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PROJECT RISK MANAGEMENT AND PERFORMANCE IN THE GHANAIAN CONSTRUCTION INDUSTRY

MATILDA EWUSI

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PROJECT RISK MANAGEMENT AND PERFORMANCE IN THE GHANAIAN CONSTRUCTION INDUSTRY

BY

MATILDA EWUSI

A thesis submitted to the Department of Marketing and Supply Chain Management of the School of Business, College of Humanities and Legal Studies, the University of Cape Coast in partial fulfilment of the requirements for the award of Master of Commerce degree in Project Management

JANUARY 2021

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DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original work and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature………….................................. Date……………………

Name: Matilda Ewusi

Supervisor's Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision laid down by the University of Cape Coast.

Supervisor's Signature…………................................ Date…………………..

Name: Dr Edmond Yeboah Nyamah

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ABSTRACT

The study sought to assess the perception of project risk, project risk management practices in the Ghanaian construction industry and its effect on project performance. It employed a mixed approach using an exploratory sequential design. Contractors, quantity surveyors, and project managers were interviewed and given questionnaires. The responses analysed using descriptive statistics, structural equation modelling and thematic analysis. The study found that the construction industry perceived risk as an event with a negative outcome and risks inherent in the industry included financial risk, safety and human risk, political risk and weather conditions. The study also found that the main response to the various risks is in the industry was risk reduction. Project risk had a 52% significant negative effect on project performance. Measuring risk in the project lifecycle, risks at project initiation, planning and execution had negative effect on project performance. However, risks at project closure phase did not have any significant effect on project performance. The study concluded that firms in the construction industry perceived that risk had damaging effect on their performance. Also, the industry adopted risk reduction strategies and a backup (contingency) to manage risks. The study recommended that though risks are mostly negative outcomes, some event have positive outcomes hence a proper risk assessment can improve project performance in the construction industry. Also, more resources should be allocated to manage risk since it accounts for more than half of project performance. Continuous monitoring of risks should be done in all phases of the project lifecycle to avoid escalation of risk.

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KEYWORDS

Risk

Risk Management

Risk Identification

Risk Analysis

Risk Response

Project Initiation

Project Planning

Project Execution

Project Closure

Project Performance

Construction Industry

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DEDICATION

To my family

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ACRONYMS

GDP	Gross Domestic Product
TOC	Theory of Constraint
MMDAs	metropolitan, municipal and district assemblies
GIBs	businesses in Ghana
RGD	Department of the Registrar General
MWRWH	Ministry of Water Supplies, Works and Housing
MORH	Ministry Roads and Highways
PMI	Project Management Institute
PMBOK	Project Management Book of Knowledge
GREDA	Ghana Real Estate Developers Association
PROCA	Progressive Road Contractors Association
GHiS	Ghana Institution of Surveyors
ABCECG	Association of Building and Civil Engineering Contractors of Ghana

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CHAPTER ONE

INTRODUCTION

Introduction

Risks of a particular construction project are insufficiently defined and quantified in most developing countries during the pre and post-contract stages, which typically results in a loss for either the contractual agreement used in the implementation of the project or its client (Dada & Jagboro, 2007; Nwosu, 2003; Onukwube, 2002; Odeyinka & Iyagba, 2000). Due to the lack of risk reduction and ambiguity that any project faces, there are several negative effects for project participants for the lack of an effective project risk management function.

Background to the Study

Organisations that are important to the economic growth of a country are active in the construction industry. The following sub-sectors are involved in the industry: infrastructure (energy, water and sanitation); housing and urban development (municipal, commercial and residential buildings) and transport infrastructure (airports, ports and harbours, roads,). Thus, the industry forms a critical part of the economy of most countries (Ofori, 2006). It contributes a significant percentage to the socio-economic development of emerging economies and a major source of employment (Yornu & Ackah, 2019; Ofori, 2006; Jekale, 2004). For example, in 2015, the Ghana Statistical Service published a revised Gross Domestic Product, where all industrial activities in the country were recorded, the Construction Subsector recorded the highest growth of 7.4% in 2014 and the second largest contribution of up to 12.3% to the country's GDP.

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While the construction industry's contribution to both developed and developing countries' economies is important, the industry has experienced low global performance over the years and has not been able to produce the desired results (Yornu & Ackah, 2019). Averagely, two-thirds of project failure has been experienced globally (KPMG, 2013; McManus & Wood-Harper, 2008; Heeks, 2002, 2005, 2006). In Ghana, the situation is not different, the Ashanti Region has 14 projects amounting to GH¢3,886,979.93 scheduled for completion between 2007 and May 2017 and still unfinished or abandoned, 61 projects costing GH¢8,124,887.02 at different stages of completion were abandoned while new projects were awarded in the Brong Ahafo Region. In the Central zone, 14 projects were postponed or abandoned at different stages of completion, costing GH¢1,840,758.00 (Auditor's General Report, 2017).

The Eastern and Western areas have also abandoned projects. According to the Western Region survey, 33 projects awarded by six assemblies at a total cost of GH¢6,824,536.85 in the Eastern Region and 15 projects for GH¢1,775,451.00 that were scheduled to be completed within one year were delayed from 4 to 61 months after the expected completion date, projects were not completed and contractors were also not on site in the Western Region. The northern part of the country is not exempted, in the northern part, there are 10 projects with a value of GH¢1,724,650.67, in the Upper East there are five projects with a value of GH¢659,527.90, and in the upper west there are 15 projects with a value of GH¢949,224.86, all of which were delayed or abandoned as of 2017 (Auditor's General Report, 2017).

The low performance of the construction industry is not limited to their project delivery, but also their firm performance. In a study conducted by Hayes

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Perry and Thompson (1986), many construction firms have gone bankrupt for a number of reasons. Zou (2006) states that while contractors in developing countries have limited access to sources of financing, particularly small and medium-sized contractors, poor management has in some cases led to the liquidation of construction firms (Eyiah & Cook, 2003). Several research studies have been done to determine the factors behind the project's failure, and it has been found that major indicators of the project's failure are known as problems of risk management (Herroelen, 2014; Grefen, Pernici, & Sánchez, 2012).

The Theory of Constraint (TOC) states that organizations, systems and processes are constrained by many issues (risks) of which at least one such constraint prevents organizations, systems and processes from achieving their objectives. The Constraint Theory, therefore, uses the focusing process to identify that constraint (risk) and then restructure it to address its negative effect (Goldratt, 1984). The construction industry can be argued to be vulnerable due to the complexity and high degree of uncertainty.

Therefore, organizations need to define the restriction (risk) and, according to the TOC process, restructure the rest of the organization around it. It is of the view that managing these limitations (risk) and the system (project) as it interacts with these limitations is the secret to success. Therefore, the need for identifying risk, evaluating it and responding to it before and during a project. This aids in the success of a project. Risk management in the construction industry should be well acknowledged and managed as an integrated project management function.

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Based on literature, risk management is fraught with limitations in construction projects and has influenced their effectiveness in project implementation and ultimately their firm efficiency. (Serpella, Ferrada, Howard & Rubio, 2014). One of the world's most competitive, dangerous and demanding industries is the construction industry. However, the sector has a very low record of risk management, with many major projects struggling to achieve cost objectives and deadlines. The risk of a specific construction project is not sufficiently identified and quantified in most developing countries, at both pre- and postcontract level, and this usually results in a contractual arrangement used to complete the project or causing a loss to the contractor (Dada & Jagboro, 2007; Nwosu, 2003; Onukwube, 2002; Odeyinka & Iyagba, 2000).

Political instability-related constraints (risks), corruption, currency volatility, material availability and interest rates have been considered problems in infrastructure projects in developing countries, and this has contributed to negative effects for building projects (Hammond, 2018; Flanagan, Norman & Chapman, 2006; Mills, 2001). Common problems in developing countries affecting the construction industry, according to Baloi and Price (2003), include lack of management skills, shortages of skilled labour, poor quality of materials, low productivity, shortages of equipment and shortages of supplies. One of the most important things for construction contractors is management problems, apart from technological challenges, as they have to deal with major constraints such as missing data, volatile customer conduct, and ambiguous project circumstances. Risk management is also an integral aspect of all construction companies' decision-making process.

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There is a gap between existing risk management techniques and their practical implementation by construction contractors (Segal, Segal & Maroun, 2017). This study is therefore aimed at examining risk management practices and project performance in Ghanaian construction companies.

Statement of the Problem

Studies show that through project failure, corporations and governments around the world are losing vast sums of money (Fabian & Amir, 2011; McManus & Wood-Harper, 2008). A KPMG Global Construction Survey (KPMG, 2015) revealed that out of 109 organizations that spent more than $10 million on capital construction projects, 60% reported that at least one project failed or underperformed. Compass International analysed 20 major construction projects (Oil & Gas, Utilities, Pharmaceutical & Commercial Buildings) in 2019 and found that the final cost of construction surpassed the approved authorized budget by more than 15 per cent and that these cost overruns exceeded 75 per cent of the budgeted cost in some particular instances.

For many construction industry countries, this is also a serious concern (Rahman, Memon, Aziz & Abdullah, 2013; Endut, Akintoye & Kelly, 2009). An analysis of 308 public and 51 private sector development projects in Malaysia found that 79.5% of projects in the public sector were not completed within a defined timeline and that 53.2% of projects were not completed within the budget. On the other hand, only 66.65% and 62.8% of projects in the private sector have not been completed within the anticipated time and expense (Endut et al., 2009). In their analysis, Liew, Low, Wong and Wong (2019) reinforced this by discovering an RM4 billion project with an initial budget of RM1.6 billion.

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The rate of project failure in Ghana is high, and the costs associated with these failures are extremely unsustainable (Amponsah, 2013). Williams (2016) estimates that approximately one-third of projects in Ghana have never been completed, accounting for almost 20% of all local government capital expenditure. In 2011, Ghanaians were shocked to hear about the failure and abandonment of the $10 billion housing project. Also, several housing projects of this kind have failed after billions of dollars have been invested in them ($180m Saglemi Housing Project, Asokore Mampong Housing Project, etc.). In addition, unfinished and unused projects cost the state more than GH¢30 million in 2017 in at least 40 metropolitan, municipal and district assemblies (MMDAs), according to the Ghana Auditor General Survey. According to Annan (2019), if these projects were properly managed and completed, about 15,000 job opportunities would have been created for the people of Ghana.

Project failure is not only attributed to cost and time overruns but also has socio-economic and environmental impacts on construction companies as well as on the country. Carrero, Malvárez, Navas and Tejada (2009) in Spain and Abdul-Rahman, Wang and Mohamad (2015) in Malaysia have also found that environmental and socio-economic impacts could be caused by a failed Malaysian project. The socio-economic effect is caused by a decrease in the area's importance and the lack of jobs. Whereas the environmental effect consists of visual impact, alteration of the landscape, corrosion of waste and depletion of biodiversity. In Ghana, failed projects, such as abandoned road projects, have caused accidents that have led to the loss of human life as well as reduced driver productivity due to constant vehicle breakdowns on such roads (Foray Jnr., 2019).

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These failed projects have been attributed to poor risk management by several researchers (Kululanga & Kuotcha, 2010; Dada & Jagboro, 2007; Nwosu, 2003; Onukwube, 2002; Odeyinka & Iyagba, 2000). Studies have noted that the key problem in developing countries (such as Ghana) is that risk management is very limited and ineffective in construction projects (Serpella et al., 2014; Mago, Hofisi & Mago, 2013; Steinwand, 2000). Unfortunately, many contractors lack the expertise and know-how to handle risk effectively. In Ghana, Nyamah, Yi, Oppong-Sekyere and Nyamaah (2014) and Boateng and Boateng (2014), the study found that the management capacity of firms is weak due to how they respond to risks. Consequently, in Ghana's construction companies, the problem of project failure and the collapse of most construction firms are due to poor risk management.

In the last four decades (Forbes, Smith & Horner, 2008), construction risk management research has grown significantly because construction projects have been exposed to risks during their lifetime. (Schieg, 2006). The majority of these works are based in developed countries. Risk, unlike other management areas, is prone to changes in the environment in which it is located. As Ofori (1993) put it, "the structural problems of the construction industry in developing countries are more fundamental, more serious, more complex and, overall, much more pressing than those faced by their counterparts elsewhere." The key causes of additional costs in developing country privatized infrastructure projects have been described as risk factors associated with currency volatility, political uncertainty, interest rates, bribery and material availability (Rosenbaum, 1997). Kangari and Lucas (1997) also pointed to the political nature of all government-funded projects in developing countries. Nyamah et

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al. (2014) argue that not all global risks in a particular sector apply to that sector in Ghana.

However, the few studies that have been conducted in Ghana have looked at identifying the risks facing the construction industry (Yornu & Ackah, 2019), key success factors for risk management (Agyakwa-Baah, Chileshe & Stephenson, 2010) and risk management for procurement challenges (Adu Gyamfi, Zievie & Boateng, 2016). All of this research work has also been quantitatively assessed. Also, risk is ever present in all phases of the project lifecycle, however, little is known on how risks in each of the project lifecycle phase affect project performance. This study, therefore, aims to fill the gaps in the literature by examining Ghana's construction projects' risk management practices and performance.

Purpose of the Study

The primary aim of this research is to examine Ghana's construction projects' risk management practices and project performance.

Research Objectives

This research aimed at gathering input from construction contractors on the following aspects of risk management and project performance. To:

1. assess the risk perception by the construction industry
2. analyse risk inherent in the construction industry
3. examine the risk response strategy adopted by the construction industry
4. analyse the effect of risks at the project initiation phase on project performance in the construction industry
5. analyse the effect of risks at the project planning phase on the project performance in the construction industry

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6. examine the effect of risks at the project execution phase on project performance in the construction industry
7. assess the effect of risks at the project closure phase on project performance in the construction industry

Research Questions

The following questions will guide the study.

1. What is the perception of risk in the Ghanaian construction firm?
2. How does the construction industry assess risk?
3. How does the construction industry respond to risk?

Research Hypotheses

H_1 – there is a significant negative effect of risks at the project initiation phase on project performance of the construction industry

H_2 – there is a significant negative effect of risks at the project planning phase on project performance of the construction industry

H_3 – there is a significant negative effect of risks at the project execution phase on project performance of the construction industry

H_4 – there is a significant negative effect of risks at the project closure phase on project performance of the construction industry

Significance of the Study

Risk issue can never really be exhausted, and while numerous studies have been performed (Billet, 2010; Aven & Renn, 2009; Arnold, 2009), The very nature of risk makes understanding of this definition difficult and the results of the study can lead to more questions than responses (Bhimani, 2009).

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In addition, risk management is a concept that changes all the time and still needs a lot of guidance (Mikes, 2009; Wahlstrom, 2009; Power, 2007).

Researchers such as Fatini and Glaum (2000); Froot (1993) and Stulz (1984) have shown that risk management is intended to help an enterprise achieve its goals, such as eliminating cash flow volatility, protecting profits from fluctuations, mitigating foreign exchange losses, and fostering the company's sustainability through growth and profitability. Hence the need for risk management in industries especially the construction industry which is embedded with complexities and uncertainties because this research could help managers in the construction industry to meet their project objectives to improve performance.

This research is timely as it seeks to provide knowledge about construction firms and how to effectively manage risk on the project. It will help managers and other professionals find the best way of planning and executing projects through the appropriate risk management tools. This research work will also provide the Ghanaian construction firms with guidelines of best risk management practices. It will provide them with the ideas required in relation to the risk management of construction companies for others players in the construction industry, such as consultants, clients, subcontractors, etc. This will help you explain how construction firms' risk management strategies contribute to project execution. It will thus help in the planning and management of future projects in developing countries and the world at large.

In addition, one of the major sub-sections of project management is risk management. The study will therefore be useful to academia, as it will enrich available literature on risk management. This will include lecturers and students

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of various tertiary institutions, where it can be used as a teaching and learning tool. This will be the basis for further risk research and provide further insights into constructing companies' risk management practices. It will also provide useful basis for further risk management studies.

Limitation of the Study

The research was limited to the construction firms in Ghana that are registered with the Ghana Chamber of Commerce (Ghana Chamber of Commerce, 2020), because of the constraints of time and resources. The study was confined to companies in the Ghana metropolises of Kumasi, Accra, Sekondi-Takoradi and Cape Coast. This is because such companies are highly concentrated in these cities in the country. The study, therefore, excluded construction firms which are located outside the four major metropolises in Ghana. Finally, some firms did not wish to partake in the study because they felt how they manage risk has an indirect relationship with the firm's reputation.

Delimitation

This study targets construction companies in Accra, Kumasi, Cape Coast and Sekondi-Takoradi metropolises in Ghana and is limited to the specified sample size.

Organization of the Study

Five chapters are organized for the research. The context, the problem statement, the intention of the study, the research issue, the importance of the study, the limitations of the research and the study organization are covered by Chapter One. This is known as the introduction. On the other hand, chapter two provides the theoretical context on which the thesis was based, reviews the

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literature related to the subject under study, and sets the basis for the current research work.

The description of the research design, target population, sample size, data source, sampling methodology, data collection tool, statistical techniques to be used for data analysis and process examination are outlined in Chapter three, referred to as the research methods.

Chapter four focuses on the findings and discussion centred on the interpretation of results. This section is divided into two parts: preliminary analysis and further analysis based on the objectives of the study. Finally, summarizing all the descriptive and inferential analyses mentioned in the previous chapter, justifying the study's key findings and implications, and concluding with suggestions for future studies.

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CHAPTER TWO

LITERATURE REVIEW

Introduction

This chapter provides the theoretical framework for development of this thesis, discusses risks management literature and its impact on the performance of the companies in the construction industry in Ghana, and sets the foundation for the current research work. It addresses in depth the different concepts in the report, the industry's perceptions of risk management, the industry's risk recognition, how risk is responded to and the impact of risk on the construction industry's project results. Goldratt's theory of constraint was behind this research.

Theoretical Review

The research is supported by the psychometric paradigm, the paradigm of cultural theory and the theory of constraint. The first two theories underpinned the understanding of risk and the constraint theory underpinned the method of risk management.

The Psychometric Paradigm

In accord with the psychometric model that has its roots in psychology (Sjöberg, 1996 in Oltedal, Moen, Klempe & Rundmo, 2004), risk is considered to depend on a risk product's overall properties. A risk item has numerous marks, which improve people's perceptions of risk. According to Sjöberg, Moen and Rundmo (2004), perceived risks are subjectively built upon institutional, financial, cultural and psychological factors by individuals ().

The psychometric model also highlights that the stable characteristics of personality are different and there are similarities to risk behaviour (Llewellyn,

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2008). The psychometric paradigm indicates that survey methods can assess most of the variables associated with human risk perceptions (Sjöberg et al., 2004). Risk is defined in terms of people's views, but usually, the risk target (e.g. personal or general) is not set in studies (Sjöberg, 2003).

The Cultural Theory Paradigm

The cultural theory model is focused on sociological studies and seeks to explain how people view and behave on the world around them. In particular, the theory notes that this is primarily influenced by social problems and cultural enforcement (Oltedal et al., 2004). The assessment of risk is not governed by the characteristics, conditions, preferences, or characteristics of things in danger. It is a social or cultural phenomenon that is built. What is seen as risky and risky is a role for cultural adherence and social learning (Douglas, 1978).

Application to Perception

This study based its findings on risk perception on both the psychometric model and cultural theory, because people are supposed to be conscious of the risk as a result of threats and social processes. The following concept of risk perception was used in this study: "Risk perception is the subjective assessment of the likelihood of a particular type of accident occurring and how concerned we are with the consequences." Risk perception entails probability assessments as well as the implications of a bad result.

Risk perception goes beyond the individual, and it represents values, symbols, history, and ideology as a social and cultural construct (Sjöberg et al., 2004). The basic elements of both the psychometric model and the paradigm of the cultural theory are captured by this concept. Another significant feature to be taken into account is that, as Messner and Mayer pointed out, different

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perceptions of risk can contribute to different behavioural outcomes for individuals – "due to their specific perception of flood risk individuals, social groups and also public persons like mayors, politicians and employees in the public sector dealing with flood protection and disaster management may handle this issue very differently" (Messner & Mayer, 2006).

Thus, the way one view risk determines how he or she will handle it. Thus, knowing how the construction industry perceives risk will help understand how they manage it.

Theory of Constraint

The study is guided by The Theory of Constraint (TOC), propounded by Goldratt (1990) which states that in every organisational system, there are several constraints (risks) that prevent any management system (projects) from achieving more of its goals. TOC is concerned with the presumption that each system has at least one bottleneck that can be described as a situation in which the system is unable to achieve high standards of performances with regard to its objectives (Goldratt, 1990).

The concept is to define the organization's (project) objectives, identify the variables that impede the achievement of those goals (risk), and then enhance business operations by constantly trying to minimize or remove the restricting variables (risk) that affect the achievement of the goals of the organization (Wilkinson, 2013).

Zadry and Yusof (2006) defined TOC as a blend of principles, philosophy and tools conceived to ensure optimal performance of any organization by enabling the members of that organization to identify control and eliminate any problem that prevents that organization from operating at

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peak performance. Mablin and Balderstone (2003) synopsis of TOC conveyed the important message that TOC is a powerful management theory that encourages organizational leaders to approach problems they face from a system perspective using systems thinking process in an environment designed to support the focusing or iterative process of ongoing improvement. Such an approach will allow the identification of a breakthrough and sustainable solutions to both simple and complex problems.

The Theory of Constraints has three components: The Five Focusing Phases, The Processes of Thought, and Throughput Accounting. TOC includes a basic technique, known as the Five Focusing Steps, for the identification and removal of limitations. TOC provides five processes to be used to strengthen organizations of the system that are limited (Goldratt & Cox, 1984). These are 1) Define the limitations, 2) Determine how to take advantage of the limitations, 3) Delegate all else to the above decision, 4) Relieve the limitations, 5) Repeat as needed.

A complex problem-solving technique called the Reasoning Processes also involves TOC. The Thought Processes for complex structures with several interdependencies are streamlined. Their purpose is to define the root causes of unintended effects (referred to as UDEs) first and then remove the UDEs without producing new ones. In order to answer the following three central questions in the TOC, the thought processes are used:

- What needs to be modified?
- What is it going to turn into?
- What behaviour will cause change?

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Risk management is a methodology for identifying and quantifying all risks that a company or project faces to decide deliberately how to manage risk (Markmann, Darkow & Von Der Gracht, 2013). Risk management is about taking action to reduce the likelihood and impacts of potential risks affecting projects or organisations. Any project risk may be restrictive or be restrictive. The fundamental principle behind the theory of constraints is that the efficacy of any mechanism is often limited (the "weakest link of the chain"). It is not surprising that all risk management practices are based on risk identification and management. Therefore, TOC also looks at identifying constraints (risks) and managing it to improve the performance of a system just as risk management looks at identifying risk and managing it to achieve project objectives.

When applying the philosophy, concepts, principles, and tools embedded in the TOC framework, organizational leaders can offer their employees with the necessary gears they require to identify, manage, and break the most restrictive limiting factor that prevents them from contributing to the success of projects (Asseman et al., 2014).

The error often made in practice is that during the initial phases of the project, project risks are identified and quantified and management and engineering efforts are centred on deducting the highest risks identified (Kendrick, 2015). If the highest risk event is established, to minimize the risk or reduce either the probability of occurrence or its effect to a level where it will no longer be important, the priority should be on that event. The feedback loop of step 5 of the TOC focus process ensures that the total risk is continuously and systematically reduced by continuously reducing the highest current risk (Steyn, 2002).

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Risk management planning, risk recognition, risk evaluation, risk quantification, risk response planning, and risk monitoring and control are six elements of project risk management identified by PMI (2013). The standard states that risk identification is a reiterative process and residual and emerging risks are defined through risk monitoring and control referring to TOC stage five. Nine phases were defined by Chapman and Ward (1997): describing, concentrating, recognizing, structuring, ownership, predicting, assessing, preparing and managing. A feedback loop between controlling and describing was suggested by Chapman and Ward. The Australian/New Zealand Norm AS/NZS 4360 (1995) also makes explicit the feedback loop for revisiting risk recognition. The idea that risk detection and risk quantification should be re-visited is not new.

A feedback loop is also suggested by the TOC approach and goes a step further - it shows when the feedback loop should be triggered immediately after raising the current constraint(s) (risk). In other words, as soon as substantial progress has been made to remove the risk(s) the company was focused on. Figure 1 shows a risk management model to ensure the systematic reduction of risk per the TOC strategy. This ensures that at the correct level, risk events that are not initially classified under the highest risk will receive the attention needed.

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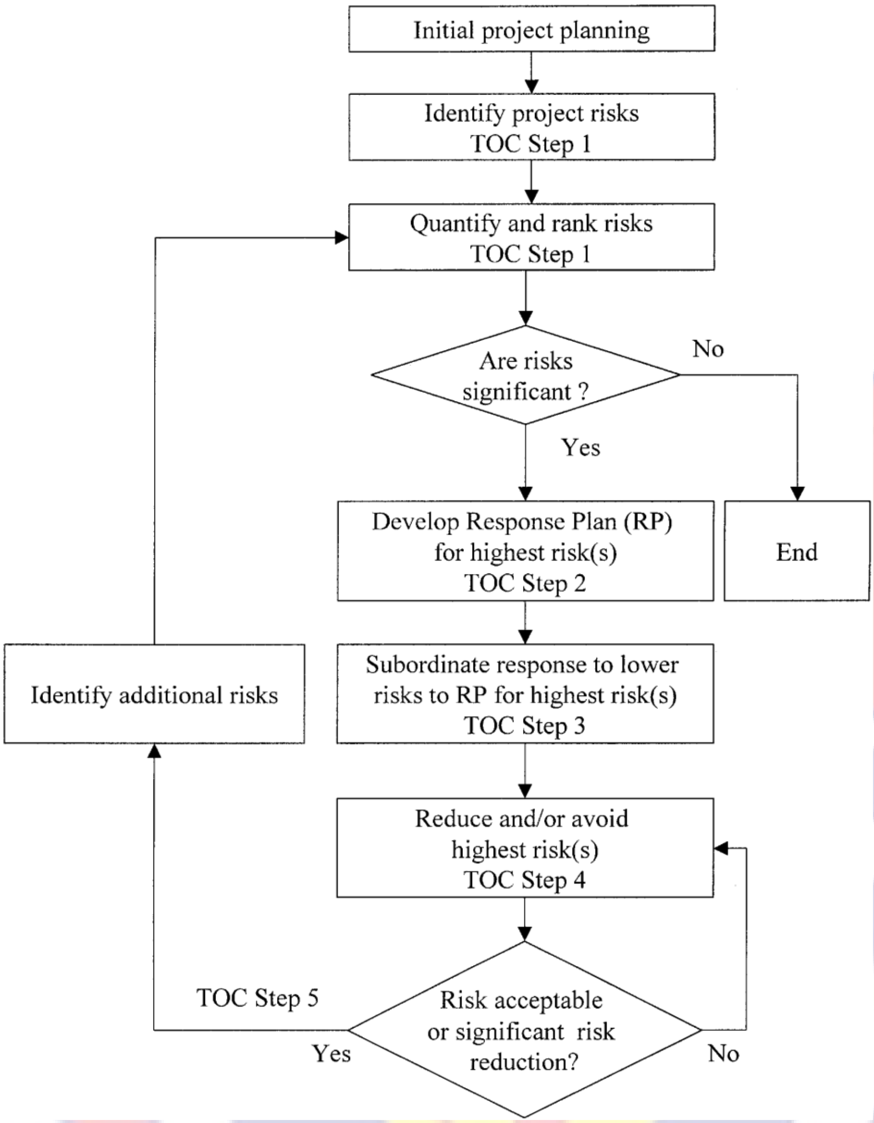

Figure 1: TOC risk management model
Source: Steyn (2002)

Conceptual Review

Overview of the Construction Industry in Ghana

According to Dadzie, Abdul-Aziz and Kwame (2012), the construction industry in Ghana is diverse and serves multiple stakeholders. The construction industry, in general, comprises several companies performing various tasks in a contract agreement which may take the form of the procurement of building materials, personnel, equipment and general services necessary to carry out a particular project (Dogbegah, Omoteso & Owusu-Manu, 2013; Laryea &

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Mensah, 2010). In this respect, these companies represent the fundamental framework of the building industry.

The demand for infrastructure in the economy has changed considerably and, as a result, the construction industry and its operating environment have been forced to be highly dynamic with product characteristics and industry structures are evolving at an ever-growing rate (Dansoh, 2005). Unfortunately, it is difficult to meet the demands of the country's economic resurgence in the current state of the construction industry. Moreover, general construction problems such as poor efficiency, corruption, delays and lengthy pre-contract award procedures that result in overwhelming delays, costs and unacceptable quality of work have a big impact on local businesses (Ahiaga-Dagbui, Fugar, McCarter & Adinyira, 2011).

Ayarkwa, Dansoh and Amoah (2010) stated that a huge quantity of small companies characterizes the construction industry in Ghana. Large companies are mainly international firms that open their subsidiaries in Ghana, while small enterprises in Ghana have mainly indigenous firms (GIBs) (Eyiah & Cook, 2003). The Department of the Registrar General (RGD) is an official agency which, in compliance with the company's registration laws, is responsible for registering contractors (general constructions and general civil). Designation and categorisation of contractors are done by the Ministries of Water Supplies, Works and Housing (MWRWH) and Roads and Highways (MORH).

Amoah, Ahadzie and Dansoh (2011) presented and addressed the classification and categorisation criteria for MWRWH. According to them, the guidelines include the following: holding plants and equipment, financial status, past success and professional competence. Also, for construction and civil

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engineering contractors, MWRWH has two primary categories: ‘D’ category for general construction works, while 'K' for civil works. These categories are classified into four (4) classes, ranging from classes of construction works D_1, D_2, D_3 and D_4 to classes of civil works K_1, K_2, K_3 and K_4. Inversely, for the concrete structures and furniture ranging from A_1B_1, A_2B_2, A_3B_3 and A_4B_4 and listed road contractors as A and B according to MORH.

According to Table 1, the following orders, 1, 2, 3 and 4, are additionally grouped into financial groups by contractors in each category. Small-sized construction companies (SSBCs) are D_3, D_4, and K_4 classes, and account for more than 90% of Ghana's labour markets (Amoah et al., 2011). Similarly, the A_3B_3 and A_4B_4 small road companies (SSRCs) are referred to as road operators. The rest are multinational companies and large companies compared to classes D_1, D_2 and K_1, K_2, A_1B_1 and A_2B_2 (Eyiah & Cook, 2003). This regulation provides for the forum to monitor and regulate construction activities in Ghana in accordance with Dansoh (2005), while, based on this classification, most private customers chose contractors.

Table 1: Contractor classification in Ghana

Financial class	General building works	Civil works	Road contractor
1	D_1	K_1	A_1B_1
2	D_2	K_2	A_2B_2
3	D_3	K_3	A_3B_3
4	D_4	K_4	A_4B_4

Source: Amoah et al. (2011); Laryea and Mensah (2010); and Dansoh (2005).

van Egmond and Erkelens (2007) stated that 90% of the 7095 construction companies listed in Ghana are D_3 or D_4, classified by the contractors of the Ministry of Water Resources, Works and Housing

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(MWRWH)and the Ministry of Road and Highways (MORH), listed and categorised. Small contractors are categorized in classes D_3 and D_4. With tender amounts of up to $1 million, this group of contractors carries out less complicated construction work (van Egmond & Erkelens, 2007; Eyiah & Cook, 2003). This was verified in their work by Amoah et al. (2011). The total work performed by these contractors was estimated to range from 10% to 20% of the overall construction production by Ayarkwa (2000).

Ayarkwa et al. (2010) found, for the planning, design, and construction of commercial and infrastructure facilities, such as power, water supplies, and transportation, skills and capacities are critical for managing the building companies. Industrial studies by Ayarkwa et al. (2010) show the lack of appropriate technical expertise, equipment or main staff to handle construction projects adequately for the majority of contractors employed in the construction industry as well as lacking ample credit and funds. This is further supported by qualitative evidence provided by Ofori (1984) who identified key issues for several years such as the lack of lending, the delay in paying contractors for finished work, and the poor communication system in the development industries.

Overview of a Project and its Lifecycle

In Ghana, the construction sector thrives on various projects that have to be managed to produce the desired outcome or reduce risks and maximize benefits. In defining a project, it was defined by Larson and Gray (2011) as a non-permanent undertaking to produce a particular service, product, or outcome result and is characterized by the following:

- time constraint,

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- a set objective,
- desired performance criteria,
- budget constraint, and
- engagement of distinct sectors and professionals.

Kerzner (2001) on the other hand defines a project as a succession of work on a fixed starting and closing date, which has a specific aim to achieve within the time, cost and resource constraints. The life of a project determines how it begins and ends. Depending upon the source of the classifications or groupings, the phases of the project life cycle differ. The stages mentioned by Larson and Gray (2011) include the following: stage description, stage planning, stage execution and stage closing. Four phases of the project life cycle have been demonstrated by PMI (2017). For all sectors, this was introduced for the reason of its universality.

Initiation stage: This phase sets out the initial project range with the environment in mind and uses the preliminary scope statement to integrate the required resources. The key constraints, including costs, tasks and schedules, are in particular involved. Include contract documentation, the necessary equipment list and the necessary project budget. (PMI, 2017).

Planning Stage: This stage is intended to demonstrate the management of the project through the remaining stages. The tasks, the sequence of operations and the resources needed against the various grouped operations are defined during this stage. It ensures that a project meets its target population and that it is able to meet the identified project constraints that may include time and budget constraints (PMI, 2017).

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Stage of implementation: this is the project's stage of implementation. The work defined in the project management plan is carried out in order to achieve the project goal. It also incorporates mainly people's and other resources' activities and coordination, to achieve the desired results as described in the project management plan (PMI, 2017).

Closing stage: This phase is the stage at which the finished project is formally accepted by the client. Project tasks are completed and certified at this stage and project relevant contracts are concluded and closed (PMI, 2017).

Construction Definition of Risk

Owing to time and expense over-runs associated with building projects, risk in construction has become the focus of concern. For the researchers, the nature of risk and the sense of the word 'risk' is a matter of concern. Risk is described as "an uncertain event or condition that, if it occurs, has a positive or negative impact on the objectives of a project" according to the PMI (2015). Wang, Dulaimi and Aguria (2004) see risk as a multifaceted term, whereas it is characterized by Baloi and Price (2003) and Yu (2002) as the possibility of a damaging event occurring in the project that affects its goals.

Several definitions of "risk" are available in literature. Rake (2012) refers to the risk that is historically understood as the probable negative effect of an operation and certain value characteristics that may result from some current or future process. The risk is described by Brun, Wolff & Larsen (2011) as "the possibility of an adverse event weighted by the severity of its consequences." The risk is defined by Rosa (2003) as "a situation or event where something of human value is at stake (including humans themselves) and where the result is uncertain."

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Risk in construction is a project whose uncertainty leads to insecurity as to the duration, quality and final cost of the project. Akintoye and MacLeod (1997) describes the construction risk as a "variable". Therefore, identifying something as risk implies that occurrence is probable. Project risk entails both risks to the goals of the project (adverse risk events) and opportunities to enhance those goals (beneficial risk events).

Nevertheless, several scholars have argued that the term danger communicated a threat message, whereas the word uncertainty was more appropriate to suggest that there was also a chance (Serpell et al., 2014). They concluded that uncertain adverse events are regarded as threats (Serpell et al., 2014). Risks are thus known to be the likelihood of an adverse outcome resulting from a decision (Wood & Ernest, 1977). However, negative outcomes may not always be correlated with risk. Risk may also offer opportunities, but because most risks usually have negative outcomes, most people regard only the negative risk side (Hillson, 2011; Baloi & Price, 2003). Hence, this study hypothesis that risk in the construction industry has a negative and uncertain outcome on project objectives, and the project as a whole.

Construction Risk Management

Management of risk is a vital field for project management because it facilitates the prediction and identification of actions that may have an adverse effect on a project. It is understood that one major role of any project manager is to handle exigencies or threats that occur when managing a project, and that function is mostly difficult and ineffective if risk management has not been sufficiently exercised or braced since the start of the project. A correct,

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structured strategy and more importantly, skills and experience are necessary for risk management to work efficiently and effectively.

The risk management process that emerged in the 30s exists to identify, evaluate, handle, and track risks that occur within an entity or project (Zheng et al., 2009). This approach became an important part of project leadership in the 70s (Arikan, Dağdeviren & Kurt, 2013; Del Caño & De la Cruz, 2002). Risk managers must understand that risk is part of every project (Hubbard, 2009) and the risk identification and how it can be prioritized, is one of the key challenges (Anderson & Anderson, 2009). This is a vital method and that is why project managers accept risk management as an imperative practice for successful project management (Goh & Abdul-Rahman, 2013; Baloi & Price, 2003).

Risk management is characterized as the risk identification and assessment process and the implementation of methods to minimize risk to an appropriate degree (Tohidi, 2011). Risk management is also an integral and systematic way to identify, analyse and respond to risks in order to reach project goals (PMI, 2013). Risk management is a method aimed at defining and quantifying all risks to which an organization or project is exposed to make a deliberate choice about how to handle the risks (Markmann et al., 2013). Risk management means taking the appropriate precautions against possible threats, minimizing the likelihood and effect of their occurrence and impacting programs or organizations.

As a basic concept, risk management is defined by Uher and Toakley (1999) as the mechanism aimed at managing the degree of risks and changing the associated impact. Risk management intends to find, analyse and monitor risks using techniques to minimize them to an appropriate level and to have a

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successful project (Rohaninejad & Bagherpour, 2013; Lee, Park & Shin, 2009). However, some studies (Tummala & Schoenherr, 2011; Dwivedula & Bredillet, 2010) have suggested that the field of risk management should not be restricted to risk mitigation and control, but should be aimed at preventing the risk defined. Following Fan and Stevenson (2018), risk management is considered for this study as the entire activity aimed at identifying risky conditions, along with the development of stratagems to lessen the likelihood of risk incidence and effects.

In the literature, various models of the risk management method have been suggested by different researchers and different information bodies (Goh & Abdul-Rahman, 2013). One comes across studies promoting the need to go through a three-stage (Ahmed, Kayis & Amornsawadwatana, 2007), five-stage (Taylor, 2006), six-stage (PMI, 2013) and nine-stage method to effectively incorporate risk management (Kululanga & Kuotcha, 2010). This study considers the implementation of risk management in four consecutive phases as a commonly accepted methodology in the literature, which is the PMI risk management method, taking into account the straightforwardness and practicality of coping with less phases for experts in the industry; (1) risk identification (2) risk analysis (3) risk response (4) risk monitoring and control (PMI, 2015).

Identification and analysis of risks specify and estimate risk probability and adverse effects, while risk responses relate to project management steps to minimize risk probability and effects (Fan & Stevenson, 2018).

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Risk identification

The effectiveness of the use of risk management in any form of a construction project is fundamental to defining the key risk factors and evaluating their comparative worth (Chan, Yeung, Yu, Wang & Ke, 2011; Skorupka, 2008; Ruthankoon & Ogunlana, 2003) and serves as the basis for succeeding phases of a construction project (Wang et al., 2004). Risk detection is thus considered the most significant stage in the risk management process (Banaitiene, Banaitis & Norkus, 2011; Zaghloul & Hartman, 2003; Ward, Curtis & Chapman, 1991). In addition to accuracy, the results of the risk identification phase should be very thorough and detailed (Bajaj, Oluwoye & Lenard, 1997). According to Al-Bahar and Crandall (1990), the lack of a strong frame of information on major project risks and their significance may be a basis of project threats in any context.

For this point's success, the source of information on risk identification is relevant and should enable experts who have extensive experiences with similar construction projects to indirectly discuss (Ruthankoon & Ogunlana, 2003). The outcomes of the risk identification process can therefore be inferred as being largely based on where the experts come from and on the risks common on the basis of their experiences themselves.

Risk analysis

Risk assessments have the ultimate purpose of forecasting and assessing the effect on projects of potential risks (McClelland, 1961) and of supplying decision-makers and management with important details (Herzberg, Maunser & Snyderman, 1959). The effects of risk decision and their results are seen in this process (Ozta & Okmen, 2004). Taking into consideration the

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critical function of accurate decision-making knowledge and determining the best risk solution, undertaking large investigations that combine the opinions of many experts from various contexts will increase the efficacy of risk analysis (Adams, 2006).

According to Rahman and Kumaraswamy (2004), the essence and degree of risks change on a timely basis as project progress. The implementation of risk assessment during the project's life cycle would also provide all participants with valuable knowledge in order to face risks (Zou, Zhang & Wang, 2007; Ward & Chapman, 2003).

Risk response

Risk response is the way to change the adverse effects of threats by implementing appropriate remedial measures (Tah & Carr, 2000). In this step, the available choices and actions are developed to promote opportunities and minimize risks for project targets (Nieto-Morote & Ruz-Vila, 2011). In response to the risks of projects, it seems feasible to implement four strategies, including preservation, elimination, transition and risk avoidance (Mills, 2001; Herzberg et al., 1959).

Nevertheless, it seems impossible to remove construction hazards (Goh et al., 2013). Each party to the contract tends to be aware of these risks levels and to take account of the losses (Mak & Picken, 2000). Knowledge of the allocated risks for each participating group and the ongoing planning required to cope with the risks are important and lead to projects success (Zou et al., 2007).

The construction operation entails various complexities, multiple intricacies, different methods and divergent environments since each

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construction project is special and complex. Therefore, the identification and management of possible risk factors, which can differ greatly depending on many circumstances from project to project, plays a critical role in optimizing the performance and ensuring the project's efficient execution.

Construction Project Performance

For most stakeholders in the construction industry, the idea of project success has been a matter of utmost concern. To meet fixed targets, initiatives are required to be carried out. A project is successful due to the satisfactory achievement of the set goals. In the last two decades changes have been identified in the world's market views of the building industry. Various researchers discussed low production and the inefficiency of industry (Beatham, 2003; Anumba & Evbuomwan, 1999). Project output was deemed to be related to the progress of the project and this is also related to project goals (Chan & Chan, 2004). Based on various dimensions, project performance has been calculated.

Several previous studies have investigated the efficiency of construction projects. Reichelt and Lyneis (1999) noted three significant mechanisms that underlie a project's dynamic output: the structure of work performance, effects from upstream phases to downstream phases, and feedback effects on productivity and quality of work. Based on the following five dimensions, Sadeh, Dvir and Shenhar (2000) assessed project performance: achieving design targets, benefiting end-users, benefiting the developing company, benefiting national infrastructure and security (a combined measure for project success).

The key performance requirements for construction projects were defined by Thomas, Macken, Chung and Kim (2002) as work progress, financial

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stability, health and safety, quality standards, finances, customer relationships, consultant relationships, management skills, claim and contractual disputes, subcontractor relationships, quantity of subcontracting and reputation. The build-up time is becoming more important, Chan and Kumaraswamy (2002) said, as it is often a key benchmark in assessing project progress and project organization competitiveness.

Project performance measures such as personnel, expense, time, efficiency, health and safety, climate, communication and customer satisfaction c were defined by Cheung, Cheung and Suen (2004). A consolidated system for assessing project performance was created by Chan and Chan (2004). The structure consists of the following eight dimensions of project success: cost, user expectation/satisfaction, environmental efficiency, health and safety, time, quality, the satisfaction of participants, commercial/profitable value. Navon (2005) has concluded that a control system is an essential element for the identification of factors influencing the effort of the construction project. Each project goal requires one or more project performance indicators (PPI).

Pheng and Chuan (2006) found that variables related to human contributed a major part in assessing the progress of a project. Ugwu and Haupt (2007) pointed to the reduction of the performance problems associated with building projects, including costs linked to delays, claim, waste & refuse, etc. through both early involvement with contractor (ECI) and the early involvement of suppliers (ESI). Ling, Low, Wang and Lim (2009) have found that the consistency of the contract text, the quality of response to perceived differences and the degree of contract adjustments are the most critical of scope management activities. It has been proposed that international companies follow

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some highlighted project management methods to help them achieve better project efficiency in China. Also, PMI (2017) said that the progress of the project should also be calculated with regard to the achievement of the project objectives. Thus, project performance has different measures depending on the organisation and industry of the firm.

Empirical Review

Risk Perception by the Construction Industry

Research has described the perception of danger as one of the critical factors influencing the protection of a person on a building site. Even with a defined safety programme, in their day-to-day activities craft workers face genuine safety dangers that could lead to an accident and decide to face the potential risk (Howell, Ballard, Abdelhamid & Mitropoulos, 2002). It is possible to describe risk perception as a "subjective judgement on the frequency and severity of specific risks" (Hallowell, 2010). To include subjective exposure assessment and probability, Rundmo (2000) extends this concept.

Decision-makers view risk associated with a context differently, based on factors such as their values, training, culture, experience, and how risk events can impact their place in the business and/or career (Alkaf, Karim, Rahman, Memmon & Jamil, 2012). This diversity of interpretation makes decisions a subjective matter based on intuition, personal experience or internal corporate requirements. (Mahendra, Pitroda & Bhavsar, 2013).

Because risk perception is a key component of risk management, risk management and perceived benefits need to be assessed and managed according to attitude and challenges. How individuals in this industry view risk are essential for efficient risk management. This is mostly because, risk to different

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individuals or organizations sometimes means different things (Remenyi & Heafield, 1996). Each stakeholder, also for project success, has a different meaning. In a specific project, stakeholders often have different vested interests and thus understanding can also vary among different stakeholders (Bryde & Brown, 2004). Therefore, it is no surprise that different participants think differently when they assess the success of a project.

Risk is one of the main factors in the management of the project and contributes to the project performance. Risk management in the Malaysian construction industry is not well practiced due to the lack of expertise in risk management (Yusuwan, Adnan & Omar, 2008). Therefore, for them to practice risk management while managing projects, it is important to understand risk management expertise among construction professionals (Zaini, Takim & Endut, 2011).

Although the need for a all-inclusive method to risk management and the outcome on project results of the project party's perception of project risks are important for all types of projects, they come into particular sharper focus when construction companies have to work on foreign projects overseas. The Bayesian analysis on foreign contract construction risks: case of payment delays in the developing economy was published by Adams (2008). He used the elicitation model to compare Ghana and the UK study sample. The study concluded that different risk expectations influence risk estimates.

Akintoye and MacLeod also conducted research on risk analysis and management in construction (1997). They examined the risk assessment for their building industries and the extent to which risk analysis and management strategies are applied to the industry through questionnaire surveys of general

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contractors and project management procedures. The study showed that building risk typically reflects the costs, time and quality of the project and that the analysis and management of construction risks depend primarily on intuition, judgment and experience.

Habibnezhad, Fardhosseini, Vahed, Esmaeili and Dodd (2016) researched the topic “The relationship between construction workers’ risk perception and eye movement in hazard identification”. The study looked at the hypothesis that employees perceive risk when identifying risk, and the risk affects their visual search strategy. The study used eye-tracking technology to test this hypothesis. They found that employees with greater risk perception spent less time on threats, mainly because they noticed them or perceived them more quickly than they perceived them as having less risk perception.

Risk perception is generally regarded as affected by human values, behaviours, choices and feelings (Akintoye & MacLeod, 1997). However, there may be incorrect and contradictory assumptions and perceptions (Raftery, 1994). In the 1992 study of the Royal Society, the risk interpretation should not be reduced to a single subjective correlation between a particular mathematical model, such as the product of probabilities and effects, as the risk interpretation imposes unduly restrictive assumptions on what is a human and social phenomenon. The factors which have affected risk perception formation, including education context, functional experience, a person's cognitive features, knowledge availability, impact of peer grouping, etc. have been identified by Choffray and Johnson (1977) and Ritchie and Marshall (1933).

Literature has provided different explanations of how people shape risk judgements, and several studies have found that risk likelihood and outcome

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evaluations are common attributes (Hallowell, 2010; Esmaeili, Hallowell, & Rajagopalan, 2015). It is widely recognized that the above factors can influence the risk perception of the respondents, and this study does not specifically investigate them.

Several papers on risk management, most surveys are obsolete in developing countries and limited knowledge of the perception of risk in developing countries have been published (Hameed & Woo 2007). In building projects, however, respondents were asked to identify the risk to obtain an industry view on building risk.

Risk Inherent in the Construction Industry

Risk identification, an essential project risk management process, not only involves the identification, but also correlation of specific threats (Hillson, 2009). Risk identifying as it seeks to define the source and nature of risk is probably the first, perhaps the most critical step in the risk management process. It requires identifying possible risk situations and clarifying risk responsibilities during the construction project (Wang & Chou, 2003). The basis for the next steps is the identifying of risks: analysis and control of risk management. Corrects risk acknowledgement to ensure risk management performance.

To ensure successful risk assessment, a reliable risk detection process should be carried out first (ISO, 2009; Tworek, 2012). Reeves et al. (2013) suggest that inefficiencies in the recognition of threats in the production of complex systems have been the cause of failures. Researchers have worked on various risk detection techniques, including nominal group techniques (Delbecq & VandeVen, 1971), Delphi techniques (Chapman, 1998), surveys (Bajaj et al.,

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1997), brainstorming and interviews (Chapman, 2001), checklists, the study of documents (Kasap & Kaymak, 2007) and SWOT analysis (Sweeting, 2011).

Investigations into the effectiveness of these approaches show that 68 per cent of contractors use brainstorming to identify threats to construction projects irrespective of their weaknesses (Tworek, 2012). The secret to handling them is to identify project risks. Regardless of its possibility or effect, the project team needs to recognize all possible project risks. Barkley (2004) therefore concluded that risk identification was an art, not science.

The key risk factors for high level buildings were identified in San Santoso, Ogunlana and Minato (2003), conducting questionnaire surveys in Jakarta. to be design problems, site management, good customer intervention in communication, and coordination between contractors and consultants and maintenance of construction equipment. In the case of Thailand's major infrastructure projects, Ghosh and Jintanapakanont (2004) analyzed building risk factors and the following reported: delay in construction; unavailability of funds; an unclear scope of work; a contractor's financial failure; economic crisis; delay in dispute resolution; delay in resolving contractual issues; failure of subcontractors; delays by third parties

Furthermore, Wiguna and Scott (2005) investigated the risk factors that affect the performance of construction in Indonesia and identified: defective design; high price inflation; owner's design change; bad weather; delayed contract payments; unexpected site ground condition; faulty construction work; poor cost control; availability issues. The risk factors that influence Palestinian construction performance were analysed by Enshassi et al. (2008) and he identified the following factors as most significant: working in hazardous areas;

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contractor financial failure; defective design; regular closure of borders; Gaza Strip segmentation; delayed contract payments; inadequate coordination between project parties; awarding design to unqualified designers and unmanaged cash flow.

El-Sayegh (2008) further investigated risks in the construction industry of the United Arab Emirates (UAE) and found: the shortage in materials and labour supply; inflation and sudden changes in prices; unrealistic construction schedules; changes in design and the improper intervention of clients. Risks in construction projects according to Zavadskas, Turskis and Tamošaitiene (2009), including cultural differences, climatic change, instability, economic-financial problems and the possibility of change in the state’s policies.

Turkey (2011) has recognized the following as most important in a study aimed at segregating the risk factors causing cost overrun in Ethiopia's federal road construction projects: delays on completion time; unexpected inflation; scope changes; inadequate site investigation and the unstable cost of manufactured materials. The risk factors for large projects in Iran have, too, been reviewed and described by Tadayon, Jaafar and Nasri (2012) as most essential: time constraint; project complexity; novel construction methods required; frequent changes in statutory regulations; and experience of parties involved in the construction operation.

Karim, Rahman, Memmon, Jamil and Azis (2012) assessed the significant risk factors in construction projects from the contractor’s perceptive. They selected 25 literature risks and grouped them into five categories: politics, building, finance, climate and architecture. Using the relative importance model, they analysed the views of contractors on risks defined from literature

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and found that late deliveries of material, shortages of material, shortages of equipment, cash flow problems and poor quality of workmanship were the major risk-contributing factors.

To assess the risk factors in the building industry in Malaysia, Goh and Abdul-Rahman (2013) surveyed and recorded, among other things, the following as most significant: variation orders; inflation and price fluctuation; customer late payment; insufficient time to prepare a bid; tight project schedule; workers default; inclement weather; unpredictable politics; design errors and ambiguous contracts. Hwang, Zhao and Gay (2013) analysed the risk factors influencing Singapore's public housing project schedule performance and found these: cooperation between different parties; successful site management; and labour availability.

On the other hand, Mahamid (2013) analysed and listed, as most critically, the risk factors affecting road construction projects in Palestine: the owner's payment delay; the contractor's financial status; weak coordination between the building parties; high bid competitions; low efficiency of equipment; and the political situation. In the literature for effective risk monitoring for project management, many risk classification methods have been proposed. Several methods were taken to classify building risk factors into global primary categories that can better cover the various factors. However, there is still no agreement between investigators on the classification schemes for such classes.

A list of factors derived from various sources was provided by Perry and Hayes (1985), which were divided in terms of risks held by consultants, contractors and customers. Physical risks, building risks, construction risks,

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political risks, financial risks, environmental risks and contractual risks. Construction risk factors were listed into the following six major groups by Al-Bahar and Crandall (1990): acts of God; financial; political; physical; and environmental; construction and design. However, in the following three major subsets, Abdou (1996) assigned construction risks: architecture, time and financial risks.

Artto and Kähkönen (1998) divided risks into four categories: financial risks (e.g. credit risk or cash flow), pure risks (e.g. weather conditions and hazards), business risks and political risks (almost anything that may occur in a project) that apply to a specific political situation and risks that are often triggered by risky situations, such as war, among others. In construction projects, Hendrickson (1998) categorized risks into the following groups; building risks, political risks, physical risks, financial risks, design risks, legal-contractual risks and environmental risks.

Tah and Carr (2000) defined the building risks associated with the following two large basic schemes: internal and external. Risks were grouped into four subsets by Chapman (2001): business, climate, project and customer. By the nature of the risks, i.e. legal, management, financial, political, business and technological risks, as well as political risk. Shen, Wu and Ng (2001) classified them into six categories. However, the risk classification between Ghosh and Jintanapakanont (2004) is nine main classes: financial; contractual and legal; security; force majeure; operational; design; physical; subcontractors and delay. The construction risk factors were also categorized by Wiguna and Scott (2005) into four major divisions: external and site conditions; economic and financial risks; technical and contractual risks and management risks.

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Whereas Assaf and Al-Hejj (2006) limited "construction delays" to construction risk factors.

More details were provided by Enshassi et al. (2008) with risk factors in the following nine major groups: environmental; design; physical; legal; financial; logistics; construction; management and political risks. Nonetheless, Rezakhani (2012) has proposed the following five major risk classifications: operational; external; project management; financial and engineering risks. In the following four main subsets, Zuofa (2011) also assigned risk factors: market, organizational, force majeure and risk of project size and execution, While Tadayon et al. (2012) classified building risks in 11 main categories, namely construction, demand/products, financial, environmental, technological, political, communications, geographical, geotechnical and social.

However, the classification of risks was further extended by Barlish, Marco and Thaheem (2013) into the following 12 main groups: financial; socio-cultural; political; legal; environmental; technological; customer; design; acts of God; subcontractors; risks related to the site and operation and management. The risks are classified into such categories, according to the PMI (2015): external, technological, organizational, project management or environmental. In the construction industry, Mhetre, Konnur and Landage (2016) classified risk into construction risks, technological risks, operational risks, physical risks, financial risks, environmental risk and factors of socio-political risk.

Understanding and classifying project risks may lead to certain decisions regarding, for instance, the advantages or the disadvantages of project acceleration, contract form, project funding, etc. Risk detection will lead to

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simple response procedures in advance when risks arise. If threats are detected correctly it guarantees efficient risk control because it reveals hidden causes of loss that may result in unlikely consequences (Ghasemi, Sari, Yousefi, Falsafi & Tamošaitienė, 2018). The effect that positive risks cannot be identified equates to the effect that adverse risks cannot be identified (Fadun & Saka, 2018).

How Construction Industry Responds to Risk

It is understood that the construction industry continues to use a small range of risk management strategies over time and in various nations, which are not suitable for every situation. Risks can also seriously impact the key objectives in construction projects: time, expense, scope and efficiency, which can mean additional costs and thus a low rate of return on investment for the client and, among other effects, a loss of profit for the contractor. Therefore, there is a need to decide the appropriate measures to respond to these risks after risk detection and evaluation. An answer that is relevant to the risk priority should be agreed upon.

Risk response techniques include four types of steps that are taken to minimize the probability of risk incidents occurring and/or reduce the negative effects of those risks, including risk avoidance, risk preservation, mitigation and transition (Tang, Qiang, Duffield, Young & Lu, 2007; Choudhry & Iqbal, 2013; Hasseb et al., 2014; Iqbal, Nasir Chaudry, Iqbal & Zia, 2015). Several previous studies have analysed the attitudes of contractors towards risk management (Kartam & Kartam, 2001; Wiguna & Scott, 2005; Zou et al., 2007; El-Sayegh, 2008; Enshassi et al., 2008; Wang & Yuan, 2011; Hanna et al., 2013; Hwang et al., 2013). Although the most common reactions to building problems, like

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preparation, scheduling, resources, techniques and methods in use on the sites, the appropriateness of equipment and work efficiency, poor workmanship, and rework are to risk retention and reduction, risk transfer responses represent normal approaches to customer behaviour or inactions.

Many project managers have developed the opinion, according to Perry, Thompson and Wright (1982) and Hayes, Perry and Thompson (1983), that typical forms of project organization, contract types and contract conditions are inadequate for high-risk, complex projects. Unconventional options appear more fitting, such as target-cost contracts, cost-reimbursable contracts or alternative types of management contracts. However, in terms of good management, a well-determined approach continues to be the weakness of the risk management mechanism, cautious recognition of risks that can only be accomplished if "all" parties involved in the construction enterprise, including contractors, consultants, authorities clients, and policymakers, understand their risk obligations, risk responsibilities, risk responsibilities and risk-taking responsibilities (Perera, Dhanasinghe & Rameezdeen, 2009).

Risk reactions are the key element of the risk management process which determine whether measures in the identification, qualification and quantification stage will be taken with regards to the risks assessed (Ghasemi et al., 2018). Risk responses are achieved through several options to eradicate or mitigate the expected risk and the assignment of the best substitute as a response. Although it belongs to all project enterprises, it is common knowledge that the risk can be effectively managed to minimise its adverse impacts on project objectives.

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Risk response is involved in the implementation of options and/or measures to increase conditions for the achievement of project goals. Major attempts have been made over the past decade to develop new approaches, instruments, standards and procedures to cope with project risks (Baccarini & Archer, 2001; Ward & Chapman, 2003; Del Cano & De la Cruz, 2002; PMI, 2009). Integrating risk management into a formal method to overcome the uncertainties and complexities encountered by the project team is the fundamental explanation behind all of these strategies.

Zwikael and Ahn (2011) have carried out one of the most recent and comprehensive studies, involving 701 project managers in seven industries, in 3 countries (Japan, Israel and New Zealand). The study highlights the significance of project context, taking into account the project risk levels of the industry and region. Only modest levels of risk management preparation would suffice to reduce the negative impact of risk on project performance, the authors say. These results are confirmed by de Bakker, Boonstra, and Wortmann (2012) and emphasize the value of recognizing risks as having more widespread effects on project performance, accompanied by risk reports. There is a need to track established risks, identify new risks and manage risk responses. This process involves updating, as required, the risk register (log).

Effect of Risk on Project Performance of the Construction Industry.

Risk management software is used to optimize costs in construction projects (Eskandari & Korouzhdeh, 2016). Algahtany, Alhammadi and Kashiwagi (2016) conducted a report on construction projects in Saudi Arabia and found that the overall performance of the construction industry in the country has been impacted by weak project performance in the past three

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decades. The authors have argued that traditional risk management techniques do not have an expected impact on helping contractors execute on-time projects within the budget when setting quality standards.

A proper, structured methodology and, more importantly, awareness and experience of various types of projects that have been previously conducted must therefore be available, to have an efficient and successful risk management strategy. It needs to be aware, for example, of the unexpected situations that may arise during the project execution, activities that work or do not work well, or methods for measuring or estimating risk as soon as it is feasible to occur (Alaghbari & Kadir, 2007).

As part of their long-term strategic strategy, risks that impact the company's profit must be managed to increase a construction company's profitability. The primary explanation is that different threats distinguish construction projects. In projects to be competitive in sustaining gross profit at a reasonable level for a company, a mechanism to effectively manage those risks plays an important role. Project priorities are part of the organizational goals, acting as the core elements of a construction company's operating goals since the functioning of a construction company relies solely on the construction projects in which it is involved (Zhao, Hwang & Low, 2014).

A recent survey on PPP opportunities in Asia shows that the perceived degree of political risks and PPP opportunities are negatively linked, as is the investment appetite in Asian countries (Sachs, 2006). Akintoye and MacLeod (1997) found that risk management was essential for construction activities in reducing losses and improving profitability. Heavy-duty risk affects the planning, the cost and the overall performance of the project directly. A proper

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Risk Mitigation Planning would ensure that the project objectives are better and smoother in the time, costs and quality parameters specified if developed for identified hazard areas. For every successful construction project, successful risk management is considered necessary (Tadayon et al., 2012; Banaitiene et al., 2011).

Also, projects to be delivered in developed countries need even greater attention to the effects of risks on projects (Kwak & Dewan 2001; Wang et al., 2004). Moreover, infrastructure-related initiatives are more relevant to developing countries than to developing countries (Ghoddousi & Hosseini, 2012). Therefore, the successful management of the risks involved in the construction projects amounts to project success (Ren, 1994).

The pivotal role of risk management in construction projects was strengthened by Baloi and Price (2003), which postulated that there would be a direct link between successful risk management and project performance, given their possible impact on project objectives. There has been extensive study of the relation between risk and success or failure of the project (Ropponen & Lyytinen, 2000; Kwak & Stoddard, 2004; Zwikael & Globerson, 2006; Han & Huang, 2007; de Bakker, Boonstra & Wortmann, 2010, 2012). There have been controversial results in these studies. In some surveys, the risk management has a low impact on project success (Ropponen & Lyytinen, 2000; Zwikael & Globerson, 2006). Even moderate levels of preparations for risk management are sufficient to minimise the harmful impacts of risk to project performance (De Bakker, Boonstra & Wortmann, 2010).

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Effect of Project Initiation Risks on Project Performance

In order to minimize negative impacts on overall results, risks are correlated with each project phase should be defined. Many challenges encountered in later stages of the PLC are due to unmanaged threats from the earlier period (Ward & Chapman, 2003). This demonstrates how imperative it is, specifically in the initial project phase, to carry out the precise analysis. Risk management is viewed by Raz, Shenhar and Dvir, (2002) as a process that begins with project definition and continues through the preparation, implementation, control and closure phase. In comparison, Elkington and Sallman (2002) found that in the risk management process, the conceptualization step is the most significant.

Westland (2007) describes phases in the project where more emphasis can be put on risk management. In the initial project process, the feasibility study is carried out, which is a detailed examination of a project proposal. At this time, a variety of solutions are identified and analysed and the potential risks associated with the solutions proposed are assessed.

Effect of Project Planning Risks on Project Performance

A study by Lyons and Skitmore (2002) shows that planning and execution are two phases in which risk management most frequently applied. A risk strategy is often developed in the planning process, where possible threats relevant to project planning are identified. In order to ensure that any possible risk has been addressed, all stakeholders can contribute to creating this plan. The risk plan allocates the form of action that should be taken to respond to a specific issue in addition to recognizing risk. This planning stage tries to

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minimise risks prior to implementation, whereby any risks arising are extremely costly if no action is taken in advance (Westland, 2007).

Risk management procedures should be initiated during the early stages of the project where work is planned and contracted in cooperation with the preliminary capital budget. In subsequent stages, the systemic risk management helps to control those critical elements that can adversely affect project performance.

Effect of Project Execution Risks on Project Performance

Monitoring and control are conducted in the PLC implementation phase to ensure that the process follows the plan and that all identified risks are dealt with. The entire project process should be monitored, beginning at the time when the risks are recognised. Risk management is more widely used in planning and execution according to Lyons and Skitmore (2002). In its description, Smith et al. (2014) said the highest emphasis on control and monitoring processes in order to ensure activities performed according to the plan and risk identified during the previous phases is essential to manage risk during the exercise phase.

Effect of Project Closure Risks on Project Performance

In Westland's (2006) opinion, during the review of each phase of the PLC, risk assessment should be carried out. A high level of uncertainty is expected to decrease with the progress of the project than at the beginning of the project. Doubts that arise any time require that controversial issues be reconsidered and reviewed. Such a procedure will require the review and discussion of previous steps with new assumptions. Decisions are taken as the PLC continues to move, which necessitates changes in previous steps.

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That is, decisions made at a certain stage can lead to a further modification of the concepts of measures taken at the initial stage of the PLC. At the closing of the project, the project objectives, benefits and accomplishments are assessed and the entire project summarised. All parties then have a chance to list all activities or risks that have not been managed in full during the project. Unmanaged risks can be further discussed and used as a warning in future projects (Westland, 2006).

Conceptual Framework

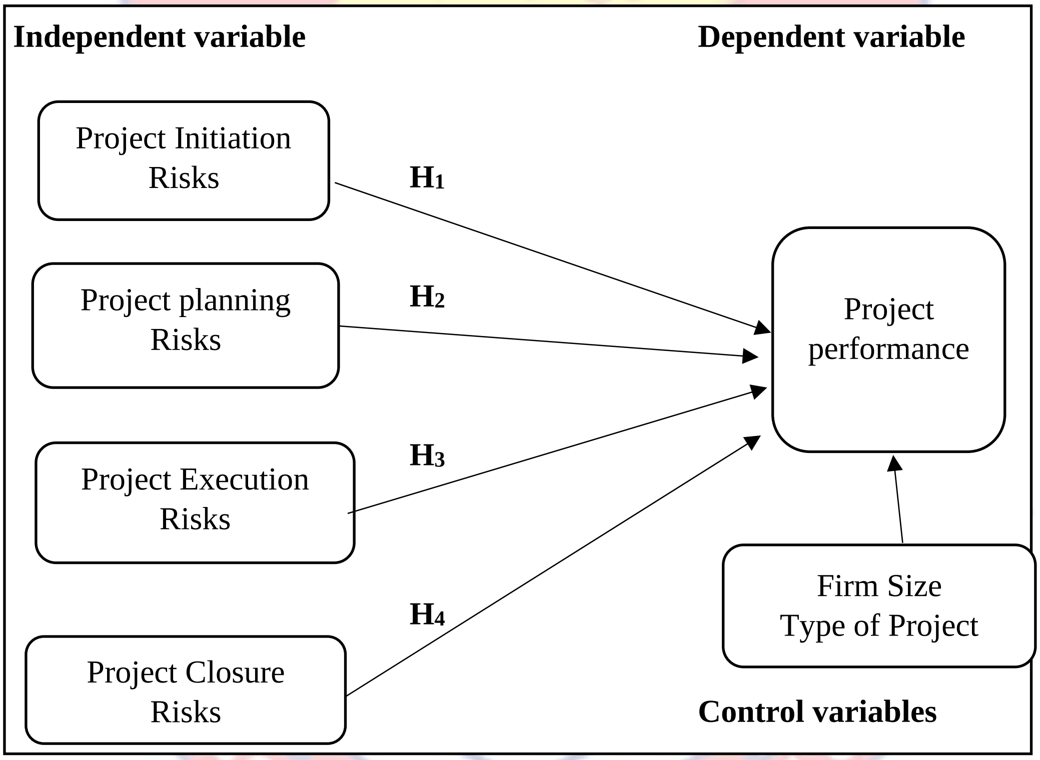

Figure 2: Conceptual framework
Source: Author's construct (2020).

Figure 2 shows the conceptual framework for objective four to objective seven. After the qualitative assessment has been done for the first three objectives, risks occurring in the various phases of the project life cycle (which are the independent variables) were regressed against the dependent variable,

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project performance, whilst holding the size of the firm and the type of projects done by the construction firms constant.

Chapter Summary

This chapter reviewed two models on risk perception where risk was found to be subjectively constructed with several factors influencing how people perceive risk. Risk management was done in limited ways in the construction industry according to previous literature. It was also noted from literature that risks in the project lifecycle and its effect on performance were not known. The chapter finally gave a graphical presentation of the research objectives in the conceptual framework.

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CHAPTER THREE

RESEARCH METHODS

Introduction

This chapter focused on the use of appropriate tools, techniques and methods for gathering information for the issues being researched into. The chapter examined the research design, the study area, target population, study population, sample and sampling technique, sample size, research instrument and data analysis. The chapter starts with a description of the study design. Also, the rest of the headings explained the methods used for data collection as well as the data analysis.

Research Philosophy

For this analysis, the pragmatic model offers a conceptual foundation. The pragmatic paradigm refers to a worldview that focuses on "what works" rather than what can be considered 'true' or 'real' entirely and objectively (Tashakkori & Teddlie, 2003). This is a deconstructive paradigm that encouraged the use of the polar questions of truth and reality in the study of mixed approaches (Feilzer, 2010). Pragmatism's study theory recognises ideas that are only important if they support action. Pragmatics understand that the whole picture can never be provided with a single viewpoint, and that different reality may exist. There are several ways to look at the world and to conduct a study (Saunders, Lewis & Thornhill, 2012). The research question is the most important determinant of the philosophy of research, according to the philosophy of pragmatism. The choice of approach and the nature of the research issues raised are directly linked by Pragmatists.

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Research Design

In particular, the selection of any form of design is informed by the research questions under investigation. Given this, the study employed the design of exploratory sequential mixed method research (MMR). It was chosen to generally analyse and comprehend the habits, attitudes, and expectations of contractors, project managers, and quantity surveyors in risk management. An approach to study, integrating qualitative and quantitative data collection and analysis in a series of steps, is the exploratory sequential mixed process (Creswell & Clark, 2017).

Qualitative data are initially collected and analysed in a research design and topics are used to drive the development of a quantitative tool to further explore the problem of research (Creswell et al., 2011; Tashakkori & Teddlie, 2008; Onwuegbuzie, Bustamante & Nelson, 2010). This design results in the conduct of three analytical phases: the second phase after the primary qualitative phase is quantitative; the integration phase connects two data strands and extends initial qualitative exploratory conclusions (Creswell et al., 2011). This research reports on all three stages of the study.

Research Approach

Qualitative study methodologies are used to investigate why or how a phenomenon occurs, to identify or explain the essence of an individual's experience, while quantitative methodologies answer causality, generalisation or the magnitude of effect (Fetters, Curry, & Creswell, 2013). Mixed approaches are researched using qualitative and quantitative strengths of research, as well as "the Third Analytical Orientation" (Tashakkori & Teddlie, 2008). Creswell and Clark (2011) describe their core elements although there is

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no universal definition of the research on mixed methods: both qualitative and quantitative data strands are collected and evaluated separately in a single research sample, and combined to answer the research query, either simultaneously or sequentially.

Onwuegbuzie and Combs (2010) stated that, "Mixed analyses include the use of at least one qualitative analysis and at least one quantitative analysis, implying that to perform a mixed analysis, both types of analysis are necessary". Instead of using the binary analysis lens to approach the problem of research, the research approach of mixed methods will advance the erudite discourse by drawing on the metiers of both methodologies.

Because of the purpose of the analysis, the combined research approach was used. This technique is used in both an objective and subjective way to collect and evaluate data. The study aimed to analyse the risk management of the construction industry and its effect on the performance of the business and, therefore, to obtain objective and subjective responses from suppliers, project managers and quantity surveyors. The investigator used both quantitative and qualitative analysis approaches to achieve the study's goals. Qualitative research deals with problem research, phenomena understanding and questions answering, according to Cooper and Schindler (2014).

Therefore, the qualitative analysis attempts to obtain a comprehensive understanding of a situation for goals one, two and three. To stress objective actions and statistical, mathematical or computational analysis of survey data, questionnaires and surveys, quantitative approaches have been used to manipulate pre-existing statistical data using computer techniques. This has

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been used to test objective four - seven. In this light, the type of research design to be used for the analysis was motivated by this strategy.

Study Area

Ghana is continually placing demand on the country's construction industry as a result of growing oil and gas industry, infrastructure investments, fast urbanisation, the growing housing deficit. However, rising prices for energy and building materials present long- and short-term challenges. Despite setbacks, the construction industry continued to expand. According to the statistical service from Ghana, the Government agencies responsible for the collection of economic data and indicators, the construction sector was the biggest sub-sector in the sector in 2015 with a growth rate of 30.6% and a 14.8% share of GDP. It has increased steadily in the past five years, increased more than 70% since 2010, with around 320,000 employees.

The Ghana building industry has contributed and benefited in the last two decades to a rapidly growing economy. The government invests in rail, road and property projects throughout the country, due to strong demand generated by a growing urban services economy. The increased spending in the 2019 budget reflects this. Several government actors in the construction sector of Ghana are active. Housing infrastructure is the responsibility of the Ministry of Water Resources, Works and Housing (MWRWH), while civil infrastructure projects are directed by the Ministry of Roads and Highways (MORH).

While many technical engineers, technicians and architects in Ghana are responsible for construction projects, there is no overall regulatory entity, and there are currently few legislative mandates or compliance mechanisms in the industry. In Ghana's infrastructure, housing, and commercial property

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development, public-private partnerships are still relevant, particularly given the country's current budget constraints.

Despite significant growth in the construction sector in recent years, particularly with respect to other parts of the economy, there remain a number of challenges, including unfavourable exchange rates, land tenure issues, high interest rates and increased costs for public utilities and buildings. Funding for private sector building companies operating in Ghana remains a major problem. The single biggest concern for the construction and the real estate market is access to capital (Construction & Real Estate chapter of The Report: Ghana, 2017).

In 2014 the Ghana GIIF (Ghana Infrastructure Investment Fund) was founded in order to attract more private investment. This funds pools government budgets for priority infrastructure projects, value added tax income and state-owned business, along with other outlets.

Population

According to Creswell (2014), a population is a group of entities or individuals sharing particular characteristics. The study's population comprised all contractors, project managers and quantity surveyors from the construction industry. The study specifically targeted parties in the construction industry that was at managerial positions to acquire information about risk management and project performance in the industry. Sample was drawn from an unknown population of contractors, project managers and quantity surveyors in Ghana.

Sample and Sampling Procedure

It was necessary to sample a limited proportion to represent the entire population because of the large number of contractors, project managers and

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quantity surveyors. One can make certain extrapolations about the features of the population from which it was taken by analysing the characteristics of a sample.

Qualitative Sampling Procedures

Sampling allows the researcher to study a relatively small number of units and obtain a representation of the entire target population instead of the target population (Creswell, 2014). Therefore, for the qualitative aspect of the study, the study sampled a maximum of 10 out of the population using deliberate sampling. Glaser and Strauss (1967) recommend the concept of saturation to achieve a suitable sample dimension in qualitative studies. Thus, after 10 interviews the saturation point for the qualitative aspect of the study.

Purposive sampling is a technique of non-probability sampling and occurs when “elements selected for the sample are selected by the researcher's judgement” (Black, 2019). It proves to be productive because, because of the nature, objectives and priorities of research design, just a handful of people can be used as primary data sources. In addition, it is a sampling technique in which the researcher be contingent on his or her judgement to engage in the sample while selecting members of the population. This is a specific subgroup where all sample participants are the same as a specific profession or rank in an organization's hierarchy (Saunders & Lewis, 2012). Researchers also assume that a reasonable choice can be used to save time and time for a representative sample (Black, 2019).

Quantitative Sampling Procedures

Based on the 10-fold rule proposed for PLS-SEM analysis by Hair et al. (2011) and Peng and Lai (2012), the minimum sample size for the quantitative

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step of the work was 100. The principle is that the maximum number of external or internal model links leading to a latent variable within the model should be 10 times the sample size (Goodhue et al., 2012).

For this analysis, the largest number of structural paths shown in the structural model was six. As such, the minimum sample size was 6 * 10 = 60. Hair et al. (2012) also stressed that the PLS-SEM mandates researchers to focus on the sample size against the background of the data characteristics and model. More precisely, they suggested that the expected sample size should be obtained from power analysis using the part of the model which has the greatest number of predictors.

To meet this requirement, Cohen (1988) provided a sample size determination table suitable for obtaining the lowest sample size in PLS-SEM (Appendix C). Researchers have primarily used this table to evaluate the minimum sample sizes for their PLS-SEM models by fulfilling some simple assumptions that include the number of arrows directing to a construct, sig. rate, least R^2 and statistical power associated with that. This study, therefore, met these assumptions by making the maximum number of arrows equal to 6 pointing at a given construct, a sig value of 0.05, 0.20 minimum R^2 and 80 per cent statistical strength, the minimum predicted sample size was 75. (Appendix C). Therefore, since the 107-sample size used is greater than 75, the minimum sample size of the analysis for the PLS-SEM model was adequately met.

In order to select interviewees from the sampling frame, simple random sampling was used. This is a standard technique for probability sampling. Probability sampling is usually necessary in quantitative analysis since the objective is frequently to generalise the results for the population of the selected

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sample (Zickmund, 2000; Minasny & McBratney, 2006). All qualified respondents included in the sampling frame were generated random numbers through the computer application. In order to select the respondents, random numbers generated have been used.

Data Collection Instrument

The key method used in collecting data was the standardized questionnaire and interview guide with respect to the purpose of the research. The questionnaire is a quantitative data collection tool in which each participant is asked to answer in a pre-arranged order to the same set of questions (Saunder & Lewis, 2012). In a bid to attain the purpose of the study, the questionnaire was grouped into two (2) major sections with Section A soliciting for information on the respondents' demographic characteristics such as age, gender and years in construction. Section B primarily focused on the study's objectives four and as such was further divided into six (6) subsections. These subsections consisted of items under four classifications of risk and two aspects of firm performance.

All the items under the subsections employed a seven (7) point rating scale with 1 representing the least agreement and 7 representing strong agreement. The use of the scale was prompted by the goal of the study. The various subsections had at least five (5) items or construct respectively. Therefore, the structured questionnaire aided in soliciting for relevant data from respondents for analysis.

Also, unstructured interviews were used to clarify issues on objective one, two and three. Thus, the interview schedule was considered the most appropriate due to the nature of the objective research one, two and three. They

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are also useful for gaining thorough information about individual feelings, discernments and views and allowing questions to be asked in more detail.

Measurement of Variables

Table 2 shows how variables under study were operationalised for this research. Some measurements were obtained from previous research and some obtained from the initial interview conducted from experts.

Table 2: Measurement of variables

Variable	Measurement	Source
Project initiation risk	Unclear project objectives Tight project schedule Budget availability Availability of skilled project team Stakeholders approval Unclear project deliverables Unclear scope definitions	Cerić (2003)
Project planning risk	High-performance standard Tight project schedule Incomplete approval and other documents Variations by the client Inadequate project scheduling Design variations Inadequate or insufficient site information (soil test and survey report) Lack of coordination between project participants Excessive approval procedures in administrative government departments Incomplete or inaccurate cost estimate High-quality expectations	Cerić (2003)
Project execution risk	High-performance metrics Tight project schedule cost estimate not sufficient Delays site information (soil test and survey report) Unavailability of sufficient professionals and managers Lack of coordination between project participants Variations of construction programs Unsuitable construction project planning Serious noise pollution caused by construction Occurrence of dispute	Cerić (2003)

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	General safety accident occurrence Unavailability of sufficient amount of skilled labour Low management competency of subcontractors Price inflation of construction materials	
Project closure risk	High performance/quality expectations risk Issues in transferring deliverables Defective work Client acceptance Maintenance Political interference Legal related risk Quality issues	Cerić (2003)
Project performance	The project followed the schedule Project is completed within budget The project had qualified acceptance and successful delivery The project met the requirements of the stakeholders We are likely to cooperate with the other party again in the future The project experience enhanced the capability of all project teams	Salapatas (1985), Alsulamy, Wamuziri and Taylor (2012)
Firm size	The firm's management has the required experience to manage risk issues The firm has adequate resources to handle risk issues The firm has a sufficient number of employees to handle risk issues The firm's total assets are enough to handle risk issues	Zadeh and Eskandari (2012), Hanson and Wernerfelt (1989).

Validity and Reliability

The validity and reliability of the instrument were assured before introducing the collection tool. Validity relates to the degree to which the test items assess what they plan to do (Saunders & Lewis, 2012). The instrument's content validity, for instance, was assessed by giving the drafted questionnaire and interview guide to the peer group to review and make necessary corrections. Also, expert judgement was sought from a supervisor. This was

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also done to ensure that each question on the instrument was unambiguous, clear and measured what they were intended to achieve.

Reliability is seen as the consistency of a score from one occasion to the next (Sekaran & Bougie, 2016). It, therefore, measures the extent to which the data collection instrument can be trusted and relied upon and this was achieved by testing the Cronbach alpha and the composite reliability. The outcome of these results was greater than (0.70), suggesting that the collection instrument of the analysis could be relied on. It is to note that, the value of these tests was displayed in Chapter four of this study.

Data Collection Procedures

In every study, one has to go through various processes before administering the data collection instrument to respondents. Two methods for the data collection were used in the study. This includes telephone interviews and questionnaires for interviewees. These methods/tools have been used to obtain the required data used to analyse data. In data collection, these mixed approaches were used to obtain data indicative of the target population of the analysis.

Thus, the use of interview schedule and questionnaire allowed all research objectives to be answered. The processing of data was performed in two stages. Data from contractors, project managers and quantity surveyors who had handled at least five construction projects was collected in the first phase of this analysis. Semi-structured interviews were the main qualitative instrument used. The interviews focused on risk perception, risk assessment, risk management and risk surveillance. For each respondent, the interview took at least 30 minutes.

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Data from the qualitative phase were used to develop a questionnaire for the second quantitative phase of the study. Questions based on the important topics emerging from qualitative data analysis were built. The questionnaire was extended to contractors, project managers and quantity surveyors to generalise the results of the initial qualitative study. The questionnaire was completed by a total of 107 respondents. For descriptive and inferential statistics, data were analysed using SmartPLS 3.0.

Data Processing and Analysis

The field data have been coded and processed with the software SmartPLS 3.0. The data were based on the study's objectives. An analytical approach that comprised descriptive in the form of quantitative methods was used. The data were analysed using mainly tables that showed the descriptive and inferential statistics of the relevant variables. The information was edited, coded and eventually analysed after the data collection. The coding allowed the investigator to remove objects that were not done. It also allowed numbers to be assigned to the different responses to the questionnaire objects.

In the case of the interview plan, in the form of narratives and thematic areas, the responses to the different items were analysed and recorded. As SmartPLS has been designed to deliver different analytical tools in social science research, it was considered to be the most appropriate data analysis software for quantitative data.

Ethical Considerations

There are important ethical challenges in every study which must be adequately addressed (Patten & Newhart, 2017). The right to privacy, anonymity and the security of information are some of the major ethical

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problems that are normally taken into account. In order not to disadvantage respondents, these major ethical principles are expected to be followed. Therefore, these ethical issues were discussed and, for example, the exercise of one's own free will through voluntary participation was allowed to all respondents. So, no respondent was forced to participate against their will or compelled to participate. By enabling respondents to respond themselves to the questionnaires and interviews, the potential issues of the right to privacy were solved.

In the context of anonymity, respondents were prohibited from divulging any names or other private identities such as addresses and locations. This was avoided to ensure that each respondent was anonymous. Finally, the participants were also fully assured that none of their data would be publicly visible or used for other than this research. This was done in an attempt to resolve the confidentiality ethical issue. In this regard, we identified and addressed all major ethical issues accordingly.

Chapter Summary

This chapter addressed the techniques used to accomplish the purpose of the research. Specifically, the chapter addressed key elements of the research methods mentioned in the study in terms of research methodology, population, sampling technique, data collection instrument, procedures, validity and reliability, processing and analysis of data. The quantitative method and descriptive nature were precisely adopted by the study because of its purpose. In a bid to achieve its aim, the next chapter presented the findings and discussion of the study's data. This chapter addressed the techniques used to accomplish the purpose of the research.

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CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

The answers provided by the respondents through interviews and questionnaires are analysed in this chapter. The chapter covers the socio-demographic characteristics of respondents and further assesses the perception of the construction industry's risk, the risks inherent in the construction industry, how the industry responds to these risks and the impact of the risk on the construction industry's project performance. A total of 10 interviews (top executives in the construction industry) and 107 questionnaires were fully responded to. Thus, used for the analysis in this chapter.

Socio-demographic Characteristics of Respondents

The particular personal characteristics of the respondents are analysed in this section. Such background information includes sex, age, occupation, marital status, and other information related to society. The results are reported in Table 3a and 3b. Ten experts were interviewed, Table 3a shows the respondent profile of the respondents. The respondent profile of the interviewed managers shows that the selection of managers with varied work experience would allow the researcher to obtain views on the various aspects of risk management. The experience of managers ranges from 5 to 10 years. This experience indicates that several projects have been managed by the respondents and are appropriate for this report.

From Table 3b, the majority (70) of the respondents were male. This represents (66%) of the 106 respondents. Thus, 36 respondents were female, representing (34%) out of the 106 respondents. With regards to the age

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distribution of the respondents, twenty-eight (37) of the respondents had age distribution of 31 to 40 years, denoting about (34.9%) of the respondents, followed by 18 to 30 years (36) representing (34%). This was followed by those in the age group 41 to 50 years, these were twenty-six (26) representing 24.5% and those over 50 years were seven (3) representing 6.6%.

In terms of educational qualification of respondents, 100 of the respondents had tertiary education and they represent 94.3% of the respondents, those with primary, senior high and other educational levels were three, one and two respectively and that represents 2.8%, 0.9% and 1.9% respectively. The respondents were further asked about their position in their various companies and 37 were project managers which represent 34.9%. Twenty-eight (28) respondents were quantity surveyors and that represents 26.4%. Contractors were 22 representing 20.8%. Likewise, those in other positions in their organisations such as general managers and engineers were 13 and 6 respectively, representing 12.3% and 5.7%. Also, respondents were asked the construction association they belong to.

From Table 3b, twenty-six (30.2%) respondents were members of GREDA while 24 (27.9%) members of ABCECG. Those in other construction associations not listed were 11 (12.8%). Those without any association and members of PROCA were 7 and 9 respectively, representing 8.1% and 10.5% respectively. Members of GHiS were 4 representing 4.7% of the respondents. The number of years respondents had worked in their current capacity was further assessed. Majority of the respondents (44) had worked for 1 to 5 years. This represented 43.1% of the respondents. Those who had worked for 6 to 10 years were 35 and they represent 34.3% of the total respondents. Seventeen (17)

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of the respondents had worked for 11 to 15 years in their various capacities and they represent 16.7%. The remaining 6 (5.9%) had worked above 15 years in their said positions.

Additionally, respondents were asked about the type of projects they mostly undertook. Forty-three undertook building projects, this represents 42.2% of the respondents. Nineteen (18.6%) were into road construction, fifteen (14.4%) dealt in civil works. Moreover, thirteen (12.7%) dealt in all three projects, that is, road construction, building construction and civil works. Nine (8.8%) were into just road and building construction and three (2.9%) of the respondents engaged in other construction projects.

Also, respondents were asked to state the number of projects they are likely to undertake in a year and majority of the respondents (50) representing 47.6% stated that they handled 1 – 5 projects in a year. However, 28 (26.7%) and 27 (25.7%) stated that they are likely to undertake 6 – 10 projects and above 10 projects annually. Furthermore, the age of the business in which respondents worked was assessed. A majority (24, 23.3% each) were working in companies that were 1 – 5 years, 6 – 10 years and 11 – 15 years. Those in companies that were above 20 years and 16 – 20 years were 23 (22.3%) and 8 (7.8%) respectively. This implies that the majority of the construction firms were within the age bracket of 1 – 20 years and hence had taken enough project to know risk issues encountered in the industry.

Also, the number of employees in these companies were assessed. A majority (53, 51%) had 5 – 19 employees while 30 representing 28.8% had 20 – 99 employees. Twelve (11.5%) had 100+ employees and 9 representing 8.7% had less than 5 employees. This implies that the majority of construction firms

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are classified as small firms based on the classification by Amoah et al. (2011). Finally, respondents were asked whether their companies had project risk managers or not. Majority of the respondents (54, 51.9%) were in the negative that their companies did not have project risk managers but 50 of the respondents representing 48.1% were in the affirmative that their companies had project risk managers.

Table 3a: Socio-demographics of Interviewed Respondents

S/N	Role	Experience
1	Project officer	7
2	Project manager	9
3	Manager	6
4	General manager	8
5	Project manager	5
6	Project officer	5
7	Project manager	9
8	Managing director	10
9	Quantity Surveyor	5
10	Project manager	6

Source: Field survey, (2020).

Table 3b: Socio-demographics of Questionnaire Respondents

Sex	Frequency	Per cent
Male	70	66.0
Female	36	34.0
Total	106	100.0
Age		
25 - 30 years	36	34.0
31 - 40 years	37	34.9
41 - 50 years	26	24.5
Over 50 years	7	6.6
Total	106	100.0
Level of education		

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Primary education	1	.9
Senior high school	3	2.8
Tertiary	100	94.3
Others	2	1.9
Total	106	100.0
Position of Respondent		
Contractor	22	20.8
Project manager	37	34.9
Quantity surveyor	28	26.4
Engineer	6	5.7
Others	13	12.3
Total	106	100.0
Construction Association		
GREDA	26	30.2
ABCECG	24	27.9
ASROC	5	5.8
PROCA	9	10.5
GhiS	4	4.7
Others	11	12.8
Non	7	8.1
Total	86	100.0
Number of Years Working		
1 - 5 years	44	43.1
6 - 10 years	35	34.3
11 - 15 years	17	16.7
Above 15 years	6	5.9
Total	102	100.0
Type of Project Undertaken		
Road	19	18.6
Building	43	42.2
Civil works	15	14.7
Others	3	2.9
All Three	13	12.7

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Road and building	9	8.8
Total	102	100.0
Number of Projects taken in a Year		
1 – 5	50	47.6
6 – 10	28	26.7
Above 10	27	25.7
Total	105	100.0
Age of Business		
1 - 5 years	24	23.3
6 - 10 years	24	23.3
11 - 15 years	24	23.3
16 - 20 years	8	7.8
Above 20 years	23	22.3
Total	103	100.0
Number of Employees		
Less than 5	9	8.7
5 – 19	53	51.0
20 – 99	30	28.8
100+	12	11.5
Total	104	100.0
Have a project risk manager?		
Yes	50	48.1
No	54	51.9
Total	104	100.0

Source: Field survey, (2020).

Descriptive Statistics of Variables

In this section, the variables under study were explored using descriptive statistics. Means, standard deviation, skewness and kurtosis were the tools used for this analysis. A mean scale interpretation (*0 – 1.49=Not at all agree; 1.5-2.49= slightly agree; 2.5 – 3.49= moderately agree; 3.5-*

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4.49=Agree and 4.5 – 5= highly agree) was adopted from previous studies to guide the interpretation of the results (Alston & Miller, 2001).

Project Initiation Risks

In this section, the risk that occurs during the initiation of a project were assessed. Seven risk questions were asked, to which respondents were asked to assess their level of agreement to these risks which normally occurs at the project initiation phase. The responses of the respondents were presented in Table 4. From Table 4, respondents moderately agreed to all these risks occurring at the project initiation phase (M=2.99, S. D=.614). Also, skewness and kurtosis were used to determine the normality of the data. A general rule for skewness, according to Hair et al. (2017), is that if the number is greater than +1 or less than-1, it is an indicator of a significantly skewed distribution and for kurtosis, when the number is greater than +1, the distribution is too high and when it is less than-1, it implies a distribution that is too flat. Therefore, in both cases, anything above these rule shows the data is not normally distributed. Hence, with skewness of .387 and a leptokurtic kurtosis of .621, the responses from this phase are normally distributed.

Going into the various risk indicators used in the project initiation phase, respondents moderately agreed that all risk indicators listed in Table 4 occur during the project initiation phase with mean values ranging from 2.82 – 3.45 and standard deviation ranging from 1.027 – 1.313. In terms of normality of the data, with skewness ranging from -.188 - .207 and kurtosis ranging from -.958 to -.526, the data can be said to be fairly normal.

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Table 4: Risks at Project Initiation

Indicators	Mean	Std Deviation	Skewness	Kurtosis
Unclear scope definitions	3.45	1.194	-.188	-.958
Unclear project objectives	3.04	1.313	-.126	-.591
Unclear project deliverables	3.01	1.098	.207	-.588
Budget availability	2.90	1.209	.122	-.723
Tight project schedule	2.88	1.123	-.020	-.591
Stakeholders approval	2.84	1.127	.229	-.526
Availability of skilled project team	2.82	1.027	-.174	-.591
Average Score	2.99	.614	.387	.621

Source: Field survey, (2020).

Project Planning Risks

This section analysed the risks that usually exist in the construction industry during the project planning process. Descriptive statistics such as mean and standard deviation were used to explain the existence of the variables, while the normality of the results was evaluated using skewness and kurtosis. Results for these are presented in Table 5. On the whole, respondents moderately agreed that all the 11 indicators used to assess risks in the project planning phase occurs during project planning (M=2.62, S. D=.654). Responses were normally distributed with skewness of .279 and a kurtosis value of .204. This implies that all these risks occur during project planning though with different level of probability of occurrence and severity of impact.

Individual indicators used had various degree of acceptance. Risks such as inadequate scheduling, high-quality expectations, incomplete approvals, excessive approval procedures in administrative government departments, tight project schedule, variations by the client, lack of coordination between project

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participants and design variations were moderately agreed with mean ranging from 2.50 – 2.79 and standard deviation ranging from .948 – 1.121. However, three risks were slightly agreed to by the respondents with mean ranging from 2.42 – 2.49 and a standard deviation of 1.182 – 1.226. These were high-performance standard, incomplete or inaccurate cost estimate and inadequate or insufficient site information. All these risks were normally distributed in terms of skewness and kurtosis except for high-performance standard and inadequate or insufficient site information which were platykurtic (lack of outliers).

Table 5: Risks at Project Planning

Indicators	Mean	Std Deviation	Skewness	Kurtosis
Inadequate project scheduling	2.79	.977	-.160	-.817
High quality expectations	2.78	1.079	.255	-.288
Incomplete approval and other documents	2.70	1.087	-.048	-.828
Excessive approval procedures in administrative government departments	2.70	1.087	.241	-.680
Tight project schedule	2.68	1.043	-.030	-.824
Variations by the client	2.57	1.121	.260	-.796
Lack of coordination between project participants	2.53	.948	.257	-.285
Design variations	2.50	1.133	.277	-.607
High performance standard	2.49	1.182	-.118	-1.098
Incomplete or inaccurate cost estimate	2.46	1.226	.497	-.733
Inadequate or insufficient site information (soil test and survey report	2.42	1.241	.316	-1.121
Average Score	2.62	.654	.279	.204

Source: Field survey, (2020).

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Project Execution Risks

Risks that occur at the project execution phase were also assessed. These were done using means and standard deviation to describe the data and skewness and kurtosis were used to assess the normality of the data. A mean scale of 1 – 5 on the level of agreement was used and interpreted as follows *0 – 1.49=Not at all agree; 1.5-2.49= slightly agree; 2.5 – 3.49= moderately agree; 3.5-4.49=Agree and 4.5 – 5= highly agree* (Alston & Miller, 2001). In this phase, 15 risk indicators were used and the results were presented in Table 6. From Table 6, on the average, respondents moderately agreed (M=2.64, S. D=.618) that all the 15 risk indicators occurred in the construction industry when projects are executed. This was moderately skewed with skewness of .528 and leptokurtic (profusion of outliers) with a kurtosis value of .953.

The 15 risk indicators had two different levels of agreement from respondents. Risk such as unsuitable construction planning, low management competency of subcontractors, serious noise pollution, unavailability of sufficient amount of skilled labour, general safety and accident occurrence, the occurrence of the dispute, lack of coordination between project participants, unavailability of sufficient professionals and managers, variations of construction programs, high-performance metrics, insufficient site information, and prices inflation had mean ranging from 2.54 – 3.02 and standard deviation ranging from 1.040 – 1.243. Those that were slightly agreed to by respondents were tight project schedule, delays, and cost estimate not sufficient. These had mean ranging from 2.30 – 2.49 and dispersion from the mean ranging from 1.105 – 1.237.

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Table 6: Risks at Project Execution

Indicators	Mean	Std Deviation	Skewness	Kurtosis
Unsuitable construction project planning	3.02	1.243	-.171	-.855
Low management competency of subcontractors	2.97	1.040	.118	-.639
Serious noise pollution caused by construction	2.90	1.098	.206	-.552
Unavailability of sufficient amount of skilled labour	2.86	1.092	.179	-.614
General safety and accident occurrence	2.81	1.146	.180	-.713
Occurrence of dispute	2.74	1.087	.134	-.672
Lack of coordination between project participants	2.71	1.140	.329	-.414
Unavailability of sufficient professionals and managers	2.70	1.067	-.056	-.720
Variations of construction programs	2.64	1.133	.267	-.800
High performance metrics	2.56	1.085	.606	.094
site information (soil test and survey report	2.56	1.122	.134	-.743
Price inflation of construction materials	2.54	1.194	.217	-1.046
Tight project schedule	2.49	1.105	.330	-.429
Delays	2.36	1.237	.486	-.770
cost estimate not sufficient	2.30	1.186	.501	-.752
Average Score	2.64	.618	.528	.953

Source: Field survey, (2020).

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Project Closure Risks

Risks that occurred during project closure in the construction industry were further assessed. Means, standard deviation, skewness and kurtosis were used for this analysis. With an average of 2.67 and standard deviation of .771, respondents moderately agreed that the 8 risk indicators used to assess risk at project closure occurs during that phase and this was normally distributed with skewness of .420 and kurtosis of -.055.

Individually, all risks indicators were moderately agreed (Mean ranging from 2.65 – 2.94 and S. D=1.018 – 1.210) to by respondents except political interference which was slightly agreed to by respondents with a mean of 2.48 and standard deviation of 1.254. All these were normally distributed. This implies that all these risks occur during project closure but with the different probability of occurrence and severity of impact. This is shown in Table 7.

Table 7: Risks at Project Closure

Indicators	Mean	Std Deviation	Skewness	Kurtosis
Legal related risk	2.94	1.210	-.171	-.844
Quality expectations risk	2.82	1.172	.231	-.844
Client acceptance	2.80	1.163	.194	-.777
Maintenance	2.76	1.018	.011	-.338
High performance risk	2.71	1.110	.372	-.330
Defective work	2.67	1.153	.288	-.637
Issues in transferring deliverables	2.65	1.094	.156	-.685
Political interference	2.48	1.254	.500	-.741
Average score	2.67	.771	.420	-.055

Source: Field survey, (2020).

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Project Performance

In this section, the performance of projects undertaken in the construction industry was assessed using a scale of 1 – 5, where 1=0% performance, 2=25%, 3=50%, 4=75% and 5=100%. A mean scale of *0 – 1.49=0% performance; 1.5-2.49= 25% performance; 2.5 – 3.49= 50% performance; 3.5-4.49=75% performance and 4.5 – 5= 100% performance* was used to interpret the results in Table 6 (Alston & Miller, 2001). Respondents stated that projects handled in the construction industry could be rated as having a performance percentage of 75% (M=3.66, S. D=.757) and this was normally distributed with skewness of -.236 and kurtosis of -.406.

Looking at the various performance measures of project performance, respondents agreed that 75% of the projects handled enhanced the capability of all the project teams, met the requirements of the stakeholders, had a likelihood of cooperating with the third party again and had quality acceptance and successful delivery. These had a mean ranging from 3.66 – 3.98 and a standard deviation of .920 – 1.262. Also, 50% of the projects handled in the industry were completed within budget and followed the schedule. These had means of 3.46 and 3.27 and a standard deviation of 1.105 and 1.045 respectively. This implies that projects handled in the construction industry performed a little above average. This is seen in Table 8.

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Table 8: Project Performance

Indicators	Mean	Std Deviation	Skewness	Kurtosis
The project experience enhanced the capability of all project teams	3.98	1.262	-.967	.162
The project met the requirements of the stakeholders	3.87	1.043	-.667	-.270
We are likely to cooperate with the other party again in the future	3.73	.947	-.760	.600
The project had qualified acceptance and successful delivery	3.66	.920	-.495	.153
Project is completed within budget	3.46	1.105	-.077	-1.009
The project followed the schedule	3.27	1.045	-.355	-.029
Average Score	3.66	.757	-.236	-.406

Source: Field survey, (2020).

Firm Size

In this section, the ability of the construction firm to handle several issues were assessed on four parameters using means and standard deviation. From Table 9, it can be seen that respondents moderately agreed that their firms had adequate resources to handle risk, the management had the required experience to manage risk issues, had a sufficient number of employees to handle risk issues and the firm’s total assets were adequate to handle risk issues. These ranged from 3.27 – 3.42 and standard deviation from .981 – 1.231. This implies that firms in the construction industry could handle the risk they face in the industry.

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Table 9: Firm Size

Indicators	Mean	Std Deviation	Skewness	Kurtosis
The firm has adequate resources to handle risk issues	3.42	1.104	-.607	-.044
The firm's management has the required experience to manage risk issues	3.39	.981	-.416	.069
The firm has a sufficient number of employees to handle risk issues	3.32	1.151	-.391	-.687
The firm's total assets are enough to handle risk issues	3.27	1.231	-.040	-1.051
Average Score	3.35	.937	-.474	-.501

Source: Field survey, (2020).

Risk Perception of the Construction Industry

This objective was to assess how the construction industry perceived risk, thus, their definition of risk. Interviews were the means of collecting data for this purpose. Ten respondents who were experts in the industry were interviewed. Several responses were received. Risk in previous literature as viewed differently by various researchers. The following thematic areas were obtained from respondents' responses.

Risk is an event with negative effect

Several responses from respondents suggested that risk connotes negativity in the industry. Some responses from respondents that connote this theme are "*negative events"* by few of the respondents. Additionally, some respondents went further to state that risk had damaging consequences on their work performance and the organisation as a whole. Words such as risk "*hinder the performance of one's duty, counterproductive, affect my job performance*

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and influence job performance". Thus, risk according to them are negative events with damaging effects if they occur. Most research done in this area also showed that risk is a negative event.

Risk is an event with both positive and negative effects

To some respondents, risk has both negative and positive effects. Statements such as "*a negative and positive event", "does not connote negative activities, but positive as well"* confirmed that risk is seen to be bi-focal and *"that impacts positively or negatively on projects".* This implies that to some in the industry, the outcome of risk can be both negative or positive though the "*positive is quite negligible"* according to another. PMBOK (2017) is one of the works that opined of risk having both negative and positive effects.

Risk as uncertainty

Risk was also equated to uncertainty by some respondents in the construction industry. Various statements - "*risk is an uncertainty", "risk is about uncertainty"* - made by few respondents proved this point. This is a misconception harboured by some respondents in the industry. This is because, literature as shown that risk and uncertainty are sometimes used interchangeably by those in industry but the two have different definitions.

From the above, one can tell that the construction industry perceived risk in three perspectives; as a negative event, positive event and uncertainty. These affected projects handled in the industry.

Discussion

Surprisingly, the term "risk" is not even familiar to actors working in the construction industry. Findings from the interviews showed that the term risk was better understood as an undesired occurrence, issue or threat that makes

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it difficult to attain project goals. Klemetti (2006) reported that respondents viewed risk as a negative term and Akintoye and MacLeod (1997) reported that the construction industry regarded risk as events that negatively impacted project goals such as cost, quality and time. The same result was obtained. Also, risk can be both positive and negative in its impact, as indicated by Webb (2003), however, there was a misconception by some on the definition of risk.

Risks Inherent in the Construction Industry

This objectively assessed the risk management process in the construction industry. The objective started with the risk identification process, risk inherent in the industry, risk categorisation and documentation, risk analysis done in the industry and risk responses adopted. Experts in the industry ranging from contractors, general managers to quantity surveyors were interviewed on this to solicit for their views on these issues.

Risk Identification Process in the Construction Industry

Risk identification process adopted by the construction industry was assessed. Respondents were asked how their firms identified risk. Responses received from the various respondents were grouped under the two main themes; *the when of risk identification* and *tools for risk identification.* The when of risk identification is further divided into three sub themes – *risk identification at project start, risk identification during the project and risk identification at start and during the project*. Tools for risk identification were sub themed as well:

Risk identification at project start

Research shows that risk identification is done at the beginning of a project. Usually during the project planning phase risks are identified,

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documented and categorisation. Evidences from respondents showed that risk identification was usually carried out at the start of the project by most firms in the construction industry. Statements such as "*before a project is executed, an assessment is done to assess the possible risk", "risk is identified before the start of a project", "we have a meeting before each project is bided for"* affirmed this.

Risk identification during the project

One stated that risk identification is done during the project and not at the start. He stated that "*during operations, it is our duty to look for risk that is likely to occur and that occurs*" in the project. This implied that the identification of risk by some firms in the industry is done when the project is in motion. Thus, risks are identified as and when they occur.

Risk identification at start and during the project.

Risks were also identified by some firms in the construction at both the start of the project and still during the project. Respondents stated "*risk is identified before the start of a project and some in the course of the project*". Literature shows that risk identification should be done throughout the project lifecycle. Therefore, some firms are following due process but these are few.

Past experience as a risk identification tool

There are several tools used for risk identification, however, most firms in the industry made use their experiences they gain from previous projects. According to respondents, "*risk is identified from past experience",* and "*through lessons learnt"*. Thus, some firms base on the experience they have had from managing risks in previous projects and the lessons they learnt from those projects to identify risks.

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Brainstorming as a risk identification

Other firms in the industry also made use brainstorming as a means to identifying risk. Statements that confirmed this were "*necessary risks are identified through brainstorming*", "*issues related to risk are identified through brainstorming*" this is mostly done during meetings organised before the start of a project.

Expert judgement as a risk identification tool

Few also made use of experts' judgement or advice to identify risk. Such made statements like "*Risks are identified from experts in the field*", "*when works are advertised in the dailies, I call my quantity surveyor for him to assess the works*", among others affirmed that some firms only made use of this tool for risk identification. However, these experts are within the firm.

Using a combination of risk identification tools

Also, some firms used more than one risk identification tool to identify risks, most use a combination of tools. This was proved from statements made by responses – "*risks are identified based on past experience and brainstorming of possible risks likely to occur*", "*through benchmarking with competitors, brainstorming and expert advice*" – when asked how risk identification is done in their various firms. This implies that some firms used more than one tool for risk identification to capture all the risks likely to occur.

The above responses show that several processes are used by the construction industry to identify risk, but the most common and most used by the industry were; from past experience, brainstorming and lessons learnt from previous projects.

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Discussion

Among the respondents, the most widely used methods to define potential threats were previous experience and brainstorming. This finding correlates to Lyons and Skitmore's (2004) research that showed brainstorming and case-based approach as the most common tools for identifying risk. Chapman (2001) also found brainstorming as one of the techniques used by the construction industry. In addition, Tworek (2012) has identified 60% of contractors using brainstorming as a risk identification technique. No time was allotted for risk identification in the project and respondents declared that at the time of their occurrence, possible risks were controlled.

In order of terms, as defined in the literature, the members of the project team did not formally define risk. They felt that when they focused on the actual project instead of looking for issues, their time was spent more effectively. Risks in the project have been established only to a limited degree through practice. Moreover, in the form of a checklist, a variety of risks that are typical of a construction project can be compiled and used in future projects.

Risks in the Construction Industry

In this section, various risks that firms in the industry faced were identified through interviews. Several risks were discovered from responses of the respondents such as "*weather conditions*", "*cultural issues*", "*quality issues, government policy*", "*inflation, risk of unfinished work developing problems due to funding, interest rate risk*", "*accidents*", "*credit risk (interest rate on loans and loan default issues)*", "*health risks (demanding nature of work)*", "*damaged materials (transporting the materials site)*", "*nature of the soil*", "*logistics risk*" "*safety issues*", "*resource risk*".

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However, financial risk was prominent among them. This is because all respondents affirmed that they faced one financial issue or the other. "*Funding*", "*finance (for construction, 30% of the contract sum is paid, hence the company would have to source finance to finish up the project*" were few of the responses that connote financial risk.

Issues of weather which was noted as "*natural risk*" by respondents and government policies as "*political risk*" were mentioned by most respondents as risks they face in the construction industry. These manifest in the form of "*rain, thunder*" for natural risk and "*government policies, government interference, change of government*" for political risk.

Consequentially, it can be said that there are numerous risks faced by firms in the construction industry and major among them were financial risk, weather conditions, political risk, human risks, resource risk, logistic risk and safety issues. Previous studies done (Goh & Abdul-Rahman, 2013; Abd Karim et al., 2012; Turkey, 2011; Zavadskas et al., 2009) identified similar risks in their studies.

Risk Categorisation in the Construction Industry

This section examined how risks are categorised by the construction industry. Respondents were asked how their firms categorised or classified risk for risk analysis purpose. The responses are grouped into various themes below:

Risk categorisation based on severity

Research on risk categorisation shows that several categories of risk have been provided. Most firms group risk on the nature of the risk, thus, several categories have been seen in literature. However, a few firms were of the view that risk in their firms were categorised according to the severity of the risks.

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Responses that confirmed this were; "*Risk is categorised based on severity*", "*the severity of risk is based on how it affects project performance*". Thus, some firms categorise risk identified on the basis how it affects their projects performance.

Risk categorisation based on source

Also, one firm categorised their risks based on where the risk emanated from, that is, the source of the risk. "*It is categorised based on where the risk is coming from*", was what the respondent said. The respondent went further to state that "*risk from the organisation is termed as internal risk and those outside the firm are known as external risk*".

Risk classification based on the nature of the risk

It was also noticed that few firms in the industry categorised risk based on how those risk looked like, that is the nature of the risk. Statements from respondents were; "*been quite informed on the nature of the various risks, a look at them could tell how they will affect the project*", confirmed this. Thus, these firms classified risks into "*material handling or safety issues, financial risk, quality of work, and customer relationship*", and others "*Safety issues, Human risk (workers interaction with community people) and Financial risk*".

No risk categorisation done

Incidentally, most of the firms did not categories risk. Risk was handled as and when they occurred. "*Risk is not categorised, no categorisation is done*", were some statements made by respondents that proved that some firms in the construction industry did not categorise risk identified.

Thus, according to experts' responses shown above, classification of risk in the construction industry is dependent on many factors such as the

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severity of impact on project performance if it occurs, source of risk and the nature of the risk (how the risk looks like). This finding was supported by studies such as Tah and Carr (2000) who classified risk into internal and external risks and others who (Konnur & Landage, 2016; Barlish et al., 2013; Tadayon et al., 2012; Zuofa & Ochieng, 2011; Enshassi et al., 2008) classified risk based on the nature of the risk.

Risk Documentation and Communication

After the risk has been identified, the risk is communicated and documented. Therefore, in this section, respondents were asked whether the risk is communicated and documented by firms in the construction industry or not. Interviews responses of the respondents were reported using themes. Two general themes were derived from the responses of the respondents – *risk documentation* and *risk communication.* Under risk communication, a subtheme was obtained – direction of communication, whether top – down, down – top or both.

Risk communication

Respondents were asked whether risks identified were communicated or not. Responses from respondents showed that, few firms communicated risks identified in their firms. Respondents affirmed that "*there is a system of risk reportage and correspondence*" in their firms. Thus, only few organisations in the industry had a system for communicating risk.

Direction of risk communication

Though few communicated risk identified, the study sought to find out what direction the communication took – from top management to the employees, from employees to top management or both channels.

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Top – down risk communication

Risk was found to be communicated from management to employees in few firms in the construction industry. They stayed that "*risk is communicated to all parties involved*", thus, management informs any employees that is likely to face risk so as to aware.

Down – top risk communication

In other firms, risk was communicated from employees to management. Respondents made statements such as "*employees are those who send the signal when they face risk*", affirmed this. Thus, as and when risk is identified in the course of operations, employees communicate it to management to handle.

Top – down and Down – top risk communication

Also, some firms made use of both direction of communication to communicate risk. Respondents stated that "*risk identified are communicated from top management to employees and employees do likewise reports the risk they face during operations to the management*". This implies that management communicates risk identified before the project starts to employees and employees communicate new risk that emerge in the course of operations.

Thus, though few firms in the construction industry have a system of reportage for risk, three direction for risk communication were used by those few firms. Risk documentation was assessed under the following subthemes; risk documented in reports, minutes, memos, logbook, risk not documented, and what is documented.

Risk is not documented

After risk is communicated, respondents were asked whether risk is documented or not. Few firms claimed that "*Risks are not documented*" with

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the reason that "*it is just known*" and "*everybody is aware*" of risk identified, hence, no need for documentation.

Risk is documented in reports

Most firms were found to document risk identified, however, where risks were documented differed from one firm to another. A number of firms in the construction industry documented risk identified in reports. Thus, reports that were written for reporting the risks was the only risk was reported in these firms. Respondents affirmed these by stating that "*risks identified in the course of a project is written in a report*" and "*risks are mostly documented in reports as and when they occur during the operation of activities*".

Risk is documented in minutes

Others also documented risk identified in minutes. Statements such as "*it is documented in our minutes*", proved that some firms used minutes written at meetings where risk is identified. This implies that risks are identified at project planning meetings and documented in the minutes of the meetings.

Risk is documented in a logbook

A few others made use of the logbook to document risk. Respondents stated that "*risks are documented in a logbook daily with a remark column for challenges or risk*". This, implies that some organisation in the industry had a document specifically for recording only risk issues and details of risk.

Risk is documented in more than one document

Some firms in the industry used several documents as a source document for documenting risks identified. Respondents stated that "*risk is documented in a memo as challenges or part of minutes of a meeting that are*

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raised prior to starting a project". Thus, in these firms, different documents are used to document risk depending on the time the risk was identified.

What is documented

After documents in which risks are documented have been assessed, what is documented about those risks were also examined. Several details about risks were recorded by different organisations in the construction industry. Some firms stated that "*risks identified are documented with information concerning the type of risk, their severity if it occurs and methods of handling risks*". Thus, risks are documented with details whilst others are documented without any details.

The above responses show that risk is mostly documented though not in the right document, that is, the risk register. Risks in the construction industry are mostly documented in memos, reports and minutes. And that is the system of documenting risk in the industry. Risk is also communicated in the industry from top management to employees and from employees to management.

Risk Analysis of the Construction Industry

Finally, how risk is analysed in the industry was also assessed. Firms in the industry were interviewed on how they analysed risk after identification and documentation. Their responses are reported according to the following themes.

No risk analysis is done

Few firms were of the view that "*risk analysis is not done*" by their organisations. Reasons were that "*the organisation itself doesn't bother itself much on risk and doesn't have a clear-cut policy on risk in the organisation*" Thus, these firms handle risks as and when they occur.

Risk analysis based on severity

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Several methods are used for analysing risk in various industries. Research has provided both qualitative and quantitative methods of risk analysis. It was found that few of the firms in the construction industry analysed risk "*based on the severity of the risk*" and "*their impact on project success*". Others do otherwise, in their case "*cost is assigned to risk based on the cost of its impact*". This implies that firms using this method of risk analysis do not only assess the risk based on severity but its impact on the project as a whole. This method, as claimed by some respondents was not a properly done. In their own words, "*no proper analysis is done*" but "*financial risk is prioritised above all other risks*".

According to the respondents, risk analyses is done based on the impact of the risk, others in the industry did not have a clear-cut policy on risk in their firms and the rest did nothing on risk analyses. They handled and managed risk as and when it occurred.

Discussion

The greatest differences can be seen between the theory and how the market operates in this aspect of the risk management process. As previously reported, except for probability and effect analysis, the respondents were not familiar with any approach used to assess potential risks. Overall, not many construction industry professionals use these formal approaches. Lyons and Skitmore (2004) found that the techniques most commonly used in risk analysis are intuition, judgement and experience, whereas formal approaches such as risk impact assessment are used only to a limited degree. This was attributed to the general lack of understanding of the industry's risk analysis instruments.

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Additionally, a risk matrix of all risk identified was developed based on the probability and severity of the risk. All risks were found to be moderate sources of risk based on the PMBOK 6th edition classification. This implies that though most risks were seen to be high in literature, the industry held the perception that their effect was not that damaging and that affected the way of handling these risks. However, findings have proved otherwise, thus, the industry should use more structured methods in addition to the risk impact assessment to analyse identified risk.

Table 10: Risk Matrix

Impact	**Very Low**	**Low**	**Medium**	**High**	**Very High**
Probability	**0.05**	**0.1**	**0.2**	**0.4**	**0.8**
Very High 71-90%					
High 51-70%			PP3, PE5, PC8	PP1, PP7, PP11, PE1, PE4, PE15	
Medium 31-50%			IN2, IN4, IN6, PP2, PP9, PE2, PE6, PE7, PE10, PE12, PE14, PC1, PC2, PC3, PC4, PC5, PC7	IN1, IN3, IN5, IN7, PP4, PP5, PP6, PP8, PP10, PE3, PE8, PE9, PE11, PE13, PC6	
Low 11-30%					
Very Low ≤10%					

Source: Author's Construct (2020).

How the Construction Industry Responds to Risk

This assessed how the industry responded to risk. In this section, the industries responses to risk and whether the risk is monitored after initial risk identification process was assessed, thus, this section is divided into two sections.

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Risk Responses Adopted by the Construction Industry

This section assessed the various responses adopted by the construction industry in managing and controlling risk. Responses were collected through interviews and analysed using thematic analysis. Responses of the respondents are reported themes.

Risk reduction as a response strategy

Several methods of responding to risks have been stated in literature. Respondents in the industry were asked what ways they managed risk. Their responses proved that risk reduction was the most preferred method of handling risks. This method was also highly used by most firms in the construction industry. Responses such as "*mostly measures are put in place to reduce risk*", "*most of the risks that occur are mitigated*", "*most of the risk faced in the company are responded to by putting measures in place to handle them*" and many other responses affirmed this.

Risk sharing as a response strategy

Others were found to use risk sharing as a risk response strategy. Respondents stated that "*risk is shared based on which stakeholder is responsible for the risk event*", also, "*when risks involved in projects are high, we share such risks with other companies in the industry*". Thus, these firms in the construction industry share risk when they find it to risky for only them to bear.

Risk avoidance as a response strategy

One firm affirmed avoiding risk as a means to handling risk. The respondent stated that "*in certain cases where the risk in a project is unmanageable, the project is forsaken or not undertaken*". Thus, after initial

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assessment of the project, if the risk in the project exceeds the firm's capacity, the project is not undertaken by the firm.

contingency as a response strategy

Contingency is one of the response strategies for handling risk. Few construction firms were found to use this strategy. Respondents stated that "*we use contingency to handle risk*" and that contingency "*is a percentage of the project amount*", thus to say, a percentage of the project amount is added to the project cost to obtain the total project cost. Hence, when risk occurs, firms using the contingency hedges the cost of the impact of risk.

Different risk response strategies

It was also found that few firms in the construction industry made use of more than one risk response strategy depending on the type of risk being responded to. This was affirmed when respondents stated that "*mostly, risks are treated corporately. Most of the risks that occur are mitigated. Risks such as accidents and others are transferred to a third party but this is in the minority. Avoidance of risk is not an option in the company for fear of escalation. Risk related to government policy is mostly accepted*".

Another also stated that "*for accidents, the company insures the vehicles we use (thus transfer risk) and for other risks, we put measures in place to reduce it. Financial risk is accepted*". And finally, "*a contingency is used mostly to handle risk, but there are always rules for negotiation - five per cent less or five per cent more. Projects are insured by the government as all-risk insurance which is paid to the contractor to insure the project with an insurance company. But, sometimes contract documents are altered to include some other activities to handle the risk which are unmanageable or contingency cannot*

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cater for. Also, some risks are overlooked, comparing the time the awarding agency would use in handling the risk and the cost of that risk" was stated by another.

This shows that depending on the type of risk and the cost, different firms in the construction industry use different response strategies to handle risks. Thus, not one risk response strategy is always used for all risks.

Consequentially, risk responses strategies adopted by the construction industry are more of putting measures in place to reduce the impact of the risk on the project.

Discussion

Respondents were of the view that risk responses for risks were not the same for all risk. Response strategies are drawn depending on the type, nature and impact of the risk on the project. Thus, risk response strategies employed by the industry included risk reduction which was the commonest found, risk sharing, risk transfer, risk avoidance and risk acceptance. Studies such as Choudhry and Iqbal (2013); Hasseb et al. (2014) and Iqbal et al. (2015) found similar risk responses as the strategies used by construction firms to handle risk.

Also, based on the outcomes where threats were defined by the actors, the most frequently preferred action was mitigation. Many of the respondents decided that all threats are manageable, so the safest alternative is to reduce them. The most frequently selected type of action against risks in the Lyon and Skitmore (2004) report also included risk mitigation.

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Risk Monitoring

This section assessed whether construction firms in the industry monitored risk after the initial identification process. The following were the responses given by respondents.

Risk is monitored

The study found out that a few firms monitored risk after the initial risk identification to identify new risk or risk escalation or other issues.

The when of risk monitoring

Through the responses of the respondents, the study found out that different firms in the construction industry had different time for risk monitoring. Some stated that "*expert advice are sought on what went wrong and lessons learnt*", that is, monitoring is done at the end of the project. Others also stated that risk monitoring is "*done during the execution of the project*" and finally, it is also "*done periodically to assess likely risks that arise*". Thus, different times are employed by different organisations for risk monitoring.

The how of risk monitoring

Also, the study found out that different firms use different methods to monitor risk. A respondent stated that "*performance evaluation is done on the project and expert advice are sought*", another added that "*constant reviews are done*". Thus, some firms make use of performance evaluation methods while others use reviews to monitor risk in the construction industry.

Few responses were obtained for this section. All the respondents who answered were of the view that risk is monitored but this is done at different times by different organisations and with different methods.

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Assessment of PLS-SEM

Objective four - seven was analysed using Partial Least Square (PLS), a modelling technique for structural equations. In assessing PLS-SEM outcomes, the first step includes analysing the measurement models. If all the requirements are met by the measurement models, researchers must then test the structural model (Hair et al., 2017).

Measurement Model Assessment

The first phase in the evaluation of the reflective measurement model requires evaluating the loadings of the indicator. The model had four exogenous variables, one endogenous variable and two control variables. Each variable had several indicators measuring it. The exogenous variables were; project initiation risk (PINI), project planning risk (PPLAN), project execution risk (PEXEC) and project closure risk (PCLO). PINI had seven indicators (INA1 – INA7), PPLAN had eleven indicators (PPA1 – PPA11), PEXEC had fifteen indicators (PEA1 – PEA15) and PCLO had eight indicators (PCA1 – PCA8). The endogenous variable was project performance (PPERF) which had six indicators (PP1 – PP6). The control variables were firm size and type of project undertaken by the construction firm. Firm size was measured using four indicators (FS1 – FS4) and the type of project undertaken was measured categorically. Figure 3 shows the initial model.

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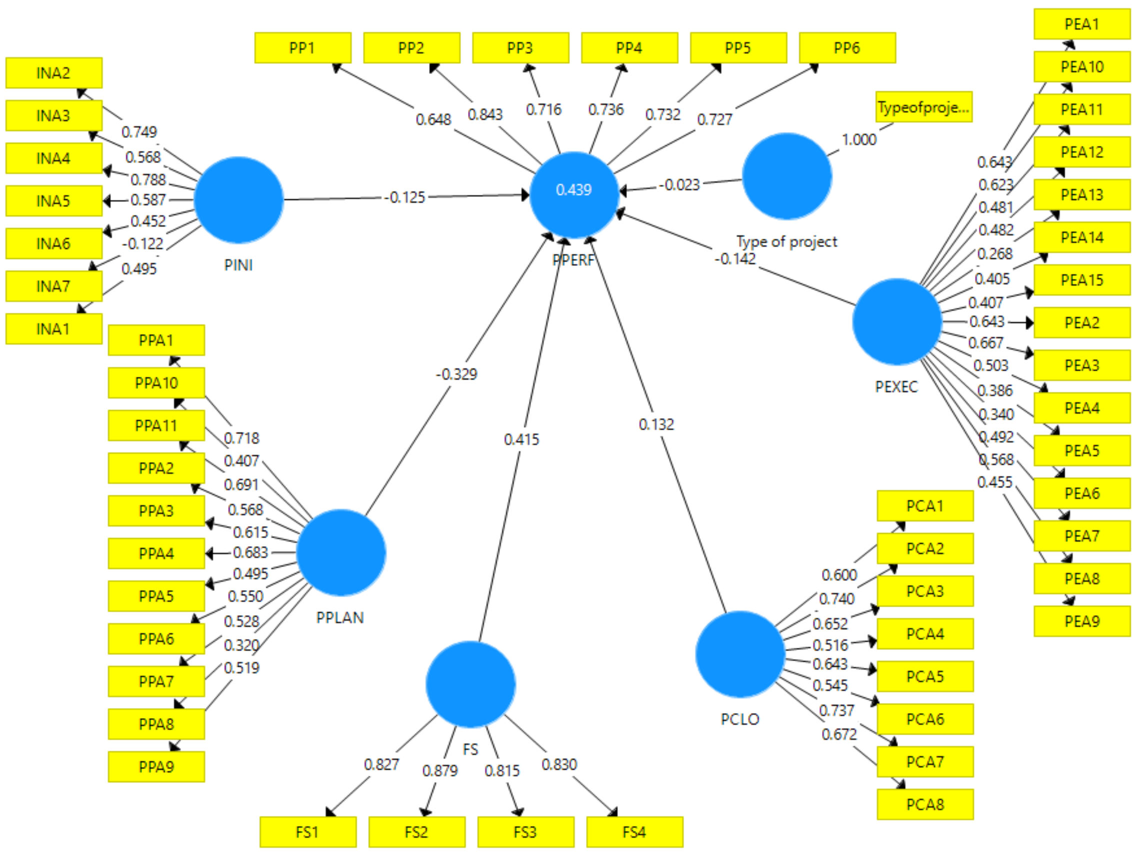

Figure 3: Initial Model
Source: Author's construct, (2020).

The indicators measuring constructs in the initial model was assessed based on Henseler, Ringle, and Sinkovics (2009) criteria for assessment. According to them, loadings above 0.70 are recommended, as they imply the capacity of the construct to explain more than 50% of the variance of the indicator, providing reasonable reliability of the object. After careful assessment of the initial model against Henseler's criteria, all loadings below the criteria were removed. Thus, indicators that measured each of the constructs were;

Project initiation risk – INA2 which is tight project schedule and INA4 – availability of skilled project team.

Project planning risk – PPA1 – High-performance standard, PPA4 – variations by client and PPA11 – high-quality expectations.

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Project execution risk – PEA1 – high-performance metric, PEA2 – tight project schedule and PEA10 -serious noise pollution caused by construction works

Project closure risk – PCA2 – issues in transferring deliverables, PCA3 – defective work, PCA7 – legal-related risk and PCA8 – quality expectations risk

Project performance – PP1 – project followed the schedule, PP2 – the project is completed within budget, PP3 – the project has quality acceptance and successful delivery, PP4 – project met the requirements of stakeholders, PP5 – we are likely to cooperate with the other party again in the future and PP6 – project experience enhanced the capability of all project teams.

Firm size – FS1 - The firm's management has the required experience to manage risk issues, FS2 - The firm has adequate resources to handle risk issues, FS3 - The firm has a sufficient number of employees to handle risk issues and FS4 - The firm's total assets are enough to handle risk issues.

These were the indicators that measured risk in the Ghanaian construction project lifecycle and project performance. Figure 4 shows the final model extracted.

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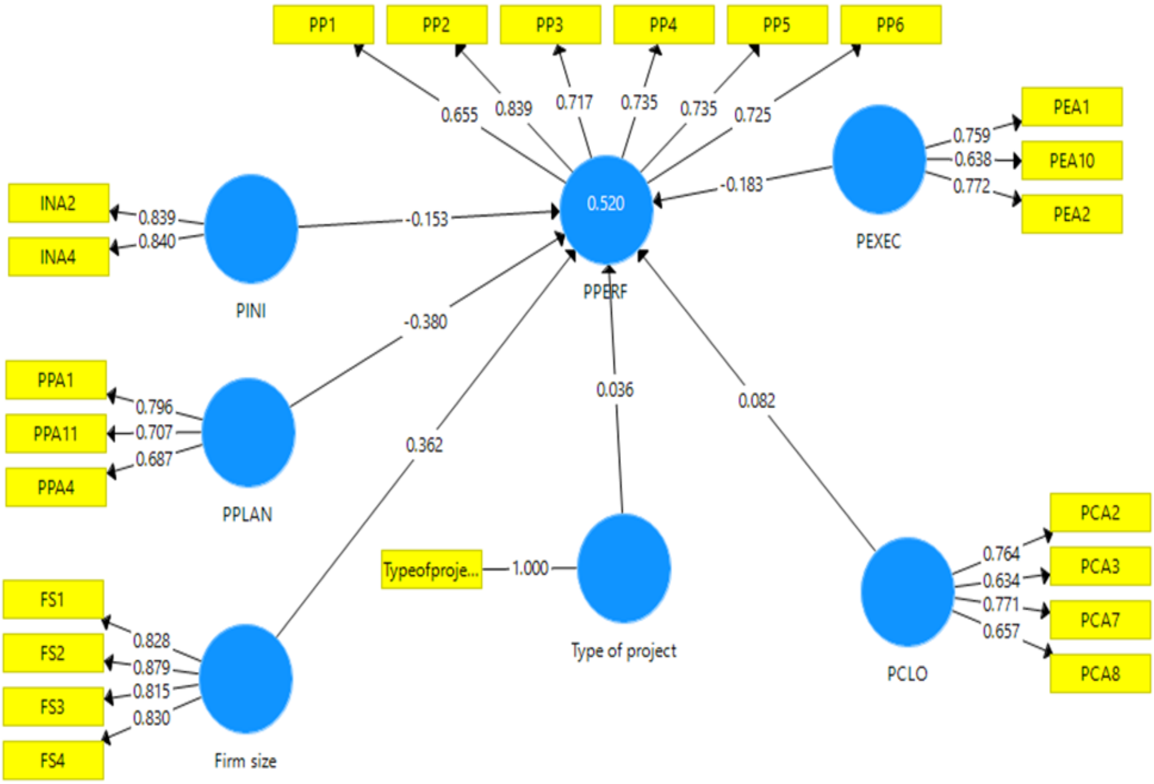

Figure 4: Final Model
Source: Author's construct, (2020)

Outer Model Assessment

The next step is to determine whether the measures of the constructs in external models are reliable and valid. The researcher should rely on proper calculations and interpretations of structures that form the basis for the evaluation of the internal model relationships with the evaluation of the external model. In determining the internal reliability of the model, the composite reliability of Jöreskog (1971) is most frequently favoured over Cronbach and Meehl's (1955) Cronbach Alpha.

The reason is that, as opposed to Cronbach's Alpha, composite reliability does not assume that all indicator loads in the population are equal. This is in conformity with the PLS-SEM algorithm working concept, which prioritises the indicators in the model estimation on the basis of their reliability. Cronbach Alpha is mostly sensitive to the number of items on the scale and

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appears to underestimate internal consistency reliability in general. Values of 0.60 to 0.70 are thus considered satisfactory using composite reliability and values of 0.70 to 0.90 in more advanced research stages (Nunnally & Bernstein, 1994; Diamantopoulos, Sarstedt, Fuchs, Wilczynski, and Kaiser, 2012). From Table 11, composite reliability for the outer model ranged from 0.70 – 0.90, implying that the internal consistency of the constructs was ensured.

The external model validity has been evaluated. The convergent and discriminating validity of a structure is examined for validity. The degree to which the construct converges to describe the variance of its products is convergent validity (Hair et al., 2019). Average variance extracted (AVE) from each structure is 0.50 or higher, thus, convergent validity is supported. The AVE is the main average value of square loading of a group of indicators (Hair et al., 2014) and is similar to the communality of a construct. Simply put, an AVE of 0.50 implies that more than half of the variance of its indicators are explained by the build. Thus, from Table 11, AVE for the various constructs was all above the 0.50 threshold, hence convergent validity was ensured.

Table 11: Construct Reliability and Validity

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Firm size	0.859	0.863	0.904	0.703
PCLO	0.690	0.723	0.801	0.503
PEXEC	0.549	0.560	0.768	0.526
PINI	0.581	0.581	0.827	0.705
PPERF	0.831	0.845	0.876	0.542
PPLAN	0.579	0.596	0.775	0.535

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Type of project	1.000	1.000	1.000	1.000

Source: Field survey, (2020)

The degree to which in the structural model metrics of various constructs differ, i.e., the construct measures what needs to be measured, are defined by the discriminating validity. One way of determining whether discrimination exists is through the Fornell and Larcker (1981) criteria. This method indicates that constructs have more variance with their indicators than any other construct. The AVE of each construct must be higher than the highest square correlation with any other construct in order to test that requirement. The effects of the Fornell-Larcker Criterion are illuminated in Table 12 and the AVE of each construction exceeds the square.

Table 12: Fornell-Larcker Criterion

	Firm size	PCLO	PEXEC	PINI	PPERF	PPLAN	Type of project
Firm size	0.838						
PCLO	-0.343	0.709					
PEXEC	-0.221	0.447	0.725				
PINI	-0.260	0.309	0.324	0.840			
PPERF	0.503	-0.373	-0.507	-0.408	0.736		
PPLAN	-0.245	0.553	0.625	0.350	-0.579	0.732	
Type of project	-0.117	0.234	0.184	0.165	-0.178	0.348	1.000

Source: Field survey, (2020)

Nevertheless, recent research suggests that the Fornell-Larcker criteria are not sufficient for determining the validity of discriminants. According to Henseler et al. (2015), the Fornell-Larcker criterion doesn't work well when the loads on a construct indicator vary little. Hence the proposed relationship

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between heterotrait-monotrait (HTMT) by Voorhees et al. (2016). HTMT is the average value of the item correlations across the constructs in relation to the (geometric) average correlations of the objects that measure the same construct. Henseler et al. (2015) suggests a threshold value of 0.90 for structural models of constructs that are conceptually rather similar. Table 13 shows the HTMT values of the construct.

Table 13: Heterotrait-Monotrait Ratio (HTMT)

	Firm size	PCLO	PEXEC	PINI	PPERF	PPLAN	Type of project
Firm size							
PCLO	0.466						
PEXEC	0.346	0.719					
PINI	0.364	0.507	0.574				
PPERF	0.571	0.428	0.736	0.599			
PPLAN	0.338	0.803	1.105	0.606	0.789		
Type of project	0.158	0.271	0.259	0.216	0.185	0.419	

Source: Field survey, (2020)

Finally, multicollinearity issues were assessed. The variance inflation factor (VIF) is also used to measure the collinearity of the variables. VIF values 5 or higher show critical collinearity problems between indicators (Hair et al., 2014). Nevertheless, collinearity issues may also occur in the lower VIFs of 3-5 in accordance with Mason and Perreault (1991) and Becker et al. (2015). Table 14 shows the VIF values which are well below the threshold of 3 and hence, there were no issues of multicollinearity.

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Table 14: VIF

	PPERF
Firm size	1.171
PCLO	1.588
PEXEC	1.718
PINI	1.215
PPERF	
PPLAN	2.113
Type of project	1.148

Source: Field survey, (2020)

Assessing Structural Model (Outer model assessment)

The next step in evaluating results is to test the structural model if the measuring model is assessed satisfactorily. The coefficients (R^2), the cross-validated blindfolding redundancy measure Q^2, the impact size (f^2) and the statistical significance and significance of the direction coefficients were the basic evaluation parameters to be taken into account. R2 tests the variance explained in every endogenous constryct and thus measures the explaining power of the model (Shmueli & Koppius, 2011). It is 0 to 1, with higher values showing higher explanatory capacity. The values of the substantial, moderate and poor R^2 are 0.75, 0.50 and 0.25 as referenced, in Henseler et al. (2009) and Hair et al. (2011).

Table 15 shows the R-Squared value of 0.520 for the model. This implies 52% of the endogenous variable is explained by the exogenous variables, in effect, risk amounts to 52% of projects performance. Thus, when risk in the projects are not managed, issues such as project delay, spending over the budgeted cost, quality issues, client acceptability and others are the

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outcome. There is, therefore, a need for companies in the construction industry to establish strategies for risk response. Previous research (Banaitiene et al., 2011; Tadayon et al., 2012) has suggested that risk management is essential to the success of construction industry ventures.

The Q^2 value is measured in order to test the predictive precision of the PLS Path model (Geisser, 1974; Stone, 1974). This metric is based on an approach to blindfold, excluding the individual points of the data matrix and calculating the average of the removed points (Rigdon, 2014; Sarstedt et al., 2014). As such, Q^2 is not a prediction test outside of the sample, but incorporates out of sample prediction elements and explicative power within the sample (Shmueli et al., 2016; Sarstedt et al., 2017a). In the endogenous structure, Q^2 values should be higher than nil (Hair et al., 2019) to suggest that the structural model is predictively accurate for that structure. The PLS-path model's small, medium and large predictive relevance are represented in Q^2 values greater than 0, 0.25 and 0.50. A Q^2 of 0.257 was obtained from Table 15, suggesting a median predictive significance.

F^2 is frequently used to determine how the removal of some predictor construct, changes an endogenous construct's R^2 value. Therefore, the rank order of the predictor constructs when describing a depending construct in the structural model is always identical when comparing the size of the path coefficients with the effect sizes for f^2. Values greater than 0.02, 0.15 and 0.35 are, as a rule of thumb, small, medium and large f^2 effect sizes (Cohen, 1988). From Table 15, it can be seen that all exogenous variables had small effect each on the endogenous variable independently.

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Table 15: Explanatory Power of Exogenous variables

	R Square	Q Square	f Square
Firm size			0.234
PCLO			0.009
PEXEC			0.041
PINI			0.040
PPERF	0.520	0.257	
PPLAN			0.142
Type of project			0.002

Source: Field survey, (2020)

Finally, the path coefficient which represents the hypothesised relationships were assessed after running a bootstrapping to assess their significance. Table 16 shows the different relationships and their significance. Four relationships were tested with two variables controlled – firm size and type of project undertaken. Firm size had a significant positive effect (Beta = 0.362, $p \leq 0.05$) on project performance. This implies that the higher the experience of the firm in managing risk with adequate resources, the higher performance of projects. The type of projects construction firms undertook did not have any effect on the risk and its effect on project performance.

Risk occurring in the various phases of the project lifecycle of construction projects; starting the project (Project Initiation – PINI), organising and preparing the work (Project Planning – PPLAN), carrying out the work (Project Execution - PEXEC) and closing the project (Project Closure – PCLO) were assessed to test their effect on project performance (PPERF). Three phases in the project lifecycle had a risk that affected project performance negatively.

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Project Initiation Risks on Project Performance

Research objective four focused on the effect of project initiation risks on project performance. The study hypothesised (H_1) that: risks at the project initiation phase significantly influence the project performance of the construction industry in Ghana negatively. The outcome of Table 16 showed that risks emerging during the implementation of projects had a substantial negative impact on project performance ($\beta = -0.153$; $t = 1.996$; $p < 0.05$). This is because 1.996, which is greater than 1.96, was the model's t-stat. As such, the outcome's course was in line with the hypothesis. The research discovered a negative association between exogenous and endogenous variables from the beta. This means that a risk increase in the unit at the initiation stage of the project will lead to a 15.3 per cent decrease in project performance. This means that the risks that occur at the start of the project play a key role in the construction industry's project performance.

At the start of a project, more things are unknown, according to Darnall and Preston (2010), thus risk in the initiation process must be taken into account and balanced against the possible value of the performance of the project to determine if the project should be selected. The study’s result has been supported by the theory of constraints. The theory posits that the construction industry could be exposed to various constraints during the project lifecycle which could only be addressed when appropriate strategies are implemented (Goldratt, 1990). This means that the firms studied can overcome risks at the project initiation phase by adopting relevant strategies to respond to them.

The results are also consistent with previous studies like Elkington and Sallman (2002); Raz et al. (2002) and Westland (2007), Who in the risk

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management process has found that, the conceptualization phase is the most important. Therefore, it could be argued that the identification and management of risks at the initiation stage plays a crucial role in increasing the project performance of construction companies around the world, including those in Ghana.

Project Planning Risks on Project Performance

Objective five of the research centred on the effect on project performance of project planning risk. The hypothesis (H_2) was that risks significantly negatively affect the project performance of construction firms within the selected metropolises in Ghana during the project planning process. The outcome of Table 16 showed that risks had a major negative impact on project performance during the project planning process ($\beta = -0.380$; $t = 4.332$; $p < 0.05$). This is because the t-stats of 4.332 was > 1.96. As such, the direction of the result was in line with the directional hypothesis. Hence, the hypothesis that "there is a significant negative effect of risks at the project planning phase on project performance of the construction industry" was supported.

The outcome of the analysis is an indicator that a unit rise in the risks at the project planning stage would lead to a 38.0 per cent decrease in the project results of the companies studied). This implies that the project performance of the construction industry improves when the appropriate responses are implanted to reduce or eliminate these risks. The project planning phase plays a vital in the project lifecycle as it enables firms to plan for every aspect of the project lifecycle. Proper planning and appropriate risk responses implemented in this phase can improve the performance of projects in the construction industry.

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The planning process in project management is a crucial one according to Pinto and Slevin (1987) and Turner (2008). Everything in the project is planned for at the project planning phase and hence, the risk that emerges in that phase has a higher effect on project performance as equated to the other phases in the project lifecycle. Goldratt (1990) posited that in every system there is a limiting factor which hinders the achievement of organisational goals. This is what is seen in this finding – how the risks occurring in this phase decreasing the general performance of projects in the construction industry.

A study conducted by Lyons and Skitmore (2002) proves that the most common use of risk management is to plan the stage. This is because threats are established for each large group of activities until the project is approved and it moves into the planning stage. To define growing levels of comprehensive risk analysis, a risk breakdown structure (RBS) may be used. Furthermore, Westland (2007) posits that this stage in the project lifecycle attempts to minimize risk before the implementation phase, when no action is taken in advance, any risk arising is very expensive. Thus, a critical phase in the project lifecycle.

Project Execution Risks on Project Performance

In terms of the sixth research objective on the effect of project execution risk on the project performance of the construction industry, the analysis concluded that there is a significant negative effect on the project performance of the construction industry during the project execution phase. From Table 16, the path coefficient between project execution risks and project performance ($\beta = -0.183$) was significant at 5% sig. level with a t-stat of $2.026 > 1.96$ ($p = 0.043 < 0.05$). The H_3 was, therefore, supported indicating that a unit increase in

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project execution risk will cause a decrease in project performance by 18.3%. This implies that how projects are executed or how work is done in the project executed phase can increase or decrease the general performance of projects in the construction industry.

According to Darnall and Preston (2010), the project team gets more information as the project progresses and the overall risk for the project usually decreases as operations are carried out without fail. Hence, risks in this phase though have a negative effect on project performance is far lower than that of the planning phase. According to the theory of constraints, the firms studied, project performance of the firms will decrease due to the constraints (risks) that are likely to arise in the project execution phase (Goldratt, 1990).

This result corresponds to the Lyons and Skitmore (2002) study, which concluded that planning and implementation are the two most frequently used steps in risk management. Smith et al. (2014) also described that risk management during the execution phase is of great importance. This phase is because more emphasis is placed on controlling and monitoring work processes. These findings are clear indications that risk identification and management is vital to project performance construction firms across the globe including Ghana.

Project Closure Risks on Project Performance

Contrary to the previous findings, the fourth hypothesis that there is a significant negative effect of risks at the project execution phase on project performance of the construction industry was not supported. This is because, the result had a t-stat value of 0.865 which was less than 1.96 ($\beta = 0.082$; $p > 0.5$). Thus, the study rejected H_4. This means that a unit increase in project

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closure risks will not cause any change in the project performance of the firms studied. This implies that risks at the project closure phase do not play any significant role in determining the project performance of the construction firms within the metropolises understudy.

This implies that during the project closure, likely risks that arise in that phase do not have any significant effect on the project performance. It is because major risks that could affect the project performance do not normally occur in this phase. Studies such as Westland (2006) have shown that the entire project is summarised at project close and the objectives, benefits and achievements of the project are assessed. All parties have therefore an opportunity to list all activities or risks that have not been fully managed throughout the project. These unmanaged risks can be discussed and used for future projects as a warning. Hence, the reason risks in this phase do not have a significant effect on the performance of the project.

Table 16: Path Co-efficient

	Original Sample	Sample Mean	T Statistics	P Values	Decision
PINI -> PPERF	-0.153	-0.143	1.996	0.047	Accepted
PPLAN -> PPERF	-0.380	-0.372	4.332	0.000	Accepted
PEXEC -> PPERF	-0.183	-0.183	2.026	0.043	Accepted
PCLO -> PPERF	0.082	0.050	0.865	0.387	Rejected
Firm size -> PPERF	0.362	0.363	4.838	0.000	Accepted
Type of project -> PPERF	0.036	0.040	0.614	0.539	Rejected

Source: Field survey, (2020).

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Chapter Summary

This chapter provided the findings and discussions as pertaining to the results. In the first objective, risk was found to be perceived in three different forms by the construction industry. A formal risk identification and analysis was not followed in the construction industry. The third objective found that risk reduction strategies were the most preferred way of responding to risk. Risk in the project lifecycle was found to have a negative effect in all phases of the project lifecycle with the exception of the project closure phase. Risks in this phase had no effect on project performance.

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CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This chapter provides a review of the results of the different study objectives, conclusions and policy consideration recommendations, as well as suggestions for further research.

Summary

The research aimed to reveal literature in the construction industry on risk management. The study aimed to assess the impact of risk management on the Ghanaian construction industry's project results. The study specifically examined the following research objectives:

1. assess the risk perception by the construction industry
2. examine the risk inherent in the construction industry
3. assess how the construction industry respond to risk
4. analyse the effect of risks at the project initiation phase on project performance in the construction industry
5. analyse the effect of risks at the project planning phase on the project performance in the construction industry
6. assess the effect of risks at the project execution phase on project performance in the construction industry
7. assess the effect of risks at the project closure phase on project performance in the construction industry

The study used interviews and two hypotheses to help achieve the research objectives. The study adopted the pragmatist philosophy thus relying on both quantitative and qualitative method using the exploratory sequential

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design. From extensive reviews of previous studies data gathered from Ghana's construction firms were developed a semi-structured interview guide and structured questionnaire. One hundred and seven (107) valid responses were used for data processing using the basic random sampling and purposeful sampling process. Using IBM SPSS Statistics (version 26) and SmartPLS (version 3) tools, the data was then processed. To fix problems in the report, both descriptive and inferential statistics were used.

More specifically, frequencies and percentages were used to evaluate the respondents' socio-demographic data. Risk in the industry, on the other hand, was defined using means, standard deviations, skewness and statistics on kurtosis. Thematic analysis was used for the analysis of interview data and the technique of structural equation modelling of partial least squares was used for hypothesis testing. The significance test was based on the premise that the t-statistics should be higher than 1.96 and thus have a p-value < 0.05. The key results of the analysis concerning the research objectives were finally discussed in this section.

In relation to the first research objective, the analysis found that risk is considered to be negative in the construction industry, even though in principle it can have two dimensions. Thus, risk affected project activities and project performance negatively. The second objective assessed the risk inherent in the construction industry looking at the process of risk identification to risk analysis. Major methods of risk identification were brainstorming, past experience from other projects and lessons learnt. This was found in the interviews conducted. Also, several risks were discovered to be faced by the

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construction industry. Chief among them was financial risk, then followed by human risks, weather conditions, resource risk, logistic risk and safety issues.

Next, how risk was categorised by the construction industry was assessed. The study found that risk was classified based on the severity of the risk as well as how the risk looks like (nature of the risk). The study also found that risks identified were documented in memos, reports and minutes rather than a risk register. Additionally, the industry had a system of communication for risk identified in the course of executing one’s duties. Furthermore, the risk threshold in the industry was assessed based on the impact of the risk on the project and the capability of a construction firm to handle a project. Finally, the second objective looked at the industry analysed risk. The study found that qualitative means of risk analysis was commonly employed by the industry for risk analysis while some had no clear-cut policy on risk in their organisations.

The third research objective focused on examining how the construction industry responded to the risk they identify. The study found several risk response strategies used by the industry to manage risk. However, risk reduction response strategies were found to be the most profound strategy used by the industry. Others such as risk-sharing, risk transfer, risk acceptance and risk avoidance were also used to handle some other risks depending on the impact of the risk on the project. This suggests that how risk was generally referred to in the industry was to put measures in place to minimize either the effect or the likelihood of the risk.

The study found that the project initiation risk had a negative impact on the project output of construction firms in Ghana in relation to the fourth research objective. This means that how well the risk in this phase is identified

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and handled plays significant roles in improving the project performance levels of the firms studied. The result implies that the firms in the construction industry should not underplay risks that emerge when projects are conceptualised, because they invariably have a damaging effect of project performances.

The study also looked at the impact of the risk of project planning on project performance in the construction industry in Ghana. The result showed that risks that exist in this process have a substantial negative impact on the company's project output levels. This means that, at this point, a unit risk increase leads to a decrease in the project output of the studied firms. As such, this point in the life cycle of the project is a very significant stage. . This is because, this phase is where planning for the whole project takes place, thus risks in this phase have a higher effect on project performance if not well identified and responded to.

In relation to the sixth research objective, the risk occurring at the project execution stage was found to have a negative effect on the project performance of construction firms. This implies that early identification and response to risk in this phase is effective in improving the project performance levels of the firms studied. This means that though the risk in the planning stage can be well identified and responded to, caution should be taken when undertaking this phase since risks in this phase have damaging consequences on project performance.

The last research objective focused on exploring the effect of the risk of project closure on the construction industry in Ghana. The study found no significant effect on the project performance of the companies surveyed on the

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risks that arise in this step of the project life cycle. This means that, in this process, a unit risk increase does not result in any significant decrease in project performance.

Conclusions

The study aimed at examining the effect of risk management on project performance in the Ghanaian construction industry. Consequently, the following conclusions were based on the main findings of the study.

For the first research objective, the study concluded that anything that hampered the work of employees in the course of undertaking a project is seen as a risk in the construction industry. This is risk is seen as having gating consequences when undertaking projects. In addition, previous empirical studies have largely supported the results by demonstrating that risk does have adverse impacts.

In terms of the second research objective, the result had practical implications for the management of firms in the construction industry. The result implies that firms in the industry used brainstorming and past experience as primary tools for risk identification and the risk was just noted down in memos, reports and minutes without further descriptions. Also, analysis of was scantily done. The study provided empirical evidence limited knowledge of the firms in the industry had on risk management. The study, therefore, concluded that firms in the construction industry had limited knowledge on the process of risk identification right to risk analysis.

For the third objective, the risk reduction was found to be the most prominent way of managing risks by the firms studied. This result also had practical implications for management of Ghanaian construction firms. The

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study practically implies that construction firms should not only put measures in place to reduce the impact of the risk but should also put measures in place to reduce the probability of the risk occurring. This is because, some when risk impact is reduced, there will still be a little effect on the project. Thus, management should consider reducing the probability of the risk occurring as well as reducing the impact of the risk. On this note, the study concluded that firms in the construction industry emphasising on the reducing the impact of risk alone at the detriment of reducing the probability of the risk is not a complete way of handling risk.

For the fourth research objective, the study's result practically implies that management of the construction firms should consider the identifying and managing risks in this phase. This is likely to increase project performance, when risks identified are responded to appropriately. Previous empirical studies have largely supported the outcome by stating that companies that prioritise proper risk management will further improve their project performance level. The study concluded that management should start a risk management process immediately the project is initiated or conceptualised.

In terms of the fifth research objective, the result had practical implications for the management of the construction industry. This result indicates that the management of the companies studied should take project planning phase into consideration as one of the main aspects of the project life cycle. Planning well could invariably enable management to complete projects on budget, time and with the appropriate quality. The study provided empirical evidence that the implementation of planning is likely to improve project performance. The study, therefore, concluded that identifying and responding

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to risk in the planning phase has a large propensity of increasing project performance by a huge margin.

In terms of the sixth research objective, the study revealed that risks at the project execution phase have a negative significant effect on the project performance of construction firms. The practical implication of this finding is that management should emphasise on developing and strengthening risk management in this phase as well as the planning phase. This is because the risk management process will help identify and manage risk emanating from the phase and invariably increase project performances. This finding has been supported by existing related literature by indicating that firms that focus on risks occurring in the planning and execution phase to improve their project performance.

For the last objective, risk at project closure was found to have no significant effect on the project performance of the firms studied. This result also had practical implications for the management of the construction firms. The study practically implies that management should not put much emphasis on risk occurring in this phase, but should still monitor them. This is because, some contextual factors including the nature of the project, environment of the project and others could affect risks in this phase. Thus, management should consider monitoring risks in these phases to prevent them from escalating and having a damaging effect on project performance. On this note, the study concluded that the risk in this phase does not have an effect on project performance.

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Recommendations

The following recommendations are taken based on the study results and conclusions made hereby. The study recommended that risk education or training should be organised by firms in the construction industry for all employees that handle risk to improve their knowledge on risk. This will help improve the perception the industry has about risk. Since risk can be both a threat and an opportunity. Previous literature has proved that the more knowledge one has on risk, it improves the perception and manageability of the risk.

The study also recommended that the management of the firms studied should develop policies on risk management and strengthen their knowledge of risk management through constant training and workshops. This can be successfully achieved by instilling a risk culture in the organisation which is supported by all levels of the management. This would enable the firms in the construction industry to easily identify risk and analyse to assess which one to prioritise and which one to monitor.

The study further recommended that the management of the firms studied should place more emphasis on reducing the probability of the risk occurring and other risk response strategies when managing risk. Management should, therefore, adopt and invest in risk response strategies that are best suited to handle a particular risk.

It is recommended that management should start the risk management process immediately a project is initiated. Thus, immediately a project is conceptualised, the construction industries should start the risk management process. Management of construction firms should have proper project

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planning. This is because project planning is the basis for all activities in the project lifecycle. Everything that will be carried out depends on the plans made at the project planning phase. Thus, effective project planning provides a basis for every aspect of the project including risk management process and the success of the project depends on the initial plans made at the planning phase.

Also, management should emphasize on developing and strengthening risk management in the project execution phase so as to strengthen the process started at the conceptualisation phase. Risks in the project closure phase should be monitored even though they do not have any effect on project performance. This is because there is a likelihood of escalation of these risks when triggered by other factors.

Suggestions for Further Research

The study focused on the risk management process in the Ghanaian building industry and its impact on project performance in the industry. Further research may therefore cover other countries with the use of a qualitative data collection method, in particular in developing economies. This will enhance existing knowledge and help generalise results.

The study was also confined to the project performance aspect of the overall business performance of the companies. Therefore, further research may be undertaken to explore other dimensions of performance, including financial, market and sustainable performance. This contributes to the extension of existing knowledge about how risk management affects other dimensions of business performance in the building industry. Also, risk responses and their effect on the project and firm performance can be assessed as well as the mediating effect of responses on performance.

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REFERENCES

Abd Karim, N. A., Rahman, I. A., Memmon, A. H., Jamil, N., & Azis, A. A. A. (2012, December). Significant risk factors in construction projects: Contractor's perception. In *2012 IEEE Colloquium on Humanities, Science and Engineering (CHUSER)* (pp. 347-350). IEEE.

Abdou, O. A. (1996). Managing construction risks. *Journal of Architectural Engineering*, *2*(1), 3-10.

Abdul-Rahman, H., Wang, C., & Mohamad, F. S. (2015). Implementation of risk management in Malaysian construction industry: Case studies. *Journal of Construction Engineering*, *2015*, 1-6.

Adams, F. K. (2006). Expert elicitation and Bayesian analysis of construction contract risks: An investigation. *Construction Management and Economics*, *24*(1), 81-96.

Adams, F. K. (2008). Risk perception and Bayesian analysis of international construction contract risks: The case of payment delays in a developing economy. *International Journal of Project Management*, *26*(2), 138-148.

Adu Gyamfi, T., Zievie, P., & Boateng, V. (2016). Risk management of procurement challenges: The implication to construction firms in Ghana. *American Journal of Engineering Research (AJER)*, *5*(8), 168-172

Agyakwa-Baah, A., Chileshe, N., & Stephenson, P. (2010). *A risk assessment and management framework to support project delivery* (Doctoral dissertation). National Technical University of Athens.

Digitized by Sam Jonah Library

Ahiaga-Dagbui, D. D., Fugar, F. D., McCarter, J. W., & Adinyira, E. (2011). Potential risks to international joint ventures in developing economies: The Ghanaian construction industry experience. In Uwakweh, B.O. (Ed) *Proceedings of the CIBW 107 conference on innovation and sustainable construction in developing countries*. Hanoi Vietnam, 191-196

Ahmed, A., Kayis, B., & Amornsawadwatana, S. (2007). A review of techniques for risk management in projects. *Benchmarking: An International Journal*, *14*(1), 22-36

Akintoye, A. S., & MacLeod, M. J. (1997). Risk analysis and management in construction. *International Journal of Project Management*, *15*(1), 31-38.

Alaghbari, W. E., Kadir, M. R. A., & Salim, A. (2007). The significant factors causing delay of building construction projects in Malaysia. *Engineering, Construction and Architectural Management*, *4*(2), 192-206

Al-Bahar, J. F., & Crandall, K. C. (1990). Systematic risk management approach for construction projects. *Journal of Construction Engineering and Management*, *116*(3), 533-546.

Algahtany, M., Alhammadi, Y., & Kashiwagi, D. (2016). Introducing a new risk management model to the Saudi Arabian construction industry. *Procedia Engineering*, *145*, 940-947.

Alston, A. J., & Miller, W. W. (2001). Instructional technology utilization and availability in North Carolina and Virginia secondary agricultural education programs. *Journal of Southern Agricultural Education Research*, *51*(1).

Digitized by Sam Jonah Library

©University of Cape Coast https://ir.ucc.edu.gh/xmlui

Alsulamy, S., Wamuziri, S., & Taylor, M. (2012, September). Evaluation of key metrics for measurement of project performance. In *28th Annual ARCOM Conference* (pp. 3-5).

Amoah, P., Ahadzie, D. K., & Dansoh, A. (2011). The factors affecting construction performance in Ghana: the perspective of small-scale building contractors. *The Ghana Surveyor*, 41-48.

Amponsah, R. (2013). *The real project failure factors and the effect of culture on project management in Ghana: Ghana Institute of Management and Public Administration (GIMPA), Accra.* ICBE-RF Research Report No. 45/12

Anderson, D. R., & Anderson, K. E. (2009). Sustainability risk management. *Risk Management and Insurance Review*, *12*(1), 25.

Arikan, R., Dağdeviren, M., & Kurt, M. (2013). A fuzzy multi-attribute decision making model for strategic risk assessment. *International Journal of Computational Intelligence Systems*, *6*(3), 487-502.

Arnold J (2009) *Risk: An introduction*. Polity Press

Artto, K. A., & Kähkönen, K. (1998). *Managing risks in projects*. Taylor & Francis

Assaf, S. A., & Al-Hejji, S. (2006). Causes of delay in large construction projects. *International Journal of Project Management*, *24*(4), 349-357.

Asseman, A., Aloraidi, N. A., Salim, M., Rezk, E., Dawoud, H., Alkhuzaei, N. N., ... & Bouras, A. (2014). Software project management: Theory of constraints, risk management, and performance evaluation. *The Journal of Modern Project Management*, *2*(1).

Digitized by Sam Jonah Library

©University of Cape Coast https://ir.ucc.edu.gh/xmlui

Aven, T., & Renn, O. (2009). On risk defined as an event where the outcome is uncertain. *Journal of Risk Research*, *12*(1), 1-11.

Ayarkwa, J., Dansoh, A., & Amoah, P. (2010). Barriers to implementation of EMS in construction industry in Ghana. *International Journal of Engineering Science*, *2*(4), 37-45.

Baccarini, D., & Archer, R. (2001). The risk ranking of projects: a methodology. *International Journal of Project Management*, *19*(3), 139-145.

Bajaj, D., Oluwoye, J., & Lenard, D. (1997). An analysis of contractors' approaches to risk identification in New South Wales, Australia. *Construction Management & Economics*, *15*(4), 363-369.

Baloi, D., & Price, A. D. (2003). Modelling global risk factors affecting construction cost performance. *International Journal of Project Management*, *21*(4), 261-269.

Banaitienė, N., Banaitis, A., & Norkus, A. (2011). Risk management in projects: peculiarities of Lithuanian construction companies. *International Journal of Strategic Property Management*, *15*(1), 60-73.

Barkley, B. (2004). *Project risk management*. McGraw Hill Professional.

Barlish, K., Marco, D. & Thaheem, A. (2013). Construction risk taxonomy: An international convergence of academic and industry perspectives. *American Journal of Applied Sciences*, *10*(7), 706- 713.

Beatham, S. (2003). *Development of an integrated business improvement system for construction* (Doctoral dissertation). Loughborough University.

Digitized by Sam Jonah Library

Becker, J. M., Ringle, C. M., Sarstedt, M., & Völckner, F. (2015). How collinearity affects mixture regression results. *Marketing Letters*, *26*(4), 643-659.

Bhimani, A. (2009). Risk management, corporate governance and management accounting: Emerging interdependencies. *Management Accounting Research*, *20*, 2-5

Billiet, P. (2010). Risk management of exogenous risks in an acquisition: The buyer's perspective on the target's decrease of value. *IUP Journal of Risk & Insurance*, *7*(3).

Black, K. (2019). *Business statistics: for contemporary decision making*. John Wiley & Sons.

Boateng, A. A., & Boateng, G. O. (2014). An appraisal of risk management practices of microfinance institutions in Ghana. *Journal of Economics and Sustainable Development*, *5*(6).

Brun, W., Wolff, K., & Larsen, S. (2011). Tourist worries after terrorist attacks: Report from a field experiment. *Scandinavian Journal of Hospitality and Tourism*, *11*(3), 387-394.

Bryde, D. J., & Brown, D. (2004). The influence of a project performance measurement system on the success of a contract for maintaining motorways and trunk roads. *Project Management Journal*, *35*(4), 57-65.

Carrero, R., Malvárez, G., Navas, F., & Tejada, M. (2009). Negative impacts of abandoned urbanisation projects in the Spanish coast and its regulation in the Law. *Journal of Coastal Research*, 1120-1124.

Cerić, A. (2003). *A framework for process-driven risk management in construction projects* (Doctoral dissertation), University of Salford.

Digitized by Sam Jonah Library

©University of Cape Coast https://ir.ucc.edu.gh/xmlui

Chan, A. P., & Chan, D. W. (2004). Developing a benchmark model for project construction time performance in Hong Kong. *Building and Environment*, *39*(3), 339-349.

Chan, A. P., Yeung, J. F., Yu, C. C., Wang, S. Q., & Ke, Y. (2011). Empirical study of risk assessment and allocation of public-private partnership projects in China. *Journal of Management in Engineering*, *27*(3), 136-148.

Chan, D. W., & Kumaraswamy, M. M. (2002). Compressing construction durations: lessons learned from Hong Kong building projects. *International Journal of Project Management*, *20*(1), 23-35.

Chapman, C. B., & Ward, S. C. (1997). Managing risk management processes: navigating a multidimensional space. *Managing Risks in Projects*, 109-118.

Chapman, R. J. (1998). The effectiveness of working group risk identification and assessment techniques. *International Journal of Project Management*, *16*(6), 333-343.

Chapman, R. J. (2001). The controlling influences on effective risk identification and assessment for construction design management. *International Journal of Project Management*, *19*(3), 147-160.

Cheung, S. O., Cheung, K. K., & Suen, H. C. (2004). CSHM: Web-based safety and health monitoring system for construction management. *Journal of Safety Research*, *35*(2), 159-170.

Digitized by Sam Jonah Library

©University of Cape Coast https://ir.ucc.edu.gh/xmlui

Choffray, J. M., & Johnston, P. E. (1979). Measuring perceived pre-purchase risk for a new industrial product. *Industrial Marketing Management, 8*(4), 333-340.

Choudhry, R. M., & Iqbal, K. (2013). Identification of risk management system in construction industry in Pakistan. *Journal of Management in Engineering*, *29*(1), 42-49.

Cohen, J. (1988). *Statistical power analysis for the behavioural sciences.* Hillsdale, NJ: Laurence Erlbaum Associates.

Cohen, J. (1992). Statistical power analysis. *Current Directions in Psychological Science*, *1*(3), 98-101.

Cooper, D. R., & Schindler, P. S. (2014). *Business research methods*. McGraw-Hill.

Creswell, J. A. (1998). Five qualitative traditions of inquiry. In *Qualitative inquiry and research design. Choosing among five traditions*, 47-72.

Creswell, J. W. (2003). A framework for design. In *Research design: Qualitative, quantitative, and mixed methods approaches*, 9-11.

Creswell, J. W. (2014). *A concise introduction to mixed methods research*. SAGE publications.

Creswell, J. W., & Clark, V. L. P. (2017). *Designing and conducting mixed methods research*. Sage publications.

Creswell, J. W., Klassen, A. C., Plano Clark, V. L., & Smith, K. C. (2011). Best practices for mixed methods research in the health sciences. *Bethesda (Maryland): National Institutes of Health*, *2013*, 541-545.

Cronbach, L. J., & Meehl, P. E. (1955). Construct validity in psychological tests. *Psychological Bulletin*, *52*(4), 281.

Digitized by Sam Jonah Library

©University of Cape Coast https://ir.ucc.edu.gh/xmlui

Dada, J. O., & Jagboro, G. O. (2007). An evaluation of the impact of risk on project cost overrun in the Nigerian construction industry. *Journal of Financial Management of Property and Construction*, *12*(1), 37-44.

Dadzie, J., Abdul-Aziz, A. R., & Kwame, A. (2012). Performance of consultants on government projects in Ghana: client and contractor perspective. *International Journal of Business and Social Research*, *2*(6), 256-267.

Dansoh, A. (2005). Strategic planning practice of construction firms in Ghana. *Construction Management and Economics*, *23*(2), 163-168.

Darnall, R., & Preston, J. (2010). *Project management from simple to complex*. Flat World knowledge.

De Bakker, K., Boonstra, A., & Wortmann, H. (2010). Does risk management contribute to IT project success? A meta-analysis of empirical evidence. *International Journal of Project Management*, *28*(5), 493-503.

de Bakker, K., Boonstra, A., & Wortmann, H. (2012). Risk managements' communicative effects influencing IT project success. *International Journal of Project Management*, *30*(4), 444-457.

Del Cano, A., & de la Cruz, M. P. (2002). Integrated methodology for project risk management. *Journal of Construction Engineering and Management*, *128*(6), 473-485.

Delbecq, A. L., & Van de Ven, A. H. (1971). A group process model for problem identification and program planning. *The Journal of Applied Behavioral Science*, *7*(4), 466-492.

Digitized by Sam Jonah Library

Diamantopoulos, A., Sarstedt, M., Fuchs, C., Wilczynski, P., & Kaiser, S. (2012). Guidelines for choosing between multi-item and single-item scales for construct measurement: a predictive validity perspective. *Journal of the Academy of Marketing Science*, *40*(3), 434-449.

Dogbegah, R., Omoteso, K., & Owusu-Manu, D. (2013). A qual-quant (Q^ sup 2^) method for exploring and appraising project management competency requirements for managing large projects in Ghana. *International Journal of Construction Project Management*, *5*(2), 135.

Douglas, M. (1978). *Cultural bias* (No. 35). London: Royal Anthropological Institute.

Dwivedula, R., & Bredillet, C. N. (2010). The relationship between organizational and professional commitment in the case of project workers: Implications for project management. *Project Management Journal*, *41*(4), 79-88.

Elkington, P., & Smallman, C. (2002). Managing project risks: A case study from the utilities sector. *International Journal of Project Management*, *20*(1), 49-57.

El-Sayegh, S. M. (2008). Risk assessment and allocation in the UAE construction industry. *International Journal of Project Management*, *26*(4), 431-438.

Endut, I. R., Akintoye, A., & Kelly, J. (2009). *Cost and time overruns of projects in Malaysia*. Retrieved on August, *21*, 243-252.

Digitized by Sam Jonah Library

©University of Cape Coast https://ir.ucc.edu.gh/xmlui

Enshassi, A., Choudhry, R. M., Mayer, P. E., & Shoman, Y. (2008). Safety performance of subcontractors in the Palestinian construction industry. *Journal of Construction in Developing Countries*, *13*(1).

Eskandari, H., & Korouzhdeh, T. (2016). Cost optimization and sensitivity analysis of composite beams. *Civil Engineering Journal*, *2*(2), 52-62.

Esmaeili, B., Hallowell, M. R., & Rajagopalan, B. (2015). Attribute-based safety risk assessment. II: Predicting safety outcomes using generalized linear models. *Journal of Construction Engineering and Management*, *141*(8), 04015022.

Eyiah, A. K., & Cook, P. (2003). Financing small and medium-scale contractors in developing countries: A Ghana case study. *Construction Management and Economics*, *21*(4), 357-367.

Fabian, C., & Amir, A. (2011). The Chad-Cameroon pipeline project – assessing the world bank's failed experiment to direct oil revenues towards the poor. *The Law and Development Review*, *4*(1), 32-65.

Fadun, O. S., & Saka, S. T. (2018). Risk management in the construction industry: Analysis of critical success factors (CSFS) of construction projects in Nigeria. *International Journal of Development and Management Review*, *13*(1).

Fan, Y., & Stevenson, M. (2018). A review of supply chain risk management: definition, theory, and research agenda. *International Journal of Physical Distribution & Logistics Management*, *48*(3), 205-230.

Fatemi, A., & Glaum, M. (2000). Risk management practices of German firms. *Managerial Finance*, *26*(3), 1-17.

Digitized by Sam Jonah Library

©University of Cape Coast https://ir.ucc.edu.gh/xmlui

Feilzer, Y. M. (2010). Doing mixed methods research pragmatically: Implications for the rediscovery of pragmatism as a research paradigm. *Journal of Mixed Methods Research*, *4*(1), 6-16.

Fetters, M. D., Curry, L. A., & Creswell, J. W. (2013). Achieving integration in mixed methods designs—principles and practices. *Health Services Research*, *48*(2), 2134-2156.

Flanagan, R., Norman, G., & Chapman, R. (2006). *Risk management and construction* (2nd ed.). Oxford: Blackwell Pub.

Foray Jnr., J. (2019, November). *Road Accidents: The case of Ghana, causes, solutions and lessons for Africa.* Retrieved from http://africanreality.over-blog.net/2019/11/road-accidents-the-case-of-ghana.causes-solutions-and-lessons-for-africa.html

Forbes, D., Smith, S., & Horner, M. (2008). Tools for selecting appropriate risk management techniques in the built environment. *Construction Management and economics*, *26*(11), 1241-1250.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, *18*(1), 39-50.

Froot, K. A. (1993). *Currency hedging over long horizons* (No. w4355). National Bureau of Economic Research.

Geisser, S. (1974). A predictive approach to the random effect model. *Biometrika*, *61*(1), 101-107.

Ghasemi, F., Sari, M. H. M., Yousefi, V., Falsafi, R., & Tamošaitienė, J. (2018). Project portfolio risk identification and analysis, considering project risk interactions and using Bayesian networks. *Sustainability*, *10*(5), 1609.

Digitized by Sam Jonah Library

©University of Cape Coast https://ir.ucc.edu.gh/xmlui

Ghoddousi, P., & Hosseini, M. R. (2012). A survey of the factors affecting the productivity of construction projects in Iran. *Technological and Economic Development of Economy*, *18*(1), 99-116.

Ghosh, S., & Jintanapakanont, J. (2004). Identifying and assessing the critical risk factors in an underground rail project in Thailand: a factor analysis approach. *International Journal of Project Management*, *22*(8), 633-643.

Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory: strategies for qualitative research*. New York NY: Aldine de Gruyter.

Goh, C. S., & Abdul-Rahman, H. (2013). The identification and management of major risks in the Malaysian construction industry. *Journal of Construction in Developing Countries*, *18*(1), 19.

Goldratt, E. M. (1990). *Theory of constraints* (pp. 1-159). Croton-on-Hudson: North River.

Goldratt, E. M., & Cox, J. (1984). *The goal: Excellence in manufacturing*. North River Press.

Goodhue, D. L., Lewis, W., & Thompson, R. (2012). Does PLS have advantages for small sample size or non-normal data? *MIS Quarterly*, 981-1001.

Grefen, P., Pernici, B., & Sánchez, G. (Eds.). (2012). *Database support for workflow management: The WIDE project* (Vol. 491). Springer Science & Business Media.

Habibnezhad, M., Fardhosseini, S., Vahed, A. M., Esmaeili, B., & Dodd, M. D. (2016, January). The relationship between construction workers' risk

Digitized by Sam Jonah Library

©University of Cape Coast https://ir.ucc.edu.gh/xmlui

perception and eye movement in hazard identification. In *ConstructionR Research Congress* (pp. 2984-2994).

Hair Jr, J. F., Sarstedt, M., Ringle, C. M., & Gudergan, S. P. (2017). *Advanced issues in partial least squares structural equation modeling*. SAGE publications.

Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., & Thiele, K. O. (2017). Mirror, mirror on the wall: A comparative evaluation of composite-based structural equation modeling methods. *Journal of the Academy of Marketing Science*, *45*(5), 616-632.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing Theory and Practice*, *19*(2), 139-152.

Hair, J. F., Sarstedt, M., Pieper, T. M., & Ringle, C. M. (2012). The use of partial least squares structural equation modeling in strategic management research: a review of past practices and recommendations for future applications. *Long Range Planning*, *45*(5-6), 320-340.

Hallowell, M. (2010). Safety risk perception in construction companies in the Pacific Northwest of the USA. *Construction Management and Economics*, *28*(4), 403-413.

Hameed, A., & Woo, S. (2007). Risk importance and allocation in the Pakistan Construction Industry: A contractors' perspective. *KSCE Journal of Civil Engineering*, *11*(2), 73-80.

Hammond, D. (2018). Where next for community engagement? *Public Sector*, *41*(4), 4.

Digitized by Sam Jonah Library

©University of Cape Coast https://ir.ucc.edu.gh/xmlui

Han, W. M., & Huang, S. J. (2007). An empirical analysis of risk components and performance on software projects. *Journal of Systems and Software*, *80*(1), 42-50.

Hanna, A. S., Thomas, G., & Swanson, J. R. (2013). Construction risk identification and allocation: Cooperative approach. *Journal of Construction Engineering and Management*, *139*(9), 1098-1107.

Hansen, G. S., & Wernerfelt, B. (1989). Determinants of firm performance: The relative importance of economic and organizational factors. *Strategic Management Journal*, *10*(5), 399-411.

Haseeb, M., Bibi, A., Qureshi, Q. A., & Khan, I. (2014). Analysis, Perception and Aspects of Risk Management in the Construction Sector of Pakistan. *European Journal of Business and Management*, *6*(20), 126-138.

Hayes, R. W., Perry, J. G., & Thompson, P. A. (1983). Management contracting. *CIRIA Report*, *100*.

Hayes, R., Perry, J., & Thompson, J. (1986). *Risk Management in engineering construction: a guide to project risk analysis and risk management*. London: Thomas Telforf.

Heeks, R. (2002). Information systems and developing countries: Failure, success, and local improvisations. *The Information Society*, *18*(2), 101-112.

Heeks, R. (2005). E-government as a carrier of context. *Journal of Public Policy*, *25*(1), 51-74.

Digitized by Sam Jonah Library

©University of Cape Coast https://ir.ucc.edu.gh/xmlui

Heeks, R. (2006). Health information systems: Failure, success and improvisation. *International Journal of Medical Informatics*, *75*(2), 125-137.

Hendrickson, D. (1998). Humanitarian Action in Protracted Crises: The New Relief 'Agenda' and Its Limits. *Relief and Rehabilitation Network Paper No. 25*. Overseas Development Institute, London.

Henseler, J., Hubona, G., & Ray, P. A. (2016). Using PLS path modeling in new technology research: updated guidelines. *Industrial Management & Data Systems*.

Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). The use of partial least squares path modeling in international marketing. In *New challenges to international marketing*. Emerald Group Publishing Limited.

Herroelen, W. (2014). A risk integrated methodology for project planning under uncertainty. In *Essays in Production, project planning and scheduling* (pp. 203-217). Springer, Boston, MA.

Herzberg, F., Maunser, B., & Snyderman, B. (1959). *The motivation to work*. New York, NY: John Wiley and Sons Inc.

Hillson, D. (2011). *Dealing with business uncertainty*. Unloaded from: http://www. risk-doctor. com/briefings.

Hlaing, N. N., Singh, D., Tiong, R. L. K., & Ehrlich, M. (2008). Perceptions of Singapore construction contractors on construction risk identification. *Journal of Financial Management of Property and Construction*, *13*(2), 85-95

Digitized by Sam Jonah Library

©University of Cape Coast https://ir.ucc.edu.gh/xmlui

Howell, G. A., Ballard, G., Abdelhamid, T. S., & Mitropoulos, P. (2002, August). Working near the edge: a new approach to construction safety. In *Annual conference on lean construction* (Vol. 10, pp. 49-60).

Hubbard, G. (2009). Measuring organizational performance: Beyond the triple bottom line. *Business Strategy and the Environment*, *18*(3), 177-191.

Hwang, B. G., Zhao, X., & Gay, M. J. S. (2013). Public private partnership projects in Singapore: Factors, critical risks and preferred risk allocation from the perspective of contractors. *International Journal of Project Management*, *31*(3), 424-433.

Iqbal, S., Nasir Chaudry, S., Iqbal, N., & Zia, M. (2015). Impact of liquidity risk on firm specific factors: A case of Islamic banks of Pakistan. *Journal of Business and Management Research*, *9*, 256-260.

Jekale, W. (2004). Performance for public construction projects in developing countries: Federal road and educational building projects in Ethiopia. *Norwegian University of Science & Technology*.

Jöreskog, K. G. (1971). Statistical analysis of sets of congeneric tests. *Psychometrika*, *36*(2), 109-133.

Kamara, J. M., Anumba, C. J., & Evbuomwan, N. F. (1999). Client requirements processing in construction: a new approach using QFD. *Journal of Architectural Engineering*, *5*(1), 8-15.

Kangari, R., & Lucas, C. L. (1997). *Managing international operations: A guide for engineers, architects and construction managers*. New York, NY: ASCE Press.

Digitized by Sam Jonah Library

©University of Cape Coast https://ir.ucc.edu.gh/xmlui

Kartam, N. A., & Kartam, S. A. (2001). Risk and its management in the Kuwaiti construction industry: a contractors' perspective. *International Journal of Project Management*, *19*(6), 325-335.

Kasap, D., & Kaymak, M. (2007, August). Risk identification step of the project risk management. In *PICMET'07-2007 Portland international conference on management of engineering & technology* (pp. 2116-2120). IEEE.

Kendrick, T. (2015). *Identifying and managing project risk: essential tools for failure-proofing your project*. Amacom.

Kerzner, H. (2017). *Project management: a systems approach to planning, scheduling, and controlling*. John Wiley & Sons.

Klemetti, A. (2006). Risk management in construction project networks.

KPMG, U. (2013). GRI, unit for corporate governance in Africa (2013): Carrots and sticks. In *Sustainability reporting policies worldwide-today's best practice, tomorrow's trends*.

Kululanga, G., & Kuotcha, W. (2010). Measuring project risk management process for construction contractors with statement indicators linked to numerical scores. *Engineering, Construction and Architectural Management*, *17*(4), 336-351.

Kwak, Y. H., & Dewan, S. (2001). Risk management in international development projects. *The George Washington University*.

Kwak, Y. H., & Stoddard, J. (2004). Project risk management: lessons learned from software development environment. *Technovation*, *24*(11), 915-920.

Digitized by Sam Jonah Library

©University of Cape Coast https://ir.ucc.edu.gh/xmlui

Larson, E. W., & Gray, C. F. (2011). *Project Management: The managerial process*. Tata McGraw-Hill Education.

Laryea, S., & Mensah, S. (2010). Health and Safety on construction sites in Ghana. In *the Construction, building and real estate research conference of the royal institution of chartered surveyors*, 2-3 September 2010, Dauphine Universite, Paris, France.

Lee, E., Park, Y., & Shin, J. G. (2009). Large engineering project risk management using a Bayesian belief network. *Expert Systems with Applications*, *36*(3), 5880-5887.

Liew, K. T., Low, W. W., Wong, K. S., & Wong, S. Y. (2019, April). Risk assessment of infrastructure projects on project cost. In *IOP conference series: Materials Science and Engineering* (Vol. 495, No. 1, p. 012088). IOP Publishing.

Ling, F. Y. Y., Low, S. P., Wang, S. Q., & Lim, H. H. (2009). Key project management practices affecting Singaporean firms' project performance in China. *International Journal of Project Management*, *27*(1), 59-71.

Llewellyn, D. J. (2008). The psychology of risk taking: toward the integration of psychometric and neuropsychological paradigms. *The American Journal of Psychology*, 363-376.

Lyons, T., & Skitmore, M. (2004). Project risk management in the Queensland engineering construction industry: a survey. *International Journal of Project Management*, *22*(1), 51-61.

Digitized by Sam Jonah Library

©University of Cape Coast https://ir.ucc.edu.gh/xmlui

Mago, S., Hofisi, C., & Mago, S. (2013). Microfinance institutions and operational risk management in Zimbabwe: Insights from Masvingo Urban. *Mediterranean Journal of Social Sciences*, *4*(3), 159.

Mahamid, I. (2013). Common risks affecting time overrun in road construction projects in Palestine: Contractors' perspective. *Construction Economics and Building*, *13*(2), 45-53.

Mahendra, P. A., Pitroda, J. R., & Bhavsar, J. J. (2013). A study of risk management techniques for construction projects in developing countries. *International Journal of Innovative Technology and Exploring Engineering*, *3*(5), 139-142.

Mak, S., & Picken, D. (2000). Using risk analysis to determine construction project contingencies. *Journal of Construction Engineering and Management*, *126*(2), 130-136.

Markmann, C., Darkow, I. L., & Von Der Gracht, H. (2013). A Delphi-based risk analysis—Identifying and assessing future challenges for supply chain security in a multi-stakeholder environment. *Technological Forecasting and Social Change*, *80*(9), 1815-1833.

Mason, C. H., & Perreault Jr, W. D. (1991). Collinearity, power, and interpretation of multiple regression analysis. *Journal of Marketing Research*, *28*(3), 268-280.

McClelland, D. C., & Mac Clelland, D. C. (1961). *Achieving society* (Vol. 92051). Simon and Schuster.

McManus, J., & Wood-Harper, T. (2008). *A study in project failure*. British Computer Society. Available at: < http://www. bcs. org/server. php.

Digitized by Sam Jonah Library

Messner, F., & Meyer, V. (2006). Flood damage, vulnerability and risk perception–challenges for flood damage research. In *Flood risk management: hazards, vulnerability and mitigation measures* (pp. 149-167). Springer, Dordrecht.

Mhetre, K., Konnur, B. A., & Landage, A. B. (2016). Risk management in construction industry. *International Journal of Engineering Research*, *5*(1), 153-155.

Mikes, A. (2009). Risk management and calculative cultures. *Management Accounting Research*, *20*(1), 18-40.

Mills, A. (2001). A systematic approach to risk management for construction. *Structural Survey*, *19*(5), 245-252.

Minasny, B., & McBratney, A. B. (2006). A conditioned Latin hypercube method for sampling in the presence of ancillary information. *Computers & Geosciences*, *32*(9), 1378-1388.

Morse, J. M. (1994). Designing funded qualitative research. In Denzin, N. K., & Lincoln, Y. S. (Eds.), *Handbook of qualitative research* (p. 220–235). Sage Publications, Inc.

Navon, R. (2005). Automated project performance control of construction projects. *Automation in Construction*, *14*(4), 467-476.

Nieto-Morote, A., & Ruz-Vila, F. (2011). A fuzzy approach to construction project risk assessment. *International Journal of Project Management*, *29*(2), 220-231.

Nnadi, E. O. E., Enebe, E. C., & Ugwu, O. O. (2018). Evaluating the awareness level of risk management amongst construction stakeholders in

Digitized by Sam Jonah Library

©University of Cape Coast https://ir.ucc.edu.gh/xmlui

Nigeria. *International Journal of Construction Engineering and Management*, *7*(1), 47-52.

Nunnally, J. C. (1994). *Psychometric theory 3E*. Tata McGraw-hill education.

Nwosu, A. A. (2003). Integrating ICT into STM classroom: Status and implications. In *Proceeding of the 44th STAN Conference* (Vol. 56).

Nyamah, E. Y, Yi, F., Oppong-Sekyere, D., & Nyamaah, J. B. (2014). Agricultural supply chain risk identification-a case finding from Ghana. *Journal of Management and Strategy*, *5*(2), 31.

Odeyinka, H. A., & Iyagba, R. I. (2000). Risk management in construction to avoid cost overrun. *Nigeria Institute of Quantity Surveyors*, *31*, 14-21.

Ofori, G. (1984). Improving the construction industry in declining developing economies. *Construction Management and Economics*, *2*(2), 127-132.

Ofori, G. (1993). Research on construction industry development at the crossroads. *Construction Management and Economics*, *11*(3), 175-185.

Ofori, G. (2006, November). Attaining sustainability through construction procurement in Singapore. In *Proceedings of CIB W92 conference on sustainability and value through construction procurement, Digital World Centre*, *Salford, UK* (pp. 378-388).

Oltedal, S., Moen, B., Klempe, H., & Rundmo, T. (2004). Explaining risk perception: An evaluation of cultural theory. *Rotunde*, *85*, 1-33.

Onukwube, H. N. (2002). An evaluation of factors that influence tender prices of building works in Nigeria. *The Quantity Surveyor*, *40*(3), 38-46.

Onwuegbuzie, A. J., & Combs, J. P. (2010). Emergent data analysis techniques in mixed methods research: A synthesis. In *Handbook of mixed methods in social and behavioral research*, *2*, 398.

Digitized by Sam Jonah Library

©University of Cape Coast https://ir.ucc.edu.gh/xmlui

Onwuegbuzie, A. J., Bustamante, R. M., & Nelson, J. A. (2010). Mixed research as a tool for developing quantitative instruments. *Journal of Mixed Methods Research*, *4*(1), 56-78.

Öztaş, A., & Ökmen, Ö. (2004). Risk analysis in fixed-price design–build construction projects. *Building and Environment*, *39*(2), 229-237.

Patten, M. L., & Newhart, M. (2017). Understanding research methods: An overview of the essentials.

Peng, D. X., & Lai, F. (2012). Using partial least squares in operations management research: A practical guideline and summary of past research. *Journal of Operations Management*, *30*(6), 467-480.

Perera, B. A. K. S., Dhanasinghe, I., & Rameezdeen, R. (2009). Risk management in road construction: the case of Sri Lanka. *International Journal of Strategic Property Management*, *13*(2), 87-102.

Perry, J. G., & Hayes, R. W. (1985). Risk and its management in construction projects. *Proceedings of the Institution of Civil Engineers*, *78*(3), 499-521.

Perry, J. G., Thompson, P. A., & Wright, M. (1982). *Target and cost-reimbursable contracts*. Construction industry research and information association.

Pheng, L. S., & Chuan, Q. T. (2006). Environmental factors and work performance of project managers in the construction industry. *International Journal of Project Management*, *24*(1), 24-37.

Pinto, J. K., & Slevin, D. P. (1987). Critical factors in successful project implementation. *IEEE transactions on Engineering Management*, (1), 22-27.

Digitized by Sam Jonah Library

©University of Cape Coast https://ir.ucc.edu.gh/xmlui

PMI (2013). *A Guide to the Project Management Body of Knowledge (PMBoK® Guide)* (5th ed.), Newton Square, PA: Project Management Institute.

Power, M. (2007). *Organized uncertainty: Designing a world of risk management*. Oxford University Press.

Raftery, J. (1994). *Risk analysis in project management*. London: Chapman & Hall, .

Rahman, I. A., Memon, A. H., Aziz, A. A. A., & Abdullah, N. H. (2013). Modeling causes of cost overrun in large construction projects with partial least square-SEM approach: contractor's perspective. *Research Journal of Applied Sciences, Engineering and Technology*, *5*(06), 1963-1972.

Rahman, M. M., & Kumaraswamy, M. M. (2004). Potential for implementing relational contracting and joint risk management. *Journal of Management in Engineering*, *20*(4), 178-189.

Rake, E. L. (2012). Risk assessment on-scene. In *Risk management for the future-theory and cases*. IntechOpen.

Raz, T., Shenhar, A. J., & Dvir, D. (2002). Risk management, project success, and technological uncertainty. *R & D Management*, *32*(2), 101-109.

Reeve, E., To, J., Hendrix, I., Shakib, S., Roberts, M. S., & Wiese, M. D. (2013). Patient barriers to and enablers of deprescribing: a systematic review. *Drugs & Aging*, *30*(10), 793-807.

Reichelt, K., & Lyneis, J. (1999). The dynamics of project performance: benchmarking the drivers of cost and schedule overrun. *European Management Journal*, *17*(2), 135-150.

Digitized by Sam Jonah Library

©University of Cape Coast https://ir.ucc.edu.gh/xmlui

Remenyi, D., & Heafield, A. (1996). Business process re-engineering: some aspects of how to evaluate and manage the risk exposure. *International Journal of Project Management*, *14*(6), 349-357.

Ren, H. (1994). Risk lifecycle and risk relationships on construction projects. *International Journal of Project Management*, *12*(2), 68-74.

Rezakhani, P. (2012). Classifying key risk factors in construction projects. *Buletinul Institutului Politehnic din lasi. Sectia Constructii, Arhitectura*, *58*(2), 27.

Rigdon, E. E. (2014). Rethinking partial least squares path modeling: breaking chains and forging ahead. *Long Range Planning*, *47*(3), 161-167.

Ritchie, B., & Marshall, D. V. (1993). *Business risk management*. Chapman & Hall.

Rohaninejad, M., & Bagherpour, M. (2013). Application of risk analysis within value management: A case study in dam engineering. *Journal of Civil Engineering and Management*, *19*(3), 364-374.

Ropponen, J., & Lyytinen, K. (2000). Components of software development risk: How to address them? A project manager survey. *IEEE Transactions on Software Engineering*, *26*(2), 98-112.

Rosa, E. A. (2003). The logical structure of the social amplification of risk framework (SARF): Metatheoretical foundations and policy implications. In Pidgeon, N., Kasperson, R. E. & Slovic, P. (eds.). *The social amplification of risk*. *47*, 47-49.

Rosenbaum, D. B. (1997). Risk Questions hamper deals. *Engineering News Record*, *24*(11).

Digitized by Sam Jonah Library

©University of Cape Coast https://ir.ucc.edu.gh/xmlui

Rundmo, T. (2000). Safety climate, attitudes and risk perception in Norsk Hydro. *Safety Science, 34*(1-3), 47-59.

Ruthankoon, R., & Ogunlana, S. O. (2003). Testing Herzberg's two-factor theory in the Thai construction industry. *Engineering, Construction and Architectural Management*, *10*(5), 333-341

Sachs, J. D. (2006). *The end of poverty: Economic possibilities for our time*. Penguin.

Sadeh, A., Dvir, D., & Shenhar, A. (2000). The role of contract type in the success of R&D defense projects under increasing uncertainty. *Project Management Journal*, *31*(3), 14-22.

Salapatas, J. N. (1985). *Performance measurement for projects and project management*. Project Management Institute.

San Santoso, D., Ogunlana, S. O., & Minato, T. (2003). Assessment of risks in high rise building construction in Jakarta. *Engineering, Construction and Architectural Management*, *10*(1), 43-55.

Santos, J. R. A. (1999). Cronbach's alpha: A tool for assessing the reliability of scales. *Journal of Extension, 37*(2), 1-5.

Sarstedt, M., Ringle, C. M., & Hair, J. F. (2017). Partial least squares structural equation modeling. In *Handbook of market research*, *26*(1), 1-40.

Sarstedt, M., Ringle, C. M., Henseler, J., & Hair, J. F. (2014). On the emancipation of PLS-SEM: A commentary on Rigdon (2012). *Long Range Planning*, *47*(3), 154-160.

Saunder, M., Lewis, P., & Thornhill, A. (2012). *Research Methodology for Business Students.* England: British Library.

Digitized by Sam Jonah Library

©University of Cape Coast https://ir.ucc.edu.gh/xmlui

Saunders, M. N., & Lewis, P. (2012). *Doing research in business & management: An essential guide to planning your project*. Pearson.

Saunders, M., Lewis, P., & Thornhill, A. (2012). *Research methods for business students*. Harlow: Pearson.

Schieg, M. (2006). Risk management in construction project management. *Journal of Business Economics and Management*, *7*(2), 77-83.

Segal, T. G., Segal, M., & Maroun, W. (2017). The perceived relevance of tax risk-management in a South African context. *Meditari Accountancy Research*, *25*(1), 82-94.

Sekaran, U., & Bougie, R. (2016). *Research methods for business: A skill building approach*. John Wiley & Sons.

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

Shen, L. Y., Wu, G. W., & Ng, C. S. (2001). Risk assessment for construction joint ventures in China. *Journal of Construction Engineering and Management*, *127*(1), 76-81.

Shmueli, G., & Koppius, O. R. (2011). Predictive analytics in information systems research. *MIS Quarterly*, 553-572.

Sjöberg, L. (1996). A discussion of the limitations of the psychometric and cultural theory approaches to risk perception. *Radiation Protection Dosimetry*, *68*(3-4), 219-225.

Digitized by Sam Jonah Library

©University of Cape Coast https://ir.ucc.edu.gh/xmlui

Sjöberg, L., Moen, B. E., & Rundmo, T. (2004). Explaining risk perception. An evaluation of the psychometric paradigm in risk perception research. *Rotunde Publikasjoner Rotunde*, *84*, 55-76.

Skorupka, D. (2008). Identification and initial risk assessment of construction projects in Poland. *Journal of Management in Engineering*, *24*(3), 120-127.

Steinwand, D. (2000). *A risk management framework for microfinance institutions*. Eschborn, Germany: GTZ, Financial Systems Development, 1-70.

Steyn, H. (2002). Project management applications of the theory of constraints beyond critical chain scheduling. *International Journal of Project Management*, *20*(1), 75-80.

Stone, M. (1974). Cross‐validatory choice and assessment of statistical predictions. *Journal of the Royal Statistical Society: Series B (Methodological)*, *36*(2), 111-133.

Stulz, R. M. (1984). Optimal hedging policies. *Journal of Financial and Quantitative analysis*, 127-140.

Sweeting, P. (2017). *Financial enterprise risk management*. Cambridge University Press.

Tadayon, M., Jaafar, M., & Nasri, E. (2012). An assessment of risk identification in large construction projects in Iran. *Journal of Construction in Developing Countries*, *17*.

Tah, J. H. M., & Carr, V. (2000). Information modelling for a construction project risk management system. *Engineering, Construction and Architectural Management*, *7*(2),107-119.

Digitized by Sam Jonah Library

©University of Cape Coast https://ir.ucc.edu.gh/xmlui

Tang, W., Qiang, M., Duffield, C. F., Young, D. M., & Lu, Y. (2007). Risk management in the Chinese construction industry. *Journal of Construction Engineering and Management*, *133*(12), 944-956.

Tashakkori, A., & Teddlie, C. (2003). Issues and dilemmas in teaching research methods courses in social and behavioural sciences: US perspective. *International Journal of Social Research Methodology*, *6*(1), 61-77.

Tashakkori, A., & Teddlie, C. (2008). Quality of inferences in mixed methods research: Calling for an integrative framework. *Advances in Mixed Methods Research*, *53*(7), 101-119.

Taylor, B. J. (2006). Risk management paradigms in health and social services for professional decision making on the long-term care of older people. *British Journal of Social Work*, *36*(8), 1411-1429.

Thomas, S. R., Macken, C. L., Chung, T. H., & Kim, I. (2002). Measuring the impacts of the delivery system on project performance—Design-build and design-bid-build. *NIST GCR*, *2*, 840.

Tohidi, H. (2011). The role of risk management in IT systems of organizations. *Procedia Computer Science*, *3*, 881-887.

Toor, S. Ogunlana, SO (2010): Beyond the ‘iron triangle’: Stakeholder perception of key performance indicators (KPIs) for large-scale public sector development projects. *International Journal of Project Management*, *28*(3), 228.

Tummala, V. R., & Schoenherr, T. (2011). An implementation decision framework for supply chain management: a case study. *International Journal of Logistics Systems and Management*, *8*(2), 198-213.

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Turkey, W. (2011). *Risk factors leading to cost overrun in Ethiopian federal road construction projects and its consequences*. Unpublished thesis, Addis Ababa University Repository. [online]. Available at: http://hdl.handle.net/123456789/9965

Tworek, P. (2012). Integrated risk management in construction enterprises–theoretical approach. *Journal of Economics & Management*, *8*, 125-135.

Ugwu, O. O., & Haupt, T. C. (2007). Key performance indicators and assessment methods for infrastructure sustainability—a South African construction industry perspective. *Building and Environment*, *42*(2), 665-680.

Uher, T. E., & Toakley, A. R. (1999). Risk management in the conceptual phase of a project. *International Journal of Project Management*, *17*(3), 161-169.

van Egmond, E., & Erkelens, P. (2007, May). Technology and knowledge transfer for capability building in the Ghanaian construction industry. In *CIB World Building Congress* (pp. 1393-1405).

Voorhees, C. M., Brady, M. K., Calantone, R., & Ramirez, E. (2016). Discriminant validity testing in marketing: an analysis, causes for concern, and proposed remedies. *Journal of the Academy of Marketing Science*, *44*(1), 119-134.

Wahlström, G. (2009). Risk management versus operational action: Basel II in a Swedish context. *Management Accounting Research*, *20*(1), 53-68.

Digitized by Sam Jonah Library

©University of Cape Coast https://ir.ucc.edu.gh/xmlui

Wang, J., & Yuan, H. (2011). Factors affecting contractors' risk attitudes in construction projects: Case study from China. *International Journal of Project Management*, *29*(2), 209-219.

Wang, M. T., & Chou, H. Y. (2003). Risk allocation and risk handling of highway projects in Taiwan. *Journal of Management in Engineering*, *19*(2), 60-68.

Wang, S. Q., Dulaimi, M. F., & Aguria, M. Y. (2004). Risk management framework for construction projects in developing countries. *Construction Management and Economics*, *22*(3), 237-252.

Ward, S. C., Curtis, B., & Chapman, C. B. (1991). Objectives and performance in construction projects. *Construction Management and Economics*, *9*(4), 343-353.

Ward, S., & Chapman, C. (2003). Transforming project risk management into project uncertainty management. *International Journal of Project Management*, *21*(2), 97-105.

Webb, A. (2003). *The project manager's guide to handling risk*. Gower Publishing, Ltd..

Westland, J. (2007). *The project management life cycle: A complete step-by-step methodology for initiating planning executing and closing the project*. Kogan Page Publishers.

Wiguna, I. P. A., & Scott, S. (2005). Analysing the risks affecting construction delay and cost overruns in Indonesian building projects. In *Proceedings of the 3rd International Conference on Innovation in Architecture, Engineering and Construction*. Newcastle University.

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Wilkinson, E. (2013). Disaster Risk Governance. In *Volcanic areas: A concept note for work package 4 of the strengthening resilience in volcanic areas (STREVA) programme*. London: Overseas Development Institute.

Williams, T. (2016). Identifying success factors in construction projects: A case study. *Project Management Journal*, *47*(1), 97-112.

Yornu, I. K., & Ackah, D. (2019). Examining project risk management challenges in Ghana. *Project Management & Scientific Journal*, *1*(3), 27-39

Yusuwan, N. M., Adnan, H., Omar, A. F., & Kamaruzaman, J. (2008). Clients' perspectives of risk management practice in Malaysian construction industry. *Journal of Politics & Law*, *1*, 121.

Zadeh, F. O., & Eskandari, A. (2012). Firm size as company's characteristic and level of risk disclosure: Review on theories and literatures. *International Journal of Business and Social Science*, *3*(17).

Zadry, R. H., & Yusof, M. S. R. (2006). Total quality management and theory of constraints implementation in Malaysian automotive suppliers: a survey result. *Total Quality Management*, *17*(8), 999-1020.

Zaghloul, R., & Hartman, F. (2003). Construction contracts: the cost of mistrust. *International Journal of Project Management*, *21*(6), 419-424.

Zaini, A. A., Takim, R., & Endut, I. R. (2011, September). Contractors' strategic approaches to risk assessment techniques at project planning stage. In *2011 IEEE Symposium on Business, Engineering and Industrial Applications (ISBEIA)* (pp. 320-325). IEEE.

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©University of Cape Coast https://ir.ucc.edu.gh/xmlui

Zavadskas, E. K., Turskis, Z., & Tamošaitiene, J. (2010). Risk assessment of construction projects. *Journal of Civil Engineering and Management*, *16*(1), 33-46.

Zhao, X., Hwang, B. G., & Low, S. P. (2014). Enterprise risk management implementation in construction firms. *Management Decision*, *52*(5), 814-833.

Zikmund, W., G. (2000). *Business research methods* (6th ed.). Fort Worth, TX: Dryden Press.

Zou, P. X. (2006). Strategies for minimizing corruption in the construction industry in China. *Journal of Construction in Developing Countries*, *11*(2), 15-29.

Zou, P. X., Zhang, G., & Wang, J. (2007). Understanding the key risks in construction projects in China. *International Journal of Project Management*, *25*(6), 601-614.

Zuofa, T. (2011). Project managers perception of risk factors in heavy engineering construction projects: case of offshore projects. In: Egbu, C. & Lou, E.C.W. (Eds.). *Procs 27th Annual ARCOM Conference, 5–7 September 2011*, Bristol, UK, Association of Researchers in Construction Management, 985–993.

Zwikael, O., & Ahn, M. (2011). The effectiveness of risk management: an analysis of project risk planning across industries and countries. *Risk Analysis: An International Journal*, *31*(1), 25-37.

Zwikael, O., & Globerson, S. (2006). From critical success factors to critical success processes. *International Journal of Production Research*, *44*(17), 3433-3449.

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APPENDIX

APPENDIX A – QUESTIONNAIRE

Dear Sir/Madam

Risk *management is an important issue in the construction industry and is known to have damaging consequences on project performance. Therefore, this questionnaire is designed to solicits information to understand the probability, severity and response strategies associated with risk management in the construction industry and its effect on project performance. Please note that the information you will provide is for academic purposes only.* Your contribution would be very much appreciated.

SECTION A: DIMENSIONS OF RISKS

On a scale of 1 – 5, where is 1 – very low, 2 – low, 3 – moderate, 4 – high and 5 – very high, assign probability and severity values for the risk likely to occur in the project life cycle and tick the appropriate response strategies for the risk below.

No.	Dimensions of Risks	Probability of these risk occurring					Severity of impact when risk occurs					Response strategies			
IN	**Risks likely to occur during Project Initiation/Conception**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	**Avoid risk**	**Mitigate risk**	**Accept risk**	**Transfer risk**
IN1	Most of the project we undertake have unclear project objectives														
IN2	Most of the project we undertake have tight project schedule														
IN3	Projects do not available budget														
IN4	There is no available skilled project team for most projects														
IN5	Difficulty in obtaining stakeholders' approval for most projects														
IN6	Most of the project we undertake have unclear project deliverables														
IN7	Most of the project we undertake have unclear scope definitions														
PL	**Risks likely to occur during Project Planning**														
PL1	High performance standard is mostly required by stakeholders														
PL2	Projects within limited time frame														
PL3	Incomplete approval and other documents from appropriate authorities														
PL4	Variations by the client														

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PL5	Inadequate project scheduling														
PL6	Design variations														
LP7	Inadequate or insufficient site information (soil test and survey report)														
PL8	Lack of coordination between project participants during project meetings														
PL9	Excessive approval procedures in administrative government departments														
PL10	Incomplete or inaccurate cost estimate														
PL11	High quality expectations from clients														
		1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	**Avoid risk**	**Mitigate risk**	**Accept risk**	**Transfer risk**
PE	**Risks likely to occur during Project Execution**														
PE1	High performance metrics (high client expectations)														
PE2	Project works within limited time frame														
PE3	cost estimate not sufficient for most projects (shortage of funds)														
PE4	Delays in approving different phases of the project														
PE5	Difficulty in working at site due to nature of the soil														
PE6	Unavailability of sufficient professionals and managers														
PE7	Lack of coordination between project participants														
PE8	Variations of construction projects														
PE9	Unsuitable construction project planning														
PE10	Serious noise pollution caused by construction works														
PE11	Occurrence of dispute at site														
PE12	General accident occurrence														
PE13	Unavailability of sufficient amount of skilled labour to work on projects														
PE14	Low management competency of subcontractors to manage subcontracted works														
PE15	Price inflation of construction materials														

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PC	Risks likely to occur during Project Closure														
PC1	High performance risk issues														
PC2	Issues in transferring deliverables to client														
PC3	Likelihood of defective work														
PC4	Client acceptance issues														
PC5	Maintenance of project issues														
PC6	Political interference in project closure														
PC7	Legal related issues arising during project closure														
PC8	Quality expectations of stakeholders														

SECTION B: PROJECT PERFORMANCE

On a scale 1 (least agreement) to 5 (high agreement), please rate the level of agreement with the issues raised with respect to the performance of projects handled by the firm. Please tick {√} in response to the questions.

PP	Project Performance	1	2	3	4	5
PP1	The project followed schedule					
PP2	Project is completed within budget					
PP3	Project had qualified acceptance and successful delivery					
PP4	Project met the requirements of the stakeholders					
PP5	We are likely to cooperate with the other party again in the future					
PP6	The project experience enhanced the capability of all project teams					

SECTION C: FIRM SIZE

On a scale of 1-5, please indicate your level of agreement to each of the following statements. **1 – least agreement – 5 – highest agreement**

FS	*Firm Size*	1	2	3	4	5
FS1	The firm's management has the required experience to manage risk issues					
FS2	The firm has adequate resources to handle risk issues					
FS3	The firm has sufficient number of employees to handle risk issues					
FS4	The firm's total assets are enough to handle risk issues					

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SECTION D: DEMOGRAPHIC INFORMATION ON RESPONDENTS

1. Please indicate your sex:
   1. Male 2. Female [ ]
2. Age (years):…………………
   18 – 30 years [ ] 31-40 years [ ] 41-50years [ ] Over 50 years [ ]
3. Indicate your highest level of education:
   No Formal Education [ ] Primary Education [ ] Junior High School [ ] Senior High School [ ] Tertiary [ ]
   Others [ ]
4. Position of respondents:
   Contractor [ ] Project manager [ ] Quantity surveyor [ ] Others (please specify) …………………………………..
5. Which construction association does your firm belong to:
   GREDA [ ] ABCECG [ ] ASROC [ ] PROCA [ ] Others. ……………………………
6. Please state the number of years you have been working in this capacity 1 – 5 [ ] 6 – 10 [ ] 11 – 15 [ ] above 15 [ ]
7. Type of project undertaken Road [ ] Building [ ] Civil works [ ] Others (Please specify) …………………………
8. Number of projects taken in a year 1 – 5 [ ] 6 – 10 [ ] Above 10 [ ]
9. Please state the age of your business (in years) 1 – 5 [ ] 6 – 10 [ ] 11 – 15 [ ] 16 – 20 [ ] Above 20 years [ ]
10. Number of employees Less than 5 [ ] 5 – 19 [ ] 20 – 99 [ ] 100+ [ ]
11. Does your company have a project risk manager Yes [ ] No [ ]

THANK YOU FOR PARTICIPATING

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APPENDIX B – INTERVIEW GUIDE

My name is Matilda Ewusi a student of the University of Cape Coast pursuing a Master of Commerce in Project Management. Currently, I am in my final year and research on risk management in construction firms in Ghana. With your experience in the construction industry, I would appreciate it if you would give me your views in respect of risk in the construction industry.

Your views will be kept confidential in the writing of my research and will solely be used for the purpose of this research. All respondents are anonymous. Also, there are right or wrong answers in this discussion. T am interested in knowing what you think so please feel free to be frank and share your point of view. Your opinions are important.

1. What is your role in the company?
    - Does any event (s)/activity (ies) affect the performance of your roles?
    - How would describe this event/activity?
    - How do they affect your job performance?
    - Would you describe these events/activities as risks?
2. What do you think about risk?
    - Is it a negative event/activity?
    - Is it a positive event/activity?
    - Is it an uncertain activity?
    - Is it all of these?
3. How do your company measure the success of their project?
    - Do they measure success when projects are completed within time specified in the contract?
    - Do they measure success when project is completed with the budget allotted for the project?
    - Do they measure success when clients accept the project?
4. In the course of undertaking the project, do some activities/events affect the success of the projects?
    - What activities/events are these?
    - How do the company know these events/activities will/are influencing the success of the projects?
        - Through past project experiences
        - Through SWOT analysis (an assessment of the internal aspect of the company to know their strength and weakness in relation to projects and the external aspect of the company to know the opportunities and threats.
        - Internal assessment is done from – employees, company's operations,
        - and organisational process assets.
        - External assessment is done based on – competitors, clients expectations and needs, new technologies in the industry, changes in the construction industry

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environment, laws and regulations, globalisation and suppliers
   - Through the use of a company checklist
   - During a meeting where brainstorming is done on likely risk to occur
   - Interview people in management levels concerning risk
   - Have a workshop where risk is identified
   - Benchmarking your company with other companies in the industry.

5. Does the company categorise these activities/events under certain categories
   - What are these categories?
   - How is the categorisation done?
   - Are there basis for the categorisation?
6. How does the company measure the likelihood of these events/activities occurring?
   - On what basis does the company measure the likelihood of these events occurring?
7. How does the company measure the severity of these events/activities?
   - What basis does the company use to measure the severity of these events/activities?
8. Does the company rate the events/activities identified?
   - What basis does the company use in rating these events/activities?
9. Does the company prioritise these events/activities?
   - How does the company prioritise these events/activities?
10. The handling of these events/activities are they assign to a specific person to be accountable for it?
    - How does the company assign the risk? What basis do they use?
11. Are the risk documented?
    - What is documented about the events/activities?
      - The description of these events/activities?
      - The risk category;
      - how and why the risk can happen (cause of risk);
      - how will the risk impact the Institution if it materializes (impact on Institution);
      - the likelihood and consequences of the risk to the Institution;
      - the existing internal controls that may minimize the likelihood of the risk occurring;
      - a risk level rating based on pre-established criteria;
      - framework, including an assessment of whether the risk is acceptable or whether it needs to be treated;
      - a clear prioritization of risks (risk profile);
      - accountability for risk treatment (who is responsible for the risk); and

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- Timeframe for risk treatment.

12. Does the company document its risk identification process?
13. Are risk identified communicated to all employees?
14. Is the document with the risk identified made available to all employees?
15. What is the threshold of the company on risk?

Risk Analysis

1. Explain what the company does with the identified risk?
    - Are risk analysed using qualitative means or quantitative means
    - Explain how the company does the analysis of the identified risk
    - What criteria is being used in the analysis of the risk?
    - What qualitative methods does the company use
    - What qualitative methods does the company use

Risk response

2. Does the company respond to these risks?
3. How do they respond to the risk identified?
    - Do they put in measures to reduce risk?
    - Do they transfer the risk?
    - Do they accept the risk?
    - Do they avoid the risk?

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APPENDIX - C

Cohen's table for determining sample size in PLS-SEM

Sample size recommendation in PLS-SEM												
Maximum number of arrows pointing at a construct	Significant level											
	1%				5%				10%			
	Minimum R^2				Minimum R^2				Minimum R^2			
	0.1	0.2	0.5	0.75	0.1	0.2	0.5	0.75	0.1	0.2	0.5	0.75
2	158	75	47	38	110	52	33	26	88	41	26	21
3	176	84	53	42	124	59	38	30	100	48	30	25
4	191	91	58	46	137	65	42	33	111	53	34	27
5	205	98	62	50	147	70	45	36	120	58	37	30
6	217	103	66	53	157	75	48	39	128	62	40	32
7	228	109	69	56	166	80	51	41	136	66	42	35
8	238	114	73	59	174	84	54	44	143	69	45	37
9	247	119	76	62	181	88	57	46	150	73	47	39
10	256	123	79	64	189	91	59	48	156	76	49	41

Source: Cohen, 1988

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