IDENTIFICATION OF RISK FACTORS AFFECTING CONSTRUCTION OF PROJECTS: THE CASE OF EMERGING ECONOMY

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Abstract

Controlling project risks has become a daunting task in construction and this can be attributed to issues such as the nature of modern projects. The challenge is that risk appears unannounced at any project phase for various reasons and thereby affecting the performance and the success of unprepared projects. The current studies that explored risk matters include Pehlivan and Öztemir (2015), Katre, and Ghaitidak (2016) amongst others. However, there is absence of unanimity from these studies on risk factors in construction. Thus, this article was instigated in order to identify and classify risk factors that affect the chances of project success. The research methodology selected for this article comprised of peer-reviewed articles between the periods of 2007 to 2017. This approach involved a comprehensive scrutiny into scholarly articles to comprehend risks in construction projects. Following a conceptual analysis, eighty factors were identified and classified under the following; technical, construction, financial, socio-political, physical, organisational, and environmental and other risks. From these categories, political instability was, found to be the most influential risk factor in construction projects and this factor was classified within the socio-political category and this category has total of 11 factors. Finding suggests the need for further empirical study.

Keywords: Construction, Project, Risks Factors, Management

1. INTRODUCTION

Every construction project is a risky, unpredictable but a unique undertaking to channel proficiently to a successful and acceptable completion. Therefore, weak and inappropriate risk policies that are adopted (Branco, 2015) by construction companies in response to challenges may result in projects failing to achieve their intended purposes. According to Choudhry Aslam, Hinze and Arain (2014) successful projects are those that competently plan, organize and manage risk in a fashion that provides appropriate reaction when the need arises. This is because construction projects are created in a multifaceted environment therefore, all possible sources of risks should be monitored and treated accordingly. Risk increases costs of projects by 53% (Apolot, Alinaitwe and Tindiwensi, 2011), and the risk of corruption contributing between 10 and 30% of the contract value. Thus, risks affect the productivity, performance, quality and budget (Akintoye and MacLeod, 1997) of projects and this can possibly affect the successful conclusion of a project.

Risk has been defined by various sources, however, this study adopts the Project Management Institute (PMI, 2013)'s description. According to the (PMI, 2013) risk may be defined as a doubtful occasion that results in an advantage or disadvantage after its occurrence. In construction, each project is exposed to certain levels of risks (Santos and Jungles, 2016), and risk is extremely prevalent in all the stages of a project. However, the impact and frequency of risk depends on how well the project managers prepared for the possibility of its occurrence. It must be noted that no projects, sites, stakeholder and project teams perform precisely the same on different projects because projects are unique and poses different risks at any given time and this makes risks a force to reckon with in projects. Nonetheless, the persistence of risk has resulted in risk becoming a standard rather than an exception in the construction of projects (Arcilia, 2012). The tenacity

of risks on projects has resulted in the industry being more vulnerable to numerous types of risks and uncertainties (Ringen, van Duivenbooden and Melius, 2012) thereby, positioning itself as the most unsafe and most corrupt amongst other risks when compared to other industries. For instance, the risk of serious personal injuries is very high in the industry (Ringen et al. 2012). Consequently, all expected and unexpected risks need to be evaluated and controlled before, during and after construction process. Thus, risk assessment and management should be a prerequisite for construction projects to be prosperous and economical in avoiding risks specifically the injuries on duty. Unfortunately, risks are irregular and an integral part of almost every construction project and throughout all the project phases (Zhao, Lv, Zuo and Zillante, 2010) of the construction process. This makes it challenging to properly assess and manage risk without worsening situations. For example, projects can be disturbed by risk events that are both internal and external to the project and this leads to project managers either being able or unable to control the risk. This makes the assessment and management of risk to become an essential requirement for construction projects. According to Hwang, Zhang and Gay (2013), the control of risk factors has to be emphasised irrespective of project scope, location or the type of project so that a project's goals are realised. Meanwhile, suitable control measures greatly contribute in circumventing catastrophic outcomes.

It is therefore, evident that construction companies are faced with the enormous challenges of overcoming various types of risks in order to be successful. This has resulted in many investigations and observations carried out in an attempt to try and resolve problems related to risk. For example, risks on projects has been formerly researched by several authors who focused on certain aspects of risk to a construction project. For example, safety (Tam, Zeng, and Deng, 2004), performance (Fortunato, Hallowell, Behm and Delaney, 2012), international project (Xiaopeng and Pheng, 2013; Vu, Wang, Min, Mai and Nguyen, 2016), cost (Choudhry et al. 2014; Allen, Carpenter, Hutchins and Jones, 2015) time (Mahamid, 2013; Katre and Ghaitidak, 2016). Other studies aimed focus at project life cycle (Tserng, Yin, Dzeng, Wou, Tsai and Chen, 2009; Renuka, Umarani and Kamal, 2014) rather than from the perspective of a project's stages. Due to the insistence of risks on projects over the years, researchers proposed various types of risk assessment models for precise activities in construction project assessment (Odimabo and Oduoza, 2013; Yafai, Hassan, Balubaid, Zin and Hainin, 2014). This was intended to cover all risk evaluation and acquire complete answers which could assist in resolving risk problems in projects. Some studies went further and recommended risk management tools and techniques (Iqbal, Choudhry, Holschemacher, Ali and Tamošaitienė, 2015) which have assisted to a point in managing risk, but have not completely solved the problem. Despite the latest systems being employed all over the world (Han, Love and Pena-Mora, 2013) to manage risk in projects, it remains one of the biggest obstacle for project success. If this problem remains unsolved, it will lead to a continuation of poorly managed projects, low quality products and disgruntled customers. Therefore, the aim of this study is to identify and classify risk factors in projects so as to assist in the success of projects.

Contribution of the paper

The reason for this article is to distinguish and classify project risks factors so as to assist in the success of construction projects. The study contributes to the risk literature by and stipulating risk factors and providing recommendations on how best to manage risk. The findings of this study will help emerging economies like South African and others that have construction companies to understand risk factors and in developing relevant strategies and policies to eliminate risks. To achieve the objective of this study, the study deviates from previous studies in the following ways: uses the most recent data available, is the first to identify and classify risk factors regardless of the type of project, identifies trends and challenges associated with risks and provides relevant remedies.

Organisation of the study

The article has been structured in the following order. Firstly, the article starts by giving an overview of risk in the construction of projects. Secondly, the article converses on risk in project management, the risk cycle and risk in other parts of the world. Thirdly the article reflects on the approach employed in identifying risk factors for the article. Findings are discussed, this is, followed by the review of literature on risks identification and classification in the construction of projects. Lastly, the challenges and trends of risk in the construction of projects is followed by the conclusion.

2. REVIEW OF LITERATURE

Countless researches have been conducted all over the world in an effort to understand, predict and mitigate risks in projects. This literature review deliberates on risks in construction projects, risk identification and risk classification. All construction projects are unique, built only once but are also subject to some degree of risk. However, risk is sometimes mistaken with uncertainties. According to Rezakhani (2012) risk should be distinguished from uncertainty since it is measurable (Karimi, 2011). Risk can also be either short or long term, internal or external, and classified as business, technical or operational. Some risks are avoidable while others are unavoidable, for example, the currency exchange rates are an unavoidable risk. On the other hand disputes and strikes are avoidable risks that can be resolved through negotiations. However, no matter how risk is classified or described it must never be ignored (Latham, 1994), since it is the main source of all unsuccessful projects in construction. This is because, for instance according Heinonen (2016) and Renuka et al. (2014), the success of a project depends on how risk is identified and managed by project managers. The management process involves those structures that assist management in its role of planning, organising, leading and controlling (Du Toit, Erasmus and Strydom, 2010) of risk in projects. Management of risk can be executed through minimising, transferring or accepting the risk

(Renuka et al. 2014) factors. Therefore, mismanagement of projects can be avoided if the risk factors are appropriately defined.

As stated earlier, risk has become an inherent part of construction projects in the construction industry, as no project has ever been risk free. However, given the role and the influence of the industry in the world, certain measures must be implemented to help the industry in eliminating this phenomenon. According to Durdyev, Omarov and Ismail (2016), the industry is of great importance as it contributes significantly to the gross domestic product (GDP) and employment to many economies in the world. Therefore, it is necessary for risk factors to be eliminated at all costs and for project managers to stay alert and to be vigilant at all times. This is because risk affects project's standards, budget and completion times and thereby causing projects to also miss all the other anticipated goals (Sovacool and Cooper, 2013) as well as the GDP and employment of a country. Delivering expected results becomes an immensely difficult task. However, despite all the risks that a project experiences, it is possible to manage projects successfully through better preparation and application of effective tools and techniques (Ismail, Abd and Chik, 2008). However, Ismail, Abd and Chik, (2008)'s assertion is inconsistent with the Australian Government' Business report (2016) which concluded that the future cannot be predicted, because data is not always readily available and in abundance to do so. The Australian Government' Business's report (2016) is proven by the high numbers of project failures reported worldwide. Risk has been reported in construction industries of both the developing and the developed countries across the world. Though the risk might vary in one way or the other. For example, in emerging economies, like South Africa, amongst other emerging economies risk is a continuous challenge that has to be resolved. According to Baloyi and Bekker (2011), some of the risks that is encountered include factors such as lack of productivity, client dissatisfaction and material increases (Baloyi and Bekker, 2011), safety and many more others. These risk problems negatively affect project performance, therefore, it is important to identify and classify risks in projects in order to manage accordingly.

The roots of project risk is in the ambiguity that exist in each and every project and has been acknowledged as an important area in managing projects by the Project Management Institute (PMI). According to PMI (2013), risk is one of the ten parts that make up the project management knowledge areas that a manager must understand and manage. The ten areas are project integration, scope, time, cost, risk, human resources, quality, procurement, communication and stakeholder management. All the ten knowledge areas are essential in their own right however, the areas should not be managed in isolation if a project is to succeed. Nonetheless, this article is mostly interested in project risk management. Project risk management has become an indispensable prerequisite for the success of construction projects because each of the other areas has an element of risk in them. The table below summarises the ten knowledge areas.

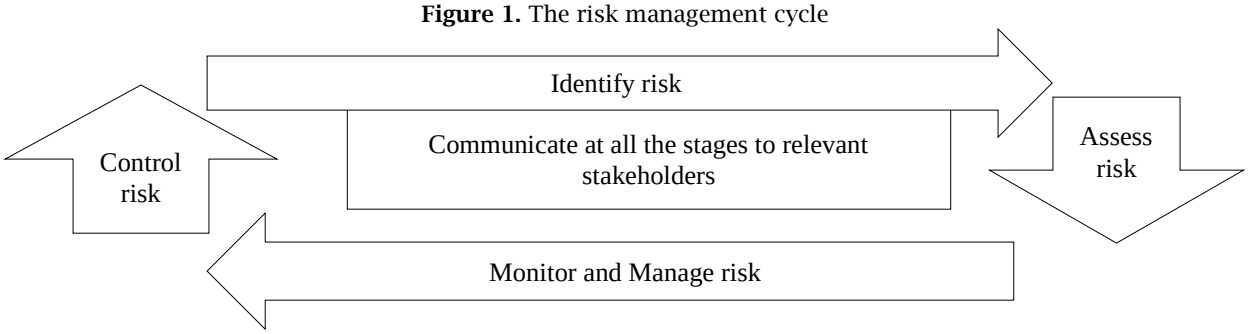
Table 1. The ten project management knowledge areas

Knowledge area	Description
Project integration management	Involves the organisation of a project in a manner that the project meets or surpasses expectations.
Project scope management	Comprises of procedures that warrants what needs to be done, when, how, where and by whom.
Project time management	Ensures that activities are carried out and completed on time
Project cost management	Ensures that the activities are completed within the budgeted cost budgeting.
Project risk management	Analyses the possibility of risk occurrence and takes action in advance.
Project human resources management	Processes that acquires, organizes, develop and manage the project team.
Project quality management	Processes and activities of performed to ensure good quality products.
Project procurement management	Ensures the creation of relationships with outside vendors and suppliers for goods and services.
Project communication management	Comprises of timely and appropriate management of project information.
Project stakeholder management	Processes used to identify and manager all people or organizations affected by the project.

Source: Project Management institute (PMI, 2013)

Risk management is a procedure whereby the project participants specifically the manager identifies, monitors and manages risk in a manner that lessens the risk's negative impact on a project (Halikas, Karvonen, Pulkkinen, Virolainen and Tuominen, 2004; Tummala and Schoenherr, 2011; APMG, 2016). The next diagram illustrates the phases that are involved in the risk management process.

Figure 1. The risk management cycle



Source: Author's compilation

Numerous methods exist for the identification of risk. For instance, the methods may include past project information, Delphi technique, brainstorming, technical expertise, group dynamics, personal contacts, checklist, scenario building (Garrido, Ruotolo, Ribeiro and Naked, 2011; Tadayon Jaafar, and Nasri, 2012). Supplementary identification methods revealed by The PMI (2004) comprise of the, checklist analysis, documentation reviews, data gathering and diagramming techniques. However, these methods are all inconsistent with Chihuri and Pretorius (2010), but consistent with Garrido et al. (2011), who discovered brainstorming as the most suitable and flexible of all available methods of identification. Despite which type of method is applied to identify risk the process is expected to deliver a comprehensive risk register, with responsibilities allocated to each point. Several studies have employed some of the methods mentioned above to identify risk factors and these are discussed below.

In China, a two-round Delphi method was employed by Ke, Wang, Chan and Cheung (2011) in an attempt to discover risks factors in projects. Ten risk factors were discovered and these ten factors are; lack of government support, wrong decisions by politicians, fiscal and monetary matters, market demand change, bribery, biased assessments and undeveloped justice system. Ke et al. (2011)'s study was inconsistent with a Luthuanian study carried out by Benaitiené, Banaitis and Norkus (2011), who through the use of 40 managers found that lack of experience and labour as the most influential risk factors. However, the authors did not classify or group the risk factors though the method of identification used was not the same. Karim, Rahman, Memmon, Jamil and Azis (2012) employed 50 questionnaires in an attempt to identify risk factors in Batu Pahat and Muar districts. Their study located the following risk factors; scarcity of material, delay in distribution of materials, inadequate use of technology low quality workmanship and financial difficulties. In the United States of America (USA), Fortunato et al. (2012) carried out a study in green building and established major safety risks that employees were subjected to by their employers. Firstly, employees worked too close to electricity and thereby faced the dangers of being electrocuted while working. Secondly, employees also worked extremely close to weighty apparatus on unsuitable ground for longer hours. This situation put employees in a very dangerous positions. All these risks suggest that the project manager did not adequately assess the site and this could result in safety and health problems for the employees concerned.

In Taipei, Kuo and Lu (2013) conducted a study on underground construction in order to determine risk factors, 5 experts' with decades of construction experience were interviewed. The findings of study revealed; design drawing errors, conflicting, poor construction site surveys, inappropriate design, ground water seepage and heavy rainfall to be the risk factors associated with underground construction. Luka and Muhammad (2014) evaluated the impact of risk on the Nigerian construction industry and found that the two main risk influencing factors are cost and time. The study also concluded that the two had the greatest effect and highest rates of occurrences. The same study found that environmental risks had the least occurrences and the least effect. Based on the outcomes of a questionnaire survey, Chien, Wu and Huang (2014), uncovered 13 risk factors, in building processes. The 13 factors were grouped into four main groups. Some of these factors include shortage of software (technical), lack of commitment (management), price increases (financial) and lack of standards (legal) among others.

After risk has been well identified through any of the preferred methods of identification, it should be categorised into related groups. According to Zhi (1992), risk can be classified in terms of occurrence, nature or the stage of construction. A number of studies have classified risk factors into related groups over the years, though some of these factors overlap to other groups. For example, the project management institute classified risks into five categories namely; technical, external, internal, organisational, and environmental and project management. This classification of risks by the project management institute seems to be a foundation for other classifications because all other classifications seem to have used this classification as a stepping-stone. Apart from classification through occurrence, other classifications are dissimilar. For example, locality category (Chileshe and Yirenkyi-Fianko, 2012; Goh, Abdul-Rahman and Samad, 2013; Kuo and Lu, 2013), market related classification (Xu, Yeng, Chan, Wang and Ke. 2010; Jayasudha and Vidivelli, 2016) time and legal (Jayasudha and Vidivelli, 2016). However, as mentioned earlier the classifications may differ but the factors overlap while other classifications tend to ignore certain aspects. For example, others might classify a factor such as new technology as a technical factor while other studies will classify it as an external factor.

The following risk categories as observed by several studies in different countries from the period

of 2008 to 2016, as deliberated below. These studies attempted to identify and group related risk factors. For example, Mañelele and Muya (2008) identified twenty-two risk factors in Zambia through brainstorming and classified these into six groups. The following is a grouping of risk factors according to the study carried out by Mañelele and Muya (2008), who classified risk as follows.

Table 2. Mañelele and Muya (2008)'s classification of risk

Project initiation • Inadequate technical advice • Disagreements on issues • Unsubstantiated funds	Budget and finance • delayed financial retirements • inadequate budgets due to delayed implementation • delayed financial disbursements
Community contribution and participants • not adhering to requirements • shortage of bricks • unfavourable weather conditions • logistical challenges	Skilled labour • unskilled workers • worker shortages • incapable committees
Material procurement • time consuming tender process • poor quality materials • unavailability of non-local materials in local shops and high-transportation costs	Quality control • lack of work programmes • absence of quality supervisor • wrong materials

Mañelele and Muya (2008)'s classification of risk did not take technical skills into consideration, which includes issues such as the use of technology and staying abreast. Most of the factors classified by Mañelele and Muya (2008) are internal factors except for unfavourable weather conditions. Therefore, this classification of risk lacks extensiveness. However, other classifications of risk that are discussed in this article came from studies by the following authors; El-Sayegh (2008), Nieto-Morote, and Ruz-Vila (2011), Mahendra, Pitroda, and Bhavsar (2013), Choudhry et al. (2014) and Vu et al. (2016). The classifications of risk by these studies is summarised in table 3 below.

Table 3 below depicts some of these classifications from the year 2008 to 2016 by different studies in different contexts.

Although all the categorisation of risks in table 3 contribute to literature, they possess shortcomings. Therefore, the categorisation system used in this article for categorising the causes of risk was based on a combination of the classification by El-Sayegh (2008) and Mahendra et al. (2013) and is presented in table 4. Thus, a combination of two different categories was, adopted in this article because the combination of these two models allow for more conclusive of many factors and for complete analysis on the identification and classification of risks in construction. The following section discusses the risks classification preferred for this article.

Technical risks- technical risks factors involves issues or concerns in the construction projects that are associated with technologies. Certain technical skills can be controlled and managed by the companies while others are uncontrollable and difficult to manage. Some of the technical risks can include incomplete design (Xu et al. 2010; Jayasudha and Vidivelli, 2016), insufficient skill (Mahendra et al. 2013) etc. and new technology (Choudhry et al. 2014; Iqbal et al. 2015) etc. Technical skills ranked first by Kikwasi (2012) as the most important as well as most critical risks to the construction of project especially the design changes factor.

Construction risks- are the risks that managers can easily plan and manage because these risks are within the manager's reach. However, the requirements are continuously changing all over the world and project managers must stay abreast and endeavour to be honest in their dealings. For example, project managers need to avoid the use of unproven engineering techniques, unsuitable programs, too high quality standards and faulty equipment in order to manage projects successfully to completion (Xu et al. 2010; Mahendra et al. 2013) etc.

Financial risks- This group of factors involves monetary related matters, some of these factors can be controlled and manipulated by the project managers such as labour costs. However other factors cannot be manipulated or negotiated for such as foreign exchange rates. Financial risk factors include; increases in prices, local taxes, and foreign exchange rates (Chileshe et al. 2012; Mahendra et al. 2013) etc. Amongst a number of the factors that are grouped under financial risks, delays in payment was ranked second by Kikwasi (2012) after design changes as the most important as well as most critical risks to the construction of project.

Socio-political risks- involves factors such as changes in laws and regulations, law and order, corruption and bribes (Xiaopeng and Pheng, 2013; Odimabo and Oduoza, 2013; IRMSA, 2017) etc. This group of factors requires project participants to abide by the laws of a country in which they operate. Project managers should be able to deal with and to overcome local and national political opposition.

Physical risks- comprises of ecological hazards that cause harm to the project with or without contact to the project. Controllable factors, in this group comprise of waste of materials, theft and damage to equipment therefore competent project manager should be able to easily identify and manage the controllable risk factors. However, the other factors such as heat and radiation are uncontrollable and project manager need to prepare for such type of risks. Some examples of physical risk factors are damages to equipment, labour injuries, radiation, heat, noise and vibration (Iqbal et al. 2015; Feng, Zhang and Wu, 2015; Jacobsen, Johnsen, Gravensen and Schovsbo, 2015) etc.

Table 3. Similarities and differences in classification

Source	Context	Classification of risk	Advantages and Disadvantages of the classification
El-Sayegh (2008)	General project, it incorporated knowledge and experience acquired from many experts.	Clients, Designers, Contractors, Sub-contractors, Suppliers, Political, Social and Cultural, Economic, Natural and Others.	The study incorporated knowledge and experience from experts. However, it did not include financial factors.
Nieto-Morote, and Ruz-Vila (2011)	Building rehabilitation	Management, Engineering, Execution and Suppliers.	This study did not consider natural factors, as well as health and safety. However, the study made use of a real project under construction and it included the execution of projects, which had not been done previously.
Mahendra et al. (2013)	Literature review and questionnaire from developing countries.	Classified project risks into, Technical, Construction, Socio-political, Physical, organisational, Financial and Environmental	This study was more inclusive and had many wide factors that covered a range of previously uncovered factors such as technical and financial. Unfortunately the study did not
Choudhry et al. (2014)	25 projects of bridge constructions in Pakistan. 100 questionnaire distributed and this was followed by interviews.	Categorised risk into; Financial, External, Design, Management, construction, Contractual and Health and Safety	This study was both quantitative and qualitative. It is the only study from the five classifications given here which included health and safety as a standalone factor. However, it only concentrated specifically on the construction of bridges only and did not include other projects. The study also did not include factors such as physical, suppliers and owners as factors.
Vu et al. (2016)	Vietnam construction projects. Specialist with decades of experience in engineering were interviewed.	Classified project risk into; structure, security, financial, survey design, terrain procurement, agreements and restraints, external situations and differences and administration	This study is the most recent study from the five classifications chosen for this study. Experience from different experts and different types of projects were the bases of the study. The study has a different take at the classifications from other studies. However, the study did not include health and safety factors.

Organisational risks- this group can be completely controllable by the project managers. All the factors in the group are part of their roles and responsibilities as project managers. For example, before each and every project starts, the project manager should ensure that the project has sufficiently skilled and qualified staff who understands what is required of them. Therefore, organisational risks include elements such as communication, excessive procedures, experience (Ke, Wang, Chan and Lam, 2010; Mahendra et al. 2013; Karim et al. 2013) etc.

Environmental risks- are external factors that managers do not have control over, and comprise of factors such as ground conditions, natural disasters, weather, and seasonal implications (Zou, Zhang and Wang, 2007; Chileshe et al. 2012; Kuo and Lu, 2013) etc. There is not much that project managers can do in terms of these factors except to prepare for the risk caused by the factor. However, most managers prefer to get insurance to solve risk associated with this particular group of factors. Environmental risks are commonly overlooked when the project manager is unfamiliar with local conditions.

Other risks – covers those risks which do not qualify put be classified under any of the other group of risks, for example public opposition (Xu et al. 2010). The group comprises of a mixture of both controllable and uncontrollable risk factors.

Table 4 below portrays the risk factors in construction projects between the periods of 2007 and 2017. The classification of risks factors employed in table 4 are a combination of El-Sayegh (2008) and Mahendra, Pitroda and Bhavsar (2013)'s classifications.

Table 4 depicts the combination of two classification as mentioned earlier. Most of the studies that attempted to identify risk factors were carried out in other countries, for example, Mañelele and Muya (2008) in Zambia, Benaitiené, Banaitis and Norkus (2011) in Lithuanian and Luka and Muhammad, Fortunato et al. (2012) in Nigeria amongst others. IRMSA (2017) was the only study that identified risk factors in South Africa the other studies examined risk in context but with other variables. However, the conclusions of these studies may not be appropriate to the scope of this article as both internal and external issues vary across the globe. Hence, this article fills in a crucial crack in construction of projects. However, none of the studies conducted concluded that risk identification might not be effective. This leads to the conclusion that proper risk identification can only be effective in specific projects or places.

3. RESEARCH METHODOLOGY

The focus of the study is to identify and classify risk factors that affect the chances of project success in the construction of projects in emerging economies. According to the author's knowledge, this study is the first mong preceding studies on risk, to use emerging

economies to identify the risk factors in the construction industry. However, this paper swerves from other earlier in three major ways: (1) Employs current statistics, (2) is the first to investigate risk factors in emerging economies in construction and (3) focuses mainly on emerging economies. The paper identifies and classifies risk factors in emerging economy and contends that a number of construction risk factors in emerging economies are similar in terms of being poorly identified, classified and managed thereby creating a problem. For instance, many repeatedly used methods suggest (implicitly or explicitly) that such problems are solely questions of geographical location. An alternative view of the generation of emerging economy is suggested and this is based on the concepts of risk factors identified.

Conceptual analysis was employed to gain a deeper insight of risk in projects. Based on extensive 107 peer reviewed studies, this article is based on the 60 of the 107 articles. To achieve the aim of this article, Google scholar, was employed to search for relevant literature and this was restricted to peer reviewed articles. From these 107 articles, 20 reported directly on the identification of risks. Therefore, 107 articles from the year 2007 to 2017 formed the basis of this article. Key words for the Google search included the following; construction projects risks, risk factors, risk management, and risk assessment. In addition, published and unpublished materials such as journals, books, periodicals, conference proceedings relating to risk in construction industry consulted and used to contribute to this article. Literature review related to this field was performed to determine current and common risk factors in construction of projects. Eight classifications of risks were, identified from literature namely; technical, construction, financial, socio-political, physical, organisational, environmental and other risk factors. Eeighty factors grouped under the eight main classifications and tabled in table 4 (see Appendix A) according to the related sources of causes. Therefore, this article reports exclusively on risk in projects.

4. RESULTS AND DISCUSSION

In this study, a comprehensive review of literature was employed to determine risk factors in projects. The following segment of the article discusses the findings of this study, and these are, tabled in tables 3, 4 and in figure 2 respectively. Table 3 summarises different classification of risks in the construction of projects. Table 4 presents a list of eighty risk factors from 2007 to 2017 and these are classified under eight classifications. A graphical presentation of risk factors is illustrated in Figure 2 to provide a bird's eye view on the risk factors a distance. The findings of this article are concerned with the identification of the eighty risk factors, classified into eight group of related factors and the results from table 4 are explained.

Figure 2. Risk factors and classification

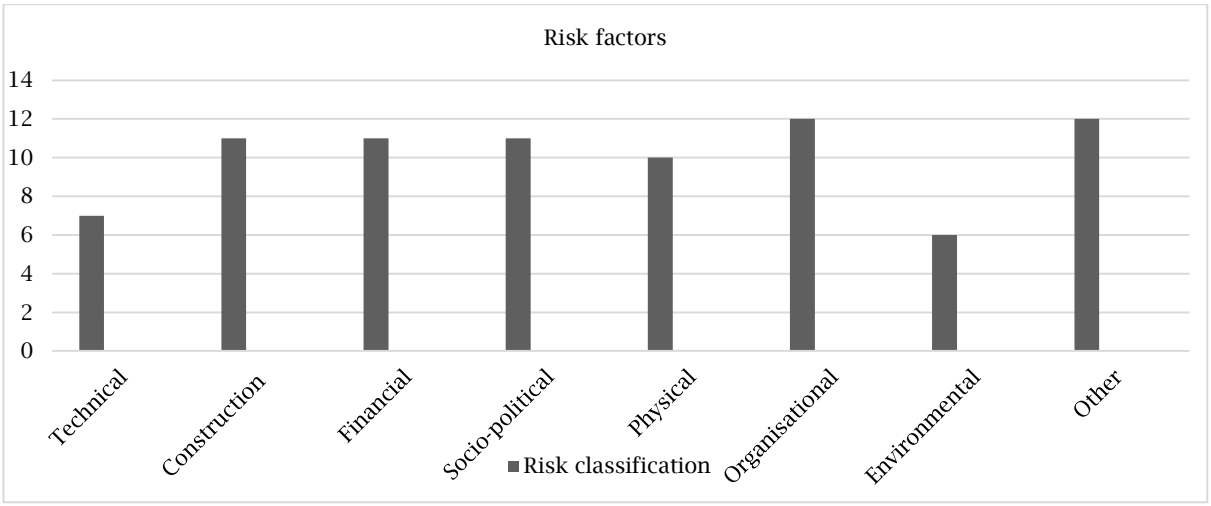


Figure 2 depicts an overall picture of risk classification in construction and the number of factors that make up each category. 80 factors are categorised within the eight categories. The next section discusses the categories of this article.

Technical risks- this group of risk factors had a total of 7 factors and from these, the top most significant risk factors of this group are new technology, change in scope, incomplete design, inadequate site investigation. The least risk factors from this group are; insufficient technical skills and construction procedures and inaccurate execution. This finding suggests that organisations should invest in new technologies and stay up-to-date with technology. It also indicates that education, training and updating technology can improve can improve project risk identification and ultimately the success of a projects. Therefore, technology is subject to managerial intervention to improve project performance.

Construction risks- this group of risk factors had a total of 11 factors and from these, the most significant risk factors of this group are labour disputes and strikes, design changes and unsuitable construction program. There are four least risk factors from this group namely; postponement of project, late handover, unproven engineering techniques and improper project feasibility. This finding implies that labour is a crucial ingredient for the success of any project. Employees go on strikes

and this jeopardises the project in many ways including giving a negative image of the company involved. Therefore, this becomes an important asset of the company.

Financial risks- this group of risk factors had a total of 11 factors and from these, price fluctuations, exchange rate and inflation are the top three factors. This finding suggest two things, firstly buying in bulk to negotiate for big discounts, buying cheaper materials or alternatively do nothing. This is because management do have control over this variable.

Socio-political risks- this group of risk factors had 11 factors. Political instability was on top of the list. The least risks in this group are racism and xenophobia. This finding alludes to the fact that governments should be stable and democracy is important. Concerning political instability, there is not much that companies can do as it is out of their control although they can influence governments through business negotiations.

Physical risks- this group of risk factors had a total of 10 factors and from these, the top three most significant risk factors of this group are accidents and fatalities, shortages of equipment and material as well as equipment and material theft. This finding suggests that companies should ensure that their health and safety policies are in order as this could result in lawsuits and even loss of life. Therefore, companies should force workers to abide by rules to improve safety. Companies have control over most of the factors found in this group and therefore, will be expected to act appropriately within the confides of both the company and the country's expectations

Organisational risks- this group of risk factors had a total of 12 factors and from these, the three most significant risk factors of this group are communication, excessive procedures and lack of qualified staff. This finding insinuates that no single organisation can survive without proper communication. Therefore, individual members within an organisation need to be provided with information that will assist in achieving goals within the organisation. Communication should be correct relevant and sufficiently conveyed to the right person at the right time through a proper channel.

Environmental risks- this group of risk factors had a total of 6 factors and from these, the top three most significant risk factors of this group are the weather conditions, pollution and safety and natural disasters. Weather conditions are uncontrollable however, this finding suggest that construction companies should find ways and means to work around this to avoid the risks from this factor.

Other risks - this group of risk factors had a total of 12 factors and from these, the top three most significant risk factors of this group are high competition bids, public opposition and problems from near project. This group of factors covers those that could not properly fit to be included in any of the seven groups.

As found from the literature review, the construction industry is an inherently risky industry. Table 4 reflects information distilled from literature between the periods of 2007 and 2017. The overview of past findings as indicated in table 3 and table 4 shows not only similarities of results but also illustrate just how widespread risk in construction projects is. From the 107 articles that were, used to consider the identification and classification of risks in construction projects, table 4, has only 1 article that focused on the South African industry. From this observation from table 4, much has not been, done in South Africa because only limited studies focused on the country.

Table 4 presents eight main categories of risks and their respective sources as derived from the literature review. As illustrated in table 4, out of the 26 studies on risks, political instability is highlighted by 12 studies on risks that are found in projects this was followed by weather conditions and new technology with 10 and 8 studies respectively. The findings of this article are applicable to other construction companies however, relevant modifications will be necessary. The findings of this article are mostly consistent with Dannreuther and Perren (2012) who concluded that politics is the most critical risk in construction projects. However, the findings of this article are also in conflict with the findings of Feng, Zhang and Wu (2015) who did not make similar findings. Literature also revealed challenges that construction practitioners are confronted with, in the identification, and classification of project risks. Below, a summary of challenges and trends in risk management is presented.

Many challenges exist in the construction of projects no matter how well and exhaustive the identification process is. According to Kutsch and Hall (2005), knowledge of the risk does not automatically imply proper application and control of risks. Therefore, this is a reason why risks continue to be a huge challenge for projects. Some of the risk challenges that still face the industry can be summarised as follows;

- Project managers still rely largely on experience to identify project risk and rarely make use of available technologies and new ideas from other construction practitioners
- Projects are increasingly becoming more complicated and bringing along new probabilities of risk that currently not known.
- The systems that are currently being used lack accuracy for identifying risks, therefore risk factors are not be managed through systematic methods
- There is lack of transparency and risk sharing in contracts.
- Technology and internet challenges- internet is a technology risk, which did not receive much cover on the classification of risk factors. The internet and type of technology that will be here tomorrow will be both a source of shock and a catalyst for other shocks, for which risk managers and other practitioners in the construction industry are not be prepared for.
- Corruption which leads to construction companies lacking the necessary degree of risk maturity as they continue to price unrealistically in order to win tenders
- Measuring the effects of risks is made difficult by factors that overlap
- The lack of transfer of knowledge and experience to junior employees
- Gained experience and information not properly applied to projects
- Lack of sufficient data to properly analyse risk and financial difficulties since risks cost money

- The need to extend the hours of operation because of bylaws, noise and complaints.
- Inconsistency in performance and high number of accidents, injuries as well as buildings that collapse during construction.

The multiplication of project risks in the world is been fundamentally driven by several factors. These factors continue to stimulate and increase changes in a ways that promote more risk factors. This makes it extremely difficult to eliminate and manage risks in construction. According to Lee et al. (2011), risk in mega projects had increased.

According to table 4, from 2015 to 2017 risk factors have continued to be experienced in construction projects. Recent trends seem to indicate that risk is highly being caused by factors such as conflict, politics and natural disasters. The possible reasons for this trend in modern years could be that projects are increasingly becoming more complicated to undertake. This creates conflict amongst participants amongst other issues. Secondly, natural disasters are increasing on a global scale (Warren, 2010; Ingirige, 2016) therefore; the risk that comes with this factor is unpredictable and a challenge to manage. Therefore, project managers will be under prepared to deal with such a risk when it occurs.

5. LIMITATIONS AND IDEAS FOR FURTHER RESEARCH

This article, though purely supported by literature, it possesses limitations because of its current state. According to Tsaurai (2015), such articles as this one have complications because they are purely based on literature studies. However, this article therefore presents a starting point and a basis for further empirical investigations and authentication within the context of different emerging economies in the construction industry. Nevertheless, the research objectives of this paper were, achieved to some extent, and some further research ideas were, identified in the process as follows:

- Identification of risk according to a specific type of construction project or on a specific stage of the project.

6. CONCLUSION AND RECOMMENDATIONS

This article has identified eighty risk factors and classified them according to their nature into eight groups of related risk factors for the construction of projects. Literature revealed the most influential risk factors from each group of factors. Political instability was, found to be the most influential risk factor in construction projects and this factor is classified within the socio-political category and this category had a total of 11 factors. Other highly rated risk factors include weather conditions, technology, exchange rate, price fluctuations, theft and communication. The study also unpacked and discussed challenges and recent trends in recent years regarding risks. The limitation of this article is that it is based purely on literature review. This is consistent with Tsaurai (2015) who concluded that there are difficulties when using literature based review studies. However, there is limited knowledge available on risks in the South African.

Considering the outcomes of this study as well as the ongoing argument on risk in construction projects, some guidelines need to be implemented. Since high levels of risk were identified in each group as skills and experience, political instability, inflation, theft and communication, the recommendations of this study are based on thesefive high risk factors. This study therefore, advocates for the application of programmes that promote education and training on risk as well as encourages companies to work closely with the government. Education and training will assist employees in refreshing or learning the latest issues that relate to risk. While involving the government will assist companies to indicate and show politicians how certain rules affect their businesses before being implemented as law. Stronger financial policies that can assist in keeping inflation rates at levels that are as low as possible are needed in order to counter the problem of material increases and other price related matters. In terms of theft, tighter security should be effected and companies need to acquire new technology and stay abreast of new technology where possible. Communication plans that allow for proper storage and retrieval of information to relevant people as and when it's needed is of great importance.

This study also urges the South African construction companies to implement effective policies and programs that increase accuracy and proper identification and management of risk. This is because proper risk identification policies can assist in risk reduction and management. Lastly, this study recommends an in-depth study to be performed for different project types such as roads, bridges, buildings among others. This article added to the worldwide literature on risk factors pertaining to any construction project. Therefore, a major part of the problem in construction can be prevented by identifying and classifying risk factors as well as minimising the risks.

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APPENDIX A

Table 4. Risk factors in construction projects between the periods of 2007 and 2017

Risk Classification and description	Source																										
	Zou et al. (2007)	Xu et al. (2010)	Ke et al. (2010)	Mahamid (2011)	Chileshe et al. (2012)	Goh et al. (2013)	Kuo and Lu (2013)	Mahendra et al. (2013)	Xiaopeng and Pheng (2013).	Odimabo and Oduoza (2013)	Nketekete et al. (2013)	Karim et al. (2013)	Hwang, Zhang and Gay (2013)	Renuka et al. (2014).	Fletcher and Penleton (2014)	Choudhry et al. (2014)	Feng, Zhang and Wu (2015)	Jacobsen et al. (2015)	Iqbal et al. (2015)	Pehlivan, and Öztemir (2015)	Karim et al. (2015)	Katre and Ghaitidak (2016)	Ingirige (2016)	Jayasudha and Vidivelli (2016)	IRMSA (2017)	Reiman et al. (2017)
Technical risks																											
Incomplete design		x						x								x			x					x		
Poor specifications		x						x																x		
Inadequate site investigation		x						x								x								x		
Change in scope	x					x		x								x			x							
Wrong procedures and execution				x				x																x		
Insufficient technical skill								x											x					x		
New technology		x	x			x		x		x		x				x								x		
Construction risks																											
Worker productivity								x																x		
Disputes, strikes								x							x	x			x					x	x	
Site conditions								x																x		
Equipment failure								x																x		
Design changes							x	x																x		
Unsuitable program	x	x			x																			x		
Project delays				x																						
Late handover				x																						
Tight schedule	x																							x		
Too high quality standards								x																		
Untested trade techniques		x																								
Improper project feasibility																								x		
Financial risks																											
Material costs								x																		
Low market needs		x						x											x							
Funding problems		x						x								x			x							
Exchange rate		x	x					x							x				x			x				
Payment delays		x		x				x											x							
Wrong estimation	x							x						x		x										
Taxes		x	x					x																x		
Price fluctuations	x				x									x		x						x		x		
Inflation		x	x		x											x								x		
Credit ratings									x																	
Labour costs		x																								
Socio-political risks																											
Changes in laws and regulation		x	x					x	x	x			x											x		
Lack of leadership		x							x																	
Bribery, corruption		x	x					x											x					x	x	
Language barrier								x																		
Law and order								x	x	x	x								x					x		
War civil disorder								x																		
Requirement for permit approval		x						x							x											
Conflicts	x						x													x				x		
Political instability		x	x	x					x	x	x		x		x	x			x			x			x	
Racism Xenophobia									x																	
Nationalisation		x	x																							
Physical risks																											
Destruction to structure								x										x								
Damage: equipment		x						x								x								x		

Risk Classification and description	**Source**																									
	Zou et al. (2007)	Xu et al. (2010)	Ke et al. (2010)	Mahamid (2011)	Chileshe et al. (2012)	Goh et al. (2013)	Kuo and Lu (2013)	Mahendra et al. (2013)	Xiaopeng and Pheng (2013).	Odimabo and Oduoza (2013)	Nketekete et al. (2013)	Karim et al. (2013)	Hwang, Zhang and Gay (2013)	Renuka et al. (2014).	Fletcher and Penleton (2014)	Choudhry et al. (2014)	Feng, Zhang and Wu (2015)	Jacobsen et al. (2015)	Iqbal et al. (2015)	Pehlivan, and Öztemir (2015)	Karim et al. (2015)	Katre and Ghaitidak (2016)	Ingirige (2016)	Jayasudha and Vidivelli (2016)	IRMSA (2017)	Reiman et al. (2017)
Labour injuries		x						x									x	x								
Equipment: fire, theft		x						x								x								x		
Material fire/theft		x						x								x			x					x		
Poor quality of materials		x										x							x							
Shortages: equipment, material		x		x								x							x					x		
Waste of materials																								x		
Accidents fatalities																x	x		x					x		x
Organisational risks																										
Contractual affairs						x		x																		
Changes in management ways				x						x														x		
Rush bidding										x																
Undocumented change orders										x																
Contractor's experience								x																	x	
Attitudes of participants								x																		
Communication		x		x	x			x												x						
Shortage of skilled staff																			x					x	x	
Excessive practices	x		x												x	x								x		
Gaps between implementation and specification										x																
Internal problems																								x		
Scant planning																x								x		
Other risks factors																										
Opposition from the community		x							x															x		
Bad: media reports									x																	
Terrorism and wars								x								x										
Fuel prices																									x	
Desirability of host country									x																	
Vandalism					x																					
High competition bids			x	x																					x	
Breach of contract		x							x															x		
Problems from near project		x							x															x		
Monopolisation of resources										x																
Light insurance																x										
Inappropriate risk allocation																x										