revealed that the early clear perception of project aims and objectives is an essential project CSF. This can be achieved in parallel with the accurate management performance. This fact is consistent with many other studies that reinforce the need for adequate management to achieve the project management success. Examples of such studies would include the study by Belassi and Tukel (1996), which resulted in revealing the relation between the lack of management support and project manager's competence with project failure. There is the study by Mok *et al.* (1997) in which they observed that the successful implementation of risk management process depended on whether the CSFs are available.

With respect to risk management, Baloi and Price (2003) suggested that there exists a direct relationship between effective risk management and the achievement of project success factors or criteria; this is true since the criticality of the identified risks is assessed by their potential impact on project objectives. However, it is important to emphasis that risk management does not mean eliminating all uncertainties but rather managing their sources to reduce the negative effect of the anticipated project risks.

3.2 Experience and familiarity with the process

Experience is considered as one of the CSFs of construction projects (Pakseresht and Asgari, 2012). Experience reflects the team's capabilities and empirically acquired knowledge to meet the project objectives. Many studies have emphasized on the project team's competence, particularly the project manager as significant project success factor (Pakseresht and Asgari, 2012). It can be stated that if the project team possesses the adequate skills to manage the project, then the probability of successfully delivering the project is expected to increase. Risk management, like any other management disciplines, involves several processes and needs to utilize certain tools and techniques. It was found that inexperienced team members are one of the critical risks that its impact needs to be carefully monitored during the RM process (Nieto-Morote and Ruz-Vila, 2011). Individuals of a given project team are expected to accept the RM process and the associated management tools without worth mentioning difficulties if they were familiar with the process and have previous implementation experience. Consequently, the success of the RM process would be achieved effectively due to their familiarity of the process.

3.3 Willingness and commitment

Team leaders and individual commitments to project and management objectives are always considered as one of the success factors (Chan et *al.,* 2004). Acceptance and willingness to embrace the proposed process would lead to the anticipated commitment. To create an organizational culture that accepts the RM process, awareness and skills must be spread and shared starting from the upper management through team leaders to individual team members (Xia *et al.*, 2018). Although the level of commitment would vary with the level of authorities and tasks involved, the culture of commitment needs to be shared. To have a successful RM process, upper management needs to commit to RM, mangers need to have the required RM skills, and workers need to properly respond to risky events (Xia *et al.,* 2018).

3.4 Integration of Stakeholders

Almaian and Bu-Qammaz (2018) investigated the role of stakeholders and emphasized the importance of stakeholders' analysis for project management success, particularly risk management. Chileshe and Kikwasi (2014) suggested that construction stakeholders understand the criticality of the management activities on enabling the initiation of the project risk management team within both the organizational and project environments, to understand other parties' expectations or interests from the project or other stakeholders and to feel the need for the interchangeable relationship. The involvement of the stakeholder is very critical; however, the overlap between their scope would be very risky.

3.5 Adequate risk ownership

Risk ownership means the responsibility to influence the risk either to eliminate its source or manage its consequences. Risk owner is the party responsible to response to risk and manage its consequences. Typically, contract documents would define the risk owners and assign the responsibilities on different parties/stakeholders to manage risks. Inadequate risk ownership would lead to RM process failure. Cooke-Davies (2002) considered adequacy

of documentation of organizational responsibilities on the project as one of the practices that is related to on-time delivery of the projects. Almaian and Bu-Qammaz (2018) revealed the importance of stakeholders' analysis and stated that assessment of stakeholder's influence and interests would assist the project team to assign risk ownership adequately.

4. External Factors

The factors considered under this category are those factors that are related to the general characteristics of conducting business in a given country. Although they are generally uncontrollable and may not be directly related to the performance of the project, it is believed that those factors would have an important influence on the RM success. Table 4 reveals the factors considered under this category and associated studies where it was cited.

Table 4. CSFs under the external factors category.

External Factors			
Uncontrollable and country related risk management	Education and training	Governmental support and emphasis on the need for RM	**Advance information system (IS) to facilitate the implementation of the process**
Al-Azemi and Bhamra (2014); Bing and Tiong (1999); Hastak and Shaked (2000); Mohamed (2003); Dikmen and Birgonul (2004); Zavadskas *et al.* (2010)	Chileshe and Kikwasi (2014); Cooke-Davies (2002); Nieto-Morote and Ruz-Vila (2011); Interviewed experts	Zavadskas *et al.* (2010); Fitzgerald (1998); Gupta *et al.*, (2013); Zhang and Kumaraswamy (2001); Interviewed experts	Ajmal *et al.* (2010); Bu-Qammaz and AlMaian (2018)

4.1 Uncontrollable and country related risk management

Uncontrollable risks are those risks that are out of the control of the project team; their sources cannot be eliminated, but their consequences must be managed effectively. It is essential to understand the concept of risk controllability. Implementing risk response strategies to eliminate uncontrollable risks is not only waste of resources and will cause RM failure but also may create additional sources of risks. The well-known uncontrollable risks are the risks that are country related. Country risks in most construction projects are critical risk sources and must be realized by the project team to manage its anticipated impacts. Al-Azemi and Bhamra (2014) conducted a study to assess the most common and critical decision factors relating to RM in build, operate and transfer (BOT) projects in Kuwait; they found that country risk category is the second most critical risk after the financial and revenue risks. International construction risk models have considered country and government risks as one of the risk clusters that must be identified and assessed Bing and Tiong (1999), Hastak and Shaked (2000), Mohamed (2003), Dikmen and Birgonul (2004), and Zavadskas *et al*. (2010). Accordingly, understanding the uncontrollable risks and implementing adequate and effective risk response strategies that are specific to those risk are considered one of the CSFs for RM.

4.2 Education and training

Training is a tool to transfer the necessary knowledge and expertise to the project team through direct communication with the team members. Acquiring the knowledge and education necessary to implement the RMP is very critical for

its success. The lack of knowledge can be a great barrier for not only its success but also the implementation to start. Chileshe and Kikwasi (2014) explained that it is essential for construction professionals to pursue specialization in risk management to set up consulting activities that allows others to seek the necessary expert advices and assistance to implement RMP in the construction projects. Risk management objectives are often identified with respect to project success criteria, and one of the success criteria is on-time delivery. Thus, project duration is considered as one of the critical project objectives. Thus, the time overrun is usually identified as a major project risk, which may jeopardize project success (Nieto-Morote and Ruz-Vila, 2011). Cook-Davies (2002) described the adequacy of company-wide education on the concepts of risk management as one of the 'real success factors' for on-time performance.

4.3 Governmental support and emphasis on the need for RM

The attractiveness of a business environment can be affected by the governmental rules and regulations that govern the business practices in the country. Gupta *et al.* (2013) argued that the private sector investors would be interested in the public infrastructure projects only if a favorable environment was created by the government. Such environment would include political, legal, economic, and commercial environments. Adequate risk allocation between parties and reliable legal framework represent important incentives for investment. The government, with all the authorities having jurisdictions, must take the lead in creating such environments as they would have more control. The government must provide country-specific and/or project-specific guarantees and support. Such guarantees may assist the investors to manage uncontrollable risks that can be better managed by the government such as change in law, foreign currency convertibility, corruption, delays in approval of various permits, and certain force majeure risks (Fitzgerald,1998; Zhang and Kumaraswamy, 2001).

4.4 Advance information system (IS) to facilitate the implementation of the process

Ajmal *et al.* (2010) study aimed at defining the critical factors for knowledge management (KM) in project business; they found that a lack of incentives and absence of an appropriate information system are the most significant barriers to successful KM initiatives in projects. Ajmal *et al.* (2010) suggested that project managers need to provide appealing incentives to encourage project teams to participate in KM initiatives and to suggest innovative ideas. Ajmal *et al.* (2010) also advised the managers to make an effective user-friendly information system available before introducing KM initiatives. An effective KM system would act as the main KM enabler, but again poor management would create a barrier for any system. In project-based organizations, a well-developed system of information technology would facilitate the communication, collection, and reuse of knowledge. According to the findings of Ajmal *et al.* (2010), the most important implications for project managers are that successful KM initiatives require appropriate incentives for team members and a user-friendly information system that facilitates the sharing and management of knowledge among all project participants. According to Bu-Qammaz and AlMaian (2018), the expected benefits from implementing reliable IS in the risk management process would include increased productivity, improved communication, integrated project information, more efficient decision-making process, and controlled project performance.

CONCLUSION

Kuwait 2035 vision is built around many development projects that require the expertise of global organizations. The proposed model of this research is part of a larger project that aimed to evaluate the risk awareness of the construction industry in Kuwait. The outcomes of the undertaken project are anticipated to provide an understanding for global organizations regarding the RM environment and risk maturity in Kuwait, which is very essential for market entry decision and country selection.

Construction projects are risky undertaking, making the promised rewards from RM implementation very appealing. Because of the unique characteristics of the construction industry and the construction projects, there are several clusters for the CSFs of the RM process. The CSFs model depicted in Figure 1 consists of four major clusters, namely, construction, project specific, project team, and external factors. Under each cluster, several factors were defined based on the results of the literature review and experts' discussion. Successful implementation of RM implies that all these CSFs must be considered critical and cannot be disregarded by the project team. Evaluating the level of criticality of each factor and creating a tool case specific prioritization of those factors will be the subject of future work.

On the other hand, it was shown through this study that the success of the RM process is expected to assist the project to succeed, but it does not guarantee its success. RM process is part of many other management processes, and there are diverse factors that would have an impact on the overall success of any construction project.

The research revealed that there is still much to be done to promote RM in the construction industry during the construction phase.

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