The Relation between Risk Management throughout Project Lifecycle and the Success of Construction Projects in the UAE

العلاقة بين إدارة المخاطر خلال دورة حياة المشروع و نجاح مشاريع التشييد و البناء في دولة الإمارات العربية المتحدة

by

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Abstract

Managing construction in the developing countries including the United Arab Emirates (UAE) is critical which emphasises the significance of Risk Management **('RM')**. However, is the organisation managing its risks effectively? This concern may occur from time to time on the top management level. This research aimed to explore the key risks affecting the construction initiatives in the UAE throughout the Project Lifecycle (**'PLC'**); and to provide adequate answers for certain research questions, 1) What are the key risks that need to be addressed at each phase?; and 2) Are there any risks that move from one phase to another?

The objectives include literature review of RM, PLC, risks associated with each phase, success criteria of the projects. The research followed the positivism philosophy, deductive approach, survey strategy based on quantitative approach into a longitudinal time horizon. A quantitative analysis has been conducted with focus on the UAE construction industry to verify the proposed hypotheses between the RM through PLC phases and the success of construction projects in the UAE. The data analysis revealed that proposed Hypotheses are valid as a result of high correlation. Also, it has been noted that number of risks move from one phase to another including the risks pertaining to financial management, QHSE aspects, governance, stakeholders, resources, roles and responsibility. In addition, a control assessment method has been discussed for the construction practitioners in the UAE to assess the internal controls effectiveness throughout the PLC. Further researches have been recommended to develop a framework of standard controls to mitigate the key risks identified in this research.

Keywords: Construction Industry, UAE Construction, Project Management, Project Risk Management, Construction Risks, Risk Management, Project Lifecycle, Construction Management, Risk Manager, Construction Governance, Construction Compliance, Enterprise Risk Management, Capability Maturity Model, Project Control, Lifecycle Phases, Initiation, Feasibility, Design, Procurement, Execution.

ملخص البحث:

قطاع التشييد و البناء هو قطاع حيوي و هام في الدول النامية بشكل عام و في دولة الإمارات العربية المتحدة بشكل خاص، و عليه تأتي أهمية إدارة المخاطر المتعلقة به، و لكن هل فعلاً تتم إدارة المخاطر بشكل كاف و فعال؟ سؤال تطرحه الإدارات العليا للمؤسسات و الجهات المختصة بهذ القطاع من وقت لآخر. و لذلك هذا البحث يعمد إلى مناقشة المخاطر الرئيسية (خلال مراحل دورة حياة المشروع) و التي قد تؤثر على على نجاح مشاريع التشييد و البناء في دولة الإمارات العربية المتحدة. كما يجيب البحث عن الأسئلة التالية، 1) ما هي المخاطر التي يجب مراعاتها خلال كل مرحلة من مراحل المشروع؟ و 2) هل هناك مخاطر تستمر/تنتقل من مرحلة لأخرى من مراحل المشروع؟

إتبع هذا البحث أسلوب البحوث الكمية من خلال تجميع المعلومات العلمية عن إدارة المخاطر و إدارة المشاريع ومراحل دورة حياة المشروع و أهم المخاطر بكل مرحلة من مراحل المشروع... إلخ، و من ثم عمل إستبيان بإستخدام أحد التطبيقات على الإنترنت (الإستبيان إستهدف العاملين بقطاع التشييد والبناء) للوقوف على أهم المخاطر المتعلقة بقطاع التشييد في دولة الإمارات العربية المتحدة وعلاقة ذلك بنجاح المشاريع المتعلقة، و تم تحليل النتائج بغرض التأكد من دقة البيانات وصلاحيتها ودرجة الوثوق بها، و بناء عليه تم إثبات وإستنتاج عدة أسباب تدعم العلاقة بين إدارة المخاطر خلال دورة حياة المشروع و نجاح مشاريع التشييد و البناء في دولة الإمارات العربية المتحدة و تحديد عدد من المخاطر التي تنتقل/ تستمر من مرحلة لأخرى خلال دورة حياة المشروع ومنها تلك المخاطر/التحديات المتعلقة بالنواحي المالية، الجودة، الصحة، السلامة، البيئة، الحوكمة، الجهات المعنية، الموارد، المهام و المسؤوليات. إضافة إلى ذلك تم مناقشة طريقة لتقييم الضوابط الداخلية المتعلقة بإدارة مشاريع التشييد و البناء بحيث يمكن تقييم مدى كفاية الضوابط الداخلية المتعلقة و الوقوف على مدى فاعليتها خلال دورة حياة المشروع. و قد أوصى البحث بعمل دراسات بحثية مستقبلية لإيجاد أطر عمل للتحكم و الحد من تأثير المخاطر التي تم عرضها.

كلمات البحث:

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CMM	:	Capability Maturity Model.
DV	:	Dependent Variables.
EIA	:	Environmental Impact Assessment.
ERM	:	Enterprise Risk Management.
HR	:	Human Recourses.
HSE	:	Health, Safety & Environmental.
IV	:	Independent Variables.
PLC	:	Projects Lifecycle.
QHSE	:	Quality, Health, Safety & Environmental.
R&R	:	Roles and Responsibilities.
RFP	:	Request for Proposal.
RM	:	Risk Management.
ROAG	:	Red-Orange-Amber-Green.
UAE	:	United Arab Emirates.

Chapter One: Introduction

This chapter deliberates on the background and significance of the issue, the ultimate aim of the research, and the identified objectives of the study. Additionally, it will highlight the scope and questions of the study in detail. This section will also provide a general overview on what construction is and what it represents especially for the developing countries.

1.1. Background and Statement of the Problem

Construction is an essential sector for all countries in general and for developing countries in particular, allowing them to connect between their urban development strategies and reality (Mahmid, Bruland & Dmaidi 2012). In addition, the construction industry affects people's lives (accommodation, offices, schools, universities, hospitals, etc.), which exerts pressure on the sector's stakeholders to complete the construction initiatives successfully within the anticipated schedule, budget and quality. However, it is evident that many of the construction initiatives (especially large scale/mega construction projects) suffer from cost and time overruns (Parsons 2015).

Managing major construction initiatives nowadays is very critical, due to the worldwide economic circumstances. Project failure is typically caused by pressure on reducing the timeline/costs, while enhancing the quality of the deliverables, which emphasises the significance of risk management to the success of any project. However, is the organisation managing its risks effectively? This question/concern may occur from time to time on the top management level (Cagliano, Grimaldi & Rafele 2014).

Several research studies discussed the project risk management practices and project lifecycle phases from a project management perspective. However, since the risk management is part of the project management framework and project lifecycle processes, risk management should not be viewed as a one-off individual process, which is separate from other aspects of managing the project through the project lifecycle.

1.2. Research Aims

Projects Risk Management and Projects Lifecycle Phases are well recognised in the literature and the project management industry. However, there is a gap in identifying the impact of typical lifecycle risks on the construction projects in the United Arab Emirates (UAE). Moreover, it is evident in the literature that the traditional way of adopting projects risk management depending on a generic risk register / plan that has been developed/identified prior to commencement of the project may not be effective for large scale projects, especially in developing countries. Therefore, projects risk management in the construction sector needs to be reactive. In order to develop an adequate reactive risk management framework for the construction projects in the UAE, the key risks affecting projects success need to be identified.

In addition to the above, **the aim of this research is to explore the key risks affecting the construction projects in the UAE (throughout the project lifecycle).**

1.3. Objectives

In order to achieve the aim, the following objectives need to be explored:

1) To investigate the literature in relation to risk management including: enterprise risk management, capability maturity models and project risk management in addition to project

lifecycle, project success criteria and the risks associated with each phase of the project lifecycle.

2) An appropriate case study will be discussed to review the existing project lifecycle stages.
3) A quantitative analysis of the key risks at each stage of the UAE construction industry.
4) A set of recommendation/control assessment methods to the construction practitioners (within the UAE construction sector) to assess/evaluate the internal controls effectiveness throughout the project lifecycle.

1.4. Scope of the Research

This research will study the key risks affecting the projects lifecycle. The research focuses on the construction sector in the UAE, including the construction initiatives in both the private and government sectors. Through a critical literature review for risk management and project lifecycle stages, a qualitative approach will be employed in order to identify the key risks over the project lifecycle. The conclusion of the paper will then be formulated and recommendations for further study will be suggested where appropriate.

1.5. Research Questions

The main goal of effective risk management is to generate better project outcomes while achieving the project objectives. Therefore, in order to enhance the project risk management as well as the project outcomes, the main questions to be examined in this research are as follows:

- **With a focus on the UAE construction industry, what are the key risks that need to be addressed by management at each stage of the lifecycle?**
- **Are there any risks that move from one phase to another?**

1.6. Research Structure

To meet the above stated objectives, relevant resources will be reviewed. The research consists of seven chapters. The ‘Introduction’ discusses the significance of the issue and describes the research’s aim, objectives, scope and questions; the ‘Literature Review’ contains a review of the related body of literature on the topic, with comments from the author as needed; the ‘Conceptual Framework’ offers the basis for the research established from the literature; the ‘Methodology and Limitation’ defines the research union layers behind the data collection as well as the limitations of the research; the ‘Data Analysis’ and ‘Discussion of Findings’ analyse and investigate the data/information obtained and highlight the result in order to substantiate the overall conclusion and recommendation formulated under the section entitled ‘Conclusion and Recommendation’.

Chapter Two: Literature Review

This chapter explores the risk management processes and its relationship with project management as well as project lifecycle. Moreover, it discusses the project's success criteria, and the key risks faced by construction projects through its lifecycle.

2.1. Risk Management

2.1.1. History of Risk Management

Dionne, G. (2013) identified that studies about risk management have been started after World War II. In contrast, the modern risk management initiatives routed to the period from 1955 to early 1960s despite the absence of academic books or courses about the topic of risk management during that period. Later, i.e. 1963 and 1964, a couple of academic books were published on the topic of risk management discussing the basic principles of the subject. The first book is by Mehr and Hedges, while the second one is by Williams and Heing, both deemed to be the first academic books about risk management.

The risk management practice has been classically linked with the insurance industry, since the insurance sector is concerned with the protection of people's lives and assets from several hazards. Later, in the mid-1950s, the insurance for certain services/activities became very expensive and inadequate in terms of coverage. Thus, new methods of risk management have been developed introducing that the mitigation and self-defense measures should take place to protect the operation/business.

The global guidelines/rules on risk management were found in the early-1980s, to enhance the risk management methods and deal with the unexpected risks that may arise during the operations

process. Moreover, the governance of the risk management was known with some additional managerial positions added to the organisations to handle the risk management practice.

In parallel, the engineers established the need for risk management associated with the technical aspects since the technological losses are not adequately covered in the typical operational risk management. Furthermore, the engineers identified the need to consider the political risk on their project risk management. Currently the operational risks are typically controlled by most of the firms. Additionally, risk management constitutes a mandatory requirement by the regulators of many sectors (banking, insurance, etc.).

2.1.2. Enterprise Risk Management

According to Farrell, M. & Gallagher, R. (2014), the past few decades have been characterised by periods of turmoil and major risk-related events. The impacts have resulted in a growing dissatisfaction with traditional risk management approaches coupled with a desire to improve the certainty with which new opportunities can be evaluated and results anticipated. Much interest has been directed toward developing more comprehensive and sophisticated approaches to risk management. They also discussed that Enterprise Risk Management (ERM) is a full-spectrum method to risk management that includes identifying, assessing, controlling and mitigating risks across each and every part of the whole enterprise. Once it is correctly performed, the ERM events are linked to the overall planned goals and are conducted within the limits of a predefined risk appetite. ERM also addresses all key risk categories including the commercial, operational, and other similar sectors.

Enterprise risk management has emerged as a possible solution. Since the emergence of the ERM concept, few organisations have completely involved the concept and applied the essential

competences to achieve the targeted value. Many academic and concrete constraints should be fixed prior to companies' ability to introduce ERM within an adequate capability in order to introduce and achieve the value they want.

To advance the development of ERM, ERM's Capability Maturity Model (CMM) has been developed to assist entities in assessing their current level of maturity, identifying their desired level of maturity, and crafting a plan to achieve their objectives. The CMM defines six evolutionary plateaus ranging from non-existent to strategic. Each evolutionary level is characterised by key milestones, as entities first expand the comprehensiveness of their risk management efforts, then deepen their understanding of risk interactions, and finally incorporate risk into strategic decision-making. These increasing levels of sophistication generally bear increasing requirements for time, money, and executive commitment to implement. The urgency with which an entity progresses toward achieving a strategic ERM capability depends on its industry, risk exposures, competitive position, risk appetite, and stakeholder pressure. This tool is designed to help entities plan, execute, and monitor their journey.

Acharyya, M. & Brady, C. (2014) found that over the past decade, and especially in the wake of headline-grabbing man-made and natural disasters, enterprise risk management has been garnering increased attention from company executives. They have established that many companies have evolved their capabilities to identify their risks and proactively manage their finance and insurable risks. However, only a limited number of companies intelligently manage their full range of challenges and risks, effectively assess and address challenges from all viewpoints, deal with the company obstructions that prevent the comprehensive viewing of the risks that face the organisation, and analytically anticipate and prepare mitigation actions to potential high risks/challenges.

Undoubtedly, the implementation of effective Risk Intelligence will be a lengthy process and on some occasions difficult. The organisations that aim for a batter position in the market are relying on its sole operational challenges, but each company that achieves the position of the ERM will find that they share related features, including the following aspects:

- Risk management (RM) policies and procedures that cover the entire business.
- Risk management plans that cover the whole portfolio of challenges, such as sector related risks, operational risks, financial risks, HSE (Health, Safety & Environmental) risks, etc.
- Risk valuation procedures based on pre-defined weightage systems by applying adequate weightage to the likelihood and impact of each and every risk.
- Risk management methods that are not different from each other, but consider risk situations and the interface of various risks and challenges.
- Risk management timely embedded within the operational processes and not to be performed only after completion of facts.
- Risk management mentality that does not rely on solely escaping the risks, instead it looks to the risks and challenges as a room of adding value to the process.

The competitive benefits of enhancing Risk Intelligence cover:

- Better capabilities to identify, mitigate, and report significant challenges.
- Minimising the load on the operational team by having a standard risk management processes, procedures, forms, etc.
- Minimising the risk management budget by sharing the knowledge about risks and incorporation of the current risk management roles.
- The capability to deliver an adequate level of comfort to the executive management.

Given the desirability of achieving risk management effectiveness status, entities need a roadmap showing the journey from where they are now to their risk management destination complete with signposts. A proven technique for depicting this is the ERM Capability Maturity Model.

2.1.3. Capability Maturity Model (CMM)

Hopkinson (2011) described that describing an entity's business in terms of capabilities is a proven and flexible construct. The capability concept allows us to shape complex entities into manageable components for the purposes of business analysis, implementation, and performance evaluation. Some capabilities are unique to an industry (for example, Technical Support). Others are common to all companies (for example, accounting and finance, human resources, and enterprise risk management). A key characteristic of this definition is that capabilities are defined and developed in terms of an enterprise's objectives. Another distinguishing feature is that a capability is the totality of its inter-related components. Processes must deliver outputs that meet the company's strategic objectives. Processes, in turn, cannot be performed without appropriate people, systems, and infrastructure. Components cannot be considered in isolation, they are mutually reinforcing.

A maturity level is a hill from a nascent state toward a state of being mature where maturity is the state of being fully developed or elaborated (Hopkinson 2011). Farrell, M. and Gallagher, R. (2014) reported that if a model is a simplified representation of a system, then we can build out the definition of a capability model. A capability maturity model is a simplified representation of a capability describing its components at different stages of elaboration and development. Below is each of the capability aspects:

Governance

Governance consists of the business goals and principles that a company tries to realise. Adequate governance arrangements are essential to successful entities as they explain decision-making roles, liability, and communication networks. Enterprises use analytical techniques to analyse their sector and anticipate the sector's growth and progress in the future in order to analyse the competition in the market and plan the strategy plans accordingly. Procedures include those goals and ethics in the enterprise by expressing activities about how to meet the aims. The formal policy framework includes both general principles and specific guidelines that relate to all parts of the industry and controlling of its threats. Policies enable risk owners to understand what the enterprise intends to accomplish. Procedures are the connection to strategy as they connect the strategy with the actual implementation.

Process

Processes are a collection of linked actions that introduce an outcome of significance to a customer. Procedures are defined as the documents that describe the activities in adequate elements that an individual with applicable awareness, abilities, and capacities undertakes, but not in-full expertise with the actions in request to do the action. There are a number of routes that collectively define the maturity of the ERM package. They begin with understanding the nature of risks, then identify them, study, assess the risks, deal with the risks, control, review, report and discuss the risks as required (Luko 2013).

People

People are critical for the realisation of any enterprise. Ironically, in terms of processes becoming progressively automated, the competence of people converts proportionally to additional

importance. The people's capability includes four main aspects: administrative organisation, roles, ability, and culture. The organisational structure sets positions and committees in place to provide oversight and management. Roles and responsibilities spell out who is responsible for performing which process activities and to what level of quality. Knowledge, skills, and abilities are important to the quality and efficiency with which processes are performed. Finally, culture encompasses the attitudes and propensity to execute processes as designed by an enterprise's people (Wademan, Spuches & Doughty 2008).

Technology

Technology and set-ups related to operational facilities. It also means applying increasingly sophisticated and demanding analytical and statistical methodologies to diverse and complex sets of data to render the information meaningful for the intended audience. Risk intelligent organisations with technology that not just saves procedures information but also provides related data to other abilities, such as long-term plans and objectives, cost and commercial aspects.

Maturity Levels

Continuous development is based on certain steps. A Capability Maturity Model gives an outline for managing these steps related to distinct maturity stages that place effective bases for continuous development. These maturity steps create an ordinal scale for evaluating and assessing the maturity of an organisation's capability. The levels also help an organisation prioritise its development efforts.

2.1.4. Projects Risk Management

The ultimate goal of the project management process is to complete a given project within schedule, budget and quality at adequate level of risks. Risks are defined as uncertain events or conditions which (if applicable) might cause a negative or positive impact on the project objectives, however they mostly have an unfavourable impact. A risk should be a definable event with probability and impact of occurrence; it could be caused by internal factors e.g. management mistakes, etc. or external factors from outside the organisation. Risks are implicit in any organisation's strategy, whether management is aware of them or not. Professional organisations make RM a portion of their daily business processes and contain it within the project regular discussions during the project discussions and team development. It is essential for successful organisations to make Risk Management part of their project management processes in order gain maximum benefits from such a method. However, some projects do not consider risk management adequately. Some organisations dimly trust their project manager, especially if he is an expert who has been in the industry for decades (Institute & Project 2012; Toader et al. 2010; Baydoun 2011).

Goh, C., Abdul-Rahman, H. & Abdul Samad, Z. (2013) identified that due to the importance of the risk management to the engineering and construction sector, many of the professional bodies have created systems and processes to help in its implementation, this can be summarised as follows:

Risks Identification:

Toader, C., et al. (2010), and BENȚA, D., PODEAN, I. and MIRCEAN, C. (2011) emphasised that although it is evident that all projects face risks, identifying those risks is one of the most challenging project management tasks. The project risks need to be identified along with the reasons and impact on the project objectives. Each risk is in accordance with pre-assigned

categories. An early identification of project risks allows for timely decision-making and mitigation actions. Thus, this phase ideally starts at the project initiation phase with the necessity to continue through the project lifecycle on a periodic basis, since in projects (especially in the construction industry) there are many unknown risks, which cannot be identified/quantified at the beginning, which requires the risk identification process to be more effective. The risk identification represents an initial step of risk management, where all knowable/inherent internal and external risks are listed/identified (based on experience, similar previous projects, etc.) and linked to one or more project objective(s).

According to Anderson, S. (2009), risks are identified through a series of targeted workshops conducted at applicable phases of the project; risk review sessions will then be implemented to serve as a formal forum to identify new risks. Routine management activities will also constitute an ongoing source of risk identification. The risk assessment is documented in a Project-specific Risk Register. The risk register and key project challenges will be escalated as part of a regular reporting process to the executive management. Further to the above, project risk management in the construction sector (especially large construction initiatives) needs to be reactive to handling any risks arising in a timely manner. This can be achieved by identifying project milestones through the lifecycle; accordingly, a reactive risk management exercise is adopted as an alternative to depending on a generic risk management plan that was developed prior to the commencement of the project.

Communication about risks is important, the construction projects demonstrate that the project lead in such projects were regularly ignorant of the major risks that were nearly hitting their projects. The scary observation was that often one of the team members was indeed aware about the risk, but did not escalate the issue to the project lead, which mostly happens due to inadequate risk communication. A successful method is to regularly include discussions about the key risks in the

undertaken activities. For example, in the team discussions, project risks must be included in the meeting agenda, indicating that the discussions about risks are significant to the project lead and allow the individuals to discuss them and escalate any new risks. Additionally, an essential line of communication is between the project lead and top executives in the firm to highlight/escalate the big risks in order to ensure that they do not shock the executive management or the key stakeholders. Accordingly, the decision-makers conclude adequate decisions to address the key challenges and issues, as they generally have more power and authority than the project lead (BENȚA, PODEAN & MIRCEAN 2011).

According to Goh, C., Abdul-Rahman, H. & Abdul Samad, Z. (2013), during the issues identification stage, both threats and opportunities need to be considered. Project issues have a bad impact on the project objectives: they are the 'bad events' that can hurt the project. Conversely, new risk methods encourage the good events and the project improvement chances. These are the unclear actions that are helpful to the project as well as the company. These events help the projects to be faster, healthier and more successful.

Planning and Implementing Risk Responses

Toader, C., et al. (2010), and BENȚA, D., PODEAN, I. & MIRCEAN, C. (2011) highlighted that applying risk mitigation is the action that indeed benefits the project. It stops a hazard from happening or reduces the negative impact on the project. Such implementation is essential in the risk management process. Additionally, it contributes to ranking the risks based on their importance. This will support having an effective risk mitigation plan, which gives attention to the key wins. There are three alternatives when the management is dealing with a risk, namely risk escaping, risk reduction or acceptance of the risk. However, escaping threats is indicative of project

planning in a way that does not meet a threat. For example, replacing vendors or applying different tools or, if treating a major risk, cancelling a project. Budgeting funds on a desperate project is not the right deal/choice.

The most frequent group of risk mitigation actions is managing and reducing the risk impact on the investment objectives to stop a threat from occurring by dealing with the reasons or minimising the negative impact that may happen. If the executives conduct an adequate risk study, they will be have several ways to control the impact. The latest mitigation group is to go with the threats. This may be the proper decision if the impact is not significant or there is no opportunity to avoid or reduce the impact. For example, there is no time to do so or it will be too costly to take such actions. However, accepting a risk should be a wise action.

Responding to risk opportunities opposes risk mitigation. It should be based on looking for opportunities, enhancing them or avoiding them (if the opportunities are deemed to very minor). Moreover, project risk management is a set of processes/methods (e.g. risk identification, analysis, responses, monitoring and controlling, etc.) that aims to identify, assess and manage the risks through the project lifecycle. In general, the main objective of managing the project risks is the reduction of the likelihood and impact of harmful actions, while in the meantime increasing the probabilities and benefits of the positive events. Projects by nature are unique, temporary and include numerous uncertain events (Institute & Project 2012), and risk management offers methods by which this uncertainty can be managed. Thus, risk management is very important for delivering projects successfully on time, within budget and in line with the anticipated quality (BENȚA, PODEAN & MIRCEAN 2011).

Baydoun, M (2011) emphasised that the project risks vary based on the project phase/stage, thus it is important for the management to identify all potential risks, answer questions related to their impact on the project objectives/events, probability for their occurrence, alternative solutions/actions. They have identified that project risk management contains four major stages: risk identification, risk evaluation, development of mitigation actions, and application of mitigation actions.

Risk Evaluation and Assessment:

Practice standard for project risk management (2009) identified that a risk rating is given to each threat based on its probability and impact based on pre-assigned rating system criteria. The Risk Rating supports the risks to prioritisation. It represents the analysis and evaluation process of the risks identified in the previous phase, where all risks and their interactions should be evaluated/assessed in order to estimate their impact on the project objectives. It is pertinent to note that the evaluation/assessment of risks is a very complex process dependent on a great number of interactions, mathematical calculations approaches, the different views/perspectives of multiple stakeholders for the threats and the opportunities of each event.

According to Anderson, S. (2009), analysing the risk type prior to decisions is essential for adequate risk mitigation. Risk study happens at multiple stages. With reference to understanding the threat at each stage, it is most effective to consider the impact and the reasons that may occur. Another stage of risk mitigation is studying the whole project. Every project lead has to respond to common queries about the overall cost required or the completion date of the project. If they consider the threats, they can present and justify to the project stakeholders the anticipated completion date for the work as well as the anticipated cost at completion. The date that has been

collected in the risk study will have valuable input to the project plans and reporting in order to conclude active answers to enhance the project risks (BENȚA, PODEAN & MIRCEAN 2011).

Qualitative Risk Assessment

Qualitative Risk Assessment is a process of ranking risks by evaluating their likelihood of occurrence and the cost and schedule impacts of the risk event. Each identified risk will be assessed qualitatively by evaluating the probability of occurrence and the influence of the risk event on the major project constraints in terms of cost and schedule. These parameters are qualitatively analysed in order to arrive at a risk rating, which places more emphasis on impact than likelihood, enabling the ranking of each risk relative to all others. Relative risk ratings are prioritised using a ROAG (Red-Orange-Amber-Green) system as described in the table below. Risks need to be ranked in terms of their individual rating, with responses being implemented in accordance with their relative priorities (Practice standard for project risk management 2009).

Risk Severity	Description	Color
Critical	Significant action needed immediately	Red
Severe	Significance of the risk will be severe but not serious.	Orange
Manageable	Significance of the risk is not severe and can be controlled by the controls in place.	Amber
Negligible	Consequences of risk are relatively unimportant.	Green

Table 2. 1: Risk Rating Definition

The qualitative assessment is captured in the Risk Register and updated on a regular basis. In accordance to the probability scales that shall be subsequently defined and applied, Figure 2.1 illustrates a sample of the ranking process. The ranking system should consider the probability score as well as the highest cost and schedule impacts. Clearly, some risks may have no cost or schedule impact (Practice standard for project risk management 2009).

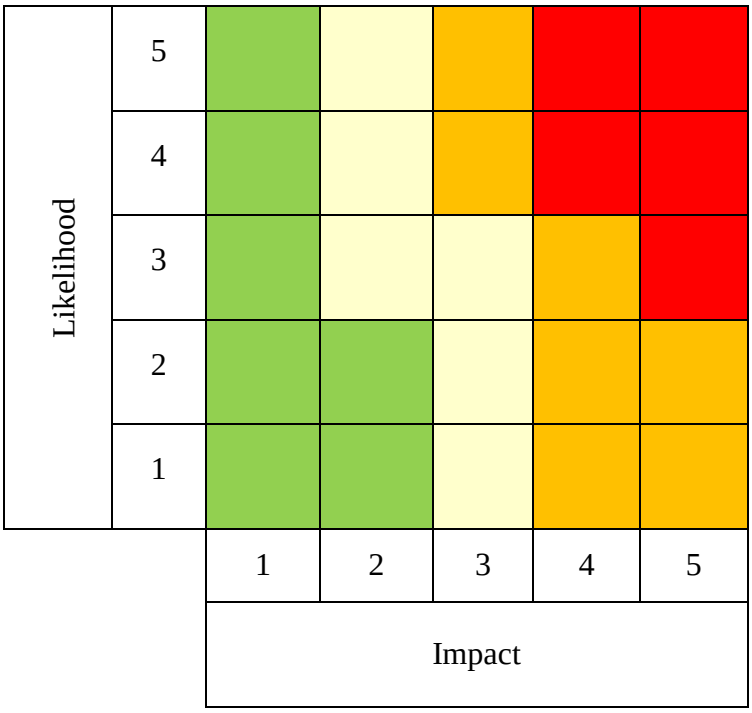

Figure 2. 1: Matrix of a Risk Rating Scale

Cost and Schedule Quantitative Risk Assessment

On a selective basis, the identified risks may be grouped and quantified in order to assess the likely cost impacts on the project cost objectives. The inputs for this quantitative assessment, provided by cost subject matter experts, will be the estimates of the probability of occurrence and cost impacts of the risk events. These estimates would be loaded into any of the Risk Analysis Tools/Software in order to run a simulation calculating a range of possible impacts to facilitate risk prioritisation and decision-making. Similar to the Cost Quantitative Risk Assessment, risks will be grouped and

quantified, on a selective basis, based on the likely schedule impacts on the project schedule objectives. The inputs, provided by schedule subject matter experts, will be the estimates of the probability of occurrence and estimate schedule impacts of the risk events. These estimates would be loaded into any of the Risk Analysis Tools/Software in order to run a simulation calculating a range of possible impacts to facilitate risk prioritisation and decision-making.

Goh, C., Abdul-Rahman, H. & Abdul Samad, Z. (2013) highlighted that choosing of an adequate risk management method is a crucial factor to managing the projects successfully in the construction sector, and choosing the suitable tool/method depends on several aspects, such as resources availability, project objectives, etc. Furthermore, one tool/method may not be sufficient to manage all situations at all phases. Certain risk management techniques are commonly implemented in the construction sector (as detailed in Table 2.2 below).

Techniques	Perry and Hayes (1985)	Akintoye and MacLeod (1997)	Ward (1999)	Raz and Michael (2001)	Tah and Carr (2001)	Tummala et al. (2001)	Wood and Ellis (2003)	Lyon and Skitmore (2004)	Dikmen et al. (2008)	Forbes et al. (2008)
Intuition/subjective judgement/ experience		✓					✓	✓	✓	✓
Decision analysis	✓	✓						✓		✓
Monte Carlo simulation	✓	✓		✓			✓	✓		✓
Risk premium		✓						✓		
Subjective probability analysis	✓	✓		✓	✓	✓		✓		✓
Brainstorming				✓			✓	✓		✓
Checklists		✓		✓			✓	✓		✓
Historical data use						✓		✓		
Probability impact grids/matrix			✓				✓			✓
Sensitivity analysis	✓						✓	✓		✓
Workshop							✓			
FMEA						✓				✓
Hazard totem pole diagram						✓				
Hierarchical risk breakdown structure					✓				✓	✓
Use case diagram					✓				✓	
Risk register			✓	✓	✓		✓			
Case-based reasoning/approach								✓		✓
Utility theory	✓									✓

Table 2. 2: RM Tools/Methods in previous studies - (Goh, Abdul-Rahman & Abdul Samad 2013)

Risk Response & Mitigation Actions:

Following to the risk evaluation and assessment, appropriate risk responses are to be planned in order to minimise the impact of risk on the construction phase objectives, assess appropriateness by the effectiveness of the response and the cost of implementation, with effectiveness being the degree to which the implementation of the response will reduce the rating of the risk. The risk response plan should be updated on a regular basis following every risk review session. Risks are to be managed by implementing one or more of the response options detailed below. Risk response plans shall be captured as part of the Risk Register.

Risk Categories

Every risk recognised in the identification stage is linked to a risk group of the following categories:

- External: The risk event happens due to conditions outside of the control of the project.
- Internal: The event happens due to decisions made by the project management team.

Identify and Select Response Options

Mitigation alternatives existing for a specific event and its related reason to single or multiple risk mitigation categories, according to the group to which the risk or the opportunity is related:

Threats:

In order to establish the most effective resolutions/alternatives to address threats. In general, solutions/actions can be classified into the following categories:

- Risk Avoidance: The easiest way to manage risk is to avoid it, but that may not be an option in most of the cases.
- Risk Mitigation: If it is not possible to avoid the risk, then the organisation should mitigate it by action that results in the minimum impact/threat to the project.
- Risk Mitigation: Risk mitigation can be achieved via limitation of the anticipated/potential threat or its probability of occurrence or both.
- Risk Acceptance: The choice to take/accept certain risk mostly occurs if that risk cannot be avoided or controlled or if the cost to do so is higher than the potential exposure as a result of this risk occurrence.

Opportunities:

- Risk Exploitation: Risk exploitation is the reverse of risk avoidance.
- Risk Sharing: Risk sharing is similar to risk transfer and can be achieved through sharing the potential positive impact with an external organisation, such as an insurer or Contractor.
- Risk Enhancement: Risk enhancement is the reverse of risk mitigation and can be accomplished through recognition of the potential positive impact, an increase in the probability of occurrence or both.

Baydoun, M. (2011), and BENŢA, D., PODEAN, I. & MIRCEAN, C. (2011) confirmed that numerous project risks remain unidentified at the project initiation stage, which may affect the appropriateness of project risk management. Furthermore, the traditional way of adopting project risk management by combining the risks faced on previous projects (assuming it would be applicable for the new project), etc. may be useful for small scale projects with limited activities/stakeholders but may not be effective for large scale projects, which have several stakeholders, complex technical parameters, different disciplines, etc.

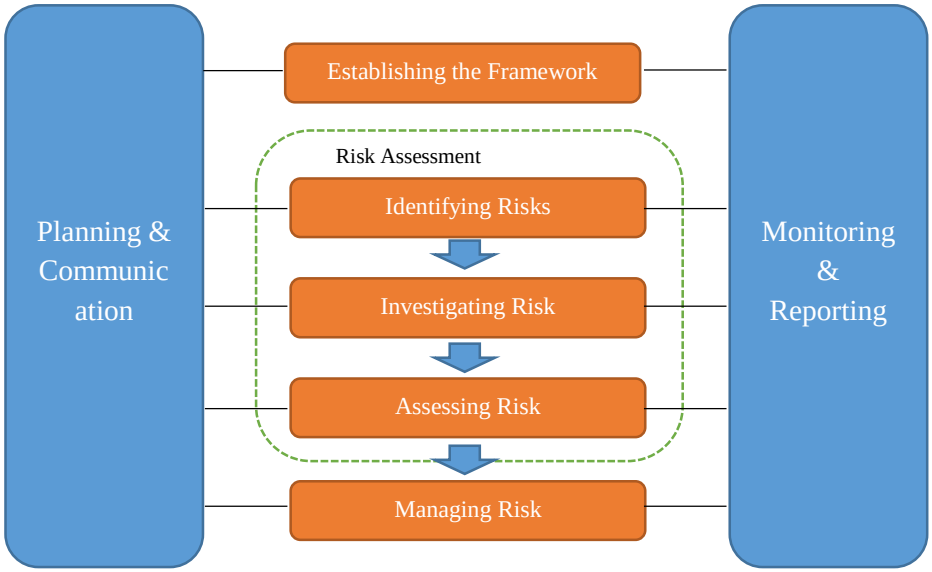

Figure 2. 2: Risk Management Progression Flow Diagram

2.1.5. Project Phase Risk Management

Project Phase Risk Management in the construction industry is a process consisting of recognising, studying and responding to the risks arising during the construction stage. It contains most of the good impact and reduces the significance of bad events. Risks are events which, if they occur, will exert a helpful or bad impact on the project objectives. Risk management contains the practices related to recognising and reacting to uncertainty (Cagliano, Grimaldi & Rafele 2014).

According to Baydoun, M. (2011), the Risk Management Team needs to coordinate with the project team throughout the planning and design stages to conduct a risk identification and analysis study and issue a baseline risk register. Once issued, the responsibility of managing project risks is transferred to the project team, while the program risk management team monitors the project risks, implementation of the Risk Management Procedure and risk response.

The Risk Management team key accountabilities include:

- Establishing, implementing, monitoring and improving the Risk Management Procedure

- Recognition, study response arrangement and controlling of portfolio , program and project risks
- Performing scenario building and probabilistic modelling to advise on time and cost contingencies
- Promoting early notification and resolution of risks
- Reporting portfolio, program and project risks

Risk management activities include risk identification and assessment, definition of the mitigation actions for key risks, control over those actions and feedback.

It is based on anticipation and prevention of events rather than on reaction to those events and the correction of their consequences.

Project risk management must be an essential portion of the project management and a focal element in the many decisions taken in a project. It is a means of exchanging experience and strengthening the interfaces between work packages.

The Project Management Team should maintain, coordinate, and monitor risk assessment activities, including the risk register and risk assessment meetings/workshops. Each risk identified

shall have a discipline responsibility for the implementation of identified risk mitigation actions. Periodic risk sessions shall be conducted in order to update the register/program and the implementation of mitigating actions, and publish the results.

A Risk Management plan should be developed to include a methodology that characterises each

risk’s likelihood of occurrence and its possible influence on the schedule, cost and technical performance of the works. This process shall include risk assessment (i.e., identification,

determination of likelihood and consequence followed by qualitative/quantitative evaluation), risk control and management (i.e., reduction planning and monitoring), and risk reporting (reports and meetings).

Risk management offers a means of anticipating the risks involved in projects throughout their design, construction and installation phases.

The major categories of risks include:

- Socio-political risks, e.g. not obtaining the requisite permits/authorisations.
- Economic and financial risks, e.g. exchange rate.
- Contractual risks, e.g. failing to honour our obligations as a contracting authority.
- Technological risks, e.g. design basis of the facility, pipeline route challenges.
- Organisational risks, e.g. underestimated complexity of the project.
- Commercial risks, e.g. delayed delivery of hydrocarbons.
- Supplier risks, e.g. bankruptcy of a contractor.

2.2. Projects Management

According to the Institute & Project (2012) and FTA (2016), a project, by definition, is an initiative to create a matchless deliverable, service, or outcome within a temporary duration i.e. until either the project objective(s) are achieved or it is not required anymore. Projects are mainly defined by their three key constraints in terms of scope, schedule, and budget. 1) Project Scope: any project needs clear documented objectives taking into account the operational needs, authorities' requirements, quality of outcomes, etc. 2) Project Schedule: each project requires a clear commencement and completion date, the project has a lifecycle/stages from commencement until completion. Upon having adequately described project objectives and the scope of works, this can be organised/planned by developing a detailed project schedule (programme). Creating the project programme includes developing a work breakdown structure that contains activities to be completed for each deliverable, forecasting the duration of each activity, and engaging them in a reasonable order. The outcome is a project schedule that states the anticipated duration of the project and logical interactions between the work activities, including activities on the 'critical path,' that controls the completion date. 3) Project Budget: the projects are mostly forced by restricted financing. Therefore, each project requires budget monitoring.

2.2.1. Projects Lifecycle Phases

Luu, T., Kim, S., Cao, H. & Park, Y. (2008) emphasised that the construction initiatives nowadays are riskier than before especially in developing countries, therefore the stakeholders need to monitor the construction projects' performance on a periodic basis and assess opportunities and risks strengths and weaknesses to recognise potential improvements.

Williams, T. (2015) identified that over time, a number of project management practices, activities, procedures, and processes have been developed to complete the projects successfully. Subsequently, organizations have utilized these criteria to measure their projects performance, often with some modification, until they have become generally accepted as valuable tools for the profession, termed ‘successful projects factors’ A number of such successful practices are listed below for consideration. There are, of course, many other successful practices that have not been included. These common success criteria for construction initiatives could be classified into two major groups:

1) Achievement of the projects goals related to cost, time and quality through effective project controls in accordance with best practices and effective, and whether such objectives were adhered to throughout project lifecycle with effectiveness of controls and assess risks/exposure.
2) Level of customers/stakeholders satisfaction and happiness of the deliverables and processes that includes happiness of the project owners, end-users, vendors, etc.

Each project can be divided into a number of phases/stages, which are collectively referred to as the Project Lifecycle. There are many methods and approaches for managing the projects through their lifecycle with different views on the project lifecycle in terms of the number and nature of the phases/stages (varying based on the organisation culture, nature of business, policies and procedures adopted, etc.) (Aouad et al. 1999). Brent, A. & Petrick, W. (2007) identified sixteen different views used in order to divide the project phases to determine the suitability and success of the internal controls and systems necessary to secure propriety and efficiency associated with the initiation, planning, execution, controlling and closing processes (as detailed in Table 2.3).

Method	Phases of the Project								
1	Conceptual	Contract Award	Execution						
			Designing	Planning					
2	Conceptual	Planning	Testing	Implementation			Closure		
3	Idea generation	Pre-feasibility		Development and execution	Commissioning		Launch	Post-implementation review	
4	Selection of the project			Execution				Application	
	Screening	Evaluation	Selection	Production	Development		Production	Marketing	Sales
5	Feasibility	Design	Procurement	Construction	Start-up		Operation		
6	Planning	Design	Procurement	Construction management	Commissioning of facility				
7	Conception	Definition	Planning and schedule	Execution	Controlling		Termination of project		
8	Definition	Planning	Execution/control		Close-out				
9	Initiation	Planning	Execution	Controlling			Close-out		
10	Initiation	Planning	Execution	Controlling			Closing		
11	Conceptual	Planning	Testing	Implementation			Closure		
12	Clarifying need	Feasibility	Definition	Implementation			Handover and closure	maintenance	
13	Pre-feasibility	Feasibility	Basic development	Execution			Start-up and handover	Evaluation and operation	
14	Pre-feasibility	Site selection	Feasibility	Feasibility report	Board decision	Detailed design	Construction	Operation	Closure
15	Idea	Concept	Investigation	Development	Validation	Launch			

Table 2. 3: Phases of Project Lifecycle - Summarised in Brent & Petrick (2007).

2.2.2. Project Success Factors

Luu et al. (2008) found that the construction section is riskier nowadays, therefore the construction companies, and particularly the firms working in developing countries, need to consciously monitor their performance and always assess their faults and introduce improvement opportunities. Williams (2015) also confirmed that in order to determine whether the project deliverables are achieving the plans, we need to measure them; these measurements can be referred to as success criteria/factors, while the success of construction projects can be classified into two key groups, as follows:

1) Meeting the objectives of the projects in terms of cost, schedule as well as quality, including completing the project milestones on time, as per the planned budget, and profit realisation of all the project stakeholders, etc., meeting the anticipated quality of the project outcomes with no faults; and

2) Agreement of the project stakeholders that covers the satisfaction of key stakeholders (end users, owners, workers, suppliers, etc.), success of the project management controls implemented throughout the project lifecycle, with minimum deviations from the original baselines and acceptable Health & Safety records.

2.3. Case Study

This section will discuss and provide details about the selected case study for this research, in terms of the background of the organization selected and the implemented lifecycle phases. Accordingly, the literature will be investigated in relation to each phase.

2.3.1. Case Study Background

A case study has been selected in this research for a government entity in the UAE (United Arab Emirates), this organisation is responsible for the constructing of mega/large scale infrastructure projects, and is deemed to be appropriate for this research as the study relating to the construction industry/projects in the UAE. It is worth mentioning that the organisation is adopting the project lifecycle consisting of Five Phases (Initiation, Feasibility, Design, Procurement, and Construction/Execution).

2.3.2. Implemented Project Phases: A Literature Review

The six aforementioned project lifecycle phases are described as follows:

Phase 1: Project Initiation Phase

The project management process starts with the nomination of the end user requirements, since the projects' ultimate objective is to turn strategies into reality, projects are generally the outcome of

the strategic plans of entities (government or private) aiming to achieve certain objectives. Accordingly, all projects should meet a clearly-defined need in line with strategic policies and objectives. Additionally, all new projects should be well-coordinated with existing and other planned projects in the portfolio. Moreover, costs/benefits or the expected impacts are realistic and properly identified; at this stage the project should be clearly defined and sufficiently well developed. Projects must be included within the Strategic Plan in order to proceed to the Project Initiation Stage. Since the project imitation stage establishes the need for the project and defines relevant project details in order to justify a decision to proceed further with the project, all realistic project options need to be careful studies, evaluated and compared; life-cycle costs/benefits are evaluated and compared prior to proceeding to the next stage (Institute & Project 2012; Khang & Moe 2008)

Phase 2: Feasibility Study (Conceptualising) Phase

The Feasibility Study (Conceptualising) stage considers alternative technical solutions and develops the Concept Design for the preferred solution, upon which the project's economic feasibility can be determined and a decision to proceed with, stop or defer the project can be made. Accordingly, the management verifies whether the best delivery option has been chosen from a comparison of realistic alternatives and the comparison takes into account the project specific objectives and constraints. The project offers best value-for-money, and major risks that have been allocated optimally with shortcomings associated with the preferred delivery model are identified (Khang & Moe 2008)

Phase 3: Design (Preliminary and Detailed Design) Phase

The Design stage develops and documents the project concept into execution documents upon which stakeholder approvals can be obtained and tender documents for the execution stage are

finalised. Accordingly, the management needs to ensure that the design documents provide clear and sufficient information to define the scope of work, develop the designs in accordance with standards with the value engineering workshops undertaken in order to ensure an optimal balance between cost and functionality. In addition, HSE (Health, Safety & Environmental) aspects, including the EIA (Environmental Impact Assessment), should be highly considered at this stage and obtain all the necessary Design NOCs accordingly. Any design issues need to be addressed and resolved, realistic and achievable construction duration and estimates are agreed and key construction risks are well identified, with the same to be addressed in the construction contract.

In the design phase (ideally prior to the completion of the detailed design), the project management team should perform a risk assessment analysis to decide whether any events or conditions may occur and affect the project's major constraints (schedule, budget, quality, HSE, etc.). With the project design becoming clearer and reaching the end, it becomes more expensive to mitigate unforeseen events. Thus, the risk assessment has to be conducted on a timely basis through the project design phase. This risk assessment is usually completed through a project risk register (Khang & Moe 2008; Institute & Project 2012).

Phase 4: Procurement Phase

There are many alternative delivery methods for the construction initiatives, such as build or design & build or design & build & maintain, etc. A project owner may decide to nominate one or all the project functions (building, design, construction supervision, etc.). Therefore the Procurement Strategy stage in the construction projects' lifecycle develops the Project Delivery Model: a high level plan on how the design, execution and any required operation and maintenance will be procured and/or packaged and how the associated risks will be allocated (Osipova & Eriksson 2011). This needs to be determined prior to moving to the preliminary/detailed design stage.

The Procurement Stage involves tendering and awarding a contract for the execution of the project. Upon completing the technical and commercial evaluation of tenders, accordingly recommended consultants/contractors are chosen to carry out the project and provide adequate resources to administer and supervise the execution. Having any risks and shortcomings associated with the selected vendors to be considered and mitigation actions put in place to manage the same. In addition, any outstanding design or issues ought to be adequately resolved and closed out (Osipova & Eriksson 2011; Institute & Project 2012).

Phase 5: Construction/Execution Phase

The Construction/Execution phase is the time where the project management team puts their plans into action. It involves the execution/implementation of the project in accordance with the construction/execution contracts in order to achieve the final product, outcome or deliverable of the project and handover to end users for operation, maintenance or implementation. A project's implementation is managed by a project manager/project management team (who is assigned by the project owner/client). It is pertinent to note that most of the project's activities with respect to numbers and costs incurred during this phase. Therefore, it has the highest potential for cost overruns and/or changes (Khang & Moe 2008; Institute & Project 2012; FTA 2016).

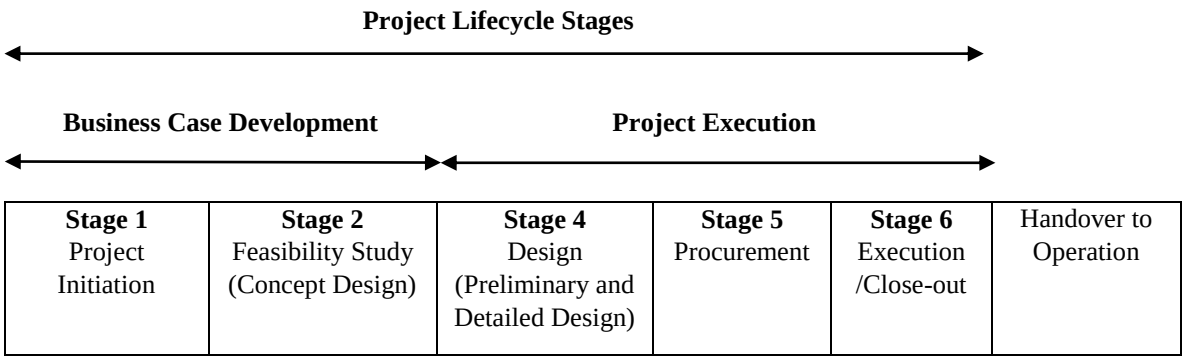

Figure 2. 3: Case Study - Project Lifecycle Stages

2.4. Key Risks throughout the Project Lifecycle

This section discusses in line with literature the key risks in each phase of the project lifecycle (in accordance with the existing gate reviews at the case study) in order to identify the key matters that impact the project success factors in each phase. The highlighted risks would be limited to the impact on the main stages identified in the selected case study lifecycle and the identified success factors of the project (project delivery and Stakeholders Satisfaction).

Risk assessments need to be implemented further to the major changes, or on the beginning of key lifecycle stages. Every assessment on the project lifecycle stages should clearly emphasise the relevant risks to the ongoing stage, in addition to the key risks through the whole lifecycle. A consistent process and framework, as set out in Part B of this section, will be adopted for all Risk Assessments (Osipova & Eriksson 2011; Institute & Project 2012).

Many researchers have discussed the key risks/challenges affecting the projects in the construction sector in relation to the project lifecycle. Table 2.4 recaps the mutual risks recognised in these studies (with a focus on developing countries).

Risk Description	**Research Reference**										
	Mishmish & El-Sayegh (2016)	Faridi & El- Sayegh (2006)	Sweis et al. (2008)	Alaghbari et al. (2007)	(Maseko 2017)	Abd El-Razek, et al. (2008)	Sohrabinejad & Rahimi (2015)	(Islam & Trigunarsyah (2017)	Kog (2017)	Mroszczyk (2015)	Feng and Wu (2013)
Project Delivery											
Lack of charter that officially approves the proj□ect	✓		✓		✓			✓	✓		
Absence of initial scope definition			✓	✓						✓	✓
Lack of project plan that documents the approach to achieve the project objectives.	✓		✓			✓		✓		✓	
Insufficient pre-defined controlling procedures over the		✓			✓		✓		✓		✓

Risk Description	Research Reference										
	Mishmish & El-Sayegh (2016)	Faridi & El- Sayegh (2006)	Sweis et al. (2008)	Alaghbari et al. (2007)	(Maseko 2017)	Abd El-Razek, et al. (2008)	Sohrabinejad & Rahimi (2015)	(Islam & Trigunarsyah (2017)	Kog (2017)	Mroszczyk (2015)	Feng and Wu (2013)
execution of the project activities.											
Inadequate assessment of the scope changes.	✓		✓		✓		✓	✓			
Unclear scope or works.	✓	✓		✓		✓	✓				
Lack of specific schedule for the works that to be executed.											
Incorrect relations between the activities included in the project schedule.			✓	✓	✓			✓			
Inaccurate estimation/assumptions of the work activities in terms of numbers, duration, etc.		✓		✓			✓	✓		✓	✓
Unrealistic schedule relations, cost or resource loading, that needed to complete individual activities.	✓		✓	✓		✓	✓				
Inadequate monitoring for the changes to the project programme.		✓	✓		✓		✓			✓	
Increase of issues that cause changes as well as budget overruns.			✓		✓		✓		✓		✓
Inadequate mitigation methods to eliminate causes of unsatisfactory performance.		✓	✓	✓		✓	✓	✓			
Lack of documented roles, responsibilities, and reporting relationships.	✓		✓		✓		✓	✓			
Not having the necessary Human Recourses (HR) to deliver the project activities.			✓	✓				✓		✓	✓
Inadequate monitoring of the team/individual performance.		✓	✓		✓		✓		✓		
Inadequate implementation of the risk management practices throughout the project.		✓		✓		✓		✓		✓	✓
Lack of timely identification of the key risks throughout the project.			✓		✓		✓		✓	✓	
Inaccurate assessment of the project risks based on the current risk score derived from the risk impact on the project objectives and likelihood of occurrence.				✓		✓	✓		✓		✓
No adequate framework to deal with uncertain events to enhance opportunities and mitigate risks.		✓	✓		✓		✓	✓			
Inadequate monitoring of the residual risks.		✓		✓		✓			✓	✓	
Lack of identification of the procurement strategy and procurement plan.	✓		✓	✓		✓	✓				
Inappropriate list of capable/qualified vendors for the competitive procurement.				✓	✓		✓		✓	✓	
Inadequate governance process for managing the tendering/bidding processes.	✓		✓			✓			✓		
Inadequate due diligence in the assessment of received proposals/quotations, negotiating with the bidders, selection process, etc.			✓	✓		✓		✓			
Inadequate contracts management with the vendors including monitoring the performance and managing the relationships,				✓	✓	✓			✓	✓	

Risk Description	Research Reference										
	Mishmish & El-Sayegh (2016)	Faridi & El- Sayegh (2006)	Sweis et al. (2008)	Alaghbari et al. (2007)	(Maseko 2017)	Abd El-Razek, et al. (2008)	Sohrabinejad & Rahimi (2015)	(Islam & Trigunarsyah (2017)	Kog (2017)	Mroszczyk (2015)	Feng and Wu (2013)
etc.											
Inability to close out of the contract including resolution of claims, testing, commissioning, taking over of works, closing the project/phase.	✓	✓		✓		✓				✓	
Inadequate management of the safety hazards related issues /concerns on the project.		✓	✓		✓	✓			✓		
Lack of a safety management plan to execute the safety related activities.							✓		✓		✓
Inadequate documentation of the safety reports, records and events.			✓		✓			✓			✓
Inadequate study of the impact on the environment nearby the project area/site and the environmental principles related to the project.			✓			✓		✓			✓
The important financial matters not addressed or mitigated on a timely basis.	✓			✓	✓				✓		✓
Inadequate controlling and monitoring of the key financial assumptions included in the Financial Plans.			✓			✓		✓		✓	
Inadequate knowledge of the contract conditions to manage the claims raised in a timely manner.	✓		✓		✓			✓			
Not avoiding or preventing claims from arising.				✓		✓		✓		✓	
Improper assessment of claims.	✓		✓		✓		✓				✓
Insufficient negotiation prior to escalating the disagreement for mediation or arbitration.				✓		✓		✓		✓	
Stakeholders Satisfaction											
Inadequate control over the quality assurance activities that needed to ensure meeting the stakeholders' expectations.	✓		✓		✓			✓	✓		
Selecting of quality principles that are not in line with the stakeholder's requirements.				✓			✓			✓	
Completed projects deliverables are not formally accepted/verified by the concerned team.		✓		✓				✓		✓	
Not maintaining the capabilities of the project team individuals.			✓			✓			✓		✓
Inadequate communication of the stakeholder's requirements from the project.		✓			✓			✓		✓	
Non-availability of timely input from the key stakeholders.	✓		✓			✓			✓	✓	
Inadequate communication on the information and updates related to the project performance.	✓		✓		✓				✓		
Insufficient interaction with the key stakeholders to resolve their concerns/issues related to the project deliverables.		✓				✓		✓		✓	
Inadequate review/update of the environmental management plans			✓		✓		✓		✓		
The project deliverables are not as expected/agreed.		✓		✓		✓		✓		✓	✓

Table 2. 4: The common risks in the construction projects (with a focus on the developing countries)

Following to the identification of common risks in the construction projects, the risks are classified based on the applicability to each phase of the project lifecycle and related CCM Components. Refer to Table 2.5 for details:

Key Risks / Challenge	Related CCM Component	Project Lifecycle Phases				
		Project Initiation	Feasibility Study	Design	Procurement	Execution / Construction
Project Delivery						
Lack of charter that officially approves the project.	Governance; Process; and Maturity Level.	✓				
Absence of initial scope definition.	Process; and Maturity Level.	✓				
Lack of project plan that documents the approach to achieve the project objectives.	Governance; and Process.		✓			
Insufficient pre-defined controlling procedures over the execution of the project activities.	Governance; Process; and Technology.					✓
Inadequate assessment of the scope changes.	Process; and People.					✓
Unclear scope or works.	Process; and Maturity Level.			✓	✓	✓
Lack of specific schedule for the works to be executed.	Governance; Process; and Technology.					✓
Incorrect relations between the activities included in the project schedule.	Technology; and Maturity Level.			✓	✓	✓
Inaccurate estimation/assumptions of the work activities in term of numbers, durations, etc.	Process; and Technology.			✓	✓	✓
Unrealistic schedule relations, cost or resource loading, that needed to complete individual activities.	Process; Technology; and Maturity Level.			✓	✓	✓
Inadequate monitoring for the changes to the project programme.	Governance; Process; and Maturity Level					✓
Escalation of issues that cause changes as well as budget overruns.	Governance; Process; and Maturity Level.				✓	✓
Lack of timely mitigation methods to eliminate the causes of unsatisfactory performance.	Governance; Process; People; and Maturity Level.			✓	✓	✓
Lack of documented roles, responsibilities, and reporting relationships.	Governance; Process; People; and Maturity Levels	✓	✓	✓	✓	✓

Key Risks / Challenge	Related CCM Component	Project Lifecycle Phases				
		Project Initiation	Feasibility Study	Design	Procurement	Execution / Construction
Not having the necessary Human Recourses (HR) to deliver the project activities.	Process; People; and Maturity Level.	✓	✓	✓	✓	✓
Inadequate monitoring of the team/individual performance.	Process; People; and Maturity Levels	✓	✓	✓	✓	✓
Inadequate implementation of the risk management practices throughout the project.	Governance; Process; Technology; and Maturity Level.	✓	✓	✓	✓	✓
Lack of timely identification of the key risks throughout the project.	Governance; Process; and Maturity Level.	✓	✓	✓	✓	✓
Inaccurate assessment of the project risks based on the current risk score derived from the risk impact on the project objectives and likelihood of occurrence.	Governance; Process; Technology; and Maturity Level.	✓	✓	✓	✓	✓
No adequate framework to deal with any uncertain events in order to enhance opportunities and mitigate threats.	Governance; Process; and Maturity Level.	✓	✓	✓	✓	✓
Inadequate monitoring of the residual risks.	Governance; Process; Technology; and Maturity Level.		✓	✓	✓	✓
Lack of identification of the procurement strategy and procurement plan.	Governance; Process; and Maturity Level.				✓	
Inadequate list of capable/qualified vendors for the competitive procurement.	Governance; Process; Technology; and Maturity Level.				✓	✓
Inadequate governance process for managing the tendering/bidding processes.	Governance; and Process.				✓	
Inadequate due diligence in the assessment of received proposals/quotations, negotiating with the bidders, selection process, etc.	Governance; and Process.				✓	
Inadequate contracts management with the vendors including monitoring the performance and managing the relationships, etc.	Governance; Process; and Maturity Level.					✓
Inability to close out of the contract including resolution of claims, testing, commissioning, taking over of works, closing the project/phase.	Governance Process People Technology Maturity Levels					✓
Inadequate management of the safety hazards related issues/concerns on the project.	Process; People; and Maturity Level.					✓
Lack of a safety management plan to execute the safety related activities.	Process; People; and Maturity Level.					✓
Inadequate documentation of the safety reports, records and events.	Process; People; and Maturity Level.					✓
Inadequate study of the impact on the environment nearby the project area/site and the environmental principles related to the project	Process; Technology; and Maturity Level.			✓	✓	✓

Key Risks / Challenge	Related CCM Component	Project Lifecycle Phases				
		Project Initiation	Feasibility Study	Design	Procurement	Execution / Construction
The important financial matters not addressed or mitigated on a timely basis.	Governance; Process; Technology; and Maturity Level.		✓	✓	✓	✓
Inadequate controlling and monitoring of the key financial assumptions included in the Financial Plans.	Governance; Process; Technology; and Maturity Level.		✓	✓	✓	✓
Inadequate knowledge of the contract conditions to manage the claims raised in a timely manner.	Governance; Process; People; and Maturity Level.					✓
Not avoiding or preventing claims from arising.	Process; and Maturity Levels					✓
Improper assessment of claims.	Governance; Process; Technology; and Maturity Level.					✓
Insufficient negotiation prior to escalating the disagreement for mediation or arbitration.	Governance; Process; People; and Maturity Level.					✓
Stakeholders Satisfaction						
Inadequate control over the quality assurance activities that needed to ensure meeting the stakeholders' expectations.	Process; People; and Maturity Level.				✓	✓
Selecting of quality principles that are not in line with the stakeholders' requirements.	Process; People; and Maturity Level.				✓	✓
Completed projects deliverables are not formally accepted/verified by the concerned team.	Governance; Process; and Maturity Level.			✓	✓	✓
Not maintaining the capabilities of the project team individuals.	Process; People; and Maturity Level.	✓	✓	✓	✓	✓
Inadequate communication of the stakeholder's requirements from the project.	Process; and Technology.	✓	✓	✓	✓	✓
Non-availability of timely input from the key stakeholders.	Process; and Technology.	✓	✓	✓	✓	✓
Inadequate communication on the information and updates related to the project performance.	Process; and Technology.			✓	✓	✓
Insufficient interaction with the key stakeholders to resolve their concerns/issues related to the project deliverables.	Process; and Technology.			✓	✓	✓
Inadequate review/update of the environmental management plans	Process; Technology; and Maturity Level.			✓	✓	✓
The project deliverables are not as expected/agreed.	Governance; Process; People; and Technology.					✓

Table 2. 5: Key risks affecting the success of construction projects throughout the project lifecycle

Chapter Three: Conceptual Framework

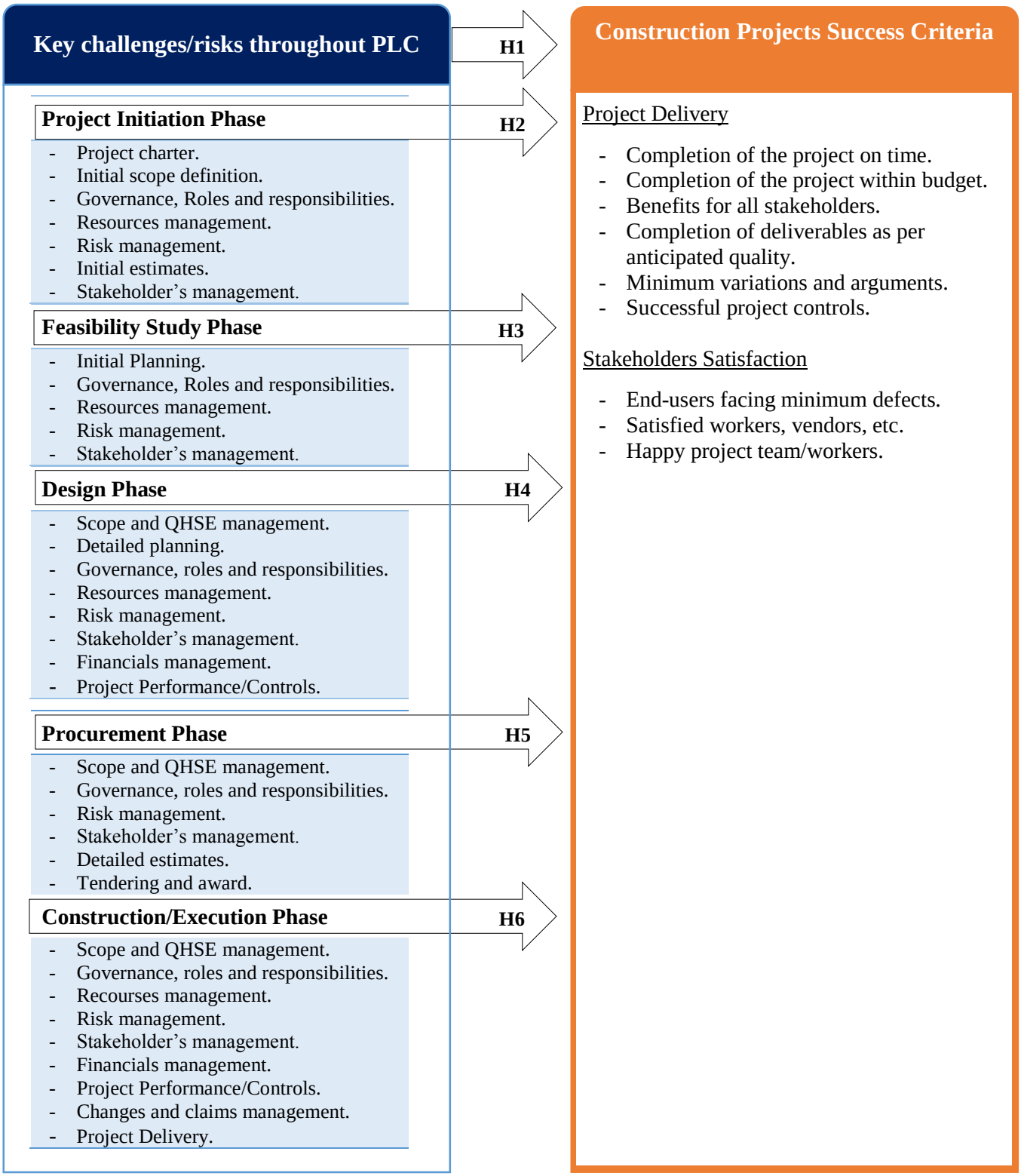

Figure 3. 1: Conceptual Framework - Key risks throughout the construction project lifecycle

Chapter Four: Methodology and Limitations

4.1. Research Methodology

According to Saunders, M., Lewis, P. & Thornhill, A. (2009), the data collection stage for the research should be supported by clear analysis/understating of the Research Union Layers (i.e. Research Philosophy, Research Approach, Research Strategy, Research Choice and Time Horizon).

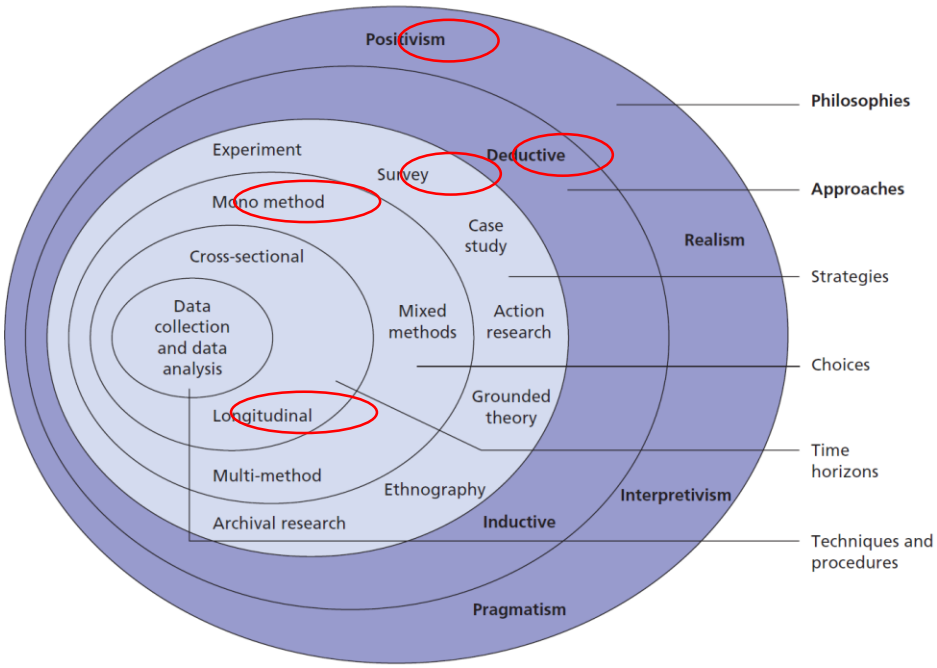

Figure 4. 1: Research Onion (Saunders, Lewis & Thornhill 2009).

This section will discuss and elaborate on the methodology followed in this research. The Positivism Philosophy is deemed to be appropriate for the research due to the technical nature of the subject and the needed knowledge/experience with the processes and terms related to risks management, project management, construction industry, etc. It is pertinent to note that the associated data collection for this philosophy needed to be quantitative with a well and minutely structured data collection method. A Deductive Approach has been adopted taking into

consideration the scientific nature of the study. Accordingly, the sequence pertaining to the deductive approach has been designed by reviewing the literature related to the subject in order to identify the applicable and the identified hypothesis and related variables have been drafted carefully using appropriate and clear technical terms as per the industry common terminology, followed by testing of the relations, validation/evaluation and discussion of the outcome.

Further to the above, A Survey Strategy based on the Choice of Mono Method (Quantitative Technique), has been adopted in order to verify the aforementioned hypotheses through examination and study of the information and data obtained through an online questionnaire (Appendix 1). It is worth mentioning that no duration has been defined for the research questionnaire/period (Longitudinal-Time Horizon). The survey contained two major parts; the first part considered collecting general information about the respondents in order to understand their appropriateness for the subject that includes the respondent's professional background, level of education, number of years of experience in the respective industry, etc. The second part focused on obtaining the information/data related to the identified parameters in the survey based on the Likert scale. The first five scales obtain information on the independent variables (the key risks affecting the construction projects in the UAE throughout the identified lifecycle phases Project Initiation, Feasibility/Concept Study, Design, Procurement and Execution/Construction), while the last scale obtains information about the dependent variable for the key success factors for the construction initiatives in the UAE. The information obtained studied on the relationship of these aspects and their variables, and it is worth mentioning that in order to ensure the most useful outcome of the research, the survey has been predominantly directed towards professionals in the fields of construction management, real estate, projects management, construction site supervision individuals, etc. with prior experience with/in the in the UAE construction industry. The related likelihood of the identified forty seven factors has been evaluated using the Likert rating scheme

that provides the following selections: (Extremely important (5), Very important (4), Important (3), Not so important (2) or Not at all important (1)). The respondents were asked to contribute to this online questionnaire, and were selected according to their background and/or professional experience in the respective fields for construction or other related fields.

The pilot questionnaire has been prepared, 10 individual feedbacks/responses have been received for the proposed questionnaire, the same has been considered to conclude/determine the final questionnaire and structure of the survey. The survey has been drafted in the form of an online questionnaire distributed via email and links to the self-selected sample. The online questionnaire obtained a total of 104 responses, which is considered to be an acceptable result for a statistical analysis that requires over thirty responses to move to the next stage; however, having a higher number of responses increases the sample size and supports the accuracy/confidence level of the outcome (Saunders, Lewis & Thornhill 2009). The obtained responses have been uploaded and analysed into the SPSS (Statistical Package for the Social Sciences) statistical software, which was deemed to be appropriate for analysing the data obtained under Part 2 of the questionnaire starting with the 'Reliability Test' in order to verify that the information obtained is reliable. A second test will be the 'Correlation Test' designed in order to verify the relation between the several factors identified and whether that outcome is acceptable. Accordingly, the 'Regression Test' will be performed in order to assess the relation between the hypotheses defined based on the literature. In addition, the risks/challenges of each phase will be ranked according to their importance from the respondents' point of view. The outcome will be analysed in detail in the 'Data Analysis' chapter.

4.2. Research Limitations

This study is limited to the identified factors in relation to risks throughout the project lifecycle and construction success that have been known during the literature review. Furthermore, the results may have been impacted by the quantity of the selected samples, culture and education differences of the respondents, etc. Thus, it would be highly recommended to conduct a more detailed study in the future in order to incorporate a larger amount of factors as well as well as a larger number of respondents.

The contracting processes involve the use of a great variety of documents, records and reports. There are few common or widely accepted terms used in the construction industry to identify these items. To help identify and access these for reviews, a listing of the most common construction documents is included. All items will not be used on every project and many of the documents listed are merely alternate names for the same document (e.g., ‘change order’ and ‘contracts variations’).

Chapter Five: Data Analysis

This section will analyse the 104 responses received on the questionnaire:

5.1. General Information - Statistics

Upon analysing the respondents' general information (Part 1), the following were noted:

Q1. What is your gender?

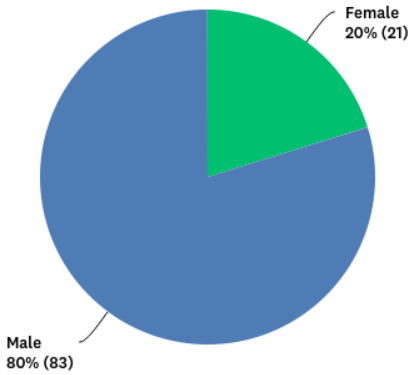

Figure 5. 1: Analysis of General Information - Gender

Q2. What is the highest level of education you have completed?

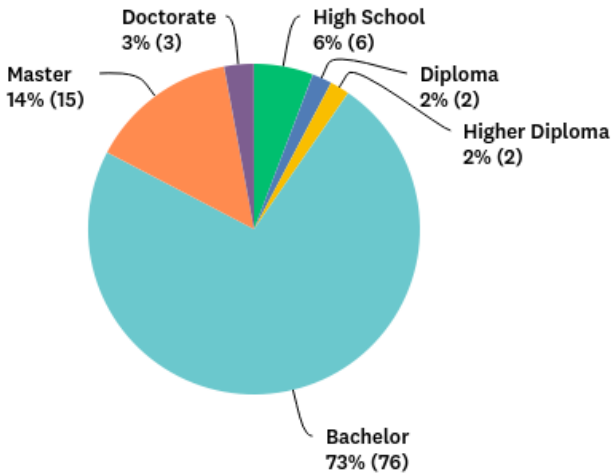

Figure 5. 2: Analysis of General Information – Level of Education

Q3. In what organisation type do you work?

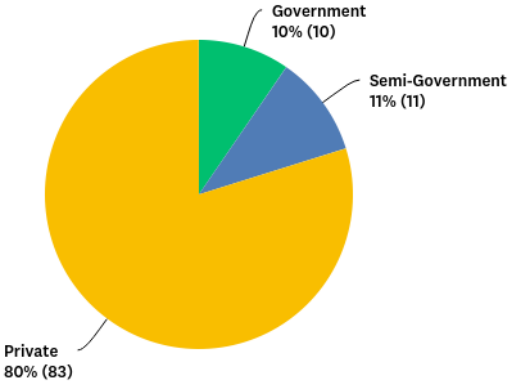

Figure 5. 3: Analysis of General Information – Organization Type

Q4. Which of the following best describes your current job level?

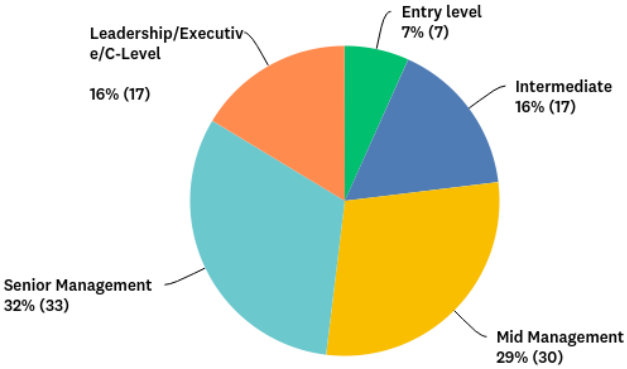

Figure 5. 4: Analysis of General Information – Job Level

Q5. How many years of industrial experience do you have?

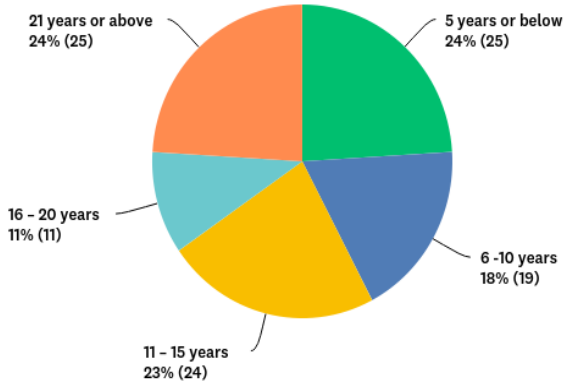

Figure 5. 5: Analysis of General Information – Experience

Q6. Which of the following best describes your company role?

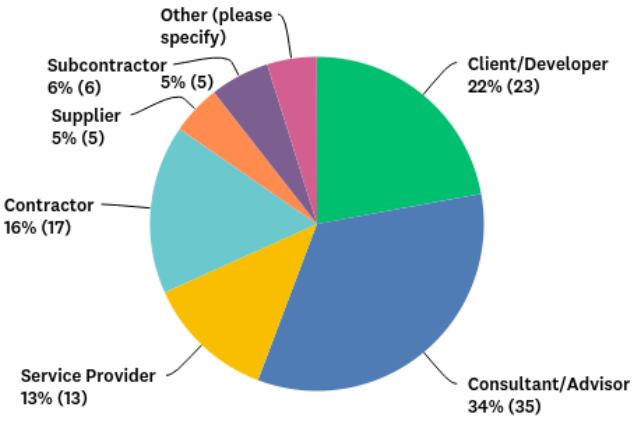

Figure 5. 6: Analysis of General Information – Company Role

Q7. Are you currently working in the UAE?

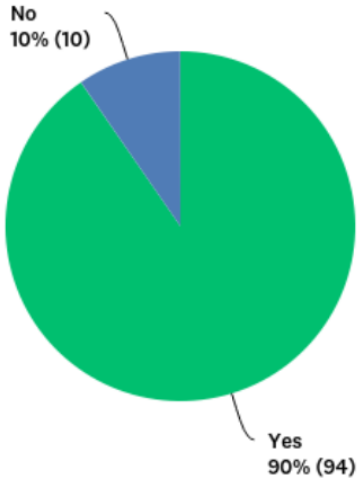

Figure 5. 7: Analysis of General Information – Current Working Status

Upon analysing the responses related to Part (2), the following were noted:

5.2. Reliability

Forty-three variables have been defined in the literature in regard to the management of typical risks throughout the project lifecycle and the success factors of the construction projects in the UAE. The reliability of internal consistency has been tested and applied the Cronbach's alpha technique, which involved a value of 0.951 (Table 5.1 below). This reflects that the data obtained in relation to the determined factors are highly reliable since this value is more than 0.7 (Norusis 1993).

Reliability Statistics	
Cronbach's Alpha	N of Items
.951	43

Table 5. 1: Reliability Statistics - Alpha method

Once the half split model has been tested, the value was 0.834 (Table 5.2 below), which supports the high reliability of obtained data as it is close to the alpha value (Norusis 1993).

Reliability Statistics			
Cronbach's Alpha	Part 1	Value	.930
		N of Items	22[a]
	Part 2	Value	.907
		N of Items	21[b]
	Total N of Items		43

Correlation Between Forms		.722
Spearman-Brown Coefficient	Equal Length	.838
	Unequal Length	.838
Guttman Split-Half Coefficient		.834

Table 5. 2: Reliability Statistics - half split method

5.3. Correlation

Subsequently, Pearson's correlation has been used in order to assess/measure the relation between the risk management of the common risks over the phases of the project lifecycle and the success influences of construction projects for the construction initiatives in the UAE (Table 5.3 below).

Correlations

		InitiationRisks	ConceptRisks	DesignRisks	ProcurementRisks	ConstructionRisks	GlobalRisksIV	GlobalSuccessDV
InitiationRisks	Pearson Correlation	1	.764**	.755**	.523**	.576**	.822**	.402**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000
	N	103	103	103	103	103	103	103
ConceptRisks	Pearson Correlation	.764**	1	.804**	.623**	.637**	.869**	.511**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000
	N	103	103	103	103	103	103	103
DesignRisks	Pearson Correlation	.755**	.804**	1	.680**	.675**	.911**	.448**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000
	N	103	103	103	103	103	103	103
ProcurementRisks	Pearson Correlation	.523**	.623**	.680**	1	.726**	.825**	.453**
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000
	N	103	103	103	103	103	103	103

ConstructionRisks	Pearson Correlation	.576**	.637**	.675**	.726**	1	.868**	.519**
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.000
	N	103	103	103	103	103	103	103
GlobalRisksIV	Pearson Correlation	.822**	.869**	.911**	.825**	.868**	1	.544**
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.000
	N	103	103	103	103	103	103	103
GlobalSuccessDV	Pearson Correlation	.402**	.511**	.448**	.453**	.519**	.544**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	
	N	103	103	103	103	103	103	103
**. Correlation is significant at the 0.01 level (2-tailed).								

Table 5. 3: Correlation test

5.4. Regression

Furthermore, the regression test has been conducted in order to verify the correlation and assess the development relation between the dependent variables (DV) (success factors of the construction projects in the UAE) and the independent variables (IV) (common risks of the project lifecycle stages), as per the steps below:

A linear regression between the global IVs (all identified risk items in the construction projects throughout the project lifecycle stages) and the global DVs (identified as the success factors of the construction projects) has been performed and revealed that the global IVs statistically extremely predict successful construction projects in the UAE, F (42.466);p < .000 representing that the regression model found the turnover intentions in a correct manner. The R Square value and adjusted R Square express that variance in the turnover intention can be justified by the perception of organisation justice (as per Table 5.4 below).

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.544[a]	.296	.289	4.348

a. Predictors: (Constant), GlobalRisksIV

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	802.866	1	802.866	42.466	.000[b]
	Residual	1909.523	101	18.906		
	Total	2712.388	102			

a. Dependent Variable: GlobalSuccessDV
b. Predictors: (Constant), GlobalRisksIV

Coefficients[a]						
Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	13.414	3.229		4.154	.000
	GlobalRisksIV	.163	.025	.544	6.517	.000

a. Dependent Variable: GlobalSuccessDV

Table 5. 4: Regression test – Global IV with Global DV

Accordingly, a linear regression test has been conducted between the global DV's and each factor group of IV's such as the Risks associated with the lifecycle Phases such as the Initiation Phase, Concept Phase, Design Phase, Procurement Phase and Execution/Construction Phase, which found the following ANOVA F values: 19.482 (Initiation Phase), 35.737 (Concept Phase), 25.307 (Design Phase), 26.144 (Procurement Phase) and 37.224 (Execution/Construction Phase) $p < .000$

representing that the regression model calculates the turnover meanings in a proper way. R Square values and the adjusted R Square display that the difference in the turnover intention could be acceptable by perception of organisation justice - as per Tables 5.5, 5.6, 5.7 and 5.8 below.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.402[a]	.162	.153	4.745

a. Predictors: (Constant), InitiationRisks

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	438.602	1	438.602	19.482	.000[b]
	Residual	2273.786	101	22.513		
	Total	2712.388	102			

a. Dependent Variable: GlobalSuccessDV
b. Predictors: (Constant), InitiationRisks

Coefficients[a]

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	20.760	3.097		6.704	.000
	InitiationRisks	.611	.139	.402	4.414	.000

a. Dependent Variable: GlobalSuccessDV
b. Predictors: (Constant), InitiationRisks

Table 5. 5: Regression test – Global IV with Initiation Phase DV

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.511[a]	.261	.254	4.454

a. Predictors: (Constant), ConceptRisks

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	708.891	1	708.891	35.737	.000[b]
	Residual	2003.497	101	19.837		
	Total	2712.388	102			

a. Dependent Variable: GlobalSuccessDV
b. Predictors: (Constant), ConceptRisks

Coefficients[a]

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	18.179	2.728		6.665	.000
	ConceptRisks	.888	.149	.511	5.978	.000

a. Dependent Variable: GlobalSuccessDV

Table 5. 6: Regression test – Global IV with Concept Phase DV

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.448[a]	.200	.192	4.634

a. Predictors: (Constant), DesignRisks

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	543.454	1	543.454	25.307	.000[b]
	Residual	2168.934	101	21.475		
	Total	2712.388	102			

a. Dependent Variable: GlobalSuccessDV
b. Predictors: (Constant), DesignRisks

Coefficients[a]

Model		Unstandardised Coefficients		Standardised Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	19.755	2.922		6.762	.000
	DesignRisks	.482	.096	.448	5.031	.000

a. Dependent Variable: GlobalSuccessDV

Table 5. 7: Regression test – Global IV with Design Phase DV

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.453[a]	.206	.198	4.619

a. Predictors: (Constant), ProcurementRisks

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	557.731	1	557.731	26.144	.000[b]
	Residual	2154.658	101	21.333		
	Total	2712.388	102			

a. Dependent Variable: GlobalSuccessDV
b. Predictors: (Constant), ProcurementRisks

Coefficients[a]

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	18.904	3.040		6.218	.000
	ProcurementRisks	.686	.134	.453	5.113	.000

a. Dependent Variable: GlobalSuccessDV

Table 5. 8: Regression test – Global IV with Procurement Phase DV

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.519[a]	.269	.262	4.430

a. Predictors: (Constant), ConstructionRisks

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	730.448	1	730.448	37.224	.000[b]
	Residual	1981.940	101	19.623		
	Total	2712.388	102			

a. Dependent Variable: GlobalSuccessDV
b. Predictors: (Constant), ConstructionRisks

Coefficients[a]

Model	Unstandardised Coefficients		Standardised Coefficients	t	Sig.
	B	Std. Error	Beta		

1	(Constant)	16.756	2.904		5.770	.000
	ConstructionRisks	.495	.081	.519	6.101	.000
a. Dependent Variable: GlobalSuccessDV						

Table 5. 9: Regression test – Global IV with Construction Phase DV

5.5. Ranking of Risks (at each stage)/Success Factors

This section highlights the ranking of the identified key risks at each stage of the project's lifecycle as well as the ranking of the identified success factor for the construction projects in the UAE. The raking will be based on the respondent's point of view, the score has been computed based on the weighted average (Likert scale from 1 to 5).

- Risks that impact the project success in the Project Initiation Phase:

Answer Choices	**Weighted Average** Likert scale from (1 to 5)
1) Risks of Initial Estimates	3.80
2) Risks of Initial Scope Definition	3.77
3) Risks of Resources Management	3.72
4) Risks of Governance, Roles and Responsibilities	3.71
5) Risks of Project Charter	3.63
6) Risks of Inadequate Risk Management	3.61
7) Risks of Stakeholder's Management	3.55

Table 2. 6: Ranking of Key Risk – Project Planning Phase

- Risks that impact the project success in the Project Study/Concept Phase:

Answer Choices	**Weighted Average** Likert scale from (1 to 5)
1) Risks of Initial Planning	3.75
2) Risks of Stakeholder's Management	3.66
3) Risks of Governance, Roles and Responsibilities	3.63
4) Risks of Inadequate Risk Management	3.60
5) Risks of Resources Management	3.55

Table 2. 7: Ranking of Key Risk – Project Study/Concept Phase

- Risks that impact the project success in the Project Design Phase:

Answer Choices	Weighted Average Likert scale from (1 to 5)
1) Risks of Financials Management	4.07
2) Risks of Project Performance/Controls	3.86
3) Risks of Detailed Planning	3.81
4) Risks of Scope, QHSE Requirements	3.79
5) Risks of Stakeholder's Management	3.70
6) Risks of Governance, Roles and Responsibilities	3.68
7) Risks of Resources Management	3.66
8) Risks of Inadequate Risk Management	3.63

Table 2. 8: Ranking of Key Risk – Project Design Phase

- Risks that impact the project success in the Procurement Phase:

Risks that impact the project success in the Project Procurement Phase	
Answer Choices	**Weighted Average** Likert scale from (1 to 5)
1) Risks of Detailed Estimates	3.98
2) Risks of Tendering and Award	3.97
3) Risks of Governance, Roles and Responsibilities	3.70
4) Risks of Scope, QHSE Requirements	3.69
5) Risks of Stakeholder's Management	3.56
6) Risks of Inadequate Risk Management	3.55

Table 2. 9: Ranking of Key Risk – Procurement Phase

- Risks that impact the project success in the Project Construction/Execution Phase:

Risks that impact the project success in the Project Construction/Execution Phase	
Answer Choices	**Weighted Average** Likert scale from (1 to 5)
1) Risks of Project Delivery	4.17
2) Risks of Scope, QHSE Requirements	4.09
3) Risks of Financials Management	4.03
4) Risks of Resources Management	4.00
5) Risks of Changes and Claims Management	3.96
6) Risks of Project Performance/Controls	3.95
7) Risks of Governance, Roles and Responsibilities	3.90
8) Risks of Stakeholder's Management	3.71
9) Risks of Inadequate Risk Management	3.65

Table 2. 10: Ranking of Key Risk – Project Construction/Execution Phase

- The success factors for the construction projects in the UAE:

Answer Choices	Weighted Average Likert scale from (1 to 5)
Deliver the project as per the anticipated quality standards	4.04
Completion of the Project on Time	4.01
Completion of the Project within Budget	3.93
Minimum Defects to End-users	3.89
Maintain Successful Project Controls	3.76
Satisfied Vendors (Contractors, Consultants, etc.)	3.71
Benefits for all Stakeholders	3.69
Satisfied Team/Workers	3.64
Minimum Variations/Disputes	3.63

Table 2. 11: Ranking of Success Factors for the Construction Projects in the UAE

Chapter Six: Discussion of Findings

In this section, the respondents' feedback on the importance of key risks at each stage of the project will be discussed and analysed for the risks that move from one phase to another. In addition, the results concluded for the mentioned hypotheses and the control assessment that may be useful to assess the internal controls related to each stage of the project lifecycle will be discussed.

6.1. Key Risks Moving from One Phase to Another

According to the respondents' feedback for the importance of key risks/challenges that impact the success of construction projects in the UAE in each phase, it was observed that the number of risks move from one phase to another. Refer to the Table 6.1 below for details.

Key Risks at Project Lifecycle Phases				
Project Initiation	**Feasibility Study**	**Design**	**Procurement**	**Execution / Construction**
Initial Estimates	Initial Planning	Financials Management	Detailed Estimates	Project Delivery
Initial Scope Definition	Stakeholder's Management	Performance/Controls	Tendering and Award	Scope, QHSE Req.
Resources Management	Governance, R & R	Detailed Planning	Governance, R & R	Financials Management
Governance, R & R	Resources Management	Scope, QHSE Req.	Scope, QHSE Req.	Resources Management
Project Charter		Stakeholder's Management	Stakeholder's Management	Changes & Claims Mgt.
Stakeholder's Management		Governance, R & R		Performance/Controls
		Resources Management		Governance, R & R
				Stakeholder's Management

Table 6. 1: Analysis of the risks that move from one phase to another

Risks of Financial Management.

The risks related to management and controls over the financial matters found to be important throughout the project lifecycle (i.e., it has been ranked as one of the top three key risks at each stage of the project lifecycle -from the respondents' point of view). That includes the risks associated with initial financial estimates at the project initiation stage to the initial (financial) planning at the feasibility study stage, pre-tender detailed estimates at the procurement phase; and management of the financial aspects during the project design and execution phases. The common risks include the following (Kog 2017):

- The important financial matters not addressed or mitigated on a timely basis.
- Inadequate controlling & monitoring of the key financial assumptions included in Financial Plans.
- Inaccurate estimation/assumptions of the work activities costs.
- Incorrect cost loading for complete individual activities.
- Unrealistic cash flow.
- Escalation of issues that cause changes as well as budget overruns.

Risks of Scope and QHSE Requirements.

The risks associated with the project scope and QHSE requirements are critical, it has been reflected with high weightage in most of the project phases, including the initial scope definition at the project initiation phase, and management and controlling of the scope and QHSE requirements at the design, procurement, and execution phases. The common risks include the following (Mroszczyk 2015):

- Absence of initial scope definition.
- Inadequate assessment of the scope changes.
- Unclear scope or works.
- Inadequate monitoring for the changes to the project scope.
- Inadequate control over the quality assurance activities.
- Selecting quality principles that are not in line with the stakeholders requirements.
- Inadequate management of the safety hazards related issues/concerns on the project.
- Lack of safety management plan to execute the safety related activities.
- Inadequate documentation of the safety reports, records and events.
- Inadequate study of the impact on the environment nearby the project area/site.
- Inadequate review/update of the environmental management plans

Risks of Governance, Roles and Responsibility.

The risks related to governance, roles and responsibility have been moved throughout the project lifecycle phases. The common risks include the following (Sohrabinejad & Rahimi 2015):

- Insufficient pre-defined controlling procedures over the execution of the project activities.
- Lack of documented roles, responsibilities, and reporting relationships.
- Lack of timely mitigation methods to eliminate the causes of unsatisfactory performance.
- Inadequate implementation of the risk management practices through the project.
- Lack of timely identification of the key risks through the project.
- No adequate framework to deal with uncertain events and residual impact.

Risks of Stakeholders' Management:

The risks of stakeholders' management are also reflected throughout all the project phases on different levels of importance with high importance in the feasibility stage as well as the design and procurement phases (Mishmish & El-Sayegh 2016). The common risks include:

- Completed projects deliverables are not formally accepted/verified by the concerned team.
- Not maintaining the capabilities of the project team individuals.
- Inadequate communication of the stakeholder's requirements from the project.
- Non-availability of timely input from the key stakeholders.
- Inadequate communication on the information and updates related to the project performance.
- Insufficient interaction with the key stakeholders to resolve their concerns/issues related to the project deliverables.

Risks of Resources Management:

The risks of resources management also move from one phase to another, which includes managing the human resources/project team and managing the resources loaded to the project activities. The common risks include the following (Maseko 2017):

- Not having the necessary Human Recourses (HR) to deliver the project activities.
- Inadequate monitoring of the team/individuals performance.
- Poor planning for the HR requirements resulting in a shortage of resources.
- Inadequate protocols for communication among the team.
- Lack of leadership/decision making skills.
- Ineffective knowledge/skills management or training programs.
- Inadequate wages, incentives or motivation for the workers.

Miscellaneous risks associated with the project objectives:

In addition to the above, there are miscellaneous risks pertaining especially to planning, procurement, and project delivery; those risks are relevant to achieving the project objectives within the main constraints of budget, time and quality. However, these risks may be significant only within the limited (one or two) phases of the project without moving throughout most of the phases as per the aforementioned. The risks include the following (Sweis et al. 2008) and (Sohrabinejad & Rahimi 2015):

- Lack of charter that officially approves the project.
- Lack of project plan that documents the approach to achieve the project objectives.
- Lack of specific schedule for the works to be executed.
- Incorrect relations between the activities included in the project schedule.
- Inaccurate estimation/assumptions of the work activities in terms of numbers, durations, etc.

- Unrealistic schedule relations or resources that needed to complete individual activities.
- Inadequate monitoring for the changes to the project programme.
- Lack of identification of the procurement strategy and procurement plan.
- Inadequate list of capable/qualified vendors for the competitive procurement.
- Inadequate governance process for managing the tendering/bidding processes.
- Inadequate due diligence in the assessment of received proposals/quotations, negotiating with the bidders, selection process, etc.
- Inadequate contracts management with the vendors including monitoring the performance and managing the relationships, etc.
- Inability to close out of the contract including resolution of claims, testing, commissioning, taking over of works, closing the project/phase.
- Inadequate knowledge of the contract conditions to manage the claims raised in timely manner.
- Not avoiding or preventing claims from arising.
- Improper assessment of claims.
- Insufficient negotiation prior to escalating the disagreement for mediation or arbitration.

6.2. Hypotheses

In this section, the outcome of the aforementioned hypotheses is discussed.

- **H1: The correlation between risks management throughout the project lifecycle phases and the success of construction projects in the United Arab Emirates is high.**

  According to Srinivas, K. (2015), the risk management throughout the project lifecycle is essential for the project success, the project manager with the risk management team role should include getting all risks together from the project team and the key stakeholders' representatives on a regular basis in order to identify the factors that may impact the project objectives in terms of scope, time, cost, quality, health and safety, etc. using everyone's collective experience together; this is an incredibly important part of the construction risks management process and introduces mitigation plans. Furthermore, identifying the related adequate treatments of the risks during the different lifecycle phases, these treatments need to be included in the project work breakdown structure as work activities. In addition, it was also confirmed that the residual that comes from the risks management treatments should be considered and covered by sufficient contingencies and be allocated against specific risks. Commitment to the project budget and completion dates with no planning or without assessing the associated risks is not appropriate Thus, the risks and related treatments should be allocated against each activity with contingency budget, whereas the absence of those fundamental steps will mostly lead to project failure (Parsons 2015).

- **H2: The correlation between the management of initiation phase risks management and the success of construction projects in the United Arab Emirates is high.**

  Thamhain, H. (2013) identified the importance of managing the imitation phase related risks in the construction industry. The first thing is to review the project charter with the project team and the

wider stakeholders, at this stage it is really important to get everyone at the same stage of the project starting by reviewing the project charter; together they can effectively make them happen. The Initiation stage is the right time to identify the challenges that may affect the project. It is the time to validate any assumptions that perhaps have not been validated adequately or if any scope items that have been missing or any required scope items required. Take the opportunity to get the project team together and the stakeholders together, review the governance requirements, roles and responsibilities about the key matters including securing the project budget, agreeing the adequate contingency percentage; it is essential to agree with the project stakeholders on an adequate contingencies percentage to be aside to deal with any unforeseen items that arise during the project lifecycle. Additionally, nominating the right Project Manager, setup of Steering Committee is a key success in getting the project objectives achieved. It is also to have a Project Kick-off Meeting with the Stakeholders and any other parties that may benefit from the project, the end-users, having that meeting will help to set up their expectations about what will be delivered and when it will delivered.

- **H3: The correlation between the management of the concept phase risks management and the success of construction projects in the United Arab Emirates is high.**

Chuing Loo, S., Abdul-Rahman, H. & Wang, C. (2013) identified that managing the risks associated with the Project Study/Conceptualisation phase makes a vital contribution to the success of the project. Starting from identifying a rough concept which elaborates different high level proposals in a global manner, and assessing their advantages and disadvantages (depending on the project objectives/need), the rough concept would have the following key aspects (the project requirements, rough budget, various proposals, etc.). Accordingly, moving to a detailed concept stage with further details, the amount of details to be included in the concept stage depends on the

project complexity. Reliance on the Concept Design information is important to progress the cost plan and agree a cost and schedule cap with the stakeholders. Thus, the full concept design information will be released in full to commence with the detail design phase. Accordingly, the outcome of the concept phase will incorporate general guidelines for the building types to direct the work of Architects and Builders. Individual packages of urban design guidelines will be developed for the various construction types, and other uses that will be established during the master planning and detail design processes.

- **H4: The correlation between the management of design phase risks management and the success of construction projects in the United Arab Emirates is high.**

  Ghoddousi and Hosseini (2012) identified that A Design Development Brief is the first stage of the project design process. The development brief should be established prior to the commencement of the design development work. Following the key stakeholders approval, the detailed design will be commenced. The benefits of the Development Brief phase are:

  - A basic foundation for good design and value generation.
  - Increased motivation and innovation.
  - Less chance of incurring additional fees for abortive work.
  - Reduced risk due to the communication/co-ordination between the various team members.
  - Less risk to both the Client and the design team due to clearly identified needs/restraints.

- **H5: The correlation between the management of procurement phase risks management and the success of construction projects in the United Arab Emirates is high.**

  According to Morledge, R. & Smith, A. (2013), one of the essential activities implemented by the project team during the project lifecycle phases is constituted by the procurement activities. That

includes the selection of the right procurement method, studying the risks transfers, liabilities of the parties, conditions of contracts, agreed plans that focus on the critical deliverables and objectives of the project. Also the governance, roles and responsibilities related to the procurement processes (float of tenders, tender opening, tender evaluation, tender award, etc.) are an essential factor for the successful procurement phase as well as the overall project success.

- **H6: The correlation between the management of execution/construction phase risks management and the success of construction projects in the United Arab Emirates is high.**

Chuing Loo, S., Abdul-Rahman, H. & Wang, C. (2013) highlighted that managing the risks associated with the project execution phase is an essential factor for the project success, that includes managing the scope changes, the team/workers welfare and incentive mechanisms, payment applications, reporting of physical progress, paid certified amounts, paid amounts, total liabilities, delivering the project to the agreed budget, scope and time plans, managing bonds/insurance, penalties, litigation, claims and disputes, interfaces between the project activities, accuracy of cash flow modelling. The key risks at the execution stage include the HSE related risk. The construction sector is a high risk business that may result in losses of life or serious injuries to the workers on the construction site. New tools and methods have been introduced in this regard to improve the processes of the construction activities to be a safer and healthier environment. However, there are areas for improvement and gaps that need careful consideration (Mroszczyk 2015).

6.3. Control Assessment Method

This section will discuss/propose a set of Control Assessment Methods for the construction companies working in the United Arab Emirates construction industry in order to manage and control the key risks related to each stage of the project lifecycle. The proposed design seeks to facilitate the conduct of a review of project's risk management practices and internal control procedures, primarily with respect to its construction projects.

Determination of existing internal controls in the company can materially affect the construction projects' performance which represents a significant risk for investments. Internal controls in and around capital programs can be the difference between a highly functioning and successful program to program failures with excessive cost, litigation and deep financial risk to the companies. Due to the size of developments programs in the UAE, this assessment may be applied to each project, or to the whole depending on the projects size or value and/or the organisation type/role.

The proposed Control Assessment Method would assist in the evaluation of how the company management currently functions and how to execute the capital projects. The identification and correction to existing (or a lack of controls) allows the company's management to optimise and improve business processes in delivering capital programs. This process is structured into four major parts:

- Program/Project Management Controls;
- Capital Budgeting and Accounting;
- Procurement;
- Construction/Execution and Close-Out;

Depending on the project's stage, all of the sections may not be applicable. Most questions are phrased to evoke a YES, NO or short answer responses. The examination can be used three ways:

1. To review management's contracting practices for a single project;
2. To review practices over a larger construction program of projects; or
3. To conduct a detailed review of the Construction Programs.

It is pertinent to note that the contracting processes involve the use of a great variety of documents, records and reports. There are a few common or widely accepted terms used in the construction industry to identify these items. To help identify and access these for reviews, a listing of the most common construction documents is included. All items will not be used on every project and many of the documents listed are merely alternate names for the same document (i.e., 'change order' and 'contracts variations'). This listing is used to assist the review team and the owner in focusing on available material, which, together with selected interviews, should form the basis of the review. The common construction documentation has been considered.

Program Management and Controls

Clarification	Yes / No / Response
Who is responsible (by title or department) for the contract formation functions?	
Who is responsible (by title or department) for the administration of construction contracts?	
Where does contract administration take place:	

▪ The head office? ▪ The site office?	
Is there a contracts department (group)? If yes, to whom does it report?	
Do the following Contract formation procedures exist: ▪ Contract packaging and scheduling? ▪ Contract identification? ▪ Bidder qualification and selection? ▪ Preparing Request for Proposals? ▪ Coordinating the bid cycle? ▪ Receipt and evaluation of bids? ▪ Bid security? ▪ Contract award?	
Are there Contract Administration Forms and Procedures relating to: ▪ Contract commencement? ▪ Contract submittals/correspondence? ▪ Progress payments? ▪ Back charges? ▪ Claims management? ▪ Notifications? ▪ Change orders? ▪ Final payments? ▪ Contract closeout?	
Organisation charts (approved) for the functional contract group (department, etc.)?	

▪ Position description for contracts personnel? ▪ Formal training programs for contracts and project personnel relating to contract formation and administration? ▪ Standard formats and report descriptions for contract progress reporting? ▪ Provisions for periodic review/updating of contract documents, forms, reports and procedures? ▪ Assignment guidelines for contract personnel?	
Is the same functional group (department) responsible for both contract formation and contract administration services to projects?	
Are contracts personnel deliberately transferred periodically from formation to administration duties and vice versa?	
Who decides the staffing level and personnel required to support a project for contract formation and administration?	
Do outsourced professionals (Consultants) take on contract formation or administration duties?	
For a typical project, how many persons are used for: ▪ Contract formation? ▪ Contract administration?	
Are periodic Projects Audits performed to determine the adequacy, economy, and effectiveness of the contracts formation and administration functions? ▪ Who performs these? ▪ How often are they performed? ▪ When was the last audit completed?	
Are periodic Cost Audits performed on selected contracts to verify proper	

payment? ▪ Who performs these? ▪ How often are they performed? ▪ When was the last audit completed?	
Are work plans (programs) used to guide contract cost audits?	
Are different, distinct standard work programs used based upon the contract pricing strategy (i.e., lump sum, unit price, cost-reimbursable)?	
Are standard work programs tailored to the degree of error or overcharge risk involved?	

Table 6. 2: Control Assessment - Program Management and Controls

Capital Budget and Accounting.

Clarification	Yes / No / Response
Capital Budgeting	
Is there a Capital Budgeting Process, or Budget Development Process?	
Who approves the Budget?	
Is the Budget published to the Stakeholders?	
Who is accountable for Budget Performance?	
Is the Budget tied to Historical Cost Data?	

Is the Budget tied to a Master Plan and Master Schedule?	
Is the Budget tied to published Design Standards and Quality Standards?	
Is construction-in-progress regularly reviewed for adherence to budgeted amounts?	
Who Approves the Project?	
Are there any established thresholds for capital project approval? What is the limit?	
Are Budget overruns required to be approved before additional costs are incurred?	
How are actual costs compared against the budget?	
How are overruns identified? Who is responsible for tracking overruns?	
How does the Management approve the Budget?	
Is the Budget used as a benchmark during the Concept, Design, Procurement, and Construction Phases?	
Is the Budget compared to Actual Costs during each of the above phases?	
How are the Budget Performance Metrics reported to the Management?	
Are there Budget Incentives (negative or positive) tied to Budget Performance?	
Is there a specific Project Budget rolled up into larger Capitol Projects Budget (company-wide)?	
Is the final Budget Performance introduced back into the Historical Cost Data?	
Is the Budget tied to published Design Standards and Quality Standards?	
Is construction-in-progress regularly reviewed for adherence to budgeted amounts?	
Who Approves the Project?	

Are there any established thresholds for capital project approval? Amount limits?	
Are Budget overruns required to be approved before additional costs are incurred?	
How are actual costs compared against the budget?	
How are overruns identified? Who is responsible for tracking overruns?	
What additional capital investment is required, if any?	
Capital Accounting	
How often are assets physically inspected and compared to detailed records?	
Are there written procedures for the inspection process?	
How are capital requisitions authorised and what support is needed (i.e., drawings, pictures, research)?	
What procedures are in place to assure that payment processing for contractors' invoices are for valid expenses?	
Are the payments related systems integrated with the cost loaded schedule progress or Fixed Assets system?	
Are receiving documentation, purchase order or contract, and invoice matched before transactions are recorded?	
How are purchase/payments requisitions initiated and approved?	
Are payments approved prior to issuing a check/wire transfer and who approved them? Are there any established limits for approval?	
How often are the detailed payments records reconciled to the general ledger accounts? Who prepares and approves the reconciliation?	

Are the assets and/or the construction contracts adequately insured and is the insurance coverage reviewed periodically?	
Who maintains insurance, guarantees, bonds records?	
What are the physical safeguards over the accounting records/fixed asset systems construction sites (restricted access, guards, etc.)?	
Materials Receiving/Dispatch	
For the materials and equipment purchased, how will it be received?	
Are materials inspected? Matched with any receiving documents? By whom?	
Are the assets used in construction stored in a central location? Stored at the property site?	
How/by whom are the received materials validated against quantity, description etc.?	
How are the assets dispatched or transferred to the construction project?	
Are all transfers made to the fixed asset files tracked and logged?	
Is access to the materials restricted? Who monitors it?	
Are asset tracking tags used on all valuable assets? Are these tracking tags logged? How often is this log updated and by whom?	

Table 6. 3: Control Assessment - Capital Budget and Accounting.

Procurement.

Clarification	Yes / No / Response
Procurement – Planning	
Have the contract and project specifications been reviewed by Project Management?	
Did representatives of Contract Administration, Legal Counsel and Risk Management and other key areas participate in this review?	
Have the scope of works and QHSE requirements been clearly defined considering the specification, schedule, etc.?	
Have responsibilities under this contract been analysed and clarified, including interface with other contractors, design responsibilities, warranty requirements, etc.?	
Are modifications to the contract controlled? ▪ Are there formal, written procedures governing such changes? ▪ Are these procedures followed and enforced? ▪ Are all modifications highlighted for review and evaluation by appropriate personnel? These include changes in price, design, schedule and delivery, warranty, cosmetic changes, etc. ▪ Is the cost/schedule impact of each modification properly priced before a final decision is made?	

Are the Initial/Pre-Tender Estimates controlled? ▪ Are the estimating standards and procedures clearly defined and followed? ▪ Are procedures documented and followed? ▪ Do estimating methods, standards and details reflect current production practices? ▪ Is the estimating time equitably distributed considering cost and schedule impact? ▪ Are all design, purchasing, production and other assumptions clearly documented? ▪ Are standard checklists used to guard against omissions? ▪ Are clerical reviews performed to insure mathematical accuracy? ▪ Is the final estimate reviewed by personnel having performance responsibility? ▪ Is all estimating documentation controlled and maintained for future reference?	
Are the Initial Planning controlled? ▪ Have risk factors and contingency plans been clearly defined and evaluated? ▪ Who has performance responsibility? What is the level of experience and expertise in this work area? ▪ How challenging/tight are schedule requirements? ▪ What is the level of dependence on vendors, or other outside parties? ▪ What are the penalties for non-performance or late delivery? ▪ What is the impact on current and future operations should the project be	

delivered late? ▪ Is there a possibility of contract cancellation or termination and what recourse is available for cost recovery? ▪ Have time constraints limited the thoroughness of the proposal, or bid preparation activity? ▪ Is there any Procurement - Planning controls information that was not covered and that you can provide?	
Procurement - Bid Receipt and Evaluation	
Is there a bidding process? Do procedures exist for the bid receipt and evaluation process?	
Who is responsible for receiving bids?	
Who is responsible for maintaining bid security?	
Who is responsible for evaluating bids (overall)?	
Who is responsible for making the award recommendations (Technical and Commercial Evaluations)?	
Are bidders informed about the evaluation status prior to the award of the contract?	
Which owner personnel, by position, are allowed to view or are allowed to know the contents of bids (anything other than the fact that 'X' bids were received) prior to the contract award?	
Do any outsider vendors (e.g. Project Management Consultancy, etc.) receive duplicate copies of the bids?	
Are any bids ever opened prior to the bid due date?	

Are all received bids opened simultaneously?	
Who is present at the bid opening?	
Is there a log or check sheet used to record the opening of bids?	
Are evaluation 'spreadsheets' used? ▪ Are they initiated or signed by the preparer and a checker?	
Are the non-price variables from each bid (i.e., bonding information, technical submittals, schedules, etc.) recorded on the evaluation spreadsheet?	
Are the non-price reviews (i.e., technical, etc.) performed on unpriced bid copies?	
What is the disposition of bids and evaluation spreadsheets after they are no longer needed for the evaluation?	
Are 'Pre-Award' or 'Post-Bid' sessions held with the apparent successful bidder?	
Who is typically (by position) present at these meetings representing the owner?	
When and how are unsuccessful bidders notified of their failure to be awarded the contract?	
Are unsuccessful bidders informed as to: ▪ Their relative ranking? ▪ Their price in relation to other prices? ▪ The overall price spread? ▪ Why they were unsuccessful? ▪ The eventual contract price?	
Are there any other Procurement - Bid Receipt and Evaluation controls, conflict of interest, information that was not covered and that you can provide?	

Procurement - Contract Award	
Is there a Contractors, Consultants, Venders selection process? ▪ Who approves contractors? Vendors? ▪ Do procedures exist for the contract award?	
Who is responsible for preparing contract documents for signature by the parties?	
Are the following incorporated into the contract documents to be signed: ▪ General and Particular Conditions of Contract? ▪ Contract Schedules? ▪ Tender Addendums? ▪ Bidder's proposal? ▪ Negotiation results/agreements? ▪ Pre-award meeting results? ▪ Late changes to specifications/drawings?	
Are letters of intent ever used?	
Do procedures exist for the issuance of letters of intent?	
Do letters of intent: ▪ Contain references to project name; Contract Number? ▪ Contain a maximum award amount? ▪ Appear to be effective only for a specified period, i.e. expires after a stated date? ▪ Stating the management's right to extend the letter of intent for a longer period?	

▪ Incorporate, by reference, the RFP and specimen contract documents (except those minor items unresolved at the time)? ▪ Mention the management's right of receipt of bonding and insurance forms prior to the contractor's effort at the job site? ▪ State an anticipated date for contract formalisation?	
Are letters of intent signed by both parties?	
Is a log or suspense file kept for the expiration dates of the letters of intent?	
Are the negotiating procedures and objectives defined? ▪ Are all functional areas represented in the negotiating team? ▪ Are the responsibilities of each member of the negotiating team clearly defined and understood? ▪ Have the objectives of the negotiation and the negotiating strategy been defined? ▪ Are all technical discussions, conference notes and negotiations carefully documented and reviewed? ▪ Is all documentation of the negotiations controlled and maintained for future reference?	
How many copies of the 'contract' are signed?	
Does the management sign contracts before, after, or simultaneously with the other party?	
Who signs contracts for the management according to the Company's Delegation of Authority?	
Does the management use a 'Notice to Proceed'?	

Are there savings, incentive, or liquidated damages clauses in the contract?	

Table 6. 4: Control Assessment – Procurement.

Construction/Execution and Close-out.

Clarification	Yes / No / Response
Construction	
Are Pre-Construction meetings commonly held between the Employer's Representative, The Engineer, Contractor, etc.?	
Are pre-construction meeting minutes prepared with a sign-in sheet of attendees?	
Is a pre-construction walk through of the site performed by the contractor?	
Has the contract been fully executed and signed by all parties prior to the start of construction?	
▪ Are the training and formal procedures adequate? ▪ Are the personnel having performance responsibility aware of the contractual requirements and their rights and responsibilities? ▪ Are all pre-award assumptions, designs, etc., integrated into the production preparation cycle? ▪ Is the flow of information and coordination between the functional departments defined and understood? ▪ Are the cost and schedule measurement and control procedures clearly	

defined and understood?	
Are the budgets and engineering designs consistent with estimating and pre-award assumptions? ▪ Are all budgets based on pre-award estimates with adjustments clearly noted for management? ▪ Are externally purchased materials and services consistent with estimating assumptions as to quantity, price, etc.? ▪ Are deviations due to make/buy decisions, changes, etc., properly documented and controlled? ▪ Are production planning, purchasing and contractors' schedules consistent with the pre-award master plans? ▪ Are budget and design reviews adequate to ensure that production designs and budgets are consistent with pre-award estimates?	
Is performance measured and reported promptly? ▪ Are responsibilities for contract performance clearly defined and understood? ▪ Is the level of detail of performance reporting adequate to highlight problem areas on a current basis? ▪ Are performance reviews for all vendors/personnel held on a regular basis? ▪ Are all variances (favourable or unfavourable) from cost of schedule, adequately investigated and explained? ▪ Are procedures for the analysis of alternatives and corrective action for variances from plan well-defined and followed?	

Is all communication with the management controlled and documented? Is the management communication controlled through personnel trained in contractual rights and responsibilities? ▪ Are decisions relating to deviations from the plan restricted to authorised personnel? ▪ Is all correspondence with the management carefully reviewed and filed? ▪ Are the management directed changes promptly identified and is notification given by the management?	
Is adequate control maintained over subcontractors and vendors? ▪ Are the contract requirements properly defined and included in subcontractor specifications? ▪ Are subcontractor schedule requirements clearly defined and integrated with the contract requirements? ▪ Are penalties for non-performance or late delivery transmitted to contractors? ▪ Are contract requirements clearly defined and summarised to minimise purchase costs and improve schedule control?	
Are change orders adequately documented and priced? ▪ Are constructive change orders promptly identified and communicated? ▪ Are there formal procedures for monitoring all changes? ▪ Are increased costs and cost trade-offs associated with each change adequately documented for management review? ▪ Are indirect costs such as overhead, disruption, etc., properly included?	

▪ Are rights reserved in the settlement of changes to allow for the recovery of cost increases not immediately visible?	
Do procedures exist to control the following key area items such as: ▪ Progress payments? ▪ Correspondence control? ▪ Charge order processing? ▪ Use of back charges? ▪ Authority for various actions? ▪ Contract closeout process?	
Who is responsible for maintaining the contract records?	
Where are the contract records kept?	
Do procedures exist for controlling contractor submittals (i.e., insurance certificates, bond forms, shop drawings, performance schedules, samples, timesheets, etc.)?	
Who is responsible for assuring contractor submittals are made in accordance with contract requirements and for coordinating their receipt and disposition?	
Are contractor submittals controlled through the use of Log sheets? Who keeps track of the submittal/approval status for the contract-required submittals?	
Who is responsible for establishing contractual insurance requirements?	
How is proper contract insurance coverage verified?	
How does the management guard against the subsequent expiration of contract insurance coverage?	

Is all contract-related correspondence (ingoing and outgoing) properly Numbered and Filed?	
To whom is the incoming contract-related correspondence addressed?	
Who signs letters and other correspondence sent to the contractor?	
Who is responsible for keeping record copies of contract correspondence?	
Are there procedures for control and storage of contract correspondence?	
Is the performance measured and reported on a current basis? ▪ Are the responsibilities for contract performance clearly defined and understood? ▪ Is the level of detail of performance reporting adequate to highlight problem areas on a current basis? ▪ Are performance reviews for all stakeholders held on a regular basis? ▪ Are all variances (favourable or unfavourable) from cost or schedule, adequately investigated and explained? ▪ Are procedures for the analysis of alternatives and corrective action for variances from plan well-defined and followed? ▪ Are the estimates to complete adjusted to reflect actual performance and anticipated changes? ▪ Is source reporting adequately controlled to ensure accuracy?	
Is all communication with the management controlled and documented? ▪ Is the management personnel trained in contractual rights and responsibilities? Including informal discussions and telephone conversations relating to the contract.	

▪ Are decisions relating to deviations from the plan restricted to authorised personnel? ▪ Is all correspondence with the management carefully reviewed and filed? ▪ Are the management directed changes promptly identified and notification of the impact given to the management?	
Are receiving and inventory control procedures adequate? ▪ Are all materials received, inspected and checked against purchase orders to ensure that quantity and quality requirements are met? ▪ Are procedures for the rejection of materials clearly defined and adequate to initiate adjustment to plan and corrective action? ▪ Are the materials received adequately protected for future use and controlled to allow prompt identification when required? ▪ Are inventory controls adequate to accurately report scrap losses and provide early warning of material shortages? ▪ Are excess materials identified promptly and diverted to other work?	
Are the changes properly controlled? ▪ Are responsibilities for production performance and the performance budget clearly defined? ▪ Are materials substitutions strictly controlled? ▪ Are production schedules clearly defined and all deviations reported and controlled? ▪ Are alternative operating methods and changes in machine utilisation reviewed and approved by appropriate levels of management? ▪ Are all cost and schedule changes reflected in operating budgets and plans?	

▪ Are inspection and test procedures clearly defined and controlled? ▪ Are materials and parts rejections properly documented and reviewed? ▪ Is the Value Engineering exercise conducted to complete the work activities within the budget without any compromise on the anticipated quality/objectives?	
Are the change orders properly monitored and priced? ▪ Is the management notified of constructive change orders promptly? ▪ Are formal procedures defined for monitoring and controlling change orders? ▪ Are increased costs and the cost associated with each change adequately documented for management review? ▪ Are indirect costs such as overhead, disruption, etc., properly included? ▪ Is the cost and schedule impact of each change carefully documented, reviewed and evaluated by management? ▪ Are rights reserved in the settlement of changes to allow for the recovery of cost increases not immediately visible?	
Is the warranty and field service work adequately controlled? ▪ Are warranty rights and responsibilities defined and understood? ▪ Is the scope of the warranty work accurately defined? ▪ Is the warranty period clearly set forth and understood? ▪ Performance of warranty work measured and reported against budget. Is feedback provided to applicable functional departments?	

Progress and Final Payments	
Does the company management have procedures for Progress and Final payments?	
Who authorises the payments to consultants, contractors, subcontractors?	
How often are progress payments made?	
Are payments made on the basis of: ▪ The cost incurred? ▪ Elapsed calendar time? ▪ Actual construction progress?	
Who certifies that the progress listed on the progress payment request (or invoice): ▪ Has been accomplished? ▪ Is in conformance with contractual requirements?	
Which contract documents contain the measurement and payment terms dealing with progress and final payments?	
Are segments of the work priced, or identified with payment amounts for payment based upon a specific accomplishment: In RFP's? In contract documents? In a 'cost loaded schedule of values' Prepared before or after the contract award?	
Do progress payment forms contain the following: ▪ Cost account number?	

▪ Description of work item? ▪ Unit of measure employed (i.e., milestones, equivalent units, 0/100, etc.)? ▪ Unit price (or lump sum price or estimated cost)? ▪ Previous (through last month's) quantity and amount? ▪ Quantity and amount completed in this period? ▪ Quantity and amount completed to date? ▪ Page totals (crossed and footed)? ▪ Project and contract identification? ▪ Sequential estimate number? ▪ Period covered? ▪ Retention basis and amount? ▪ Amount to be invoiced (Mobilisation or Advance Payment)?	
Are contractors required to submit partial releases of liens as a prerequisite to progress payment?	
When payment checks are cut, how does the paying group (i.e., accounting department, accounts payable) verify that payment should be made: ▪ Signed payment request? ▪ Contractor invoice? ▪ Initialed invoice? ▪ Approved progress estimate? ▪ Payment memo? ▪ Verbal approval?	
Are contract change orders:	

▪ Invoiced separately from the original scope of work invoices? ▪ Only invoiced after the change order approval? ▪ Included as separate, identifiable entries on regular progress invoices or sections? ▪ Included with the original scope of works' invoice? ▪ Are payments ever made for change orders or changed work before the change order or contract modification has been approved or issued? ▪ What substantiations are required as substantiation for the costs incurred in connection with cost-reimbursable work?	
Is retention used (withheld) with progress payments? Or is retention (insert actual practice): ▪ A percentage of amounts due? ▪ A fixed amount? ▪ A combination of the above?	
Is retention released to the contractor: ▪ At contract completion? ▪ At specified periods during performance? ▪ Upon successful operation/testing of work? ▪ At a specified time after completion of work? ▪ Is retention released to the contractor after specified performance criteria have been satisfied?	
Is the process of final payment different from normal progress payments?	
Is a 'final payment checklist' used?	

Are the following prerequisites to final payment: ▪ Submittal of a signed Taking over Certificates/Document? ▪ Submittal of approved 'As-Built' drawings? ▪ Submittal of approved operating and maintenance manuals? ▪ Receipt of spare parts and special tools? ▪ Receipt of any warranty certificates? ▪ Acceptance of interface work by the following contractors? ▪ Inspection, testing and acceptance documentation?	
Notification and Change Orders	
Do procedures exist to cover the preparation, approval and issuance of notifications and change orders?	
What instruments are used to formally notify contractors (subcontractors) of a pending or proposed change (i.e., to transmit revised drawings, etc.)?	
Do the notifications named above: ▪ Require the contractor to respond within a specified time? ▪ Identify the contract, project and details of the change? ▪ Request a 'no-impact' statement if no change in cost or schedule is required? ▪ Request/specify the method by which the contractor should price the change (lump sum, unit price, etc.)? ▪ Specify that it is not a change order, but merely a request for information? ▪ Appear to be numbered consecutively? ▪ Require receipt acknowledgement?	

▪ List any attachments (i.e., new drawings/specifications) by number, date, revision and title?	
Who, by position, prepares and approves the notifications?	
Is a log of all notifications kept?	
Is a suspense file kept to monitor responses to notifications?	
Are Fair Price Estimates required internally for all notifications?	
Once a contractor's (subcontractor's) notification quote is returned, is a change or authorisation form prepared?	
Does the change order authorisation form (not the change order): ▪ Identify the project, contract, notification date and number? ▪ Contain a comparison of internally prepared estimate vs. contractor's quote?	
Do change orders: ▪ Reference project, contract, and notification? ▪ Describe the affected work? ▪ Reference contract changes clause? ▪ Seem to be numbered sequentially? ▪ State the terms of payment? ▪ If cost-reimbursable, contain a 'not to exceed' amount? ▪ Bear signatures, if so whose? ▪ Require a signature and return by the contractor?	
Are logs kept of all: ▪ Pending notifications?	

▪ Notifications? ▪ Contractor responses (quotes)? ▪ Change orders? ▪ Contractor-requested change orders? ▪ Pending claims? ▪ Resolved claims?	
Are the reports issued to project management containing the status of the items listed in the log above?	
Are change orders always issued to cover the resolution of contractor claims or requests for additional time or money?	
Is the authorisation or issuance of change orders selectively controlled, i.e., are different levels within the management's organisation authorised to approve change orders? If so, are these thresholds established by Value, Contract type, Change type, etc.?	
List the documents found in the management's files for justification/documentation of an approved change (e.g. design notice – notification – change order request – contractor quote – change order, etc.).	
Do procedures exist for the identification, reporting and processing of claims?	
Who is responsible for preparing claims defence documentation?	
Is a change order issued to finalise the resolution of a claim?	
At what point is legal counsel involved in claims resolution?	
Back charges:	

▪ Do procedures exist for back charging contractors/vendors for the cost of work not performed or not performed correctly? ▪ Is a standard back charge form used?	
Do back charge forms: ▪ Require acceptance signature/acceptance by the offending contractor/vendor? ▪ State the nature/reason for the back charge? ▪ Contain the amount to be back charged or estimated amount if cost-reimbursable? ▪ Are they all numbered sequentially and dated?	
In order to be reimbursed for the back charge work, does the management: ▪ Credit (deduct) the amount back charged on future contractor/vendor invoices? ▪ Issue an invoice to the contractor/vendor for the back charge amount? ▪ Does the management add a mark-up to the back charge for handling? If yes, what percent or amount?	
▪ Has adequate attention been given to schedule requirements? ▪ Have production capacity restrictions been considered in light of other work and schedule requirements? (Include engineering purchasing, inspection and test, etc.) ▪ Have potential machine and manpower bottlenecks and limitations been considered? ▪ Has this contract been evaluated relative to other work commitments?	

▪ Has adequate attention been given to the schedule requirements for outside purchases and subcontracts?	
Contract Closeout	
Do procedures exist to cover the formal closeout of contracts once performance has been completed?	
Is a contract closeout checklist used to assure that the contractor (subcontractor) has performed all work in an acceptable fashion and that all required documents/items have been received prior to making the final payment?	
Do procedures, logs or checklists provide for: ▪ End-Users' final inspection/acceptance report? ▪ Deficiency acceptance reports? ▪ Receipt and approval of 'As-Built' drawings? ▪ Receipt of operating manuals? ▪ Performance testing reports? ▪ Satisfaction of back charges? ▪ Release of liens?	
What instruments/departments verify the eligibility for the final payment?	
Is the contractor sent an official contract termination notice?	
Is a contractor evaluation form prepared?	
Is the contractor evaluation form filed for future bidder qualification reference?	
What is the disposition of contract files/records once the contract is completed and the final payment is made?	

Are records of contractors bonds kept? By whom? Are records reviewed for compliance maintenance?	
▪ What system is used to process and track construction expenditures? ▪ Who has access to the system?	
▪ Are records kept for contractors? ▪ Are there any monitoring procedures for the contractor's compliance with regulations?	
▪ Is a final audit to be performed?	

Table 6. 5: Control Assessment – Construction/Execution and Close-out

Chapter Seven: Conclusion and Recommendations

7.1. Conclusion

As a contribution to enhancing the management of key risks that impact the success of the construction projects in the UAE throughout the project lifecycle, this research aimed to **(explore the key risks affecting the construction projects in the UAE 'throughout the project lifecycle')**; and to provide adequate answers for the relevant research questions:

- **Question #1: With a focus on the UAE construction industry, what are the key risks that need to be addressed by management at each stage of the lifecycle?**
- **Question #2: Are there any risks that move from one phase to another?**

Taking into consideration the research structure, the research followed the positivism philosophy, deductive approach, and survey strategy based on the mono method (quantitative approach) into a longitudinal time horizon. In order to achieve the aforementioned aim and provide answers for the audit questions, a sequence of objectives have been identified and successfully completed, as follows:

- **Objective #1: Investigate the literature in relation to risks and project management.**

  A detailed investigation of the literature has been conducted in relation to the risk management aspects (overview for the risk management history from inception till date, discussion of Enterprise Risk Management (ERM) and the road to implement an effective Risk Intelligence, ERM's Capability Maturity Model and it is major components (Governance, Process, People, Technology, Maturity Levels), Projects Risk Management and the risk management processes sequence (risks identification, plan of risk responses,

risks evaluation, risk responses and mitigation plan). The literature has also covered the project management aspects including the project lifecycle phases, project success factors, etc.

Furthermore, through current literature, the key risks in each phase of the project lifecycle have been identified with a focus on the developing countries in order to find the key matters that impact the project success factors in each phase and reflect the same in the research conceptual framework and conclude the hypotheses.

- **Objective #2: An appropriate case study will be discussed to review the existing project lifecycle stages.**

  An appropriate case study has been selected for the implementation of the project lifecycle phases (i.e. A government entity in the UAE, responsible for delivering of mega/large scale infrastructure projects, the said organisation was deemed to be appropriate to this research as the study relating to the construction industry/projects in the UAE. The organisation adopting the project lifecycle that consists of Five Phases (Initiation, Feasibility, Design, Procurement, and Construction).

- **Objective #3: A quantitative analysis of the key risks at each stage of the UAE construction industry.**

  Upon completion of the literature and identifying the lifecycle phases, a quantitative analysis has been conducted for the key risks at each stage of the UAE construction industry in order to verify the hypotheses. In accordance with the defined strategy, a survey has been conducted in the form of an online questionnaire distributed via email and links. The online questionnaire obtained a total of 104 responses. The data analysis revealed that:

- Number of responses is adequate for further statistical analyses;
- Obtained data are reliable/acceptable for further study; and
- Proposed Hypotheses H1 to H6 are valid as a result of high correlation, detailed as follows:
  - ✓ **H1:** The correlation between risks management throughout the project lifecycle phases and the success of construction projects in the UAE is high.
  - ✓ **H2:** The correlation between the management of initiation phase risks management and the success of construction projects in the UAE is high.
  - ✓ **H3:** The correlation between the management of the concept phase risks management and the success of construction projects in the UAE is high.
  - ✓ **H4:** The correlation between the management of design phase risks management and the success of construction projects in the UAE is high.
  - ✓ **H5:** The correlation between the management of procurement phase risks management and the success of construction projects in the UAE is high.
  - ✓ **H6:** The correlation between the management of execution/construction phase risks management and the success of construction projects in the UAE is high.
- In response to the research question #2, it has been noted that the number of risks move from one phase to another, as follows:
  - ✓ Risks related to Financial Management.
  - ✓ Risks related to Scope and QHSE Management.
  - ✓ Risks related to Governance, Roles and Responsibility.
  - ✓ Risks related to Stakeholders' Management.
  - ✓ Risks related to Resources Management.

- **Objective #4: A set of recommendations to the construction practitioners (within the UAE construction sector) to assess the internal controls effectiveness related to projects.**

  A Control Assessment Method has been proposed for the construction companies working in the United Arab Emirates construction industry to assess and evaluate the existing internal controls in the company with respect to its construction projects, which represent significant risk as investments. This would assist in the evaluation of how the company management currently functions and areas for improvement. The identification and correction to existing (or a lack of controls) allows the company's management to optimise and improve business processes in delivering capital programs.

7.2. Recommendation

In continuation of the academic efforts/contribution to enhance the management of key risks affecting the success of the construction projects in the UAE throughout the project lifecycle, and upon conclusion of the high correlation between the risk management (throughout the project lifecycle) to the construction project in the Unites Arab Emirates, and identification of the key risks at each phase of the project lifecycle and the risks that move from one phase to another, it is highly recommended to conduct further research and academic studies to discuss a comprehensive framework for standard controls that allows the construction companies in the UAE to timely mitigate the key risks identified in this research. In addition, further research studies are required to discuss more risks and obtain wider feedback in relation to the project lifecycle risks.

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Appendices

Appendix A: Questionnaire

Survey for the Relation between Risk Management (throughout Project Lifecycle) and the Success of Construction Projects in the UAE

General Information

Gender:
- ☐ Male.
- ☐ Female.

Education:
- ☐ High school.
- ☐ Diploma.
- ☐ Higher diploma.
- ☐ Bachelor.
- ☐ Master.
- ☐ Doctorate.

Organization type:
- ☐ Government.
- ☐ Semi Government.
- ☐ Private.

Your current position level:
- ☐ Entry level.
- ☐ Junior Management.
- ☐ Mid management.
- ☐ Senior Management.
- ☐ Leadership/Executive /C-Level.

How many years of industrial experience do you have?
- ☐ 5 years or below
- ☐ 6 -10 years
- ☐ 11 – 15 years
- ☐ 16 – 20 years
- ☐ 21 years or above

Please select your primary role:
- ☐ Client/Developer.
- ☐ Consultant/Advisor
- ☐ Contractor
- ☐ Supplier
- ☐ Subcontractor
- ☐ Other (Please specify):……

Are you currently working in the UAE?
- ☐ Yes
- ☐ No

Please rate the following statements based on a Likert scale from (1 to 5), where 1 represents 'Not Important at all'; and 5 represents 'Extremely Important'.

I. Please rate the risks that impact the project success performance in the UAE (at each phase).

1	Key Risks - Project Initiation Phase.	1	2	3	4	5
1.1	Risks related to project charter.					
1.2	Risks related to initial scope definition.					
1.3	Risks related to governance, roles and responsibilities.					
1.4	Risks related to resources management.					
1.5	Risks related to inadequate risk management.					
1.6	Risks related to initial estimates.					
1.7	Risks related to stakeholder's management.					

2	Feasibility Study (Conceptualising) Phase	1	2	3	4	5
2.1	Risks related to initial planning.					
2.2	Risks related to governance, roles and responsibilities.					
2.3	Risks related to resources management.					
2.4	Risks related to inadequate risk management.					
2.5	Risks related to stakeholder's management.					

3	Design (Preliminary and Detailed Design) Phase	1	2	3	4	5
3.1	Risks related to scope and QHSE management.					
3.2	Risks related to detailed planning.					
3.3	Risks related to governance, roles and responsibilities.					
3.4	Risks related to resources management.					
3.5	Risks related to inadequate risk management.					
3.6	Risks related to stakeholder's management.					
3.7	Risks related to financials management.					
3.8	Risks related to the project performance/controls.					

4	Procurement Phase	1	2	3	4	5
4.1	Risks related to the scope and QHSE management.					
4.2	Risks related to governance, roles and responsibilities.					
4.3	Risks related to inadequate risk management.					
4.4	Risks related to stakeholder's management.					
4.5	Risks related to the detailed estimates					
4.6	Risks related to tendering and award.					

5	Construction / Execution Phase	1	2	3	4	5
5.1	Risks related to scope and QHSE management.					
5.2	Risks related to governance, roles and responsibilities.					
5.3	Risks related to inadequate risk management.					
5.4	Risks related to recourses management.					
5.5	Risks related to stakeholder's management.					
5.6	Risks related to financials management.					
5.7	Risks related to project performance/controls.					
5.8	Risks related to changes and claims management.					
5.9	Risks related to project delivery.					

II. Please rate the important success criteria for the construction projects in the UAE

6	Project Delivery and Stakeholders Satisfaction	1	2	3	4	5
6.1	Completion of the project on time.					
6.2	Completion of the project within budget.					
6.3	Completion of deliverables as per anticipated quality.					
6.4	Benefits for all stakeholders.					
6.5	Minimum variations and arguments.					
6.6	Maintain Successful Project Controls					
6.7	Minimum defects to End-users.					
6.8	Satisfied Vendors (Contractors, Consultants, etc.)					
6.9	Happy Project Team/Workers.					

Other Suggestions and Comments	

End of the questionnaire - Thank you for your valuable contribution

Returning Questionnaire: Kindly return the completed questionnaire via email to Mohamed Said on 2015133077@student.buid.ac.ae

Further Information: If you are interested in assisting our further research work / receiving a summary of our research work, please provide your E-mail address: