EVALUATING CONTRACTORS' RISK MANAGEMENT FOR TELECOM POLES CONSTRUCTION IN THE UNITED ARAB EMIRATES

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Masters in Project and Operations Management
Geneva Business School

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Abstract

This study evaluates the contractor's risk management system for the construction of telecom poles in the United Arab Emirates. When the project team lacks knowledge of risk management processes and fails to identify the risks to mitigate them, project objectives are affected causing the project delivery to be impacted as well.

In this research, certain sources of risks are categorized into four (4) distinct types where it highlights management risk, external risk, commercial risk, and technical risks that are present in the project life cycle of telecom tower construction. These risk sources were delineated from the risk breakdown structure in the PMBOK Guide 6th edition. Whereas risk management tools and techniques effectiveness have been examined, guided by the PMBOK Guide 5th edition and several authors on risk management. Moreover, it also outlines the contractor's perception of how they perceive risks that can impact project objectives in terms of scope, cost, time, and quality.

The research questions have been formulated and answered through the identification of knowledge gaps from the systematic and comprehensive literature review on risk management systems grounded on existing theories and empirical studies by several scholars in the construction industry.

By applying the deductive approach, the author utilizes a quantitative mono method, supported by the self-administered questionnaire as a research strategy in data collection. A survey questionnaire has been disseminated to prospective participants by acquiring the self-selection method and snowballing technique. Out of one-hundred sixty-eight (168) sample population, forty-three (43) samples have been validated for data collection. The survey was participated by nineteen (19) contractors and one (1) project owner represented by various positions in the telecom industry such as engineers, civil engineers, project coordinators, civil foremen, and senior engineers among others.

Descriptive analysis shows that among the sources of risks investigated for Q7 to Q18, external risk denoted by the Q8 risk factor obtains the highest frequency of feedback at 48.84%. Inferential analysis verified the claim for Hypothesis 1 that commercial risk denoted by Q16 can impact project success at 24.59%.

Descriptive analysis indicates that among the risk management tools and techniques for Q19 to Q34, the use of a checklist for risk identification is the most effective tool with 67.44%. The use of risk probability and impact assessment for qualitative risk analysis is the most cost-effective with 65.12%. Whereas the dependence of the project management team on the expert judgment in undertaking risk for quantitative risk analysis is the most useful tool with 74.42%. Inferential analysis of Hypothesis 2 proves the claim that the use of the risk register has a 0.04% correlation to project success.

Descriptive analysis shows that among the sources of risks with risk description for Q35 to Q44, technical risk denoted by Q41 obtains the highest frequency at 60.47%; commercial risk denoted by Q43 gets the highest rating at 60.47%; while management risk denoted by Q44 has the highest magnitude at 60.47%. Inferential analysis on Hypotheses 3 corroborates the claims

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that technical risk denoted by Q41 can have an effect to project objectives with 0.11%, which means the results are not statistically significant.

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Chapter 1: Introduction

1.1 Background

For two-decade, construction developments in the United Arab Emirates (UAE) have flourished into unparalleled achievements across various industries in tourism, hospitality, healthcare, education, government and private. According to the MEED article, the UAE has garnered over $443 billion worth of projects on building and infrastructure which surpassed other states in Gulf Cooperation Council (GCC) such as Saudi Arabia, Qatar, Kuwait, Oman, and Bahrain. The UAE has accounted for 41 per cent of the total construction contracts since 2004 (Thompson, 2020). As a result, this has challenged many developers and contractors to undertake risks in greater measure.

In a project whether a small scale or large, risk emerges anytime throughout the construction phase or project life cycle. Irrespective of the engagement of project owners, project managers or any stakeholders in the organization, whether the risk is imminent, current, or future, it must be dealt with. Project Management Institute (2013) defines risk as ambiguous occurrences or events causing both a positive or negative impact on project objectives such as scope, schedule, cost, and quality.

Risk in construction projects can be grouped into internal and external risks (El-Sayegh S. M., 2014). Internal risks are caused by the engagement of any stakeholders which resulted to project variations as an example; while external risks are linked to economic, financial, political, social, and cultural risks. When both risks take place, it could trigger an adverse effect on project objectives. Although the risk is inevitable in the project life cycle, its intensity can be categorized, managed, and controlled. Therefore, risk management adoption is necessary for the success of undertakings that are administered by project managers.

To date, several research on risk management in construction has been conducted in different countries such as Egypt (Osman, Issa, & Zakaria Eraqi, 2020), Vietnam (Phan, 2020), Egypt (Hosny, Ibrahim, & Fraig, 2018), Poland (Bahamid & Doh, 2017), Chile (Serpell, Ferrada, Rubio, & Arauzo, 2015), Egypt (Eid, Georgy, Osman, & Ibrahim, 2015), and the UAE (El-Sayegh S. M., 2014). Despite these explorations on risk management in construction projects, there is a shortage of information on the application of risk management particularly in the telecom industry where subject knowledge is constantly transforming.

This research intends to evaluate the risk management methods that can be adopted by project managers and risk owners for telecom tower construction. It will examine the impact of risks to project objectives from contractors' perspective, so that these knowledge gaps can be provided with the appropriate strategies that are functional for risk management for future endeavors, thus leading to project success. This chapter will introduce the research background, followed by the problem statement, research questions, research aims, research objectives, and the significance of the study.

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1.1.1 Risk Management

Risk management is the process by which the project manager and the project team collaborate to identify, assess, rank, treat, monitor, and review the risks which occur throughout the project life cycle (Rodrigues-da-Silva & Crispima, 2014). It encompasses the procedures of performing risk management planning; identifying risks with the use of a risk register; qualitative analysis by combining the risk probability of occurrence and impact; quantitative analysis by numerically assessing the impact of risks; planning risk responses which classify risk responses to develop an action plan for opportunities or positive risks and lessen the impact of threats or negative risks on project objectives; implementing risk responses by adopting the agreed-upon risk response plans; and monitoring risks by tracking the identified risks, analyzing new risks and evaluating the efficiency of risk process throughout the construction phase (Project Management Institute, 2017).

1.1.2 Monopoles and Towers Construction

In 2014, the government of Abu Dhabi through the Quality and Conformity Council (QCC) approved and issued a declaration entitled “Common standards and Specifications on Civil Work for Mobile Networks site Construction”. It aims at providing guidelines to be applied and adhered to by the telecom providers during the construction phase of site development that safeguards the environment’s safety, sound engineering practice and public health (Government of Abu Dhabi, 2014).

The article mentions the distinct types of telecom structures that are part of site development by telecom operators.

1.1.2.1 Monopoles

These are free-standing structures designed into 15m, 20m, 30m, 35m and 40m varying heights depending on their aerial feasibility. It comprises 2 platforms holding 12 vertical mounting poles that will carry antennae. Antennae load could withstand the wind up to 20 square meters, and the allowable deflection to measure verticality is 0.5% of the structure height. The standard plot size for these structures is 10m x 10m area (Government of Abu Dhabi, 2014). See Appendices page 93 to check the prototype of the 40m monopole structure.

1.1.2.2 Camouflaged or Palm Tree

Camouflaged steel poles resemble the Arabian Date Palm Tree (Phoenix Dactylifera). These are free-standing structures but specifically designed for 20m, 30m and 35m heights. Antennae loads are designed for antennae surface area that could withstand wind up to 10 square meters, with a maximum deflection up to 1 degree at operational wind velocity. Fronds are as per the required appearance and

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the bark is made of fiber glass material. The standard plot size is 10m x 10m area (Government of Abu Dhabi, 2014). See Appendices pages 91 to 92 for more details of a 30m Palm Tree Monopole and 20m Camouflaged Pole.

1.1.2.3 Lattice Towers

Lattice Towers are types of structures that are designed in 40m, 45m, 60m 75m, 90m and 120m heights, with 3- or 4-legged shapes. Its rest platform level is located at every 15m interval. The antennae loading is designed for antennae surface area to withstand the wind up to 40 square meters. The allowable tower verticality is 0.5% of the tower height. For the 40m up to 60m tower height, the plot size is 15m x 15m. While for 75m up to 90m towers, the plot size is 20m x 20m. Moreover, for tower heights ranging from 100m up to 120m, the plot size is 30m x 30m (Government of Abu Dhabi, 2014). See Appendices chapter page 93 to check the model of a 45m Self-Support Tower

1.1.2.4 Rooftop Poles

These types of structures are installed on existing buildings or existing structures with varying heights from 3m up to 4m for Wall Mount tubular poles and 3m up to 13m for Non-Penetrating Poles. Antennae loads are designed for the surface area that could withstand wind up to 6 square meters (Government of Abu Dhabi, 2014). Since the structures are installed on the rooftop, the maximum area that pole structures can occupy is 5.5m x 5.5m. To check the prototype of a 20m Rooftop Pole structure, see Appendices page 94.

1.1.3 Contractors' Role in the Project

Telecom Contractors are service suppliers that have been selected and awarded by the telecommunications operators for the construction of site development based on the specific scope of work within or throughout the project phases. The awarding of projects is decided by the project owner which is done in the form of the bidding process. The winning contractors conduct the job based on the project's requirement that is within the terms and conditions stipulated in the contract. They will carry out and deliver the services within the scope, cost, quality, and time of the given project. Suppose the agreement is signed between the project owner and the contractor, an example of a typical Statement of Works for a Rooftop Structure installation is mentioned in the succeeding section.

1. Acquisition of the proposed building/site and liaising with the building owner.
2. Site survey on the proposed building/site that is represented between the Telecom provider and the contractor.
3. Issuance of Notice-to-Proceed to the contractor.
4. Request and delivery of owner supplied items to site.

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5. Civil Works which include installation of cable tray, installation of masts/poles, and provision of the outdoor unit pad.
6. Electrical and grounding works.

To check a more detailed scope of works for rooftop poles installation, the Work Breakdown Structure (WBS) is presented. Please refer to Appendices page 95.
The above statement of work that is specifically intended for the Rooftop Poles development is conducted on existing buildings' rooftop areas. The nature of risk involved and the risk management approach in this field will be evaluated accordingly. It is important to understand that risk identification and categorization will be focused primarily within the above-mentioned statement of work as the current study is limited only to 3 months. Risk identification and categorization will review tech technical risk, management risk, commercial risk, and external risk. A detailed Risk Breakdown Structure is illustrated in the Appendices chapter, pages 96 and 98.

1.2 Problem Statements

1. Failure to identify the probability of risk occurrence and impact by project managers and project risk owners can lead to project variation, especially on the part of contractors.
2. Insufficient knowledge in implementing a risk management system throughout the construction phase can have an impact on project objectives such as scope, time, cost, and quality.

1.3 Research Questions

The following questions are intended to project managers and project risk owners of contracting companies who are engaged in the real-world scenario of the telecom construction project.

1. What are the sources of risk and risk factors that can impact project success on the telecom poles construction in the UAE?
2. What are the effective risk management techniques that can impact project success on the telecom poles construction in the UAE?
3. How do the contractors perceive risk and its impact to project objectives such as scope, cost, time, and quality?
4. What are the new strategies on risk management that can be utilized by project managers and project risk owners for future undertakings?

1.4 Aim

Given the insufficiency of studies regarding risk management practices for the telecom industry, this study aims to investigate the significance and approaches for risk management developed by telecom contractors in the United Arab Emirates.

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1.5 Objectives

1. To describe the sources of risk and risk factors that can influence project success on the telecom poles construction in the UAE.
2. To verify which risk management techniques are effective for project success on the telecom poles construction in the UAE.
3. To investigate the perception of contractors towards risk and the impact of risk to project objectives such as scope, cost, time, and quality.
4. To recommend new strategies on risk management that can be utilized by project managers and project risk owners for future undertakings.

1.6 Significance of the Research

This study will provide relevant data to the existing body of knowledge on risk management by surfacing and assessing the systems that can be applied by stakeholders for telecom industries wherein subject knowledge is fast advancing. This will fill the gap in the current deficiencies in this field of research and provide tangible value to the organizations in the same industry.

It is postulated that this new exploration of project risk management for telecom tower construction will help create new strategies on how project risk owners can treat risks to a new level in the UAE. The findings of this research will provide valuable insights and an array of information that can be beneficial for telecom contractors and corporate practitioners by the initiative of project managers or project risk owners. Hence, it will boost their objectives in undertaking sustainable businesses and projects while adopting a risk management system that is solely functional for the telecom construction projects.

Furthermore, this research will serve as a guide to promote an in-depth understanding to future researchers that would want to reassess the subject knowledge and literature while creating a new research design in their future investigations.

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Chapter 2: Summary of Literature Review

2.1 Literature Review – Theoretical

The literature related to the research topic will be built upon several theoretical models from numerous authors which demonstrate deliberately the topic of risk and risk management and its impact to project objectives such as scope, cost, quality, and time. This narrative will be backed up by relevant secondary sources of information which express significance to the current study and will develop a framework for the research questions and objectives.

2.1.1 Construction Sectors

Construction industries are grouped into three subsectors which are consists of building construction, heavy and civil engineering construction, and special trade contractors (U.S. BUREAU OF LABOR STATISTICS, Industries at a Glance, 2021).

2.1.1.1 Building Construction

This subsector comprises two industry groups such as residential building construction and non-residential building construction. The work conducted can include new undertaking, additional work, modifications and maintenance and repairs. It may also involve the on-site assembly of prefabricated, panelized buildings and temporary buildings construction. Construction work of the establishment can be subcontracted by special trade contractors (U.S. BUREAU OF LABOR STATISTICS, 2021).

2.1.1.2 Heavy and Civil Engineering Construction

This subsector consists of industry groups such as utility system construction, land division, highway, street and bridge construction, and other heavy and civil engineering construction. The work performed here may include the production of a specific part that is subcontracted by specialty trade contractors but not normally done on both residential and non-residential buildings. It could also involve new work, additional work, modifications, maintenance, and repairs (U.S. BUREAU OF LABOR STATISTICS, 2021).

2.1.1.3 Special Trade Contractors

This subsector is grouped into foundation, structure and building exterior contractors, building equipment contractors, building finishing contractors, and other specialty trade contractors. It consists of establishments which perform concrete pouring, site preparation, plumbing, painting, and electrical work that is part of building construction or other work that is related to all kinds of construction however they are not fully

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accountable for the whole phase of the project. They conduct production that is commonly subcontracted from general contractors or builders but specifically in modification and repairing works. It may also include works directly for the owner of the property or site preparation for new construction (U.S BUREAU OF LABOR OF STATISTICS, 2021).

2.1.2 Natures of Risks in Construction from Different Countries

Several authors have explored sources of risks in construction industries in certain countries. In a study conducted in India by Mhetre et al. (2016) classified seven (7) sources of risks which consist of construction risks, socio-political risks, organizational risks, financial risks, environmental, physical risks, and technical risks. Comparably, in 2017 scholars in Nepal have also investigated and categorized sources of risks into nine (9) types such as contractual risks, political risks, organizational risks, financial risks, insurable risks, geographical risks, performance risks, operation risks, and technical risks, (Koirala, 2017).

2.1.2.1 Construction Risks

Mhetre et al. (2016) asserted that construction risks can include workers' productivity, conflicts among workers, site condition, equipment breakdown, changes in construction design, high-quality standards, and modern technology. However, Koirala (2017) argued that construction risks encompass two (2) diverse types of risks – legal risks and business risks.

2.1.2.1.1 Legal Risks

Comprise of warranty claims and issues, default terminations, intellectual property violations, suspected confidentiality disclosures, legal disputes, and lawsuits.

2.1.2.1.2 Business Risks

Pertains to poor relationships between project owners and contractors, failure to achieve project objectives, serious public relations, declining morale, ambiguity, undermining of brand integrity, loss of goodwill, and reduced revenue or profits. Koirala (2017) further stated that one real scenario of business risks can occur in the project bidding where irregularity of bid documents is processed and awarded to incompetent contractors instead of assigning the new projects to competent entities.

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2.1.2.2 Political Risks

Mhetre et al. (2016) found that social risks can be correlated to political factors. Therefore, they called it a socio-political risk. These risks can include changes in laws and regulations, pollution, safety regulations, corruption, language, cultural barrier, law enforcement, civil war, and permit requirements and approvals. On the other hand, Koirala (2017) argued that these risks can happen when the project is conceptualized by the planning commission who are influenced by the political party. Due to this sphere of influence, a potential strike by the workers, closure of the project, monetary donation to a political party, interference by the political group, chaos, confidentiality of the political coalition, delay of issuance of licenses and work permits due to political involvement are one among many risks that the project owners and contractors are experiencing during the project planning phase (Koirala, 2017).

2.1.2.3 Organizational Risks

According to Mhetre et al. (2016), these risks can include a contractual relationship which is a legal relationship between two or more parties which is exhibited by the presentation of an offer, acceptance of the proffered offer, and a valid consideration of both legal and valuable agreement. Other risks include contractors' experience, the behavior of participants, inexperienced employees, and communication. But Koirala (2017) further expounded that an organizational relationship which causes risks is beyond the contractual relationship that can become a serious matter to be dealt with. For example, tensions can occur between departments who participate in the design and construction process which leads to intense arguments between stakeholders, because they tend to become focused on responsibilities, rather than perceiving the project requirements based on the current needs which call for immediate action and solution. Koirala (2017) implied that communication and cooperation between accountable stakeholders are hindered due to fear of potential lawsuits from the complainants.

2.1.2.4 Financial Risks

Mhetre et al. (2016) documented financial risks can include material cost increase, low market demand, exchange rate fluctuation, payment delays, and incorrect estimation of taxes, among others. In this type of risk, Koirala (2017) pointed out that financial risks demand the sufficiency of funds from both the project owner and contractors as a guarantee that the project will be completed as per the given project objectives. He elaborated that these can be related to financial failure from the building owner or sub-contractors wherein cash flow, fluctuations, inflation rate and taxation have not been considered before awarding of project and during project execution like the findings of Mhetre et al. (2016). He also indicated that other risks can be encountered such as labor and material cost, bank dependency while paying a higher interest rate, lack of capital, poor cash flow management, low-profit margin due to competition, and projects being awarded to the lowest bidder (Koirala, 2017).

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2.1.2.5 Environmental Risks / Insurable Risks

Construction risks such as these are linked to natural disasters and weather implications as identified by Mhetre et al. (2016). However, this type of risk can be insurable (Koirala, 2017). Construction insurance is a system of exchanging a provisional claim for a fixed payment to protect the welfare of stakeholders such as the project owners and contractors and other stakeholders involved in the construction project. The risk occurrences within the project life cycle are transferred from customers, main and subcontractors and other involved stakeholders to the insurance company that can provide contingent financial support at the time of uncertainty. Insurable risks can be shared with insurers by sharing the losses caused by natural disasters such as floods, fires, earthquakes, and hurricanes among many (Koirala, 2017).

2.1.2.6 Physical Risks

Mhetre et al. (2016) further highlighted physical risks arise from damage to the structure, damage to equipment, labor injuries, equipment and material fire, and theft, among others.

2.1.2.7 Geographical Risks

The geographical location of construction sites can be risky during project execution. For example, if the acquired site for building construction is located on rocky ground, during foundation works, it is expected that a special type of excavator can be used for digging and disposing of soil debris which may incur extra costs on the part of builders and contractors. When this has not been anticipated during the planning stage, site conditions could result in huge variation costs aside from the necessary safety measures to be implemented during site operation (Koirala, 2017).

2.1.2.8 Performance Risks

This risk category refers to the contractors' performance at the time of bid and during the execution of construction projects. The researcher has documented that contractors are being evaluated to ensure that project objectives are met such as scope, cost, time, and quality. This indicator evaluates service suppliers' capacity to deliver projects based on the given requirements and helps the customers understand which suppliers achieve better performance within the same project scope. Hence, this will help create a benchmark for areas of improvement for future undertakings (Koirala, 2017).

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2.1.2.9 Operation Risks

Operation risks are usually observed during operation in the construction project. Koirala (2017) elaborated that this type of risk can happen at all levels of the organization. These are but are not limited to business disruption, employee inaccuracies, product failure, health and safety, failure of IT processes, fraud, loss of key personnel, legal action, and loss of trusted suppliers.

2.1.2.10 Technical Risks

Mhetre et al. (2016) have revealed that technical risks in construction projects are associated with incomplete construction design, insufficient specification, inadequate site investigation, change in project scope, wrong construction procedures, and insufficient resources. However, Koirala (2017) has mentioned only a few technical risks which are correlated to the intricacy of project design in which the contractors cannot interpret the technical detail of the drawings, a certain degree of control by the project owner and consultant which could lead to technical jargon to contractors. In some cases, he pointed out that due to fast-changing technological advancement, new software, tools, and services are introduced and adopted by project owners to a particular engineering design which could have a greater complication for the project partners because of a lack of training and knowledge about the newly introduced technology.

As elaborated in PMBOK Guide 6^{th} Edition, this type of risk can include project scope definition, project requirements definition, cost estimates, assumptions and constraints, technical processes, and technical interfaces among others (Project Management Institute, 2017).

2.1.2.11 Management Risk

In the risk breakdown structure presented by the Project Management Institute (2017), management risk can be one of the sources of project risks which comprise project management, program/portfolio management, and resourcing. These also include operations management, communication, and organization wherein Koirala (2017) has differing views on his exploration of construction companies in Nepal.

2.1.2.12 Commercial Risk

This risk category consists of contractual terms and conditions, internal procurement, suppliers and vendors, subcontracts, client and customer stability, partnership, and joint ventures. Based on the enumerated risks by Project Management Institute (2017), it is evident that performance risks as investigated by Koirala (2017) can be incorporated into this category as this includes contractors' performance and relationships.

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2.1.2.13 External Risk

Project Management Institute (2017) summarizes external risks into legislation, regulations, exchange rates, project site and facilities, environmental and weather, and competition. It explained that legislation and regulation risks contradict the findings of Mhetre et al. (2016) and Koirala (2017) as they can be considered construction risks and/or political risks. Likewise, exchange rates fall into the category of financial risks as argued by Mhetre et al (2016) and Koirala (2017). Project site and facilities can also be listed as part of construction risks. Environmental and weather risks wherein Mhetre et al. (2016) have opposing views about this type of risk. And competition is a source of risk, but this has been identified by Koirala (2017) as a financial risk.

2.1.3 Risks Management in Construction from Different Countries

Qualitative research conducted by Chilean researchers presented a risk management model that is developed from a comprehensive literature review on the risk management process which has been implemented in general construction and other international projects (Serpella, Ferrada, Rubio, & Arauzo, 2015). At the initial stage of the methodology, the researchers have categorized the main factors and sub-factors using affinity analysis through the collaboration of two panels with four experts each. They have obtained the opinions and recommendations of the first panel of experts which improved the development of the risk management model, while the second panel of experts have put forth valuable observations before the final endorsement.

As a result, Serpella et al. (2015) have formulated a theory which illustrated risk management that is influenced by five (5) main factors and fourteen (14) sub-factors. These are communication, organization, knowledge, integration, and process. Common language, dissemination of risk management and adequate communication channels are the sub-factors for communication. While definition of risk management responsibilities and consciousness of the value of risk management are the elements of an organization. The degree of knowledge about risk management, knowledge management and the abilities for risk management contributes to the main factor that is knowledge. Whereas unification between project stakeholders for risk management embodies integration. The process entails integrated risk management within the organization, performance measurement, realization in every project phase, and the availability of the system for risk management (Serpella, Ferrada, Rubio, & Arauzo, 2015).

Researchers have concluded that the risk management process in both commercial and construction projects must be a component of the organizational culture as this is the standard procedure in project planning and implementation. They suggested that appropriate communication channels and expertise about risk management systems among project team members are vital to the fulfilment of risk management adoption in construction projects (Serpella, Ferrada, Rubio, & Arauzo, 2015).

Research conducted in Poland by Bahamid and Doh (2017) delved into the risk management process in construction projects for developing countries which described risk management as

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the effective methods of utilizing risk identification, risk analysis and risk response in dealing with project risks.

Risk identification is the systematic process of regular identification, evaluation, and classification of risk occurrences in construction projects (Al-Bahar & Crandall, 1990), including the correlation of risk occurrences (Liu, Zhao, & Yan, 2016). Bahamid and Doh (2017) explained that in order to achieve the risk identification process, the use of tools and techniques as proposed by Rostami et al. (2015) should include brainstorming, Delphi technique, interviews, root cause analysis, SWOT analysis which are defined by strengths, weaknesses, opportunities, and threats, and the use of presumption analysis. Scholars claimed that the first four methods share common procedures, while the other two can be effective in investigating greater risk occurrences (Crnković & Vukomanović, 2016).

Risk analysis is defined as the process that involve a crucial assessment of probable risks while categorizing risk importance that is decided by the risk owners (El-Sayegh & Mansour, 2015). According to scholars, this method entails both qualitative and quantitative risk analysis with a subcategory that is semi-quantitative (Choudhry & Iqbal, 2013). However, Bahamid and Doh (2017) have explained that the selection of methods is affected by various factors such as the nature and size of the project, available information, economic level, project schedule, experts' experience, the degree of innovation, and the project objectives (Goh & Abdul-Rahman, 2013).

Bahamid and Doh (2017) reasoned that the quantitative method is useful in determining the probability of risk occurrences provided that sufficient information is available to produce tangible results. PMBOK Guide 5th edition listed some of the most common techniques in a quantitative method which include interviewing of risk, probability distributions, sensitivity analysis with the use of a tornado diagram, expected monetary value analysis with the use of a decision tree diagram, modeling and simulation using a Monte Carlo method and expert judgment (Project Management Institute, 2013). In contrast, however, researchers explained that the qualitative approach is based on personal experience, insight, and expert judgment. And these include a risk probability and impact assessment, probability and impact matrix, risk data quality assessment, risk categorization with the use of a Risk Breakdown Structure (RBS), risk urgency assessment and expert judgment (Project Management Institute, 2013). In general, although the outcomes can be varying among analysts, they claimed that the quantitative method is found to be effective by most experts (Jarkas & Haupt, 2015).

The risk response plan is yet another method endorsed by scholars that are applied by project stakeholders upon evaluation of the known risk. Researchers believe that mitigation can be proven by the nature and possible outcome of risk, provided that the objective of this tool is to raise the level of risk control while lessening its negative impact. Bahamid and Doh (2017) have categorized risk responses into six (6) different responses such as risk retention or acceptance, risk reduction or mitigation, risk sharing, risk control, risk avoidance, and risk transfer (Goh & Abdul-Rahman, 2013). Nevertheless, PMBOK Guide 5th edition has expanded these risk responses which specifically strategize for negative risks or threats and positive risks or opportunities. For negative risks, the project team must apply risk avoidance, risk transference, risk mitigation, and risk acceptance. While for positive risks they must utilize risk exploit strategy, risk enhance strategy, risk sharing, and risk acceptance (Project Management Institute, Project Risk Management, 2013).

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Bahamid and Doh (2017) have deduced that despite the available theory in risk management which comprises risk analysis, identification and risk responses based on the published literature, the knowledge, awareness, and application of risk management by project team members and the involved stakeholders are seldom applied in construction projects on developing countries. Histories have shown minimal effort in undertaking risks on projects which impacted project objectives (Bahamid & Doh, 2017).

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2.2 Literature Review – Empirical

2.2.1 Empirical Evidence for Hypothesis 1

Research performed by Eid et al. (2015) in Egypt for mobile telecom sites, identified construction risks and provided the mitigation process for undertaking risks. Although there are several factors which influenced the deployment of telecom sites which include location, purpose, client and end-user requirements, and key performance indicators among others, the risks were classified from outdoor and indoor sites. The researchers have collected the data from industry experts wherein they classified the mobile telecom sites into four (4) different types of sites ranging from Project Type A which consist of indoor sites ranging from pico to microsites located in offices, elevators, hypermarkets and airports; Project Type B which are greenfield macro sites on less inhabited areas, intercity highways and deserts; Project Type C which consists of macro and micro sites built within populated areas such as cities, towns, and villages; Project Type D which are both rooftop and greenfield macro sites built with camouflage solutions (Eid, Georgy, & Osman, 2014).

They created a questionnaire survey that was circulated to experts employed for Mobile Network Operators and Mobile Telecom Sites contractors. The questionnaire design illustrates a 4-point Likert scale with linguistic descriptors such as Very Effective (VE), Effective (E), Moderate (M), and Not Effective (NE) which evaluated the efficiency of response actions. Out of 90 sample populations, only 25% of respondents have provided the data with full-scale analysis. 60% of the respondents have six (6) to nine (9) years of experience, and half of the respondents have been employed with mobile network operators. Most of the respondents were site managers with 28%, site engineers with 28% and acquisition specialists with 24% (Eid, Georgy, Osman, & Ibrahim, 2015).

Risk factors with risk responses were charted and marked with corresponding feedback from the respondents. Based on the gathered data, risk on peoples' objection to telecom sites with risk response choosing a landlord with good standing among villagers can lessen resistance got (VE) rating with 3.62 mean value. The need for special camouflages with risk response using a suitable truck to transport the camouflage got an (M) rating of 1.8 scores. Whereas for generators required with risk response obtaining silent generators not to cause disturbance to neighbors had an (E) rating with a 2.72 mean value. For demonstrations and strikes nearby the sites, the work delay until the tensions have receded had (VE) rating with a 3.72 mean value. Risks on special treatment with local peoples nearby the sites with risk response contacting the authorities got (NE) rating with 1.56 score.

Risks on stopping work order due to police reports with risk response obtaining security approvals before work start had (M) rating with 2.2 mean value. The increasing price of materials with risk response checking regularly and recording new prices including variations had an (E) rating with a 1.92 mean value. Unacceptable lease rental value with risk response renegotiating with the landlord got (VE) rating with 3.58 score. The unavailability of skilled workers with a risk response and the need for close supervision due to incompetence had an (M) rating with 1.62 mean value. Risk on unsafe destination tower with risk response decrease microwave antenna diameter and height got (E) rating with 3.16 score.

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In 2018, researchers Hosny et al. (2018) conducted an experimental study in Egypt utilizing the risk management model for Continuous Flight Auger piles construction. Based on the project's record, certain issues such as project delay and cost overrun are recurrent because project managers and planners rely on their intuition, judgment, and experience triggering more risks during project execution rather than implementing a methodical risk management strategy. Hence, using risk identification as one of the processes in the risk management model, scholars have listed several risk factors that were grouped into nine (9) categories.

1. External risks (Mahendra, Pitroda, & Bhavsar, 2013)
   a. Major forces: such as earthquakes, floods, storms, wars, and revolutions.
   b. Weather conditions: such as temperature increase/decrease, humidity, or rain.

2. Design risks (Mulcahy, 2010)
   a. Improper or inadequate soil assessment.
   b. Scope creep, shrinkage, or vagueness.
   c. Design requiring innovative construction methods, equipment, or materials.
   d. Drawing, quantity, or methodology changes.
   e. Incomplete design or information.
   f. Delay in designer's response.

3. Management Risks (Mahendra, Pitroda, & Bhavsar, 2013) and (Hosny, Ibrahim, & Fraig, 2016)
   a. Poor communication between project stakeholders.
   b. Improper organizational structure.
   c. Poor qualification of staff.
   d. Delay in inspection and testing.
   e. Delay in approval of contractor's submittals.
   f. Ineffective decision making.

4. Construction risks (Mahendra, Pitroda, & Bhavsar, 2013) and (Eldosouky, Ibrahim, & Mohammed, 2014)
   a. Lack of quality management (planning, assurance, and control)
   b. Labor mistakes, rework, and idle times.
   c. Labor shortage.
   d. Labor conflicts and disputes.
   e. Safety issues.
   f. Labor cost fluctuations.
   g. Surveying and site handling mistakes.

5. Sub-contractors' risks (Hosny, Ibrahim, & Fraig, 2015)
   a. Lack of managerial skills.
   b. Delay in delivering project requirements.
   c. Low credibility.
   d. Others.

6. Equipment risks (Glover, 2009)
   a. Accidents with internal or external stakeholders.

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b. Improper maintenance.
c. Delay in conducting service and spare parts delivery.
d. Logistics delay and/or failure.
e. Lack of operators' competency.
f. Others.

7. Political and Governmental risks (Griffis & Christodoulou, 2000) and (Eldosouky, Ibrahim, & Mohammed, 2014)
    a. Political instability such as changes in government, agitation for change or dispute between parties.
    b. Corruption risks such as officials demanding bribes or grants.
    c. Failure to obtain approvals or permits.
    d. Import restrictions.

8. Economical Risks (Campbell, 2005)
    a. Fund shortage such as unavailability of cash flow by the contractor.
    b. Inflation risks such as unanticipated price changes.
    c. Taxation risks such as rising tax rates or applying new taxes or customs.
    d. Economic crisis.
    e. Foreign currency risks such as unsteady exchange rates,
    f. Transfer restrictions and supply/demand equilibrium.

9. Owner generated risks (Mahendra, Pitroda, & Bhavsar, 2013) and (Mousa & Enshassi, 2005)
    a. Failure to finance the project.
    b. Unqualified owner representatives.
    c. Delay and/or refusal of compensation to the contractor.
    d. Owner's ultra-standards expectations and requirements.
    e. Delay or inability of the owner to provide full possession of the site.

These risk factors which impacted Continuous Flight Auger piles construction were drawn from the comprehensive literature review leading to the creation of sixty-nine questionnaire surveys distributed to experts consisting of senior managers, project managers, consultants, and site engineers with experience in executing piles construction in Egypt. Risks were ranked using qualitative risk analysis by multiplying the probability of risk occurrence and impact to calculate the risk score. Their findings have come up to the conclusion that risks factors such as external risk has a 16.5% score, the design got 15.2%, equipment with 15.1%, economic risk has 14.3%, construction with 11.6%, management got 11.3%, owner with 7.4%, political has 4.5% and subcontractor risks with 4.1% score.

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2.2.2 Empirical Evidence for Hypothesis 2

A study performed in the UAE by El-Sayegh (2014) evaluated the need for construction companies that adopted various risk management methods. The experiment has identified deficiencies and key barriers inhibiting the success of a comprehensive risk management process. Identification of major tasks in the risk management process has been guided by the literature review using the PMBOK Guide 3rd Edition (2004) and Wysocki (2004). El-Sayegh (2014) created a questionnaire survey form and distributed it to construction professionals from various construction firms which do business locally and internationally. The first section of the form has been filled with respondents' profiles. The second section through the seventh contained the opinions of the respondents about the implementation of risk management planning, risk identification, qualitative risk analysis, quantitative risk analysis, risk response planning and risk monitoring and control. Whereas the eighth section contained the barriers to risk management implementation.

There were 120 circulated forms in which the completed responses were filled in by 45 respondents which have been received in person, via postal mails, emails, and faxes by the scholar. The respondents' profiles have been grouped into professionals with less than 5 years which got 6.7%, 5 to 10 years had 17.80%, 10 to 20 years got 33.30%, and over 20 years had 42.20% responses. Their role consists of construction managers which got 15.60%, contractors got 53.30%, designers 11.10%, and project owners which got 20.00%. The average project sizes were grouped into project costs varying from less than 50 million AED got 8.90%, 50 to 100 million AED got 24.40%, 100 to 500 million AED got 44.40% and, over 500 million AED got 22.20%. Using the five-point Likert scale, the answers to questionnaires were solicited and the weighted average score (WAS) have been calculated.

El-Sayegh (2014) concluded that the level of complication and competition among large firms can cause a huge amount of risk aside from the usual risk occurrences in construction projects. He suggested that construction companies needed to enhance the implementation of risk management procedures even if they utilize the risk management process which covers risk management planning, risk identification, risk assessment both qualitative and quantitative, risk response planning and risk monitoring and/or control which has been updated based on PMBOK Guide 3rd Edition (Project Management Institute, 2004).

He investigated that several activities on risk management are found to be unsatisfactory such as decision trees which determine the risk response strategies with a weighted average score of 2.58, planning risk responses with 2.91, using a risk matrix with a 3.04 score, risk management activities in the project schedule with 3.09 and assigning risk response owners with 3.16. He further pointed out that there has been clear incompetence in risk response planning among local companies which could lead to confusion when the risk occurs due to the absence of a risk response owner and appropriate strategy.

The overall findings illustrated that foreign companies got the WAS equal to 3.7 which means they apply risk management more frequently than the local firms which got WAS equal to 3.36. Furthermore, the barriers to risk management implementation among local and international companies were identified. These barriers are linked to managers' understanding of the

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techniques, finding appropriate risk management methods, complexity in obtaining estimates and assessment of probability.

2.2.3 Empirical Evidence for Hypothesis 3

Research conducted in Vietnam by Phan (2020) explored about risk attitudes of contractors and their understanding of risks occurrence in construction projects. The study has been carried out for Vietnamese contractors, particularly in two cities namely Vinh Long and Can Tho. The research population that participated in the survey was selected from both small and large companies. Although the scholars have produced mixed methods, quantitative data and analytical procedures were also considered. Survey questionnaires were created which characterized respondents' attitudes towards risk and their knowledge of the risk management process.

The questionnaires comprised of 29 questions were divided into three sections. The first section was designed which collected demographics and respondents' opinions and attitudes towards risk management. The second section contained an investigation on knowledge transfer and management in their respective companies, while the third section covered practical risk management applications in construction. They distributed the questionnaires via email to 336 Vietnamese contractors by which 43 responses were collected, a fraction of 13% of the total population that is within an average response rate for external surveys between 10% to 15%. Respondents were classified according to their work experience with more than 15 years in the industry. 88% comprise contractors, 24% for developers, and 23.8% for consultants. Approximately 48% with more than 1000 employees and 52% with less than 1000 employees represented the companies' sizes.

The results obtained by the researchers show that the attitude of Vietnamese contractors on how they perceive risks are both opportunities and threats. Respondents' perception of both opportunities and threats got 90% or equivalent to (30) respondents, while (2) respondents perceive risk as a threat and (2) perceive risk as an opportunity. Their findings negate the results performed by (Akintoye & MacLeod, 1997) where the construction industries are mostly risk averse. Similarly, Phan (2020) assessment of contractors' attitudes towards risks has led to being risk-neutral which got 82% rather than being risk seeker which got 5% or risk-averse which got 13%. The scholar cited an example that one of the respondents perceived risk as generally negative. However, other respondents have understood that risk could be an opportunity, especially when dealing with financial risks.

Meanwhile, research put forth by Osman et al. (2020) has investigated identifying the risk impact on cost and time for the Egyptians Non-Residential Buildings Projects (ENRBP) in which project objectives are influenced by multiple risk factors resulting to cost overrun and time delay. According to An et al. (2005), construction risks are deemed to be the most critical among other risks where poor performance in project execution is commonly observed resulting in over budget and time delays, even project failure. Osman et al. (2020) emphasized that budget overruns and time delays can be regarded as the most important objectives other than scope and quality. They explained that construction firms in developing countries can

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experience undocumented information on the probability of risk occurrence and impact affecting project objectives primarily on cost and time.

As a result, the scholars have produced the research objectives which tested a hypothesis about agreement among contractors, consultants, and project owners where it evaluated the risk factors probabilities and impacts on cost and time. They presented an outline highlighting the most critical risk factors taken out from the Hierarchical Risk Breakdown Structure (HRBS) which created knowledge in finding the probability of occurrence and impact to project objectives. Similarly, they generated the impact of risk categories on cost and time which examined the relative importance (Osman, Issa, & Zakaria Eraqi, 2020).

Osman et al. (2020) formulated a survey questionnaire according to the available literature explored by several researchers like Khodeir and Ghandour (2019) which examined the role of value management in controlling cost overrun in residential construction projects in Egypt; Khodeir and Nabawy (2019) which identified the major risks in infrastructure projects in Cairo Festival City in Egypt; Sharaf and Abdelwahab (2015) which reviewed risk factors for a highway construction projects in Egypt; Issa and Ahmed (2014) which experimented on the quality of driven piles construction based on risk analysis; Marzouk and El-Rasas (2014) which analyzed the cause of delay in Egyptian construction projects; Issa (2012) which developed an evaluation framework for factors affecting the quality in the construction industry, and Issa (2012) which developed a model for time overrun quantification in construction of industrial projects based on risk assessment.

Questionnaires were circulated personally and manually collected, while others were transmitted via email. Out of (70) questionnaires, (40) responses were received with an average response rate of 57% out of 53% from contractors, 67% from consultants, and 48% from the owners. These respondents engaged in (186) projects ranging from small size with 14%, large with 33%, very large with 19%, and medium-size projects with 34% where most of the respondents have shared their data.

The findings of Osman et al. (2020) were taken out from (81) risk factors identified for the ENRBP. Twenty (20) were ranked to be major risk factors which have impacted cost and time. They concluded that the top-ranked risk factors were associated with dramatic changes in the prices of the materials (risk no. 50), adopting a direct attribution system rather than tendering and bidding systems (risk no. 12) and lack of project suitable fund (risk no. 29). Risk factors on project stop or delay due to revolution, and riot were found to be first in ranking which affected cost and time objectives. Local or foreign currency exchange limitations and rate fluctuation and the lack of suitable project funds came second for cost and time, respectively.

Researchers' final analysis and findings for the risk categories based on the probability of occurrence and impact on cost and time of the project are correlated to the design stage and construction management risk factors. Cost overruns soared up to 33.10% of the total ENRBP while project delay rocketed to 65.6% with an average increase of cost overruns and time delays over 20% of the project schedule.

To summarize, several sources of risk have been identified by Hosny (2018), Mhetre et al. (2016), Koirala (2017), Eid et al. (2015), and Eid et al. (2014) among others. However, these

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sources of risk and risk factors have been observed in general construction projects. It does not explicitly identify whether these risks can be occurring in telecom tower construction.

El-Sayegh (2014) exploration of risk management applications in construction firms in both local and international countries concluded that large companies could cause a substantial number of risks. And therefore, risk management practices must be enhanced by way of utilizing risk management planning, risk identification, risk assessment using qualitative and quantitative, risk response planning and risk monitoring/control (Project Management Institute, 2004). Serpella et al. (2015) findings prove that risk management implementation can be effective when there is the right communication channel and knowledge about the risk management process between the project team. But then, there are opposing views in the study performed by Bahamid and Doh (2017) which shows that despite the available literature and theories in risk management with the use of risk analysis, identification and risk responses, these methods are seldom applied to construction projects in developing countries.

Phan (2020) conclusions on Vietnamese contractors in two (2) western provinces proved that their perception of risks was treated as both opportunities and threats. Correspondingly, all the respondents have displayed their attitude being risk neutral rather than being risk seeker or risk averse. Concerning risk impact to project objectives such as cost and time particularly, Osman et al. (2020) found that among the risk factors identified for the Egyptian non-residential building projects, the risk of dramatic changes in materials prices has had the highest score which impacted cost and time significantly resulting to cost overruns and project delay.

It has been observed that between 2014 and 2015, scholars like Eid et al. (2014) and Eid et al. (2015) have already published an article concerning risk management in telecom projects in Egypt, apart from the exploration carried out in various countries like Vietnam (Phan, 2020), Egypt (Osman, Issa, & Zakaria Eraqi, 2020), Poland (Bahamid & Doh, 2017), Chile (Serpella, Ferrada, Rubio, & Arauzo, 2015), and the UAE (El-Sayegh S. M., 2014). Despite the available literature presented and published by different authors which provide theoretical and empirical evidence, there is a lack of exploration of the application of risk management particularly in telecom poles construction in the UAE. Thus, the following hypotheses are created to assess their reliability.

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Hypotheses 1

H_o: Commercial risk does not affect the project success on the telecom poles construction in the UAE.

H_a: Commercial risk does affect the project success of the telecom poles construction in the UAE.

Hypothesis 2

H_o: The use of a risk register in a risk response plan does not have a correlation to project success on the telecom poles construction in the UAE.

H_a: The use of a risk register in the risk response plan does have correlation to project success of telecom poles construction in the UAE.

Hypothesis 3

H_o: Technical Risk does not have an impact to project objectives such as scope, cost, time, and quality.

H_a: Technical Risk does have an impact to project objectives such as scope, cost, time, and quality.

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Chapter 3: Body of Thesis

3.1 Purpose Statement

This chapter will investigate and provide insights on data and methodology used in Evaluating Contractor's Risk Management for Telecom Poles Construction in the UAE. It will outline and rationalize the hypotheses formulated from the knowledge gap out of the existing literature that provided theoretical and empirical evidence inferred by several scholars.

It is important to consider that both descriptive and explanatory analyses will be utilized in the formulation of findings. Robson (2002) mentioned descriptive study as an appropriate approach when describing an exact profile of persons, experiences, or situations. Whereas explanatory analysis pertains to a study that verifies causal relationships between variables.

In view thereof, it will draw the type of research philosophy, research approach, and research method, as well as a research strategy to be able to present an empirical model that is established from the theoretical model for hypotheses testing. Correspondingly, it will also confirm which time horizon will be employed to generate data, sources and modifications based on the unit and the number of observations described the recency of the research and the sample population available during the period.

Successively, data collection and data analysis and its sources will be presented to determine the answer to research questions, aims and research objectives. Research objections will be critically analyzed should there be any missing variables, observations, survey responses or any insufficient data from the observations measured during the survey and validity of hypotheses.

3.2 Research Philosophy

The research approach to the development of knowledge emerges from the research philosophy that is called positivism, the outer core of the research onion designed by Saunders et al. (2009). This philosophical belief holds to the belief of the natural scientist in which he chooses to work through observation about social interactions and their measurements and the findings of the research are conceptualized as related to the data generated by the real scientists (Remenyi, 1998). This strategy by the researcher uses existing theory to develop hypotheses so that their reliability can be examined, verified, or disproved resulting in the theory development for further empirical studies (Saunders, Lewis, & Thornhill, 2009). In the same way, the author of this paper uses the same philosophy as the objectives and research questions evolve on the same principle.

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3.3 Research Approach

In this viewpoint, the author uses a deductive approach rather than an inductive to demonstrate the development of the theory that is subjected to thorough and rigorous testing. This follows the pattern of the research onion by Saunders (2009). Collis and Hussey (2014) stated that in such a case, it is the normal research approach in the natural sciences where its scientific principles are explanatory, thus it allows prediction of occurrences and permits them to be manipulated (Collis & Hussey, 2014).

According to Robson (2002), one of the characteristics of the deductive approach explains the causal relationships between the two or more variables from the theory such as dependent and independent variables. In other terms, causal research also called explanatory research, is conducted to be able to identify the degree and nature of cause-and-effect relationships between two variables so that the impact of specific changes on existing processes can be explained.

To cite an example, one of the hypotheses of the current research investigates whether commercial risk does not have an effect to project success on the telecom poles construction in the UAE. In this context, the dependent variable is project success, while the independent variable is commercial risk. To test the hypothesis, another characteristic of deductive approach is the use of quantitative data.

3.4 Research Method

One of the methods formulated by Saunders et al (2009) in the research onion is the use of the mono method either quantitative or qualitative. In this methodology, the researcher chooses the mono method using a quantitative approach because the procedure in data collection and analysis is conducted through the survey questionnaires and the data are illustrated in numbers or figures. According to Saunders (2009), the quantitative method is primarily applied as synonymous with data collection using questionnaires and data analysis using graphs or statistics which generates numerical data. While the quantitative can be distinguished and expressed as the numeric, the qualitative method is a non-numeric which can be expressed in words, pictures and/or video clips.

3.5 Research Strategy

The perception and responses from the prospective respondents must be obtained from the larger group of population so that the reliability of the research hypotheses can be examined. Thus, an appropriate research strategy is needed to be developed. Saunders et al. (2009) recommend various research strategies which consist of experiments and surveys that are succeeded by the mono method, aside from the case study and action research that is succeeded by the mixed method. By following the same pattern of the deductive approach followed by the mono method, the author of this research utilizes a survey strategy in the form of a questionnaire.

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This strategy demands observation and understanding from the respondents to share their feedback through an opinion poll. On this type of survey, it asks about the respondents' perception of the type of risks which can impact project success; the effective risk management tool which can influence project success; the type of risk that can affect project objectives or not; and whether project success or project objectives whether these can be achieved without the dependency on the underlying factors such as risk and risk management tools. Hence, the data that will be gathered from the survey will go through hypotheses testing using a reliability test to justify the research objectives and research questions that were developed out of the research topic.

The following diagrams present an empirical model of the predicted hypothesis to be evaluated for validity.

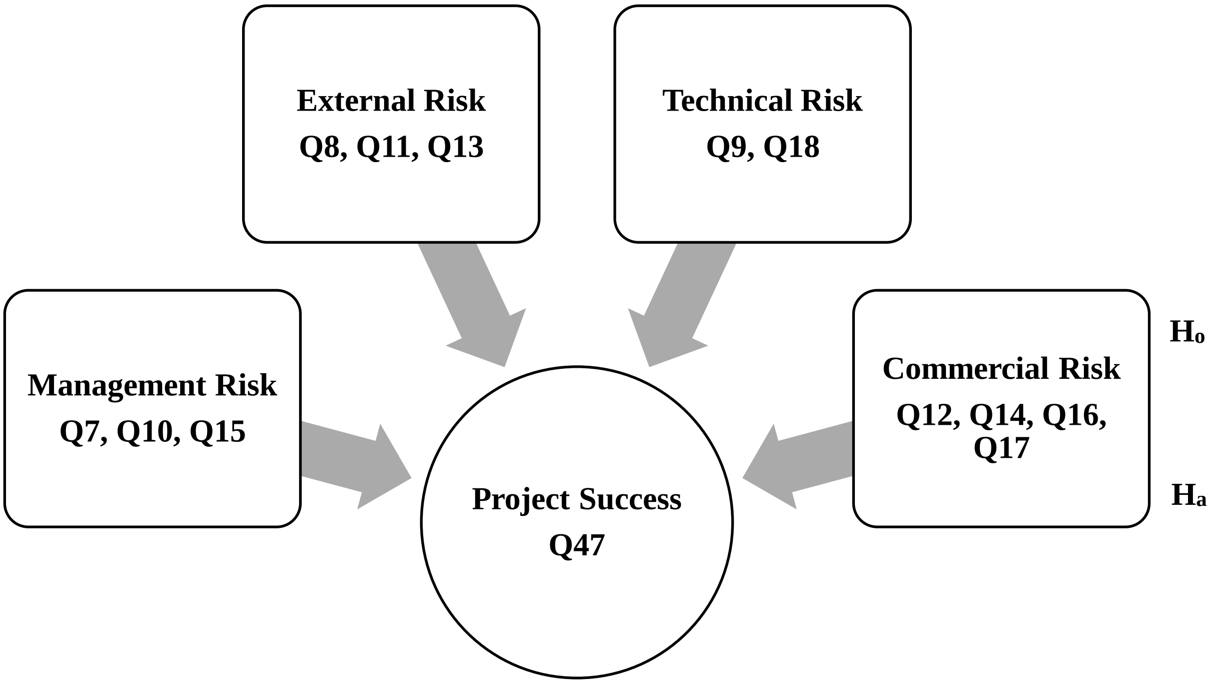

Figure 3.1 Predicted Empirical Model for Hypothesis 1

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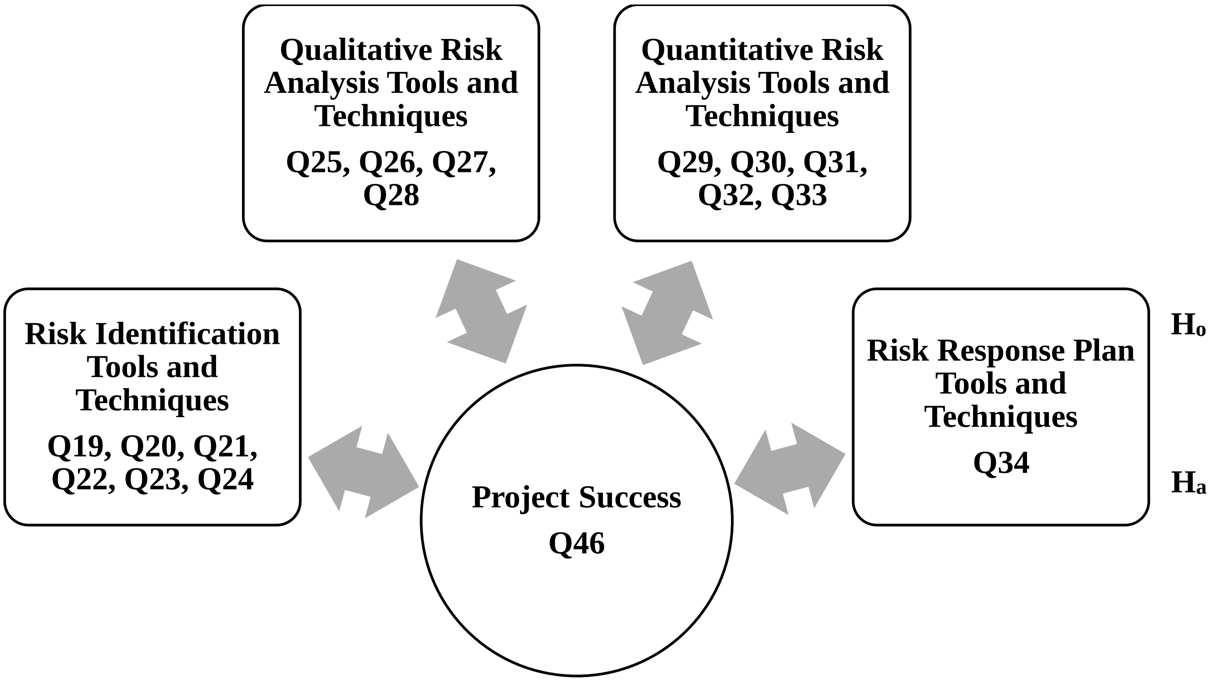

Figure 3.2 Predicted Empirical Model for Hypothesis 2

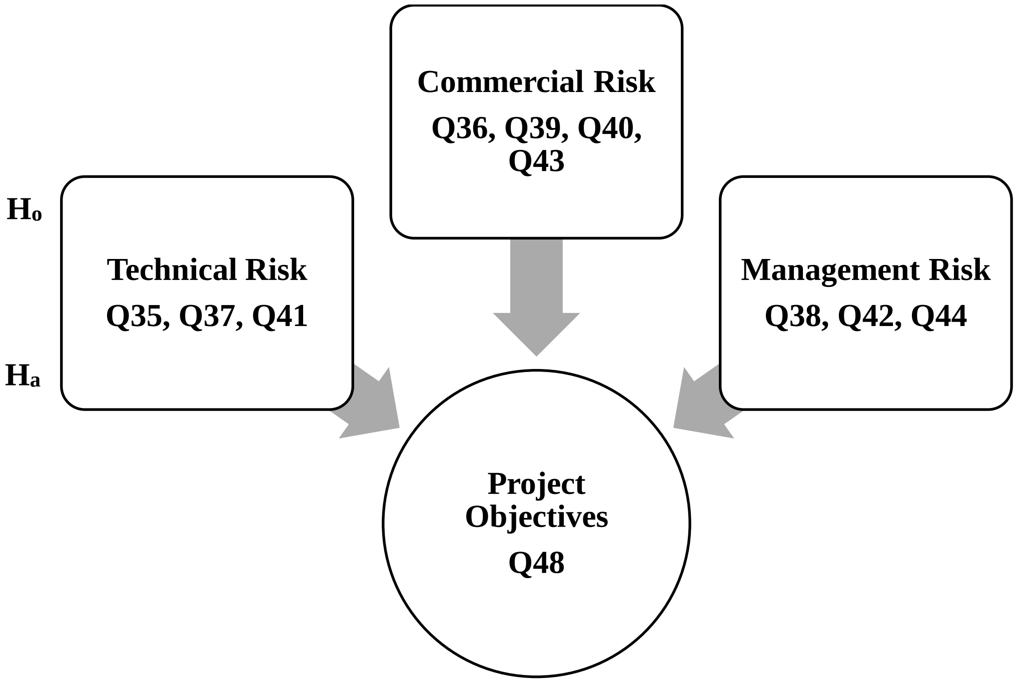

Figure 3.3 Predicted Empirical Model for Hypothesis 3

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3.6 Time Horizon

Cross-sectional studies can be applied to qualitative methods in which many case studies are conducted over a brief period. However, it can also be applied to quantitative methods wherein most of the academic research is taken with time-constraint (Saunders, Lewis, & Thornhill, 2009). Since the current research is restricted only to three months, the time horizon that is decided for this study employs the cross-sectional method. And therefore, when a cross-sectional study is used, the pattern of data collection is being preceded by the use of the survey strategy as established by Easterby-Smith et al. (2008) and Robson (2002). For example, in the current research, one of the questions is looking to describe the relationship between risk management tools such as the use of a risk register and project objectives. Or the impact of commercial risk to project success.

3.7 Data Collection

Overall, there are two different types of collecting data from specific sources. One method is through the primary sources of information and the other is by secondary sources. Primary sources in data collection are taken from the methodical observation, recording, description, analysis, and interpretation of people's behavior (Saunders, Lewis, & Thornhill, 2009). In contrast, secondary data are sources of information which comprise documentaries taken from written and non-written materials, multiple sources which are area-based and time-based, and surveys such as censuses, continuous surveys, and ad hoc surveys (Saunders, Lewis, & Thornhill, 2009).

In other words, secondary data are sources of information gathered by someone else other than the researcher, while primary data are the type of information which are collected by the researcher itself. Hence, to achieve a high validity and reliability of the information in data collection, the researcher uses primary data that are structured into observation, questionnaires, and online interviews.

3.7.1 Survey Questionnaire

The questionnaire designed for data collection is processed through the website of survey monkey dot com. It is structured into a self-administered questionnaire that is controlled using the internet (Saunders, Lewis, & Thornhill, 2009) and distributed electronically through email and social media using WhatsApp in particular. The researcher believes that these mediums of transporting data and feedback could be the most effective way of obtaining immediate responses from the prospective respondents.

Take, for example, the use of WhatsApp has brought an advantage to the researcher because of his direct access and connections with all the respondents. The prime reason behind this technique rests on their involvement with telecom construction projects. In this way, it could give a reliable and valid data point for hypothesis testing.

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The questionnaire survey is also structured into a closed-ended question as endorsed by Dillman (2007). In other terms, it is called forced-choice questions by deVaus (2002) which present several choices for respondents to be able to answer the questions produced by the researcher. According to Saunders et al. (2009), this type of questionnaire is faster and easier to answer the questions as it demands minimal writing from the respondents.

Rating questions which are commonly used in collecting opinion data are laid out on this questionnaire using the Likert-style rating scale from (1) to (5) wherein the respondents can decide on their answers with choices such as strongly agree, agree, neither agree nor disagree, disagree, and strongly disagree. Questions in the outline also include positive and negative statements to ensure that respondents can carefully decide and think of their potential answers (Saunders, Lewis, & Thornhill, 2009).

There are (48) questions in totality. Section (1) entails (6) questions about the demographic information of respondents that require an email address, educational attainment, organization, role in the company, years of experience and certification if any from Project Management Institute Incorporated. Section (2) contains (12) questions about the various sources of risks emerging from management risk, external risk, technical risk, and commercial risk that can influence project success (Project Management Institute, 2017).

Section (3) takes (16) questions about risk management tools and techniques which are fundamentally used when implementing risk identification, risk analysis which is segmented into quantitative and qualitative, and risk response plan that can influence project success (Project Management Institute, 2013). Section (4) covers (10) questions on sources of risks such as technical risk, commercial risk and management risk that can impact project objectives (Project Management Institute, 2017). Likewise, Section (5) contains (4) questions on project success and project objectives and whether these have a relationship with the sources of risk and risk management tools and techniques.

3.7.2 Sampling

The technique for selecting samples uses the non-probability sampling or the so-called non-random sampling as it generates an array of alternative methods for selecting samples based on subjective judgment (Saunders, Lewis, & Thornhill, 2009)

The distribution of the questionnaire began when the researcher shared the hyperlinks of the questionnaire from the survey monkey website and discussed the research objectives with one of the potential respondents. He is the second respondent (R2) who is also working as a project control engineer in the same telecom field. When he understood the purpose of the survey which is related to risk management for telecom poles construction in the UAE, he immediately shared his feedback, and began circulating the questionnaire too to his colleagues which are also a group of a project management team comprised of a project manager, associate engineer, civil engineer,

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and project controller. However, out of (5) respondents, only two have completed the questionnaire, where they represent (R3) and (R4) respectively.

The said sampling method is called snowballing technique. Using this method, the researcher makes contact in one or two cases with the population through WhatsApp. However, the extent of respondents is restricted only to (5) as this is manageable to the researcher. Otherwise, there will be an undetermined number of samples, or the samples could become larger which could lead to possible sampling bias (Saunders, Lewis, & Thornhill, 2009).

Apart from snowballing technique, another sampling method that was employed for data collection is the use of the self-selection sampling technique in which the researcher allows known individuals to identify their interest to take part in the research (Saunders, Lewis, & Thornhill, 2009). By applying this technique, the researcher ensures that all the respondents are engaged in telecom poles construction so that the data that will be collected are dependable.

During self-selection, the researcher has circulated the questionnaires by sharing the hyperlink through WhatsApp and obtained responses from the first respondent which is denoted by the symbol (R1), including respondents (R5) up to (R8), (R10) and (R11), (R14) up to (R19), (R21) up to (R25), (R27), (R29) up to (R43) which have completed the total number of responses.

According to Saunders et al. (2009), when a researcher chooses the self-selection technique, he publicizes or advertises it using appropriate media so that the prospective respondents take part in the opinion poll, and therefore, collect the data from the respondents. In the same way, the researcher uses the same strategy by posting the hyperlink of the survey monkey website via LinkedIn where it acquired responses from respective respondents like (R9), (R12), (R13), and (R20.

Apart from that, while the researcher has utilized both methods such as snowballing and self-selection techniques, he administered to share the hyperlink to a group of telecom companies which have been invited to participate via email. It comprises (32) email addresses which represented (32) companies. However, none of them has responded. The number of days spent on the distribution of questionnaires and data collection took (8) days only due to the restricted period for the preparation and finalization of the paper.

Overall, the total number of questionnaires sent out to the participants reaches up to one-hundred sixty-eight (168). Thirty-two (32) of which were distributed via email yet without response. One hundred twenty-four (124) were circulated through WhatsApp but only sixty-three (63) have shared their feedback. Twelve (12) were sent out via LinkedIn but only six (6) have responded. Hence, there were sixty-nine (69) responses received. But only forty-three (43) respondents have completed the questionnaire wherein they comprise nineteen (19) contractors and one (1) telecom provider.

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3.7.3 Dependent Variable

Explanatory research requires data to test a theory to be able to examine the relationship between variables. Saunders (2009) explained that dependent variable changes when there are changes in independent variables. In the questionnaire, project success is the dependent variable which covers questions (45), (46), and (47). Likewise, project objectives such as scope, cost, time, and quality represent dependent variables that are mentioned in the question (48).

3.7.4 Independent Variable

Independent variables are the ones which cause changes in the dependent variable (Saunders, Lewis, & Thornhill, 2009). In the given questionnaire, sources of risks which are mentioned in questions (7) up to (18), as well as (35) up to (44) represent independent variables. Similarly, risk management tools which are enumerated in questions (19) up to (34) denotes as independent variables.

3.8 Data Analysis

Data analysis will be presented using quantitative data that is imported from the survey monkey website. Saunders et al. (2009) rationalized that when collecting quantitative data, it should be the raw data that is generated out of the research strategy applied in collecting the data so that it can be processed, analyzed, and transformed into vivid information. This can be expressed by way of presenting the data in graphs, charts, and statistics to be able to describe and examine the relationship with the given data (Saunders, Lewis, & Thornhill, 2009).

There are two types of data that are illustrated for quantitative analysis – categorical data and numerical data. According to Berman and Saunders (2008), categorical data are a type of data whose values cannot be quantified numerically but can be grouped into categories based on the characteristics that describe the variables or rank order. Categorical data are subdivided into descriptive dichotomous data which are classified into two or more groups; and data which can be placed in rank order which are segmented into descriptive nominal data and ranked or ordinal data (Saunders, Lewis, & Thornhill, 2009).

Accordingly, data on demographics questions are categorized into a descriptive nominal data because it tells about the number of occurrences in each group of the variable; whereas questions on independent and dependent variables are classified into ranked or ordinal data as it deals with rating or scale questions where respondents are required to rate how strongly do they agree or disagree with the given statements (Saunders, Lewis, & Thornhill, 2009). Although, there are contradicting arguments from several researchers about ranked or ordinal data where it can be counted also as numerical interval data as they have similarities in size gaps between data values (Blumberg, Cooper, & Schindler, 2008).

All collected data from the (43) questionnaires were imported from the survey monkey website and coded using the Microsoft Office Excel software. The imported data in the excel file

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contains responses in the numeric form which were checked for errors and missing data and have been validated.

Descriptive analysis is outlined to describe and summarize the findings of the data collected from the questionnaire (LoBiondo-Wood & Haber, 2014). It presents calculations of central tendency such as mean, median and modes, including range and standard deviations which are part of variability. All numerical data passes through a reliability test using Cronbach’s Alpha to ensure that all questions are consistent. Demographic data are presented using bar charts and frequency tables. The rest of the variables are interpreted using the central tendency and measures of dispersion, the skewness, and kurtosis using contingency table or cross-tabulation.

Meanwhile, inferential analysis is employed to estimate the reliability of the predictions being made and generalize the data whether it is applicable or not to a broader population (LoBiondo-Wood & Haber, 2014). It further analyzes the collected data and tests the hypotheses to be able to draw conclusions that will justify the research questions and objectives. In the findings chapter, a correlation test will prove if the relationship of the strength of variables is correlated. In contrast, to test the null hypotheses, the regression equation finds out and proves whether the null is rejected or accepted.

3.9 Research Objections

As mentioned in the sampling section, there were (168) questionnaires sent out to participants. Sixty-nine (69) total responses were generated in the system. However, only (43) respondents have completed the questionnaires which consist of (19) contractors and (1) telecom providers. Therefore, only these numbers of respondents were validated for final data analysis and hypotheses testing.

There were irrelevant or non-specific responses in question 19 such as all the above, experienced team, MSRA, and a combination of answers such as root cause analysis and interviewing, despite only one answer to be decided. Likewise, in question 23, answers such as working without PPE, working at height, working without proper tools, combined answers for cause-and-effect diagrams, process flow charts, and influence diagrams including blank answers have been identified.

It has been observed that despite the (69) responses, only (43) questionnaires were validated due to incomplete data. The rest of the questions particularly on independent and dependent variables have been skipped by the respondents. Most of them, have filled up only the demographic’s questions. Some have answered questions about risk sources but did not share feedback on risk management tools and techniques, including questions on project success and project objectives. The reason could be due to questions which are not familiar to them, or they merely did not want to comment or share their feedback.

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Chapter 4: Findings

This chapter presents the data analyses and results collected from the forty-three (43) respondents who completed the survey. Descriptive statistics will outline the findings using descriptive nominal data collected on page (1) of the questionnaire which describes the demographics of the respondents. Ranked or ordinal data will be used to interpret the findings for page (2) independent variable, page (3) independent variable, page (4) another independent variable and page (5) as the dependent variable in the given questionnaire.

Inferential statistics will summarize the findings for the selected questions for hypotheses testing, examine and validate the claims if there is a relationship between dependent and independent variables, and/or whether the null hypotheses can be rejected or accepted. Consequently, it will be able to answer the research questions and corroborate the hypotheses of the current research.

4.1 Descriptive Statistics

4.1.1 Reliability Test

To examine the strength or the internal consistency of the given measurement or data from the collected responses, Cronbach's Alpha is used. It is calculated by correlating the score for each scale item with the total score for each observation such as respondents, and then comparing it to the variance for all individual item scores (Goforth, 2015).

The value of Alpha can vary between 0 which means no correlation, to 1 which implies a perfect correlation. When the value of Alpha is 0.7 or above, it is considered an acceptable value of internal consistency or reliability (Welman, Kruger, & Mitchell, 2005).

The following tables present the findings for Cronbach's Alpha values applied to (4) pages of the questionnaires using the Likert-style rating scale.

Table 4.1 Independent Variables - Risk Types

Independent Variables	Cronbach's Alpha Value	No. of Items
Q7, Q8, Q9, Q10, Q11, Q12, Q13, Q14, Q15, Q16, Q17, Q18	0.935	12

Table 4.1 shows that the value of Cronbach's Alpha is found to be 0.935 which is closest to 1. It means that the variables are almost perfectly correlated to each other.

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Table 4.2 Independent Variables - Risk Management Tools and Techniques

Independent Variables	Cronbach's Alpha Value	No. of Items
Q20, Q21, Q23, Q24, Q25, Q26, Q27, Q28, Q29, Q30, Q31, Q32, Q33, Q34	1.068	14

Table 4.2 shows that the value of Cronbach's Alpha is found to be 1.068 which is also closest to 1. It means that the variables are almost correlated to each other.

Table 4.3 Independent Variables – Risk Types

Independent Variables	Cronbach's Alpha Value	No. of Items
Q35, Q36, Q37, Q38, Q39, Q40, Q41, Q42, Q43, Q44	1.099	10

Table 4.3 illustrates that the value of Cronbach's Alpha is equal to 1.099 which means the variables represented by questions are likewise perfectly correlated to each other.

Table 4.4 Dependent Variables – Project Success and Project Objectives

Dependent Variables	Cronbach's Alpha Value	No. of Items
Q45, Q46, Q47, Q48	1.317	4

Table 4.4 demonstrates that the value of Cronbach's Alpha is equal to 1.317 which means the variables represented by questions exceeded 1.

4.1.2 Findings for Demographics

Data collected by the researcher from the demographics survey uses bar charts or column charts to be able to present a more precise height and length which denotes the frequency of occurrences of responses (Saunders, Lewis, & Thornhill, 2009).

Demographics questions on page (1) of the questionnaire consist of six (6) task orientation that includes the email addresses of respondents. However, it remained undisclosed to observe the confidentiality of the matter and the identity of the respondents.

Q1. Please indicate your email address. Your email address will not be shared and will remain confidential.
Q2. What is your highest educational attainment?
Q3. Which organization sector do you work in?

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Q4. What is your position in the company?
Q5. How many years of work experience do you have?
Q6. Do you hold a certification from the Project Management Institute?

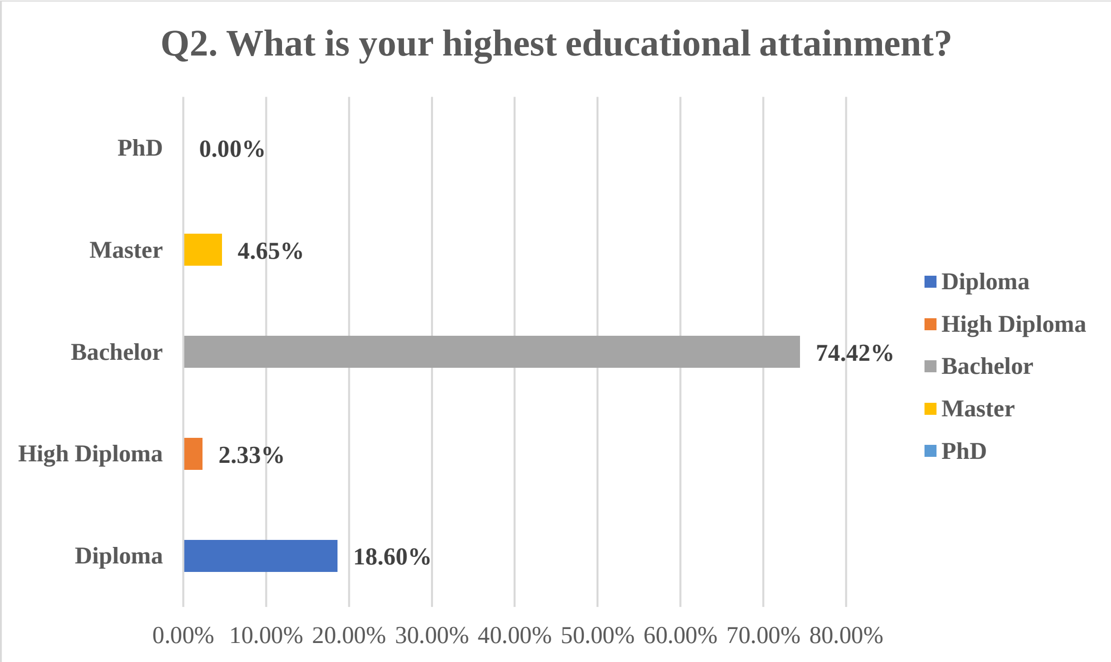

Figure 4.1 Respondents' Educational Attainment

Figure 4.1 refers to the findings for Question 2 collected data concerning their educational background. Most of the respondents hold a bachelor's degree with 74.42%, followed by a diploma with 18.60%. While respondents who hold a master's degree have 4.65% over a high diploma with 2.33%. Interestingly, no respondents have a doctorate.

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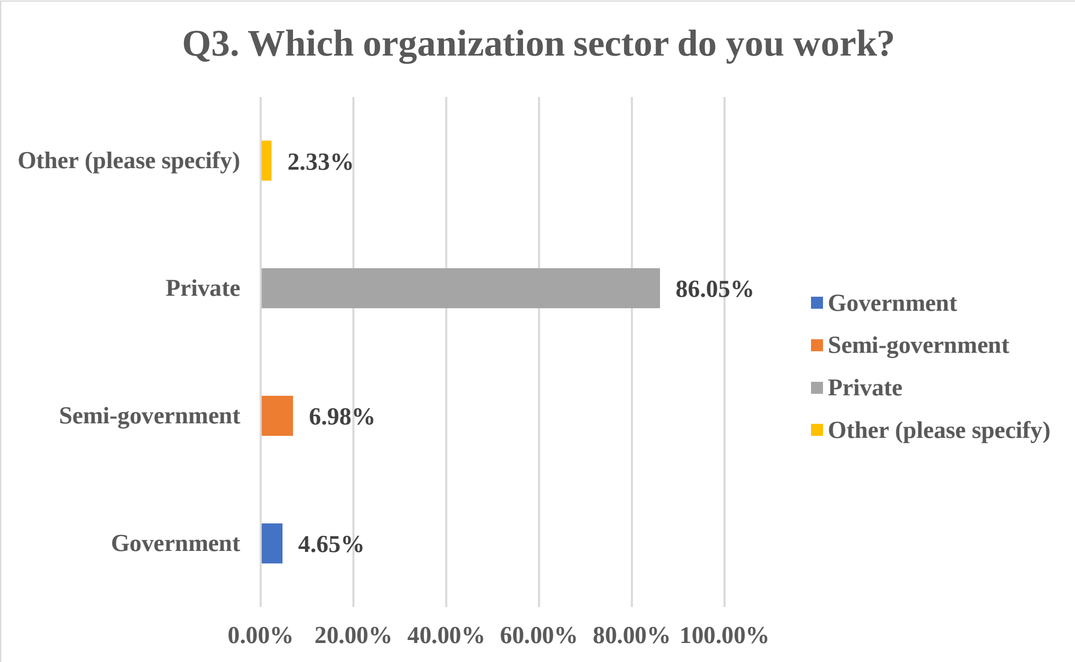

Figure 4.2 Respondents' Organization Sector

Figure 4.2 shows the results for Question 3 collected data from the respondents regarding which company sectors do they work in. The above chart shows that most of the respondents are employed in private companies which got a substantial response of 86.05% over semi-government with only 6.98% and government with 4.65% responses respectively.

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Using a Table for Categorical and Numerical Data

One of the simplest methods of summarizing the data for each variable so that it can be interpreted easily is the use of a table with frequency distribution, wherein it summarizes the number of cases frequency in each category (Saunders, Lewis, & Thornhill, 2009). In the succeeding table, the variables are in a huge list. However, using a frequency table identifies which respondents give the highest number of responses out of the various positions enumerated.

Table 4.5 Position of the Respondents (Q4)

Position	Frequency	Percentage
Civil Foreman	2	4.65%
Project Coordinator	4	9.30%
Site Acquisition Coordinator	1	2.33%
Project Manager	1	2.33%
Civil Engineer	4	9.30%
Civil Engineer Technology	1	2.33%
Business Unit Head	1	2.33%
Engineer	11	25.58%
Structural Engineer	1	2.33%
Management Head	1	2.33%
Senior Engineer	2	4.65%
Electrical Site Engineer	1	2.33%
QHSE Officer	1	2.33%
Site Supervisor	1	2.33%
Site Engineer	1	2.33%
Quality Engineer	1	2.33%
Network Planning Engineer	1	2.33%
Civil Team Leader	1	2.33%
Site Manager	1	2.33%
Warehouse Manager	1	2.33%
Civil Works SAQ	1	2.33%
HSE Coordinator	1	2.33%
Project Administrator / Cost Controller	1	2.33%
Telecom Engineer -Coordinator	1	2.33%
Acceptance & Pre-Invoicing Engineer	1	2.33%
	43	100.00%

Table 4.5 presents the findings for Question 4 collected data from the respondents concerning their position in the firm. Based on the collected data, the engineer position got a significant response of 25.58% followed by civil engineers and project coordinators who shares the same responses of 9.30% only. Both civil foremen and senior engineers generated 4.65% responses over the rest of the positions which have the same percentage frequency of 2.33%.

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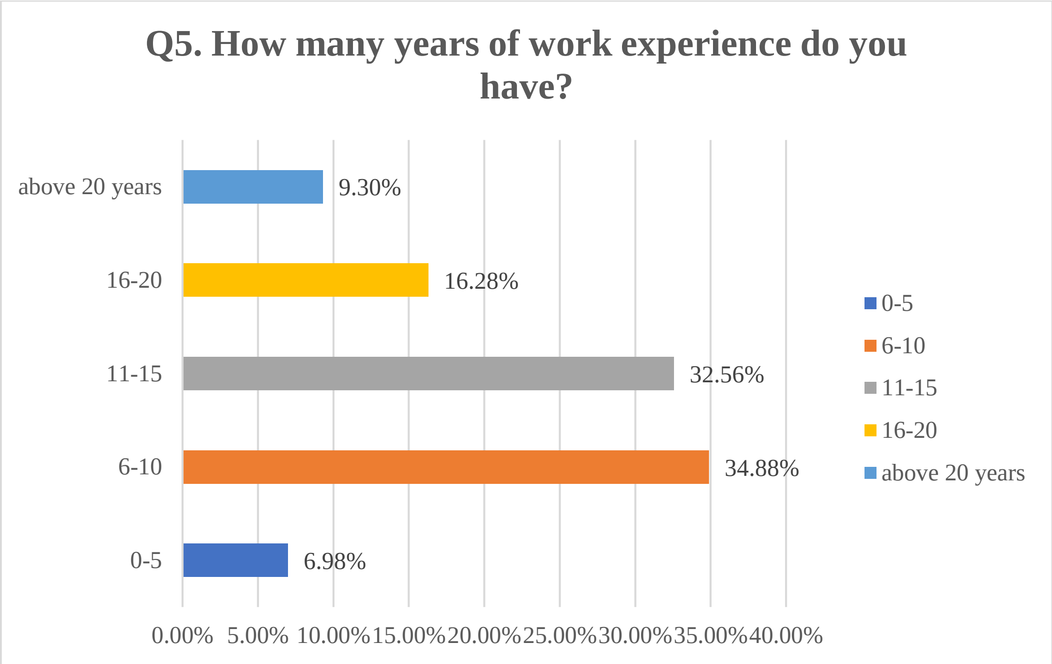

Figure 4.3 Respondents' Work Experience

Figure 4.3 indicates the findings for Question 5 collected data from the respondents' work experience in their respective companies. Those employees who have 6 to 10 work experience got 34.88% with a close margin of responses from employees working from 11 to 15 years. Meanwhile, employees working from 16 to 20 years got 16.28% responses followed by those working over 20 years with 9.30% responses. Employees who have work experience from 0 to 5 deliver 6.98% responses.

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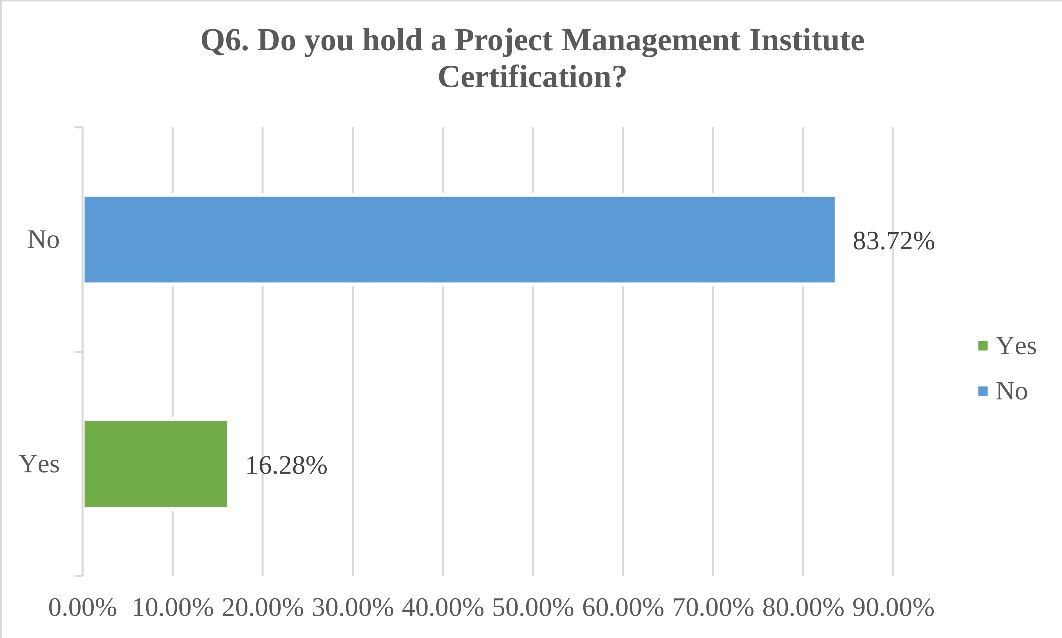

Figure 4.4 Project Management Institute Certification

Figure 4.4 illustrates the results for Question (6) collected data from the respondents who have training certificates from Project Management Institute Incorporated. Out of the total (43) respondents, the majority do not have a certification which got 83.72% frequency of responses over those respondents who got 16.28%. See the attached appendices for more relevant information.

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4.1.3 Findings for Independent Variables – Sources of Risks

Table 4.6 presents the findings for questionnaire page No. (2) from (43) respondents who completed the survey. A statistical method is used which measures the central tendency of the data such as the mean, median and mode (Saunders, Lewis, & Thornhill, 2009). They are calculated on a five (5) rating scale from questions (7) up to (18). The value of (5) denotes a strong disagreement, the value of (4) means disagreement, the value of (3) indicates undecided or neutral, the value of (2) signifies agreement on the statement, while the value of (1) indicates a strong agreement.

Table 4.6 Respondents' Perception of the Sources of Risks

	Q7	*Q8*	*Q9*	*Q10*	*Q11*	*Q12*	*Q13*	*Q14*	*Q15*	*Q16*	*Q17*	*Q18*
Mean	3.35	3.63	3.65	3.35	3.60	3.91	3.70	3.51	3.70	3.63	3.65	3.21
Standard Error	0.19	0.18	0.25	0.24	0.19	0.18	0.20	0.19	0.20	0.16	0.21	0.13
Median	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	3.00
Mode	4.00	4.00	5.00	5.00	4.00	5.00	5.00	5.00	4.00	4.00	4.00	3.00
Standard Deviation	1.23	1.16	1.63	1.59	1.22	1.19	1.32	1.26	1.32	1.02	1.36	0.86
Sample Variance	1.52	1.33	2.66	2.52	1.48	1.42	1.74	1.59	1.74	1.05	1.85	0.74
Kurtosis	(1.00)	(0.38)	(1.01)	(1.32)	(0.47)	(0.60)	(0.52)	(1.14)	(0.44)	(0.98)	(0.29)	(0.48)
Skewness	(0.31)	(0.76)	(0.85)	(0.53)	(0.67)	(0.79)	(0.78)	(0.33)	(0.91)	(0.29)	(0.99)	0.28
Range	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	3.00	4.00	3.00
Minimum	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	1.00	2.00
Maximum	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Sum	144.00	156.00	157.00	144.00	155.00	168.00	159.00	151.00	159.00	156.00	157.00	138.00
Count	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00
Confidence Level (95.0%)	0.38	0.36	0.50	0.49	0.37	0.37	0.41	0.39	0.41	0.32	0.42	0.26

The mean value, which is often called the average, consists of all data values in the calculation. The median is the middle value or mid-point after the data have been ranked. The mode is the value which occurs most often (Saunders, Lewis, & Thornhill, 2009). The standard error is an

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indicator that when the sampling error decreases, the sample size increases. Standard deviation and sample variance, which are also called measures of dispersion, describe if the scores are equally distributed within the mean or not.

Kurtosis is used to calculate the steepness and flatness of the frequency distribution or curve around the mean. If the distribution is more pointed than the normal, it is called leptokurtic which signifies that kurtosis is positive. If the distribution is flatter than normal, it is called platykurtic which indicates a negative kurtosis. However, if the distribution is moderate between extreme pointedness and flatness, it is called mesokurtic and the kurtosis implies zero value (Dancey & Reidy, 2008). Brown (2006) discovered that the appropriate kurtosis values should range between − 10 to + 10 when developing a standard error of the mean (SEM).

Table 4.6 shows that all values from Q7 to Q18 display a negative value of kurtosis which indicates a platykurtic distribution. Q17 has the highest negative value of -0.29 while Q10 has the lowest negative value which is -1.32. Q12, Q14, Q16, and Q17 of the questionnaire are concerned with Hypothesis 1 which will also be explained in the succeeding sections of inferential statistics for hypothesis testing.

The statement in Q10 says that “Risk such as unavailability of skilled workers cannot impact project success.” Kurtosis value gives -1.32. The mean value here has 3.35, its median has 4 and the mode has 5. Interestingly, 25.58% have a strong agreement with the statement while 4.65% of the respondents agree. The undecided got 9.30% responses. On the other hand, those who disagree and strongly disagree have the same frequency of responses which is 30.23% respectively.

Q14 statement says, “Risk such as the increase in materials' prices cannot impact project success.” The kurtosis value is -1.14. The mean value is 3.51, while its median and mode are 4 and 5 respectively. The findings show that those who strongly agree have 4.65%, those who agree have 23.26%, and neither agree nor disagree have 16.28%. However, there is an equal frequency of responses to those who disagree and strongly disagree with 27.91% respectively.

In the Q9 statement, it says, “Risk such as building that is structurally unsafe cannot impact project success.” The kurtosis value indicates -1.01. The mean value is 3.65, the median is 4 and the mode is 5. Strongly agree generates 23.26%, agree has 4.65%, and those disagree have 27.91%. Those who strongly disagree have the highest frequency which is 46.51%. Neither agree nor disagree got zero responses.

Q7 statement records “Risk such as the absence of Line of Sight (LOS) during site survey with the client cannot impact project success.” Kurtosis value gives -1.00. The mean value indicates 3.35, and the median and mode have 4 respectively. It shows that those who strongly agree got 9.30%, agree with 25.58%, undecided respondents got 16.28%, and those who disagree have 34.88% over those who strongly disagree with 20.93%.

Q12 statement tells, “Risk such as weak or substandard galvanization of poles cannot impact project success.” The kurtosis value here is -0.60. The mean has 3.91, the median has 4 and the mode got 5. Those who strongly agree had 2.33%, agree got 16.28%, neither agree nor disagree

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had 11.63%, and those who disagree have 27.91%. However, those who strongly disagree have got 41.86%.

The statement in Q13 shows, “Risk such as TRA (Telecom Regulatory Authority) certificate not issued due to protocol violations cannot impact project success.” Kurtosis indicates -0.52. The mean is 3.70, the median is 4 while the mode is 5. It explains that those who strongly agree had 9.30%, those who agree had 11.63%, undecided got 13.95%, disagree had 30.23%, while those strongly disagree got 34.88%.

Q11 statement asks, “Risk such as working order stoppage due to failure in submitting police records cannot impact project success.” The kurtosis value here is -0.47. The mean is 3.60, median and mode have 4 respectively. It describes that those who strongly agree had 6.98%, agree had 13.95%, undecided got 16.28%, disagree got 37.21% over those strongly disagree with 25.58% frequency of responses.

In Q15 statement says, “Risk such as shortages in materials supply cannot impact project success.” Kurtosis value gives -0.44. The mean is 3.70, median and mode got the values of 4, respectively. It shows that those who strongly agree had 9.30%, agree with 16.28%, those who disagree with 44.19%, and those who strongly disagree with 30.23%. In this statement, no respondents have feedback on being undecided.

Skewness determines the distribution of data and evaluates whether they are symmetrical about the mean or not. When the distribution projects to the left of the mean, the data is negatively skewed. When the distribution projects to the right of the mean, the data is positively skewed. But if the data are equally distributed on either side of the mean, it indicates that the data are symmetrically or normally distributed (Saunders, Lewis, & Thornhill, 2009). According to Brown (2006), the acceptable value of skewness falls between -3 and +3.

Table 4.6 findings are evident that all values from Q7 to Q17 show a negative skewness value which implies distribution to the left side of the mean. Q16 has -0.29 being the highest value while Q17 has -0.99 being the lowest. On the contrary, Q18 has the only positive value, which is 0.28, which indicates skewness to the right side of the mean.

The statement in Q18 says that “Risk such as the need for special camouflage cannot impact project success.” The skewness value is +0.28. The mean value is 3.21 while the median and mode have the same value of 3. Remarkably, 20.93% of the respondents agree, while those who neither agree nor disagree got 44.19% responses. Those who disagree have 27.91% while those who strongly disagree got 6.98% responses. Surprisingly, no respondent had a strong agreement with the given statement.

Q16 statement says, “Risk such as the unavailability of a telescopic boom crane for lifting the pole structure cannot impact project success.” The skewness value gives -0.29. The mean is 3.63, median and mode are 4, respectively. According to the findings, no respondents have had a strong agreement with the statement. But some respondents agree with 18.60%, while those neither agree nor disagree and those strongly disagree have gotten 20.93% respectively. The majority who disagree with the statement have 39.53%.

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Q17 statement asks, "Risk such as the insufficient experience of contractors cannot impact project success." It is noticeable that the skewness value here indicates -0.99 while the kurtosis is -0.29. The mean is 3.65, with the median and mode values of 4, respectively. It explains that those who strongly agree got 13.95%, those who agree got 9.30%, undecided respondents had only 2.33%, while respondents who disagree had 46.51% over those strongly disagree with 27.91%.

In general, comparing all the mean values from Q7 to Q17 except Q18 gives an average value of 3.81, a median give 4 and a mode value of 4.54. Hence, it implies a solid disagreement with the given statements from all the respondents of the survey.

4.1.4 Findings for Independent Variables – Risk Management Tools and Techniques

The succeeding table presents the findings for data collected for Questions 19, page No. (3) concerning which risk identification tools and techniques are the most effective among the choices such as interviewing, root cause analysis, Delphi technique and brainstorming.

Table 4.7 Respondents' Perception of Risk Identification Tools and Techniques

Risk Identification Tools and Techniques	Frequency	Percentage
Interviewing	5	11.63%
Root Cause Analysis	22	51.16%
Brainstorming	3	6.98%
Delphi Technique	3	6.98%
Interviewing and Root Cause Analysis	1	2.33%
Brainstorming	6	13.95%
All of the above	1	2.33%
Experienced Team	1	2.33%
Root Cause Analysis, Interviewing, MSRA	1	2.33%
	43	100.00%

Table 4.7 confirms that Root Cause Analysis has the highest number of responses about 51.16%, followed by Brainstorming which got a frequency of responses of about 20.93%, that is the sum of 13.95% plus 6.98%. Interviewing places on the third which got 11.63% frequency while Delphi technique has 6.98% responses.

The rest of the responses such as all the above, experienced team, and the combined responses for interviewing and root cause analysis including MSRA contribute a minimal value of 2.33% respectively.

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4.1.5 Findings for Independent Variables – Risk Management Tools and Techniques

In the succeeding table presents the findings for Questions 22, page No. (3) collected data concerning which risk identification tools and techniques are the most effective among the choices such as cause-and-effect diagrams, process flow charts and influence diagrams.

Table 4.8 Respondents' Perception on Risk Identification Tools and Techniques

Risk Identification Tools and Techniques	Frequency	Percentage
Cause and effect diagrams	17	41.46%
Process flow charts	21	51.22%
No answer	0	0.00%
Working without PPE, working at height, working without proper tools	1	2.44%
Cause and effect diagrams, Process flow charts, and influence diagrams	2	4.88%

Referring to Table 4.8, the highest frequency of responses goes to the Process flow charts which got 51.22%, succeeded by Cause-and-effect diagrams which have 41.46%.

The rest of the data such as the combined answer for the Cause-and-effect diagrams, Process flow charts and influence diagrams got 4.88%. There is 2.44% answered with working without PPE, working at height, and working without proper tools which are irrelevant to the question.

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4.1.6 Findings for Independent Variables – Risk Management Tools and Techniques

Table 4.9 presents the findings of the data collected for questionnaire page No. (3) of the survey.

Table 4.9 Respondents' Perception on the Risk Management Tools and Techniques

	Q20	*Q21*	*Q23*	*Q24*	*Q25*	*Q26*	*Q27*	*Q28*	*Q29*	*Q30*	*Q31*	*Q32*	*Q33*	*Q34*
Mean	2.26	2.53	2.14	2.19	1.93	2.16	2.14	2.12	2.26	2.05	2.28	2.33	2.09	2.12
Standard Error	0.14	0.16	0.13	0.15	0.11	0.12	0.12	0.12	0.15	0.10	0.14	0.13	0.10	0.12
Median	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Mode	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Standard Deviation	0.90	1.05	0.83	0.96	0.70	0.81	0.80	0.79	1.00	0.69	0.91	0.84	0.68	0.79
Sample Variance	0.81	1.11	0.69	0.92	0.50	0.66	0.65	0.63	1.00	0.47	0.83	0.70	0.47	0.63
Kurtosis	1.60	0.29	0.46	0.91	2.17	0.60	0.31	0.55	1.22	1.87	0.92	(0.05)	2.92	0.55
Skewness	1.29	0.93	0.76	0.97	0.96	0.80	0.60	0.69	1.09	0.86	0.80	0.59	1.29	0.69
Range	4.00	4.00	3.00	4.00	3.00	3.00	3.00	3.00	4.00	3.00	4.00	3.00	3.00	3.00
Minimum	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Maximum	5.00	5.00	4.00	5.00	4.00	4.00	4.00	4.00	5.00	4.00	5.00	4.00	4.00	4.00
Sum	97.00	109.00	92.00	94.00	83.00	93.00	92.00	91.00	97.00	88.00	98.00	100.00	90.00	91.00
Count	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00
Confidence Level (95.0%)	0.28	0.32	0.26	0.29	0.22	0.25	0.25	0.24	0.31	0.21	0.28	0.26	0.21	0.24

Noticeably, most responses from Q20 to Q34 except Q32 have positive kurtosis values which means a leptokurtic distribution. In other words, the distribution around the mean is more pointed than the normal distribution. Q21 has 0.29 being the lowest positive value followed by Q27 which got 0.31%, while Q33 has 2.92 being the highest leptokurtic value followed by Q25 which has 2.17%. Q28 and Q34 have the same leptokurtic values of 0.55% respectively.

Conversely, Q32 has the platykurtic value of -0.05 which is closest to the zero value which means the data is almost symmetrically distributed around the mean or denotes a mesokurtic distribution. To present the feedback from respondents, those who agree and disagree have both 11.63% frequency of responses, neither agree nor disagree have gotten 20.93%, while those who agree have had 55.81%.

Statement Q21 says, "Risk identification by the project team utilizes Assumption Analysis to explore the validity of assumptions, hypotheses, or scenarios to identify risk from

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inconsistencies, inaccuracies, or incompleteness of assumptions." The kurtosis value denotes +0.29. The mean value is 2.53 while the median and mode have the same value of 2 which represents an agreement with the statement. While some strongly agree which got 8.89%, the majority who agree with the statement have 55.56% frequency of responses. Undecided respondents have gotten 20.93% while those who disagree had 11.11% and strongly disagree 6.67% respectively.

Q33 statement reads, "Quantitative risk analysis by the project team depends on expert judgment to identify potential cost and schedule impacts and to evaluate their probability." The kurtosis value gives +2.92. The mean value in Q33 gives 2.09 with the median and mode values of 2 indicating a positive agreement on the statement. Considerably, respondents who agree with the statement have had a 74.42% frequency of responses over those who strongly agree got 11.63%. While those who neither agree nor disagree and those who disagree have the same value of 6.98%. Those who strongly disagree have zero responses.

Q27 statements say, "Qualitative risk analysis by the project team creates Risk categorization to categorize the sources of risks taken from the Risk Breakdown Structure (RBS), Work Breakdown Structure (WBS) or project phase to determine the most affected areas from uncertainties." The kurtosis value here is +0.31. The mean value is 2.14, with the median and mode value of 2 respectively, which indicates a positive agreement with the statement. Those strongly agree and undecided got 18.60% respectively, and those who agree had 55.81% over those who disagree that have 6.98% responses. However, no one had given feedback who strongly disagree with the statement.

Q23 statement asks, "Risk identification by the project team presents a SWOT analysis to identify the Strengths, Weaknesses, Opportunities, and Threats of the organization or project to increase the extent of identified risks." Kurtosis indicates a value of +0.46, the mean value is 2.14, and the median and mode values are 2 which implies a positive agreement on the statement. Strongly agree had 18.60%, but those who agree have had 58.14%, neither agree nor disagree got 13.95%, while those disagree has 9.30% responses. No respondents have feedback on strongly disagree selection.

Q28 statement says, "Qualitative risk analysis by the project team relies on expert judgment to assess the probability and impact of risk to determine the location in the matrix." The kurtosis value here indicates +0.55. The mean value is 2.12 while the median and mode have gotten 2, which signifies an agreement to the given statement. To justify, those who strongly agree have an 18.60% frequency of responses. However, those who agree with the statement got 58.14%, while respondents who neither agree nor disagree have 16.28%, and those who disagree have 6.98%. There was zero response on the strongly disagree scale.

Q32 statement reads "Quantitative risk analysis by the project team uses Modeling and Simulation which translates the specified detailed uncertainties of the project into potential impact to project objectives. For example, the Monte Carlo technique." Kurtosis gives -0.32. The mean value here is 2.33 whereas its median and mode give 2. Those who strongly agree got 11.63% while those who agree got a significant response of 55.81%. Those neutral to the statement have 20.93% while 11.63% for those who disagree. Strongly disagree got zero responses.

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Skewness from Q20 to Q34 indicates a positive value which denotes a projection to the right side of the mean. Q32 has gotten 0.59 being the lowest positive value followed by Q27 which got 0.60. Whereas Q20 and Q33 have the same skewness value of 1.29 the highest positive skewness succeeded by Q29 which got 1.09. Q26 and Q31 have the same skewness value of 0.80 while Q28 and Q34 have got the same value of 0.69.

Q34 is concerned with Hypothesis 2 which will also be validated using inferential analysis for hypothesis testing. This statement records, “The risk response plan by the project team uses a Risk Register to avoid, transfer, mitigate and accept negative risks. While for positive risks, exploit, enhance, share, and accept.” The mean value is 2.12, and the median and modes give 2, signifies an agreement to the statement. Strongly agree had 18.60%, with those who agree gives 58.14%, neither agree nor disagree generates 16.28%, while disagree has 6.98%. The strongly disagree scale has not been decided by respondents.

Q25 statement reads “Qualitative risk analysis by the project team uses Risk probability and Impact assessment generated to investigate the likelihood of occurrences of specific risks and their potential impact to project objectives such as schedule, cost, quality, or performance.” The skewness value here is +0.96 while the kurtosis is +2.17. The mean is 1.93, and the median and mode values are 2 which indicates an agreement with the statement. To describe the frequency of responses, strongly disagree got 23.26%, while those who agree have a considerable response of 65.12%. Those undecided respondents have gotten 6.98% while only 4.65% response from those who disagree. Strongly disagree scale has not been given feedback by the respondents.

In the statement of Q20, it says “Risk identification by the project team uses a Checklist from the lowest level of risk breakdown structure (RBS) that is developed based on historical data and knowledge from previous similar projects.” Based on the findings, the mean value is 2.26 while the median and mode give the value of 2. It is interesting to know that the frequency of responses from those who strongly agree and disagree have 11.63% respectively. However, most respondents have gotten 67.44%. While only 2.33% feedback those who strongly disagree with the given statement.

Statement Q31 tells “Quantitative risk analysis by the project team utilizes Expected monetary value (EMV) analysis is used as a statistical concept that calculates the average outcome when the future includes scenarios that may not happen. For example, Decision Tree Diagram.” The skewness value here is +0.80. The findings of the mean are 2.28 with a median and mode values of 2. Those who agree with the statement got 53.49% followed by those who neither agree nor disagree who got 23.26%. Those who strongly agree to have 16.28%, while 6.98% to those who disagree and 2.33 strongly disagree with the statement.

Comparably, in the Q26 statement, it says, “Qualitative risk analysis by the project team uses the Probability and Impact matrix to prioritize and plan risks responses based on their rating.” The skewness value is +0.80. The mean gives 2.16, median and mode give 2 which denotes agreement with the statement. Strongly agree have gotten 16.28%, but those who agree have had 60.47%, undecided respondents give 13.95%, disagree got 9.30%, while those strongly disagree had only 2.33%.

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Meanwhile, the Q29 statement says, “Quantitative risk analysis by the project team uses Interviewing techniques drawn on the experience and historical data to quantify the probability and impact of risk on project objectives. For example, the use of a three-point estimate for the cost.” The skewness distribution value indicates +1.29. The mean value is 2.26, median and mode values are 2. Strongly agree got 18.60%, yet those who agree have 53.49%, undecided gives 16.28%, those disagree had 6.98%, while those strongly disagree got 4.65%.

Likewise, in Q30 statement tells, “Quantitative risk analysis by the project team uses Probability distribution is used for modeling and simulation to determine the uncertainty expressed in values such as duration of schedule and cost of the project. For example, the use of Beta and Triangular distribution.” Here, the skewness distribution gives +0.86 while the kurtosis is +1.87%. The mean value is 2.05, while the median and mode are 2 respectively, which means an agreement with the given question.

Overall, the entire values of the mean for Q20 to Q34 give an average indicator of 2.18 while the median and mode give an indicator of 2. Therefore, it signifies a general agreement with the given statements on page (3) of the questionnaire.

4.1.7 Findings for Independent Variables – Sources of Risks

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Table 4.10 presents the findings for the data collected for questionnaire page No. (4) of the survey.

Table 4.10 Respondents' Perception of the Sources of Risks

	Q35	***Q36***	***Q37***	***Q38***	***Q39***	***Q40***	***Q41***	***Q42***	***Q43***	***Q44***
Mean	1.70	1.70	2.30	1.58	1.84	2.12	2.05	2.14	2.09	2.09
Standard Error	0.14	0.13	0.20	0.13	0.13	0.16	0.12	0.15	0.15	0.14
Median	1.00	2.00	2.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00
Mode	1.00	2.00	2.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00
Standard Deviation	0.94	0.83	1.30	0.82	0.84	1.07	0.82	1.01	1.00	0.89
Sample Variance	0.88	0.69	1.69	0.68	0.71	1.15	0.66	1.03	0.99	0.80
Kurtosis	3.34	5.64	(0.03)	7.18	4.10	1.10	3.39	1.69	2.31	2.20
Skewness	1.74	1.93	1.04	2.28	1.57	1.21	1.30	1.29	1.48	1.28
Range	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Minimum	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Maximum	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Sum	73.00	73.00	99.00	68.00	79.00	91.00	88.00	92.00	90.00	90.00
Count	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00
Confidence Level (95.0%)	0.29	0.26	0.40	0.25	0.26	0.33	0.25	0.31	0.31	0.28

Given the above data, kurtosis values for Q35 to Q44 indicate a leptokurtic or positive distribution that is more pointed than the normal, except for Q37 which indicates -0.03 which is almost a mesokurtic distribution.

Q38 has the highest positive value, which is 7.18, succeeded by Q36 with 5.64. Whereas, Q40 has the lowest leptokurtic value of 1.10, followed by Q42 with 1.69. All other leptokurtic values are Q39 with 4.10, Q41 with 3.39, Q35 with 3.35, Q43 with 2.31, and Q44 with 2.20.

Similarly, Q35, Q37 and Q41 will also be validated for Hypothesis 3 testing using inferential analysis.

In the Q38 statement, it says, "Failure to observe proper safety protocols by contractors during site work could lead to an accident that will impact cost, time, and quality." It is recorded that Q38 gives a kurtosis value of +7.18 as well as the skewness value of +2.18. The mean value is

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1.53, while the median and mode have 1.0 values, which indicates that there is a strong disagreement with the given statement. To substantiate, those who strongly agree have gotten 53.49% compared to those who agree with 41.86%. Respondents who disagree and strongly agree have 2.33% respectively. Neither agree nor disagree were not given feedback by the respondents.

Likewise, the Q35 statement says, “Risk by sub-contractors who are not aware of the specifications of the project could lead to installation errors, cost increase, and project delay.” The kurtosis indicates +3.34. The mean is 1.7, but the median and mode have values of 1, which denotes a strong agreement with the statement. To justify this, those who strongly agree got 51.16% responses, followed by those who agree with 39.53%, undecided and those who disagree have the same frequency of 4.65%, over those who strongly disagree with only 2.33%.

In Q36 assertion it reads, “Risk such as Galvanization quality of pole materials that are not checked properly from the source will result in materials' poor quality and defects.”. The kurtosis value gives +5.64. The mean value is 1.7 while median and mode gives an indicator of 2, which means an agreement with the given statement. Respondents who strongly agree have 44.19% but those who agree have a higher number of responses which is 48.84%. Undecided respondents including those disagree and strongly disagree have the same frequency of 2.33%.

Q40 statement says, “The risk from incomplete fixtures for grounding and earth installation could lead to the compromise of buying low-quality items from other suppliers.” The leptokurtic value here is 1.10. The mean value is 2.12, while the median and mode indicate a value of 2 which denotes an agreement with the given question. Strongly agree got 27.91%. Those who agree have a considerable response of 51.16%. Both undecided and those who disagree have 9.30% while those who strongly disagree have 4.65%.

Q44 assertion reads, “Risk due to the postponement of site acceptance for another week could trigger additional costs on the part of the contractor due to delays in the issuance of the completion certificate.” The kurtosis value here is +2.20. The mean is 2.09, and the median and mode have values of 2 which means an agreement to the given question. Findings say that those who agree had 20.93%, those who agree however got 60.47%, while undecided respondents had 9.30%, disagree with 6.98%, and those who strongly disagree had 2.33%.

To highlight the skewness value in the given data, Q35 to Q44 give all positive skewness which indicates a projection distribution which goes to the right side of the mean. The highest positive skewness can be observed in Q38 with a 2.28 value. While the lowest positive value is 1.04 from Q37.

Q37 statement reads, “Potential errors/defects on poles fabrication are imminent should there be no reference drawings and designs to be followed by the supplier.” The kurtosis value is -0.03. The mean value here is 2.30, and median and mode values are 2 respectively, which indicates an agreement with the statement. To back this claim, those who strongly agree had 27.91%, those who agree got 46.51%, and undecided respondents had only 4.65%, compared to those who disagree with 9.30% and strongly disagree with 13.95%.

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Q39 statement says, “Risk caused by the delayed delivery of pole items will result to project delay and penalty from the customer against the contractor.” The skewness value here gives 1.57. The mean value is 1.84, with the median and mode indicator of 2 which means most of the respondents do agree with the statement. Based on the findings, strongly agree have 34.88% responses, but those who agree with the statement give 53.49%, neither agree nor disagree with 6.98%, over those who disagree and strongly disagree with the same frequency of responses of 2.33%.

Q42 assertion records, “The delivery of owner-supplied BTS equipment will be delayed for 15 days, which means another crane will be used, resulting to project delay and extra cost to be borne by the in-house and sub-contractors.” The kurtosis indicates +1.69 while the skewness distribution gives +1.29. The mean value however is 2.14, while the median and mode values are 2, respectively. It means that most respondents agree with the given statement. To explain, strongly agree got 25.58%, those who agree got the highest feedback of 55.81%, over those undecided and disagree with 9.30%, along with those who disagree with only 4.65%.

In Q41 claim states, “Risk caused by various inspectors from the client with different interpretations on materials quality would lead to a potential major punch list during the site inspection.” The skewness distribution indicates a value of 1.30, the mean is 2.05, while median and mode have values of 2, which signifies an agreement with the given statement. To back this declaration, agree got 20.93%, those agree had 60.47%, neither agree nor disagree got 13.95%, but those disagree and strongly disagree both generate 2.33%.

Also, in the Q43 statement, it says, “Risk such as additional work by the customer could lead to project delay and cost overrun for contractors when variation orders are not stated or part of the contract clause.” This statement gives the skewness of 1.48. The mean value has 2.09 with the median and mode of 2 which signifies an agreement with the given question. Those who strongly agree got 23.26%, while those who agree have a 60.47% remarkable response. Intriguingly, those who neither agree nor disagree and those who strongly disagree have the same frequency of 4.65% compared to those who disagree with 6.98%.

Overall, the mean average value for all the questions from Q35 to Q44 is 1.96, while the median and mode has an indicator of 2 except for Q35 and Q38. It means that most of the respondents have a positive agreement with the given statements on page (4) of the questionnaire.

4.1.8 Findings for Dependent Variables – Project Success and Project Objectives

Table 4.10 presents the findings for the data collected for questionnaire page No. (5) of the survey.

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Table 4.11 Respondents' Perception of Project Success and Project Objectives

	Q45	*Q46*	*Q47*	*Q48*
Mean	2.28	3.37	3.28	3.23
Standard Error	0.19	0.19	0.19	0.19
Median	2.00	4.00	4.00	3.00
Mode	1.00	4.00	4.00	2.00
Standard Deviation	1.28	1.27	1.24	1.27
Sample Variance	1.63	1.62	1.54	1.61
Kurtosis	(0.57)	(0.95)	(1.00)	(1.25)
Skewness	0.74	(0.46)	(0.41)	(0.09)
Range	4.00	4.00	4.00	4.00
Minimum	1.00	1.00	1.00	1.00
Maximum	5.00	5.00	5.00	5.00
Sum	98.00	145.00	141.00	139.00
Count	43.00	43.00	43.00	43.00
Confidence Level (95.0%)	0.39	0.39	0.38	0.39

Based on the given data, it is evident that the Q45 responses seem to have opposite perceptions over other questions such as Q46, Q47 and Q48.

Kurtosis values for all questions have a leptokurtic distribution which means the curve is flatter than normal. Q48 got -1.25 being the lowest negative value, followed by Q47 with a -1.00 value, then Q46 with -0.95, while Q45 have -0.57 being the highest negative value.

Skewness distribution is also observed on Q46, Q47 & Q48 having negative skewness values of -0.46, -0.41 and -0.09 respectively, which indicates a projection distribution which goes to the left side of the mean. Although, Q48 indicates an almost a mesokurtic distribution with respect to the mean because it is close to zero value. On the contrary, Q45 got a positive skewness which denotes a projection distribution to the right side of the mean.

To classify the findings, the Q45 statement says, Project success is achievable without any deviation from the project objectives such as scope, cost, time, and quality." It is interesting to discover that the mean value here is 2.28, with a median of 2 and a mode of 1. It indicates strong agreement on the given statement. Those who strongly agree generated a 34.88%, agree got 30.23%, undecided got 13.95%, respondents who disagree had 13.95%, while those who strongly disagree have 6.98% responses.

Q46 statement records, "Project success is attainable without a risk management plan by the project team." The mean value has an indicator of 3.28, while the median and mode have values of 4. Hence, it indicates a positive disagreement with the statement. According to the findings, strongly agree got 9.30%, agree got 20.93% frequency of responses, neither agree nor disagree

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got 11.63%, those disagree got a considerable 39.53%, while those strongly disagree with 18.68%.

In the Q47 statement, it says, “Project success is obtainable without any type of risk involved.”. The mean is 3.28 with the median and mode values of 4 which signifies a disagreement on the question. Those who strongly agree, and undecided have the same scores of 11.63%, succeeded by strongly disagree which is 13.95%. Whereas those who agree have 23.26%, those who disagree have gotten 41.86%.

Q48 statement asks, “Project objectives such as scope, cost, time, and quality are quantifiable without any risks involved.” The value of the mean here is 3.28, while the median has an indicator of 3, and the mode is 2. Thus, it denotes a divided opinion concerning the statement. Referring to the findings, strongly agree got 6.98%, neither agree nor disagree had 13.95%, strongly disagree got 18.60%, while those agree and disagree have the same feedback which is 30.23% respectively.

Finally, the perception in Q45 has a positive agreement with the statement. However, Q46 & Q47 share the same frequency of disagreement. While Q48 have got divided perception of the given statement on questionnaire page No. (5).

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4.2 Inferential Statistics

4.2.1 Correlation Analysis

The correlation coefficient test is used to assess the strength of association between the dependent and independent variables which are in ranked order or numerical value. According to Saunders (2009), the coefficient that is denoted by the letter (r) can result in any value ranging from (-1) to (+1). When the value is (+1), it indicates a perfect positive correlation. In other words, the dependent and independent variables are strongly correlated. It can also be expressed that when one variable increases, the other variable also increases (Saunders, Lewis, & Thornhill, 2009).

On the other hand, when the value is -1, it denotes a perfect negative correlation. It also means that the dependent and independent variable are perfectly correlated but when one variable increases the other decreases. Between the range of (-1) and (+1) are values which represent weaker negative and positive correlations correspondingly. When the value is equal to (0), the variables are perfectly independent. It is further explained that when the probability is greater than (5%) or (0.05), then the relationship between variables is not statistically significant.

4.2.2 Regression Analysis

Saunders (2009) defined regression coefficient as a method of assessing the strength of association or relationship between the dependent variable and multiple independent variables in numeric value. It is also called the coefficient of determination that is denoted by (r2) which can give any value ranging from (0) to (+1). In this way, it measures the proportion of the variation in a dependent variable that can be explained through statistics by the independent variables. It means that when (r2) is equal to (+1), the regression prediction perfectly fits the data. Meaning, this process of measuring the coefficient of determination and regression equation using one independent variable is called regression analysis.

However, when there are two or more independent variables that are linked to a dependent variable, the process of measuring the coefficient of multiple determination is called multiple regression analysis (Saunders, Lewis, & Thornhill, 2009).

4.2.3 Hypothesis 1

H_o: Commercial risk does not have an effect to project success on the telecom poles construction in the UAE.

H_a: Commercial risk does have an effect to project success on the telecom poles construction in the UAE.

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Hypothesis 1 refers to independent variables such as Q12, Q14, 16 & 17 and dependent variable Q47 which is project success in the questionnaire. Although there are four (4) independent variables that are being linked to a dependent variable, regression analysis is utilized individually in this process using the Microsoft Excel software.

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Table 4.12 Regression Analysis for Hypothesis 1 – Q12 and Project Success

Using the regression analysis presented below in the table, the value of r^2 or R Square is equal to 0.1636 which means that 16.36% of the dependent variable that is project success, can be predicted by the independent variable Commercial Risks as elaborated in Q12 of the questionnaire.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.404522188
R Square	**0.1636382**
Adjusted R Square	0.143239132
Standard Error	1.148400403
Observations	**43**

As presented below using ANOVA, the Significance F is equal to 0.0071 which means that the null hypothesis or H_o in the regression model can be rejected since the Significance F is not equal to zero or the value is rather greater than zero. Thus, the alternative hypothesis or H_a can be accepted.

ANOVA

	df	*SS*	*MS*	*F*	***Significance F***
Regression	1	10.57939992	10.57939992	8.021846777	**0.007133721**
Residual	41	54.07176287	1.318823485		
Total	42	64.65116279			

In this setting, the Significance F is also the P-value for Q12, which is equal to 0.0071. According to science, when a low P-value is (< 0.05), the researcher can reject the null hypothesis or H_o and therefore accept the alternative hypothesis or H_a (Saunders, Lewis, & Thornhill, 2009).

	Coefficients	***Standard Error***	***t Stat***	***P-value***
Intercept	1.633385335	0.606863248	2.691521265	0.010248576
Q12	0.421216849	0.148719718	2.832286493	**0.007133721**

Lower 95%	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
0.407800144	2.858970527	0.407800144	2.858970527
0.120871285	0.721562412	0.120871285	0.721562412

While the alternative hypothesis or H_a can be accepted, the following P-value justifies the claim that "Commercial risk such as Q12 does have an effect to project success on the telecom poles construction in the UAE".

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Table 4.13 Regression Analysis for Hypothesis 1 – Q14 and Project Success

In the summary output table, the value of r^2 or R Square is equal to 0.1319 which means that 13.19% of the dependent variable is project success, can be predicted by the independent variable Commercial Risks as mentioned in Q14 of the questionnaire.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.363231927
R Square	**0.131937433**
Adjusted R Square	0.110765175
Standard Error	1.169962
Observations	**43**

As presented below using ANOVA, the Significance F is equal to 0.0166 which means that the null hypothesis or H_o in the regression model can be rejected since the Significance F is not equal to zero or the value is rather greater than zero. Thus, the alternative hypothesis or H_a can be accepted.

ANOVA

	df	*SS*	*MS*	*F*	***Significance F***
Regression	1	8.529908435	8.529908435	6.231618482	**0.01666158**
Residual	41	56.12125436	1.368811082		
Total	42	64.65116279			

The Significance F is also the P-value for Q14, which is equal to 0.0166. Since the low P-value is (< 0.05), the null hypothesis or H_o can be rejected and therefore accept the alternative hypothesis or H_a (Saunders, Lewis, & Thornhill, 2009)..

	Coefficients	***Standard Error***	***t Stat***	***P-value***
Intercept	2.02369338	0.533602645	3.792510025	0.000482228
Q14	0.357491289	0.14320726	2.496320989	**0.01666158**

Lower 95%	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
0.946060977	3.101325783	0.946060977	3.101325783
0.06827836	0.646704218	0.06827836	0.646704218

Since the alternative hypothesis or H_a can be accepted, the following P-value substantiates the claim that “Commercial risk such as Q14 does have an effect to project success on the telecom poles construction in the UAE”.

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Table 4.14 Regression Analysis for Hypothesis 1 – Q16 and Project Success

In the below table, the value of r^2 or R Square is equals to 0.2459 which means that 24.59% of the dependent variable that is project success, can be predicted by the independent variable Commercial Risks as elaborated in Q16 of the questionnaire.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.495940844
R Square	**0.245957321**
Adjusted R Square	0.227566036
Standard Error	1.090420997
Observations	**43**

As presented below using ANOVA, the Significance F is equal to 0.0007 which means that the null hypothesis or H_o in the regression model can be rejected since the Significance F is not equal to zero or the value is rather greater than zero. Thus, the alternative hypothesis or H_a can be accepted.

ANOVA

	df	*SS*	*MS*	*F*	***Significance F***
Regression	1	15.90142678	15.90142678	13.37358007	**0.00071973**
Residual	41	48.74973601	1.189017951		
Total	42	64.65116279			

The Significance F is also the P-value for Q16, which is equal to 0.0007. Since the low P-value is (< 0.05), the null hypothesis or H_o can be rejected and therefore accept the alternative hypothesis or H_a (Saunders, Lewis, & Thornhill, 2009).

	Coefficients	***Standard Error***	***t Stat***	***P-value***
Intercept	1.099260824	0.618826832	1.776362574	**0.083094359**
Q16	0.600844773	0.164300334	3.656990576	**0.00071973**

Lower 95%	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
-0.150485316	2.349006964	-0.150485316	2.349006964
0.269033517	0.932656029	0.269033517	0.932656029

Given that the alternative hypothesis or H_a can be accepted, the following P-value rationalizes the claim that "Commercial risk such as Q16 does have an effect to project success on the telecom poles construction in the UAE".

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Table 4.15 Regression Analysis for Hypothesis 1 – Q17 and Project Success

In the summary output, the value of r^2 or R Square is equals to 0.1069 which means that 10.69% of the dependent variable that is project success, can be predicted by the independent variable Commercial Risks as elaborated in Q17 of the questionnaire.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.326993881
R Square	**0.106924998**
Adjusted R Square	0.085142681
Standard Error	1.186697994
Observations	**43**

As presented below using ANOVA, the Significance F is equal to 0.0323 which means that the null hypothesis or H_o in the regression model can be rejected since the Significance F is not equal to zero or the value is rather greater than zero. As a result, the alternative hypothesis or H_a can be accepted.

ANOVA

	df	*SS*	*MS*	*F*	***Significance F***
Regression	1	6.91282547	6.91282547	4.908798165	**0.032331884**
Residual	41	57.73833732	1.40825213		
Total	42	64.65116279			

The Significance F is also the P-value for Q17, which is equal to 0.0323. Since the low P-value is (< 0.05), the null hypothesis or H_o can be rejected and therefore accept the alternative hypothesis or H_a (Saunders, Lewis, & Thornhill, 2009).

	Coefficients	***Standard Error***	***t Stat***	***P-value***
Intercept	2.190490431	0.523597505	4.183538712	0.000147516
Q17	0.298145933	0.134567846	2.215580774	**0.032331884**

Lower 95%	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
1.133063818	3.247917044	1.133063818	3.247917044
0.026380654	0.569911212	0.026380654	0.569911212

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Since the alternative hypothesis or H_a can be accepted, the following P-value validates the claim that "Commercial risk such as Q17 does have an effect to project success on the telecom poles construction in the UAE".

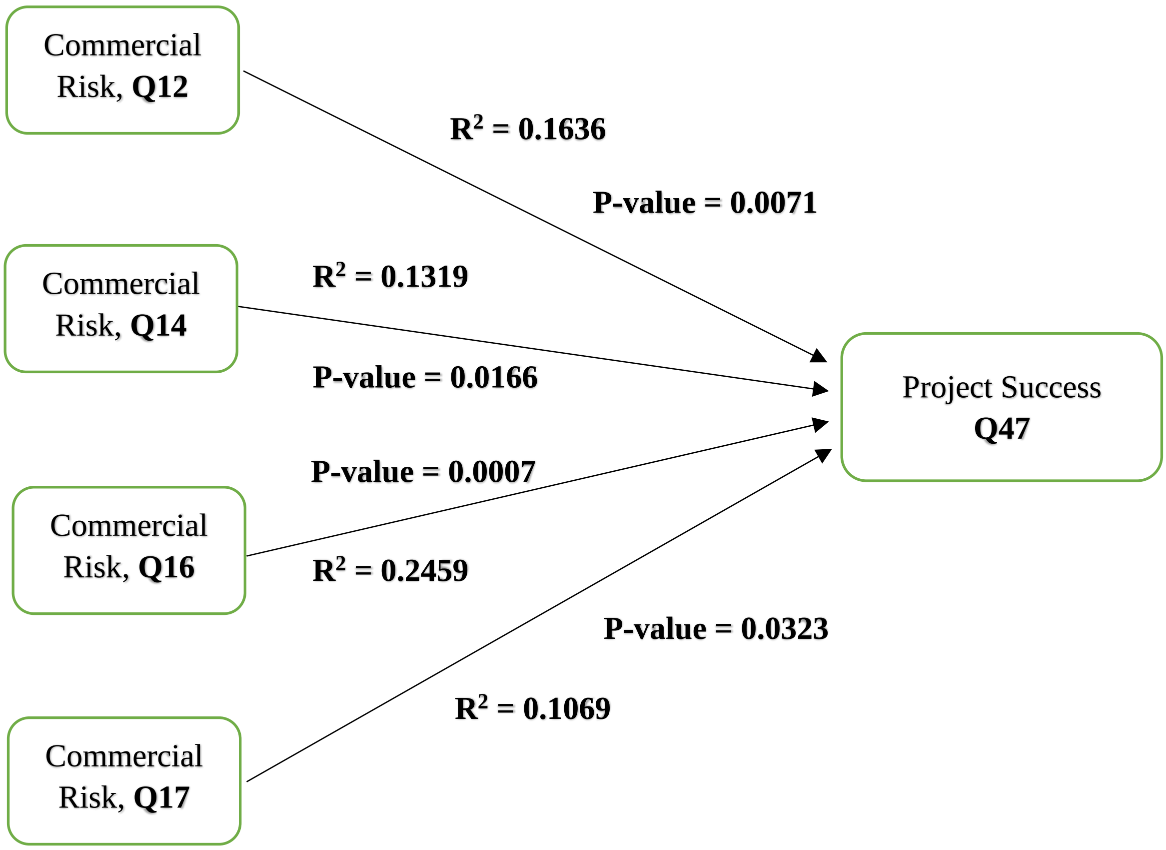

Diagram 4.1 Empirical Model for Hypothesis 1

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4.2.4 Hypothesis 2

H_o: The use of a risk register in risk response plan does not have correlation to project success on the telecom poles construction in the UAE.

H_a: The use of a risk register in risk response plan does have correlation to project success of telecom poles construction in the UAE.

Hypothesis 2 concerns Q34 of the questionnaire. Correlation and regression are used to compare both methods that will validate hypothesis 2.

Table 4.17 Correlation Analysis for Hypothesis 2 – Q34 and Project Success

Using the Microsoft Excel software, correlation analysis is utilized. The value of (r) is equal to -0.0202 which indicates a negative correlation.

	Q34	*Q46*
Q34	1	
Q46	-0.020294362	1

Based on the above findings, although the value of (r) denotes a negative correlation, it shows that there is a very weak correlation between Q34 and project success. According to the principle, when the value is equal to (0), the variables are perfectly independent or there is no correlation between the two variables such as Q34 and project success.

Table 4.18 Regression Analysis for Hypothesis 2 – Q34 and Project Success

In the summary output, the value of r^2 or R Square is equal to 0.0004 which means that 0.04% of the dependent variable is project success, which can be predicted by the independent variable Risk Response Plan tools and techniques as elaborated in Q34 of the survey.

SUMMARY OUTPUT

	Regression Statistics
Multiple R	0.020294362
R Square	0.000411861
Adjusted R Square	-0.023968337
Standard Error	1.288016872
Observations	43

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As presented below using ANOVA, the Significance F is equal to 0.8972 which means that the null hypothesis or H_o in the regression model cannot be rejected.

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.028025712	0.028025712	0.016893264	0.89722252
Residual	41	68.01848592	1.658987461		
Total	42	68.04651163			

Furthermore, the Significance F is also the P-value for Q34 which is equal to 0.8972. It explains that the relationship between Q34 and project success is not statistically significant because the P-value is (>5) or higher than (5). Thus, the null hypothesis or H_o is accepted. (Saunders, Lewis, & Thornhill, 2009).

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	3.441021127	0.565528431	6.084612083	3.28E-07
Q34	-0.032570423	0.250591661	-0.129974088	0.89722252

Lower 95%	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
2.29891329	4.583128964	2.29891329	4.583128964
-0.538650548	0.473509703	-0.538650548	0.473509703

As the null hypothesis or H_o is accepted, the following P-value supports the claim that Q34 or The use of a risk register in risk response plan does not have correlation to project success on the telecom poles construction in the UAE.

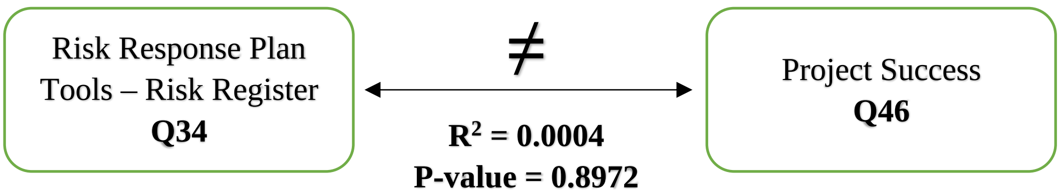

Diagram 4.2 Empirical Model for Hypothesis 2

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4.2.5 Hypothesis 3

H_o: Technical Risk does not have an impact to project objectives such as scope, cost, time, and quality.

H_a: Technical Risk does have an impact to project objectives such as scope, cost, time, and quality.

Hypothesis 3 concerns independent variables such as Q35, Q37, and Q41 and a dependent variable which is project objectives. To test the hypothesis, regression analysis is applied to this process using Microsoft Excel software.

Table 4.19 Regression Analysis for Hypothesis 3 – Q35 and Project Objectives

In the summary output, the value of r^2 or R Square is equals to 0.0036 which signifies that 0.36% of the dependent variable that is project objectives, can be predicted by the independent variable Technical Risks as mentioned in Q35 of the questionnaire.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.060360482
R Square	**0.003643388**
Adjusted R Square	-0.020657993
Standard Error	1.282412498
Observations	**43**

As stated below using ANOVA, the Significance F is equal to 0.7006 which indicates that the null hypothesis or H_o in the regression model cannot be rejected.

ANOVA

	df	*SS*	*MS*	*F*	***Significance F***
Regression	1	0.24656415	0.24656415	0.149925135	**0.700609601**
Residual	41	67.42785445	1.644581816		
Total	42	67.6744186			

In this scenario, the Significance F is also the P-value for Q35 which is equal to 0.7006. So, the relationship between Q35 and project objectives is not statistically significant because the P-value is (>5) or greater than (5). With this result, the null hypothesis or H_o is accepted. (Saunders, Lewis, & Thornhill, 2009).

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	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	3.094102886	0.407564662	7.591685868	**2.43895E-09**
Q35	0.081555834	0.210628828	0.387201672	**0.700609601**

Lower 95%	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
2.271009353	3.917196419	2.271009353	3.917196419
-0.343817713	0.506929382	-0.343817713	0.506929382

Since the null hypothesis or H_o is accepted, the following P-value verifies the claim that "Technical Risk denoted by Q35 does not have an impact to project objectives.

Table 4.20 Regression Analysis for Hypothesis 3 – Q37 and Project Objectives

In the below data, the value of r^2 or R Square is equals to 0.0051 which signifies that 0.51% of the dependent variable that is project objectives, can be predicted by the independent variable Technical Risks as mentioned in Q37 of the questionnaire.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.071761351
R Square	**0.005149691**
Adjusted R Square	-0.01911495
Standard Error	1.281442749
Observations	**43**

As indicated in the below table using ANOVA, the Significance F is equal to 0.6474 which implies that the null hypothesis or H_o in the regression model cannot be rejected.

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.348502374	0.348502374	0.212230269	**0.647459264**
Residual	41	67.32591623	1.642095518		
Total	42	67.6744186			

The Significance F is also the P-value for Q37 which is equal to 0.6474. Therefore, the relationship between Q37 and project objectives is not statistically significant because the P-value is (>5) or greater than (5). It means that the null hypothesis or H_o is accepted. (Saunders, Lewis, & Thornhill, 2009).

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	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	3.071335079	0.40082807	7.662475042	1.9441E-09
Q37	0.070026178	0.15200461	0.460684566	**0.647459264**

Lower 95%	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
2.26184637	3.880823787	2.26184637	3.880823787
-0.23695336	0.377005716	-0.23695336	0.377005716

Given that the null hypothesis or H_o is accepted, the following P-value proves the claim that “Technical Risk denoted by Q37 does not have an impact to project objectives.

Table 4.21 Regression Analysis for Hypothesis 3 – Q41 and Project Objectives

In the below statistics, the value of r^2 or R Square is equals to 0.0011 which signifies that 0.11% of the dependent variable that is project objectives, can be predicted by the independent variable Technical Risks as mentioned in Q41 of the questionnaire.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.03371347
R Square	**0.0011366**
Adjusted R Square	-0.02322592
Standard Error	1.28402473
Observations	43

As specified using ANOVA, the Significance F is equal to 0.8300 which implies that the null hypothesis or H_o in the regression model cannot be rejected.

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.076918605	0.0769186	0.04665354	**0.83006321**
Residual	41	67.5975	1.64871951		
Total	42	67.6744186			

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The Significance F is also the P-value for Q41 which is 0.8300. And therefore, the relationship between Q41 and project objectives is not statistically significant because the P-value is (>5) or higher than (5). In this regard, the null hypothesis or H_o is accepted. (Saunders, Lewis, & Thornhill, 2009).

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	3.34	0.534582125	6.2478707	1.9208E-07
Q41	-0.0525	0.243061959	-0.2159943	**0.83006321**

Lower 95%	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
2.2603895	4.4196105	2.2603895	4.4196105
-0.54337358	0.43837358	-0.54337358	0.43837358

Since the null hypothesis or H_o is accepted, the following P-value proves the claim that "Technical Risk denoted by Q41 does not have an impact to project objectives Q48.

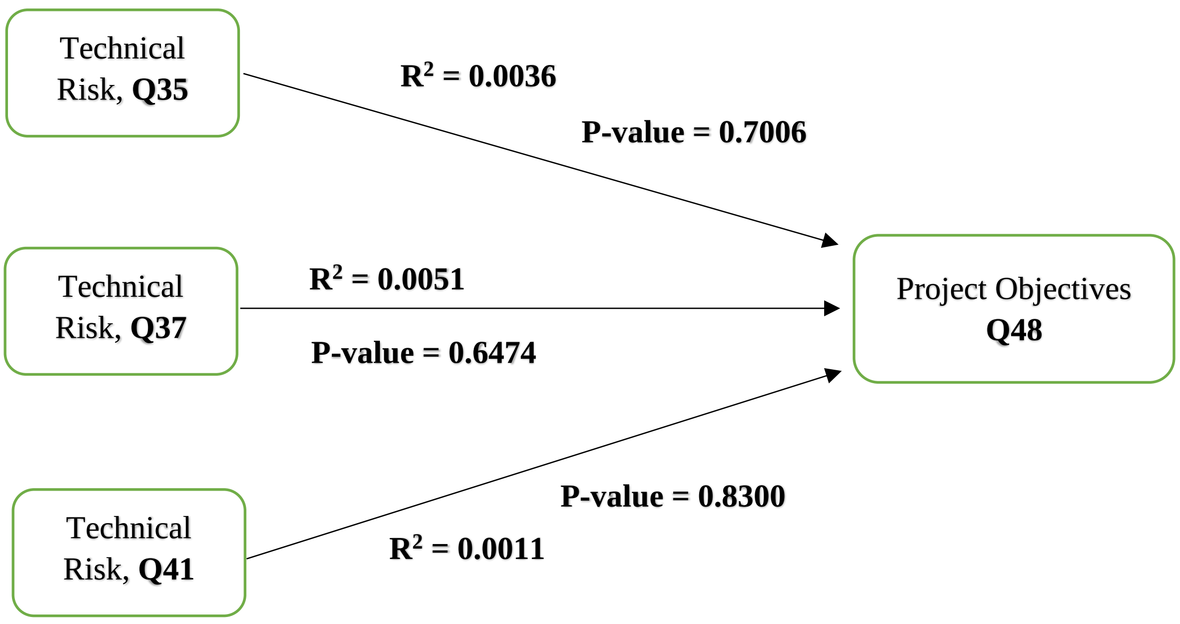

Diagram 4.3 Empirical Model for Hypothesis 3

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Chapter 5: Conclusions and Recommendations

5.1 Conclusions

In summary, the analytical findings of the study extrapolate into the succeeding rationales.

Sources of risk that can influence project success on the telecom poles construction in the UAE consist of management risk denoted by Q7, Q10, and Q15; external risk represented by Q8, Q11 and Q13; technical risk denoted by Q9 and Q18; and commercial risk signified by Q12, Q14, Q16 and Q17.

A descriptive analysis of findings shows that management risk denoted as Q15 has had the highest frequency of 44.19% which disagree with the given statement, with a mean value of 3.7 compared to Q7 and Q10 with the mean values of 3.35, respectively. The risk factor for Q15 pertains to “Risk such as shortages in materials supply cannot impact project success.” The Q7 risk factor is about “Risk such as the absence of Line of Sight (LOS) during site survey with the client cannot impact project success.” While Q10 refers to “Risk such as unavailability of skilled workers cannot impact project success.”

External risk denoted by Q8 has had the highest frequency of 48.84%, with a mean value of 3.63 compared to Q11 with a mean value of 3.60 wherein most respondents disagree with the statement with 37.21%. The risk factor for Q8 is about “Risk such as the unacceptable rental value of the leased building cannot impact project success.” In contrast, however, the mean value of Q13 is 3.7 which signifies a strong disagreement of 34.88%. The risk factor for Q13 discusses, “Risk such as TRA (Telecom Regulatory Authority) certificate not issued due to protocol violations cannot impact project success.”

Among the technical risks, Q9 has the highest feedback of 46.51%, with a mean value of 3.7, and a mode value of 5, which strongly disagree with the given statement. The risk factor pertains to “Risk such as building that is structurally unsafe cannot impact project success.” Intriguingly, Q18 has had undecided responses of 44.19% on risk factors, “Risk such as the need for special camouflage cannot impact project success.” The mean value for Q18 is 3.7, with a median and mode value of 3.

Q17 which represents one of the risk factors among commercial risks has obtained the highest frequency of feedback at 46.51% due to disagreement with the statement that says, “Risk such as the insufficient experience of contractors cannot impact project success.”. The mean value for Q17 is 3.65 which is higher than Q16 with 3.63 due to feedback that is 39.43% on the statement, “Risk such as the unavailability of a telescopic crane for lifting the pole structure cannot impact project success.” Conversely, Q12 has generated 41.86% response with those who strongly disagree with the given statement, “Risk such as weak or substandard galvanization on poles cannot impact project success.” The mean value for Q12 gives 3.91. Comparably, Q14 has the same no. of frequency of about 27.91% with those who disagree and strongly disagree with the statement, “Risk such as the increase in materials' prices cannot impact project success.” The mean value of Q14 is 3.51.

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Overall, descriptive analysis shows that by equating all the mean values of Q17 to Q17 except Q18, it gives an average value of 3.81, a median of 4 and a mode of 4.54, where it implies a solid disagreement on the given statements that risk sources and risk factors cannot impact project success on the telecom poles construction in the UAE.

Inferential analysis of the findings for Hypotheses 1 has validated that the alternative hypothesis is accepted due to P-values that are less than the significant level of 0.05 or the P-value < 0.05. And so, the commercial risks which are denoted by Q12, Q14, Q16 and Q17 do have an effect to project success on the telecom poles construction in the UAE. Nevertheless, their impact on project success can be varying at minimum magnitudes.

The Q12 risk factor can impact project success with 16.36% due to a P-value of 0.0071. The Q14 risk factor does have an effect to project success with 13.19% with the P-value of 0.0166. The Q16 can have an impact to project success with 24.59%, as the P-value is 0.0007. Similarly, the Q17 can influence project success with 10.69% due to a P-value of 0.0323.

All risk factors that were developed for Q7 to Q18 have been guided by the empirical literature review explored by Eid et al. (2015) for Global Mobile Telecom Sites' list of risks, which were presented in their research paper on Mitigating and Managing Risks in Mobile Telecom Projects in Egypt. However, their study focuses only on risk factors with risk responses from the respondents of 25% out of 90 sample population. In comparison, the current exploration has collected responses from 43 respondents which embody 25.59% out of the 168-sample population.

Sources of risk that were classified into four (4) distinct types such as management risk, external risk, technical risk and commercial risk were derived from the theoretical literature review studied by Mhetre et al. (2016), Koirala (2017) and several scholars from the Project Management Institute (2017).

Meanwhile, risk management techniques that are effective for project success on the telecom poles construction in the UAE are underpinned by risk identification tools and techniques designated by Q19, Q20, Q21, Q22, Q23, and Q24; qualitative risk analysis denoted by Q25, Q26, Q27, and Q28; quantitative risk analysis represented by Q29, Q30, Q31, Q32, and Q33; and risk response plan denoted by Q34.

Descriptive analysis confirms that among risk identification tools and techniques, Q20 has the highest frequency of feedback with 67.44% which do agree with the given statement, "Risk identification by the project team uses a Checklist from the lowest level of risk breakdown structure (RBS) that is developed based on historical data and knowledge from previous similar projects." It was seconded by Q23 with 58.14% with agreement on the statement, "Risk identification by the project team presents a SWOT analysis to identify the Strengths, Weaknesses, Opportunities, and Threats of the organization or project to increase the extent of identified risks. The mean value of Q20 is 2.26 while that of Q23 is 2.14.

It was followed by Q21 and Q24 with the same magnitude of agreement on the statement at 53.49%. Q21 tells about, "Risk identification by the project team utilizes Assumption Analysis to explore the validity of assumptions, hypotheses, or scenarios to identify risk from

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inconsistencies, inaccuracies, or incompleteness of assumptions. While Q24 says, “Expert Judgment obtained from the experts with relevant experience to similar projects to suggest potential risks based on their previous experience and areas of expertise.” The mean value for Q21 indicates 2.53 and Q24 has a mean value of 2.19.
Q22 risk identification tools and techniques verify that process flow charts have gotten 51.22% succeeded by cause-and-effect diagrams at 41.46%. All other risk identification tools and techniques for Q19 confirm that root cause analysis has gotten 51.16% followed only by brainstorming with 20.93%, while interviewing with 11.63%, over Delphi Technique with only 6.98% feedback.

Among qualitative risk analysis tools and techniques, Q25 has had the highest frequency of responses at 65.12% with agreement on the use of risk probability and impact assessment to investigate the likelihood of risk occurrences. Q26 follows next with the frequency of agreement to the statement at 60.47% about the use of probability and impact matrix to prioritize and plan risk based on their scale. Q28 however have had feedback of 58.14% which agree on expert judgment to assess the probability and impact of risk to determine the location in the matrix. While Q27 has generated a frequency of 55.81% which agree with the use of Risk Breakdown Structure (RBS) which categorizes sources of risk to determine the most affected areas from uncertainties. The mean value of Q25 is 1.93, Q26 has 2.16, Q28 has 2.12 while Q27 has 2.14.

For the quantitative risk analysis tools and techniques, the dependence of the project team on expert judgement to identify potential cost and schedule impacts which evaluate their probability has had the highest percentage of agreement at 74.42%, which is denoted by Q33. It was seconded by Q30 which promotes the use of probability distribution for modeling and simulation such as Beta and Triangular distribution which identify the risks expressed in values such as duration of schedule and cost of the project. The mean value for Q33 is 2.09 while Q30 has a mean of 2.05.

Furthermore, Q32 has a frequency of 55.81% which supports the use of modeling and simulation techniques such as Monte Carlo that translates the specified detailed risks of the project into potential impact to project objectives. All other quantitative risk analysis tools and techniques denoted by Q29 and Q31 do have the same magnitude of responses at 53.49%. Q29 is the use of interviewing techniques such as the three-point estimate for the cost. Whereas Q31 utilizes expected monetary value (EMV) analysis such as the Decision Tree diagram which calculates the average outcome when the future includes scenarios that may not take place. The mean values for Q32, Q29, and Q31 are 2.33, 2.26, and 2.28, respectively.

The risk response plan tool and technique that is denoted by Q34 endorses the use of the Risk Register template which categorizes risk either to avoid, transfer, mitigate, and accept for negative risks and positive risks, exploit, enhance, share, and accept. Nonetheless, it had gotten a frequency of responses of 58.14%.

Descriptive analysis displays the entire mean values for Q20 to Q34 generates an average of 2.18, while median and mode values have 2. Hence, it signifies the respondents’ agreement on the use of tools and techniques for risk identification, risk analysis and risk response plan to mitigate risks on the telecom poles construction in the UAE.

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Inferential analysis corroborates the findings for Hypotheses 2 that Q34 or the use of the Risk Register in a risk response plan does not have a correlation to project success. Correlation analysis proves that the value of (r) is equals to -0.0202 which indicates a negative correlation, as it implies a very weak correlation between the use of the risk register and project success. Apart from that, using the regression equation, the value of r^2 or R square is equal to 0.0004 which means there is a 0.04% correlation between Q34 and project success. In the same way, the P-value indicates 0.8972, which is greater than the significant level of 0.05 or P-value > 0.05.

Risk management tools and techniques that were employed for Q19 to Q34 are guided by the theories published in the PMBOK Guide 5th Edition by Project Management Institute (2013). It is interesting to consider that the use of a Checklist taken out from the risk breakdown structure that is developed from the past projects, was found to be the most effective tool and technique for the risk identification process (Project Management Institute, 2013). Risk identification tools and techniques endorsed by Bahamid and Doh (2017) have drawn into conclusion that SWOT analysis discovered by Rostami et al. (2015) which verifies the extent of identified risks can also be the next effective tool in investigating greater risk occurrences (Crnković & Vukomanović, 2016).

All other tools and techniques for the risk identification process by Rostami et al. (2015) which include brainstorming, Delphi Technique, interviews, root cause analysis and assumption analysis cannot be neglected as these too can be used efficiently in undertaking risks. However, it will depend on the project size and its nature, available information, economic level, project schedule, the experience of the project experts, the degree of innovation and the project objectives (Goh & Abdul-Rahman, 2013).

Qualitative and quantitative tools and techniques are drawn from the theories devised by several scholars of the Project Management Institute (2013). Among qualitative tools and techniques for risk analysis, the use of probability and impact assessment/matrix is top of the findings followed by expert judgment and the use of the risk breakdown structure (RBS) (Project Management Institute, 2013).

On the other hand, among quantitative risk analysis tools and techniques, the adoption of expert judgment in handling risk cannot be overlooked as this is the most effective tool and technique compared to other tools such as the probability distribution using the Beta and Triangular distribution method, the use of modelling techniques such as Monte Carlo method, interviewing techniques such as the three-point estimate for the cost and the use of expected monetary value (EMV) such as Decision Tree diagram (Project Management Institute, 2013). In this type of project, the quantitative method by way of adopting the expert judgement has had the highest magnitude of feedback which turns out to be supporting the claim of Jarkas and Haupt (2015).

The risk response plan with the use of the Risk Register template by the risk owners is another effective tool for undertaking risks. Although this type of tool and technique is new lingo to many stakeholders in the telecom industry, risk mitigation cannot be proven by the nature and possible outcome of risk unless the level of risk control is intensified while minimizing the negative impact. The theory postulated by Bahamid and Doh (2017) and Goh and Abdul-

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Rahman (2013) categorizes risk responses into risk retention or acceptance, risk reduction or mitigation, risk sharing, risk control, risk avoidance and risk transfer. Project Management Institute (2013) have re-grouped the risk response plan for negative risk, which is to avoid, transfer, mitigate and accept; while for positive risk is to exploit, enhance, share, and accept risks.

Based on the findings from the perception of contractors towards risk and its impact to project objectives, the types of risks and their sources have been categorized into four (4) distinct risk sources with corresponding risk descriptions, comprising of technical risk denoted by Q35, Q37, and Q41; commercial risk denoted by Q36, Q39, Q40, and Q43; and management risk represented by Q38, Q42 and Q44.

Descriptive analysis verifies that among technical risks with risk description, Q41 has generated the highest frequency of feedback from respondents with a rating of 60.47% with agreement on "Risk caused by various inspectors from the client with different interpretations on materials quality would lead to a potential major punch list during the site inspection." Q35 follows next with the highest percentage of 51.16%, but with strong agreement on the statement. While Q37 risk description has gotten 46.51% with agreement on the statement.

The mean value for Q41 is 2.05 with mean and mode values of 2. Q35 has a mean value of 1.7, with median and mode values of 1. And Q37 a mean value of 2.3 and median and mode values are 2.

Findings on commercial risk with risk description display that Q43 have the highest rating at 60.47% due to positive agreement on "Risk such as additional work by the customer could lead to project delay and cost overrun for contractors when variation orders are not stated or part of the contract clause." It is succeeded by Q39 with risk description "Risk caused by the delayed delivery of pole items will result to project delay and penalty from the customer against the contractor." Wherein Q39 has feedback of 53.49% due to their agreement on the statement compared to those who strongly agree with 34.88%.

Q40 follows third with responses of about 51.16% because they agree on risk which declares "The risk from incomplete fixtures for grounding and earth installation could lead to the compromise of buying low-quality items from other suppliers." Q36 however have had the lowest frequency agreement at 48.84% because of the respondents' decision over those who strongly agree with 44.19%. The mean value for Q43 is 2.09, Q39 has 1.84, Q40 has 2.12 while Q36 has a mean value of 1.70.

Descriptive report on management risk observed that Q44 has the highest number of feedbacks from respondents with 60.47% due to clear agreement on "Risk due to the postponement of site acceptance for another week could trigger additional costs on the part of the contractor due to delays in the issuance of the completion certificate." Q42 follows another with a rating of 55.81% due to their agreement on risk that says, "The delivery of owner-supplied BTS equipment will be delayed for 15 days, which means another crane will be used, resulting to project delay and extra cost to be borne by the in-house and sub-contractors."

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In contrast, Q38 have gotten 53.49% feedback due to their strong agreement on the statement over those who agree with 41.86%. The statement of Q38 declares that “Failure to observe proper safety protocols by contractors during site work could lead to an accident that will impact cost, time, and quality.” The mean value of Q44 is 2.09, Q42 has the mean value of 2.14, while Q38 has a mean value of 1.58.

The general descriptive findings exhibit that all the mean values of Q35 to Q44 give an average score of 1.96 and median and mode values of 2, except for Q35 and Q38 which do have values of 1. It indicates that technical risk, commercial risk, and managing risk can influence project objectives on the telecom poles construction in the UAE.

However, inferential analysis of the findings for Hypotheses 3 validates the claim that it fails to reject the null hypothesis or H_o. This is due to statistics that P-values are found greater than the significant level of 0.05, or the P-values > 0.05. To equate, Q35 can impact project objectives with 0.36% due to $r^2 = 0.0036$, and its P-value is 0.7006. Q37 can affect project objectives with 0.51% due to $r^2 = 0.0051$, and its P-value is 0.6474. Likewise, Q41 can have an effect to project objectives with 0.11% due to $r^2 = 0.0011$, and its P-value is 0.8300. With that principle, technical risks which are denoted by Q35, Q37 and Q41 do not have an impact to project objectives such as scope, cost, time, and quality.

Risk description that are utilized for Q35 to Q44 has been proposed by the author of the current research according to his work experience in the telecom industry. While risk sources categorization has been guided by the theories stated in the PMBOK Guide 6th edition by Project Management Institute (2017), alongside several authors like Eid et al. (2014) who investigated Risks in Deploying Mobile Telecom Sites and Eid et al. (2015) who explored about Mitigating and Managing Risks in Mobile Telecom Projects.

It is crucial to consider that these findings are dependent on the sample population and the number of respondents who completed the survey. The current research has generated a small number of responses about forty-three respondents who completed the survey out of 168 sample population. Therefore, the inferential outcomes differ statistically despite the results of the descriptive analyses which cannot be generalized to a broader population.

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5.2 Recommendations

Based on the conclusion drawn from the study, the following recommendations are formulated to project stakeholders of telecom poles construction for future projects and undertakings.

- Proper communication channels and knowledge about risk management systems must be applied by all stakeholders as part of the organizational culture of telecom companies (Serpella, Ferrada, Rubio, & Arauzo, 2015).
- There should be a risk owner for all projects who enables to identify and categorize risks based on risk importance which involves a crucial assessment of risks that is decided by project managers (El-Sayegh & Mansour, 2015).
- Project managers for telecom construction projects must be knowledgeable enough on risk management processes, theoretically and practically. Hence, it is crucial and a prerequisite for professionals to earn a certification from Project Management Institute which to boost their credentials and professionalism in managing simple and complex projects. It has been noted that during the survey, only few project managers have participated, wherein, aside from not having a certification from the Project Management Institute Inc., they only filled up the demographic's questions, and skipped all the questions concerning risks sources and risk management tools and techniques which have led to incomplete responses with the given questionnaire. With the same observation, other project managers who had even acquired certification from the Project Management Institute Inc., have disregarded the questionnaires, particularly on questions related to dependent and independent variables.
- The use of a checklist on risk identification process and the implementation of SWOT analysis are recommended to project stakeholders throughout the project life cycle. Similarly, while these tools are found to be effective, project stakeholders cannot ignore the usefulness of assumption analysis as well as the usability of expert judgement.
- Using qualitative risk analyses, the author endorses the use of probability and impact assessment to investigate the likelihood of risk occurrences, and the use of probability and impact matrix that prioritizes risk based on their rating. Accordingly, project stakeholders can also utilize the practicability of expert judgment and the categorization of risk using the Risk Breakdown Structure (RBS) to determine the most affected areas from uncertainties.
- Using quantitative risk analyses, the scholar recommends the efficiency of project stakeholders' dependence on the expert judgement which identifies the impacts on cost and schedule to determine the risk probability. Furthermore, the use of probability distribution for modeling and simulation like that of Beta and Triangular distribution cannot be put aside as this could become effective tool depending on its suitability to project scale, nature, and status.
- While the use of the above tools and techniques for risk identification and risk analyses are found to be beneficial, the use of the risk register template is also endorsed as it will help categorize both negative and positive risks that could impact project objectives.

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Limitations and Areas of Future Research

The author of this research would like to address the limitations of the study on the risk management system that is entirely appropriate specifically for GSM Rooftop Pole Construction. Although there are similarities of terms with other scopes in the work breakdown structure of the GSM Greenfield Monopole Construction, the scope is purely distinct apart from the project duration, project activities, project schedule, project cost, and project quality. The risk management system for Greenfield site construction could be another area of future study which will necessitate a longer period of preparation due to project size and complexity.

The geographical location of the research has been purposely chosen and planned to be conducted in the United Arab Emirates, as it is a suitable place where the author can obtain swift responses from respondents to the questionnaire survey. Other than that, he is also currently employed in a telecommunication contracting company, which delivers the same services related to telecom poles construction to customers like Etisalat and Du companies.

Before deciding as to which method and strategy to be applied to the research, the author has spent more than 2 months integrating and summarizing both theoretical and empirical literature investigated by various scholars, until the gaps were identified, and the research questions have been grounded in the existing literature.

Since the period of study has been restricted to three (3) months, the researcher chooses the mono method using quantitative, as it calls for a survey questionnaire in data collection, aside from numbers which turned out to be convenient to the researcher's capability. Moreover, his research strategy uses a self-selection technique during the distribution of the questionnaire, wherein he typically uses WhatsApp in sharing the hyperlink of the survey website with his peers and colleagues working in the telecom industry. Although, it has been noted that there were few numbers of respondents reached by way of snowballing technique.

The questionnaire survey was created online through the survey monkey website. However, it was open for responses within eight (8) days only. Afterwards, it was closed for validation and data analysis. Out of the 168-sample population, forty-three (43) responses were validated for descriptive and inferential analysis.

For that reason, it causes the null hypothesis of Hypotheses 3 to be accepted due to the results of P-values that are not statistically significant. Meaning, that the number of respondents in the current research is not enough to validate the claims that the null hypothesis or H_o can be rejected so that the alternative hypotheses or H_a be accepted.

In this regard, a larger population group will be required in the future as the next areas of investigation, to be able to produce the P-values that are less than the significant level of 0.05 or the P-values < 0.05.

The overall period of preparation has been extended to four (4) months till the research is completed, validated, and accepted by the institution.

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Scientific Research Journal (SCIRJ),
ISSN: 2201-2796

References

Abazid, M., & Harb, H. (2018). An Overview of Risk Management in The Construction Projects. *Academic Research International, 9*(2), 73-79. Retrieved from www.journals.savap.org.pk

Adeleke, A. Q., Bahaudin, A. Y., & Kamaruddeen, A. M. (2016). Moderating Effect of Regulations on Organizational Factors and Construction Risk Management: A Proposed Framework. *International Journal of Economics and Financial Issues, 6*(Special Issue (S7)), 92-97. Retrieved from www.econjournals.com

Adeleke, A., Bahaudin, A., A. M., Bamgbade, J. A., Salimon, M. G., Khan, M. W., & Sorooshian, S. (2018, June 1). The Influence of Organizational External Factors on Construction Risk Management among Nigerian Construction Companies. *Safety and Health at Work, 9*(1), 115-124. Retrieved from https://doi.org/10.1016/j.shaw.2017.05.004

Akintoye, A. S., & MacLeod, M. J. (1997). Risk Analysis and Management in Construction. *International Journal of Project Management, 15*(1), 31-38. doi:10.1016/S0263-7863(96)00035-X

Al-Babtain Power & Telecom. (2021). *Telecommunications*. Retrieved from Al Babtain Power & Telecom,: http://www.al-babtain.com.sa/products/telecommunications/

Al-Bahar, J. F., & Crandall, K. C. (1990, September). Systematic Risk Management Approach for Construction Projects. *Journal of Construction Engineering and Management, 116*(3). Retrieved from https://doi.org/10.1061/(ASCE)0733-9364(1990)116:3(533)

Algahtany, M., Alhammadi, Y., & Kashiwagi, D. (2016). Introducing a New Risk Management Model to the Saudi Arabian Construction Industry. *International Conference on Sustainable Design, Engineering and Construction . 145*, pp. 940-947. Saudi Arabia: Elsevier B.V. . doi:10.1016/j.proeng.2016.04.122

AlGheth, A., & Sayuti, M. I. (2019, September). Contributing Factors to Schedule Delays in Construction Projects in United Arab Emirates. *International Journal of Engineering and Advanced Technology (IJEAT), 8*(6S3), 422-433. doi:10.35940/ijeat.F1076.0986S319

Alibaba. (2021). *30m Date Palm Tree Monopole for Etisalat UAE*. Retrieved from Alibaba: httpswww.alibaba.comproduct-detail30m-Date-Palm-Tree-Monopole-for_1421956268.html

An, M., Baker, C., & Zeng, J. (2005). A Fuzzy-Logic-Based Approach to Qualitative Risk Modelling in the Construction Process. *World Journal of Engineering , 2*, 1-12.

Bahamid, R. A., & Doh, S. I. (2017). A Review of Risk Management Process in Construction Projects of Developing Countries. *Materials Science and Engineering , 271*((2017) 012042), 1-8. doi:10.1088/1757-899X/271/1/012042

Bahamid, R. A., & Doh, S. I. (2017). A Review of Risk Management Process in Construction Projects of Developing Countries. *Materials Science and Engineering*, 6.

Publishing Partner:
Scientific Research Journal (SCIRJ),
ISSN: 2201-2796

Berman Brown, R., & Saunders, M. (2008). *Dealing with Statistics: What You Need to Know.* Maidenhead:: McGraw-Hill Open University Press.

Blumberg, B., Cooper, D., & Schindler, D. (2008). *Business Research Methods.* Maidenhead: McGraw-Hill.

Brown, T. A. (2006). *Confirmatory Factor Analysis for Applied Research.* (D. A. Kenny, Ed.) New York, New York, United States of America: THE GUILFORD PRESS.

Campbell, D. (2005). *Risk Management Guide for Small Business.* New South Wales: Global Risk Alliance Pty Ltd. Retrieved from www.smallbiz.nsw.gov.au

Choudhry, R. M., & Iqbal, K. (2013). Identification of Risk Management System in Construction Industry in Pakistan. *Journal of Management in Engineering, 29*(1), 42-49. Retrieved from https://doi.org/10.1061/(ASCE)ME.1943-5479.0000122

Collis, J., & Hussey, R. (2014). Basingstoke, Hampshire, England: Palgrave Macmillian Higher Education.

Crnković, D., & Vukomanović, M. (2016). Comparison of Trends in Rsk Management Theory and Practices within the Construction Industry. *Electronic Journal of the Faculty of Civil Engineering, 7*(13). Retrieved from https://doi.org/10.13167/2016.13.1

Dancey, C. P., & Reidy, J. (2008). *Statistics Without Maths for Psychology: Using SPSS for Windows (4th Edition).* Harlow , Essex , England: Prentice Hall .

deVaus, D. A. (2002). *Surveys in Social Research (5th Edition).* London, England: Routledge.

Dillman, D. A. (2007). *Mail and Internet Survey: The Tailored Design Method (2nd Edition).* Hoboken, New Jersey: Wiley.

Dziadosz, A., & Rejmentb, M. (2015). Risk analysis in construction project - chosen methods. *Operational Research in Sustainable Development and Civil Engineering - meeting of EURO working group and 15th German-Lithuanian-Polish colloquium (ORSDCE 2015). 122*, p. 258. Elsevier Ltd. . doi:10.1016/j.proeng.2015.10.034

Easterby-Smith, M. T., Jackson, P., & Lowe, A. (2008). *Management Research.* London: SAGE.

Eid, M. M., Georgy, M., & Osman, H. (2014). Risks in Deploying Mobile Telecom Sites. In K. Chantawarangul, W. Suanpaga, S. Yazdani, V. Vimonsatit, & A. Singh (Ed.), *Sustainable Solutions in Structural Engineering and Construction* (pp. 507-512). ISEC Press. doi:10.14455/isec.res.2014.121

Eid, M. M., Georgy, M., Osman, H., & Ibrahim, M. (2015). Mitigating and Managing Risks in Mobile Telecom Projects. In S. S., Z. Y., Y. S., & S. A. (Ed.), *ISEC 2015 - 8th International Structural Engineering and Construction Conference: Implementing Innovative Ideas in Structural Engineering and Project Management* (pp. 857-862). ISEC Press. doi:10.14455/isec.res.2015.42

Eldosouky, I. A., Ibrahim, A. H., & Mohammed, H. E.-D. (2014, October). Management of Construction Cost Contingency Covering Upside and Downside Risk. *Alexandria Engineering Journal, 53*(4), 863-881. Retrieved from http://dx.doi.org/10.1016/j.aej.2014.09.008

Publishing Partner:
Scientific Research Journal (SCIRJ),
ISSN: 2201-2796

El-Sayegh, S. M. (2014). Project Risk Management Practices in the UAE Construction Industry. *International Journal of Project Organization and Management*, *6*(1/2), 122.

El-Sayegh, S. M. (2014, January). Project Risk Management Practices in the UAE Construction Industry. *International Journal of Project Organisation and Management* , *6*(1/2), 121-137.

El-Sayegh, S. M., & Mansour, M. H. (2015, November). Risk Assessment and Allocation in Highway Construction Projects in the UAE. *Journal of Management in Engineering, 31*(6). Retrieved October 2, 2021, from https://doi.org/10.1061/(ASCE)ME.1943-5479.0000365

Glover, J. (2009). *Risk Management of Machinery and Work Equipment.* BSI Standards.

Goforth, C. (2015, November 16). *Using and Interpreting Cronbach's Alpha*. Retrieved from Research Data Services + Sciences: https://data.library.virginia.edu/using-and-interpreting-cronbachs-alpha/

Goh, C. S., & Abdul-Rahman, H. (2013). The Identification and Management of Major Risks in the Malaysian Construction Industry. *Journal of Construction in Developing Countries*, *18*(1), 19-32. Retrieved from https://www.researchgate.net/publication/281570013

Government of Abu Dhabi. (2014). Common standards and Specifications on Civil Work for Mobile Networks site Construction. Abu Dhabi: Jawdah.

Griffis, F. H., & Christodoulou, S. (2000, December). Construction Risk Analysis Tool for Determining Liquidated Damages Insurance Premiums: Case Study. *Journal of Construction Engineering and Management*, *126*(6). Retrieved from https://doi.org/10.1061/(ASCE)0733-9364(2000)126:6(407)

Hosny, H. E., Ibrahim, A. H., & Fraig, R. F. (2015, July). Deterministic Assessment of Continuous Flight Auger Construction Durations Using Regression Analysis. *International Journal of Engineering Research and Applications (*, *5*(7), 86-91. Retrieved from www.ijera.com

Hosny, H. E., Ibrahim, A. H., & Fraig, R. F. (2016). Cost Analysis of Continuous Flight Auger Piles Construction in Egypt. *Alexandria Engineering Journal*, *55*(3), 2709-2720. Retrieved from http://dx.doi.org/10.1016/j.aej.2016.05.021

Hosny, H. E., Ibrahim, A. H., & Fraig, R. F. (2018, November 15). Risk management framework for Continuous Flight Auger Piles Construction in Egypt. *Alexandria Engineering Journal*, *57*(4), 2667-2677. Retrieved from https://doi.org/10.1016/j.aej.2017.10.003

Hosny, H. E., Ibrahim, A. H., & Fraig, R. F. (2018, November 15). Risk Management Framework for Continuous Flight Auger Piles Construction in Egypt. *Alexandria Engineering Journal*, *57*(4), 2667-2677. Retrieved from https://doi.org/10.1016/j.aej.2017.10.003

Issa, U. H. (2012). A Model for Time Overrun Quantification in Construction of Industrial Projects Based on Risk Evaluation. *Journal of American Science*, *8*(8), 523-529. Retrieved from http://www.jofamericanscience.org

Publishing Partner:
Scientific Research Journal (SCIRJ),
ISSN: 2201-2796

Issa, U. H. (2012). Developing an Assessment Model for Factors Affecting the Quality in the Construction Industry. *Journal of Civil Engineering and Architecture, 6*(3 (Serial No. 52)), 364-371. doi:10.17265/1934-7359/2012.03.010

Issa, U. H., & Ahmed, A. (2014). On the quality of driven piles construction based on risk analysis. *International Journal of Civil Engineering, 12*(2B), 88-96.

Jarkas, A. M., & Haupt, T. C. (2015). Major Construction Risk Factors Considered by General Contractors in Qatar. *Journal of Engineering, Design and Technology, 13*(1), 165-194. Retrieved from http://dx.doi.org/10.1108/JEDT-03-2014-0012

Keshk, A. M., Maarouf, I., & Annany, Y. (2018). Special Studies in Management of Construction Project Risks, Risk Concept, Plan Building, Risk Quantitative and Qualitative Analysis, Risk Response Strategies. *Alexandria Engineering Journal (2018) 57,, 57*(4), 3179-3187. doi:10.1016/j.aej.2017.12.003

Khodeir, L. M., & Ghandour, A. E. (2019). Examining the role of value management in controlling cost overrun [application on residential construction projects in Egypt]. *Ain Shams Engineering Journal, 10*(3), 471-479. Retrieved from https://doi.org/10.1016/j.asej.2018.11.008

Khodeir, L. M., & Nabawy, M. (2019). Identifying key risks in infrastructure projects – Case study of Cairo Festival City project in Egypt. *Ain Shams Engineering Journal, 10*(3), 613-621. Retrieved from https://doi.org/10.1016/j.asej.2018.11.003

Khodeir, L. M., Hamdy, A., & Mohamed, M. (2015). Identifying the Latest Risk Probabilities Affecting Construction Projects in Egypt According to Political and Economic Variables . From January 2011 to January 2013. *HBRC Journal, 11*(1), 129-135. Retrieved from http://dx.doi.org/10.1016/j.hbrcj.2014.03.007

Koirala, M. P. (2017, March 14). Contribution of Risk Factors for Infrastructure Development of Nepal. *American Journal of Civil Engineering, 5*(3), 124-131. doi:10.11648/j.ajce.20170503.11

Lavanya, N., & Malarvizhi, T. (2008). *Risk analysis and management: a vital key to effective project management*. Retrieved February 12, 2021, from https://www.pmi.org/learning/library/risk-analysis-project-management-7070

Lavanya, N., & Malarvizhi, T. (2008). *Risk analysis and management: a vital key to effective project management*. Retrieved November 15, 2020, from https://www.pmi.org/learning/library/risk-analysis-project-management-7070

Liu, J., Zhao, X., & Yan, P. (2016, June). Risk Paths in International Construction Projects: Case Study from Chinese Contractors. *Journal of Construction Engineering and Management, 142*(6). Retrieved October 2, 2021, from https://doi.org/10.1061/(ASCE)CO.1943-7862.0001116

LoBiondo-Wood, G., & Haber, J. (2014). Data Analysis: Descriptive and Inferential Statistics. In G. LoBiondo-Wood, & J. Haber, *Nursing Research: Methods and Critical Appraisal for Evidence-Based Practice (8th Edition)* (p. 311). Riverport Lane, St. Louis, Missouri: Elsevier Mosby. Retrieved from Scribbr.

Mahendra, P. A., Pitroda, J. R., & Bhavsar, J. J. (2013, October). A Study of Risk Management Techniques for Construction Projects in Developing Countries. *International Journal of Innovative Technology and Exploring Engineering (IJITEE), 3*(5), 139-142.

Marzouk, M. M., & El-Rasas, T. I. (2014). Analyzing Delay Causes in Egyptian Construction Projects. *Journal of Advanced Research, 5*(1), 49-55. Retrieved from http://dx.doi.org/10.1016/j.jare.2012.11.005

Mhetre, K., B.A.Konnur, & Landage, A. B. (2016). Risk Management in Construction Industry . *International Journal of Engineering Research , 5*(1), 153-155. doi:10.17950/ijer/v5i1/035

Mousa, J. H., & Enshassi, A. (2005, March). Risk Management in Construction Projects from Contractors and Owners Perspectives. 1-102.

Mulcahy, R. (2010). *Risk Management - Tricks of the Trade for Project Managers and PMI-RMP Exam Prep Guide, Second Edition.* RMC Publications.

Osman, M. M., Issa, U. H., & Zakaria Eraqi, A. M. (2020). Identifying the Risk Impact on Cost and Time of the Egyptian Non-Residential Buildings Projects. *International Journal of Scientific Research in Science, Engineering and Technology, 7*(1), 1-12. doi:10.32628/ijsrset196659

Paslawski, J. (2017). Flexible Approach for Construction Process Management under Risk and Uncertainty. *Procedia Engineering, 208*, 114-124. doi:10.1016/j.proeng.2017.11.028

Phan, V. T. (2020). Contractor’s Attitude towards Risk and Risk Management in Construction in Two Western Provinces of Vietnam. *Engineering, Technology & Applied Science Research, 10*(6), 6418-6421.

Phan, V. T. (2020). Contractor's Attitude Towards Risk and Risk Management in Construction in Two Western Provinces in Vietnam. *Engineering, Technology & Applied Science Research, 10*(6), 6418-6421. Retrieved from www.etasr.com

Project Management Institute. (2004). *Project Management Institute. A Guide to the Project Management Body of Knowledge (PMBOK® Guide) - Third Edition.* Newtown Square, Pennsylvania, U.S.A., Pennsylvania, U.S.A.: Project Management Institute.

Project Management Institute. (2013). Project Risk Management. In Project Management Institute, *Project Management Institute. A Guide to the Project Management Body of Knowledge (PMBOK® Guide) - Fifth Edition* (p. 310). Newtown Square, Pennsylvania, U.S.A.: Project Management Institute, Inc. .

Project Management Institute. (2013). Project Risk Management. In Project Management Institute, *Project Management Institute. A Guide to the Project Management Body of Knowledge (PMBOK® Guide) - Fifth Edition* (pp. 333-341). Newtown Square, Pennsylvania, U.S.A: Project Management Institute, Inc.

Project Management Institute. (2013). Project Risk Management. In Project Management Institute, *Project Management Institute. A Guide to the Project Management Body of Knowledge (PMBOK® Guide) - Fifth Edition* (pp. 328-333). Newtown Square, Pennsylvania, U.S.A.: Project Management Institute, Inc. .

Publishing Partner:
Scientific Research Journal (SCIRJ),
ISSN: 2201-2796

Project Management Institute. (2013). Project Risk Management. In Project Management Institute, *Project Management Institute. A Guide to the Project Management Body of Knowledge (PMBOK® Guide) - Fifth Edition* (pp. 324-327). Newtown Square, Pennsylvania, U.S.A.: Project Management Institute, Inc.,.

Project Management Institute. (2013). Project Risk Management. In P. M. Institute, *Project Management Institute. A Guide to the Project Management Body of Knowledge (PMBOK® Guide) - Fifth Edition* (pp. 324-346). Newtown Square, Pennsylvania, U.S.A.: Project Management Institute, Inc.

Project Management Institute. (2013). Sample WBS Decomposed Down Through Work Packages. In *Project Management Institute. A Guide to the Project Management Body of Knowledge (PMBOK® Guide) - Fifth Edition* (p. 129). Newtown Square, Pennsylvania, U.S.A.: Project Management Institute, Inc.

Project Management Institute. (2017). Project Risk Management. In *Project Management Institute. A Guide to the Project Management Body of Knowledge (PMBOK® Guide) - Sixth Edition* (p. 220). Newtown Square, Pennsylvania, U.S.A.: Project Management Institute, Inc.

Project Management Institute. (2017). Project Risk Management. In Project Management Institute, *Project Management Institute. A Guide to the Project Management Body of Knowledge (PMBOK® Guide) - Sixth Edition* (p. 227). Newtown Square, Pennsylvania, U.S.A: Project Management Institute, Inc.

Project Management Institute. (2017). Risk Categories. In I. Project Management Institute, *Project Management Institute. A Guide to the Project Management Body of Knowledge (PMBOK® Guide) - Sixth Edition* (p. 323). Newtown Square, Pennsylvania, U.S.A.: Project Management Institute, Inc.,.

Remenyi, D. W. (1998). Remenyi, D., Williams, B., Money, A. and Swartz, E. . In D. W. Remenyi, *Doing Research in Business and Management: An Introduction to Process and Method* (p. 320). London: SAGE.

Robson, C. (2002). *Real World Research: A Resource for Social Scientists and Practitioner-Researchers Second Edition* . Oxoford: Blackwell Publishers.

Rodrigues-da-Silva, L. H., & Crispima, J. A. (2014). The project risk management process, a preliminary study. *Procedia Technology, 16*, 943-949. Retrieved from https://continuingprofessionaldevelopment.org/risk-management-steps-in-risk-management-process/

Rostami, A., Sommerville, J., Wong, I. L., & Lee, C. (2015). Risk Management Implementation in Small and Medium Enterprises in the UK Construction Industry. *Engineering Construction & Architectural Management, 22*(1), 91-107. doi:10.1108/ECAM-04-2014-0057

Saunders, M., Lewis, P., & Thornhill, A. (2009). Analyzing Quantitative Data. In M. Saunders, P. Lewis, & A. Thornhill, *Research Methodology for Business Students Fifth Edition* (p. 414). Harlow, Essex, England: Prentice Education Limited.

Publishing Partner:
Scientific Research Journal (SCIRJ),
ISSN: 2201-2796

Saunders, M., Lewis, P., & Thornhill, A. (2009). Collecting Primary Data Through Observation. In M. Saunders, P. Lewis, & A. Thornhill, *Resarch Methodology for Business Students Fifth Edition* (p. 288). Harlow, Essex, England: Prentice Education Limited.

Saunders, M., Lewis, P., & Thornhill, A. (2009). Collecting Primary Data Using Questionnaire. In M. Saunders, P. Lewis, & A. Thornhill, *Research Methodology for Business Students Fifth Edition* (p. 362). Harlow, Essex, England: Prentice Education Limited.

Saunders, M., Lewis, P., & Thornhill, A. (2009). Collecting Primary Data Using Questionnaires. In M. Saunders, P. Lewis, & A. Thornhill, *Research Methodology for Business Students Fifth Edition* (p. 375). Harlow, Essex, England: Prentice Education Limited.

Saunders, M., Lewis, P., & Thornhill, A. (2009). Collecting Primary Data Using Questionnaires. In M. Saunders, P. Lewis, & A. Thornhill, *Research Methodology for Business Students Fifth Edition* (pp. 378-379). Harlow, Essex, England: Prentice Education Limited.

Saunders, M., Lewis, P., & Thornhill, A. (2009). Deciding What Data Need to be Collected. In M. Saunders, P. Lewis, & A. Thornhill, *Research Methodology for Business Students Fifth Edition* (p. 367). Harlow, Essex, England: Prentice Education Limited.

Saunders, M., Lewis, P., & Thornhill, A. (2009). Describing Data Using Statistics. In M. Saunders, P. Lewis, & A. Thornhill, *Research Methodology for Business Students Fifth Edition* (p. 444). Harlow, Essex, England: Prentice Education Limited.

Saunders, M., Lewis, P., & Thornhill, A. (2009). Examining Relationships, Differences and Trends Using Statistics. In M. Saunders, P. Lewis, & A. Thornhill, *Research Methodology for Business Students Fifth Edition* (p. 461). Harlow, Essex, England: Prentice Education Limited.

Saunders, M., Lewis, P., & Thornhill, A. (2009). Examining Relationships, Differences and Trends Using Statistics. In M. Saunders, P. Lewis, & A. Thornhill, *Research Methodology for Business Students Fifth Edition* (p. 450). Harlow, Essex, England: Prentice Education Limited.

Saunders, M., Lewis, P., & Thornhill, A. (2009). Exploring and Presenting Data. In M. Saunders, P. Lewis, & A. Thornhill, *Research Methodology for Business Students Fifth Edition* (p. 431). Harlow, Essex, England: Prentice Education Limited.

Saunders, M., Lewis, P., & Thornhill, A. (2009). Exploring and Presenting Data. In M. Saunders, P. Lewis, & A. Thornhill, *Research Methodology for Business Students Fifth Edition* (p. 436). Harlow, Essex, England: Prentice Education Limited.

Saunders, M., Lewis, P., & Thornhill, A. (2009). Exploring and Presenting the Datta. In M. Saunders, P. Lewis, & A. Thornhill, *Research Methodology for Business Students Fifth Edition* (p. 429). Harlow, Essex, England: Prentice Education Limited.

Saunders, M., Lewis, P., & Thornhill, A. (2009). Multiple Methods Choices. In M. Saunders, P. Lewis, & A. Thornhill, *Research Methods for Business Students Fifth Edition* (p. 151). Harlow, Essex, England: Prentice Education Limited.

Publishing Partner:
Scientific Research Journal (SCIRJ),
ISSN: 2201-2796

Saunders, M., Lewis, P., & Thornhill, A. (2009). Non Probability Sampling. In M. Saunders, P. Lewis, & A. Thornhill, *Research Methodology for Business Students Fifth Edition* (p. 233). Harlow, Essex, England: Prentice Education Limited.

Saunders, M., Lewis, P., & Thornhill, A. (2009). Non-probability Sampling. In M. Saunders, P. Lewis, & A. Thornhill, *Research Methodology for Business Students Fifth Edition* (p. 241). Harlow, Essex, England: Prentice Education Limited.

Saunders, M., Lewis, P., & Thornhill, A. (2009). Preparing, Inputting and Checking the Data. In M. Saunders, P. Lewis, & A. Thornhill, *Research Methodology for Business Students Fifth Edition* (pp. 417-418). Harlow, Essex, England: Prentice Education Limited.

Saunders, M., Lewis, P., & Thornhill, A. (2009). Selecting Samples. In M. Saunders, P. Lewis, & A. Thornhill, *Research Methodology for Business Students Fifth Edition* (p. 240). Harlow, Essex, England: Prentice Education Limited.

Saunders, M., Lewis, P., & Thornhill, A. (2009). Time Horizons. In M. Saunders, P. Lewis, & A. Thornhill, *Research Methodology for Business Students Fifth Edition* (p. 155). Harlow, Essex, England: Prentice Education Limited.

Saunders, M., Lewis, P., & Thornhill, A. (2009). Type of Secondary Data and Uses. In M. Saunders, P. Lewis, & A. Thornhill, *Research Methodology for Business Students Fifth Edition* (p. 259). Harlow, Essex, England: Prentice Education Limited.

Saunders, M., Lewis, P., & Thornhill, A. (2009). Understanding Research Philosophies and Approaches. In M. Saunders, P. Lewis, & A. Thornhill, *Research Methods for Business Students Fifth Edition* (p. 108). Harlow, Essex, England: Prentice Education Limited.

Saunders, M., Lewis, P., & Thornhill, A. (2009). Understanding your Research Philosophy. In M. Saunders, P. Lewis, & A. Thornhill, *Research Methodology for Business Students Fifth Edition* (p. 113). Harlow, Essex, England: Prentice Education Limited.

Serpell, A., Ferrada, X., Rubio, L., & Arauzo, S. (2015). Evaluating Risk Management Practices in Construction Organizations. *Procedia - Social and Behavioral Sciences, 194*(2015), 201-210. doi:10.1016/j.sbspro.2015.06.135

Serpella, A., Ferrada, X., Rubio, L., & Arauzo, S. (2015). Evaluating Risk Management Practices in Construction Organizations. *28th IPMA World Congress, IPMA 2014, 29 September. 194*, p. 209. Rotterdam, The Netherlands: Elsevier B.V. doi:10.1016/j.sbspro.2015.06.135

Sharaf, M. M., & Abdelwahab, H. T. (2015). Analysis of Risk Factors for Highway Construction Projects in Egypt. *Journal of Civil Engineering and Architecture, 9*(5), 526-533. doi:10.17265/1934-7359/2015.05.004

Szymański, P. (2017, April 24-26). Risk Management in Construction Projects. *2nd International Joint Conference on Innovative Solutions in Construction Engineering and Management. 208*, pp. 174-182. Poznan, Poland: Elsevier B. V. Retrieved from https://doi.org/10.1016/j.proeng.2017.11.036

Tagod, M., Adeleke, A. Q., & Moshood, T. D. (2021, March 20). Coercive pressure as a moderator of organizational structure and risk management: Empirical evidence from

Malaysian construction industry. *Journal of Safety Research*, *77*(June 2021), 139-150. Retrieved from https://doi.org/10.1016/j.jsr.2021.02.011

Thompson, R. (2020, December 27). *Analysing the UAE construction and transport projects pipeline*. Retrieved August 08, 2021, from https://www.meed.com/analysing-uae-construction-and-transport-projects-pipeline

U.S BUREAU OF LABOR OF STATISTICS. (2021, September 11). *Industry at a Glance - Specialty Trade Contractors: NAICS 238*. Retrieved from U.S. BUREAU OF LABOR STATISTICS: https://www.bls.gov/iag/tgs/iag238.htm

U.S. BUREAU OF LABOR STATISTICS. (2021, August 26). *Industries at a Glance*. Retrieved from U.S BUREAU OF LABOR STATISTICS: https://www.bls.gov/iag/tgs/iag23.htm

U.S. BUREAU OF LABOR STATISTICS. (2021, September 10). *Industry at a Glance - Construction of Buildings: NAICS 236*. Retrieved from U.S. BUREAU OF LABOR STATISTICS: https://www.bls.gov/iag/tgs/iag236.htm

U.S. BUREAU OF LABOR STATISTICS. (2021, September 10). *Industry at a Glance - Heavy and Civil Engineering Construction: NAICS 237*. Retrieved from U.S. BUREAU OF LABOR STATISTICS: https://www.bls.gov/iag/tgs/iag237.htm

Venkatesan, S., & Kumanan, S. (2012). Supply chain risk prioritisation using a hybrid AHP and PROMETHEE approach . *International Journal of Services and Operations Management , 13*(No. 1), 30.

Welman, C., Kruger, F., & Mitchell, B. (2005). *Research Methodology*. Capetown: Oxford University Press.

Wysocki, R. K. (2004). *Project Management Process Improvement*. Boston, MA, United States of America: Artech House, Inc. Retrieved September 28, 2021

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Appendices

Figure 1 GSM Greenfield Palm Tree Monopole Model (Alibaba, 2021)

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Figure 2 GSM Greenfield Camouflaged/Monopole Model
(Al-Babtain Power & Telecom, 2021)

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Figure 3 GSM Greenfield Self-Support Tower and Monopole Model
(Al-Babtain Power & Telecom, 2021)

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Figure 4 GSM Rooftop Non-Penetrating Pole Model

(Al-Babtain Power & Telecom, 2021)

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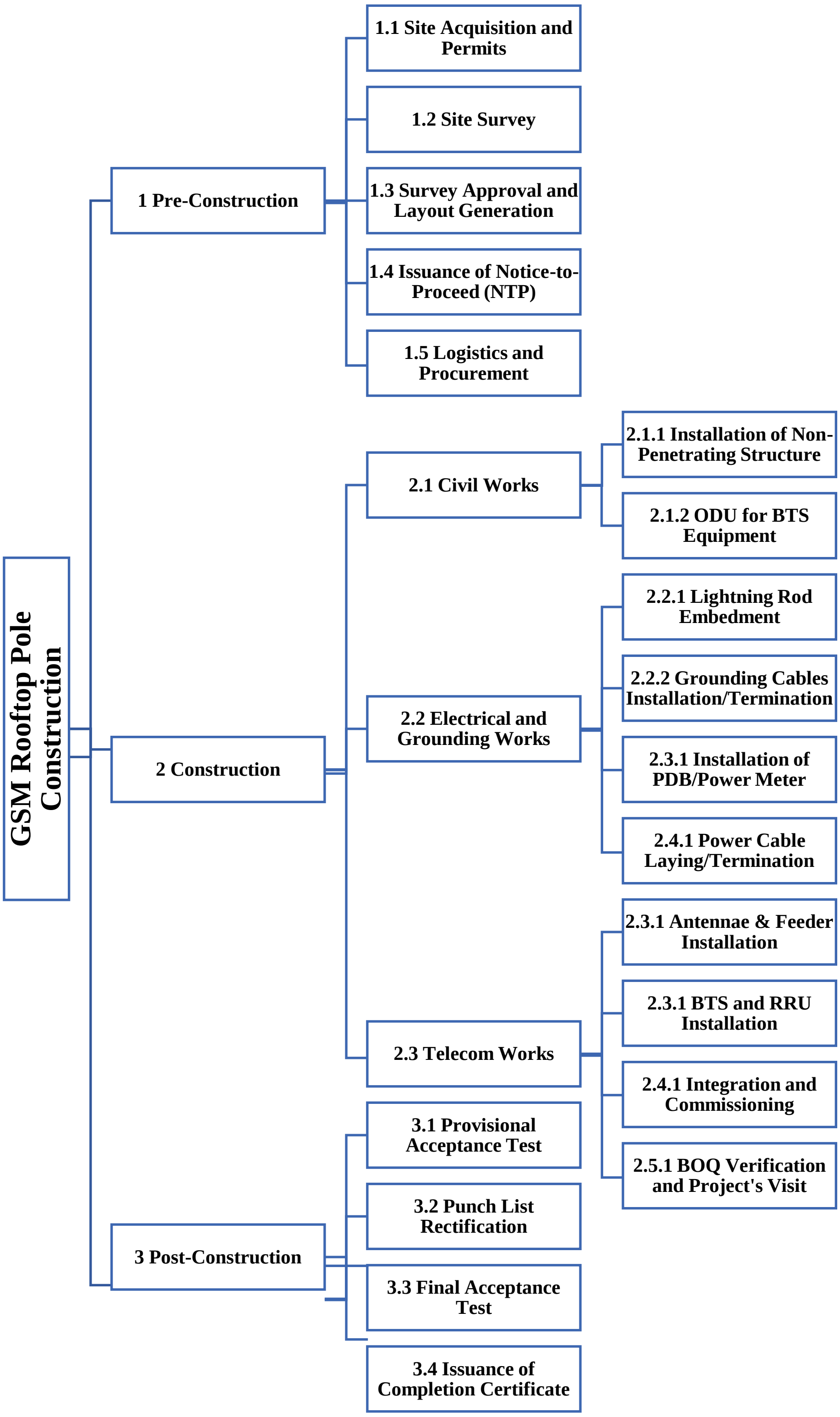
Diagram 1 Work Breakdown Structure for GSM Rooftop Pole Construction
(Project Management Institute, 2013)



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	Risk Type	No.	Risk Description
Sources of Risks	Management Risk	Q8	Unacceptable lease rental value
		Q10	Unavailability of skilled labor
		Q17	Need for Telescopic Boom crane
	External Risk	Q7	No LOS due to Environmental factors
		Q11	Stop working order, due to police records submission
		Q13	NTRA certificate not issued due to protocol violations
	Technical Risk	Q9	Building structurally unsafe
		Q18	Need for special camouflages
	Commercial Risk	Q12	Weak tower galvanization
		Q14	Materials increasing prices
		Q15	Materials shortage
		Q16	Insufficient experience

Table 1 Risk Sources with Risk Description for Global Mobile Sites
(Eid, Georgy, Osman, & Ibrahim, 2015)

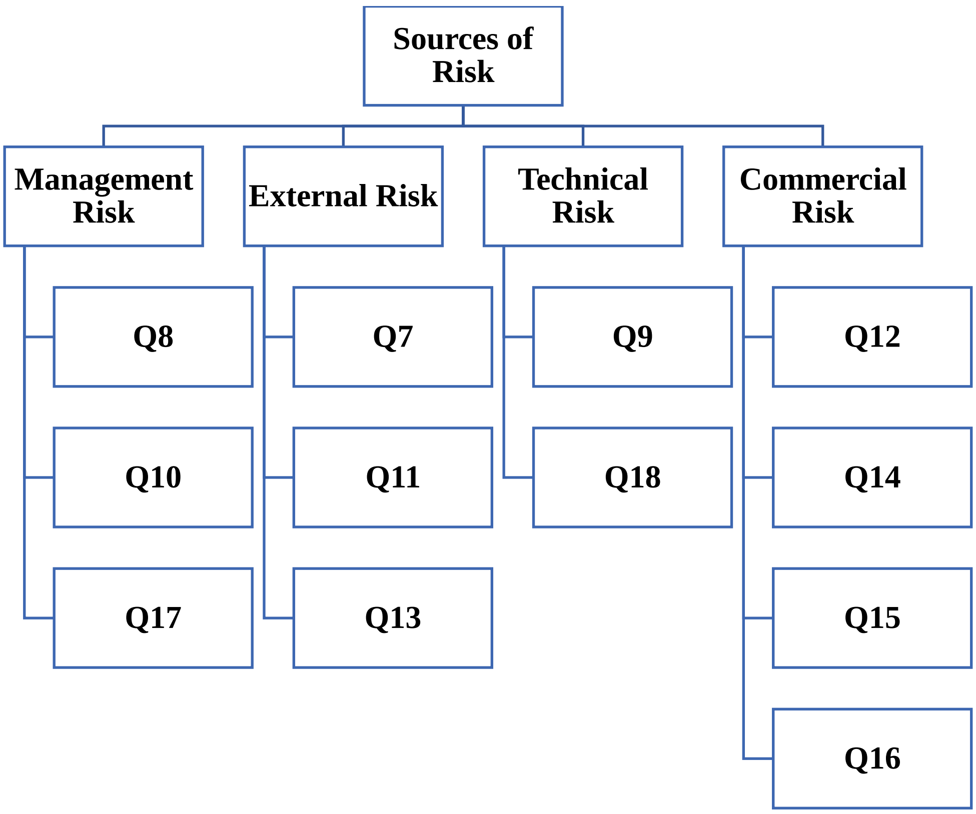

Diagram 2 Risk Breakdown Structure for GSM Rooftop Pole Construction
(Project Management Institute, 2017)

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	Risk Type	No.	Risk Description
Sources of Risks	Management Risk	Q38	Failure to observe proper safety protocols during site work could lead to a near-miss or a worse scenario.
		Q42	The delivery of BTS equipment is the customer's responsibility. It will be delayed for 15 days, which means another crane will be used, resulting to project delay and extra costs to be borne by the in-house and sub-contractor.
		Q44	Site acceptance is postponed for another week which could trigger additional costs and project completion.
	Technical Risk	Q35	Sub-contractors who are not aware of the specifications of the project could lead to installation errors, cost increases and project delays.
		Q37	Potential errors/defects on poles fabrication are imminent should there be no reference drawings and designs to be followed by the supplier.
		Q41	Different inspectors from the client with different identification and interpretation on materials quality would lead to a potential major punch list during the site inspection.
	Commercial Risk	Q36	The Galvanization quality of pole materials that are not checked properly from the source will result in inadequate quality and defects.
		Q39	The delivery of pole items will be delayed for 1 week, leading to project delay and a penalty from the customer for 7 days of extension.
		Q40	Incomplete fittings for grounding and earth installation could lead to the compromise of buying low-quality items from other suppliers.
		Q43	Additional work by the customer could lead to project delay and cost overrun especially when variation orders are not stated or part of the contract clause.

Table 2 Risk Sources with Risk Description - GSM Rooftop Pole Construction

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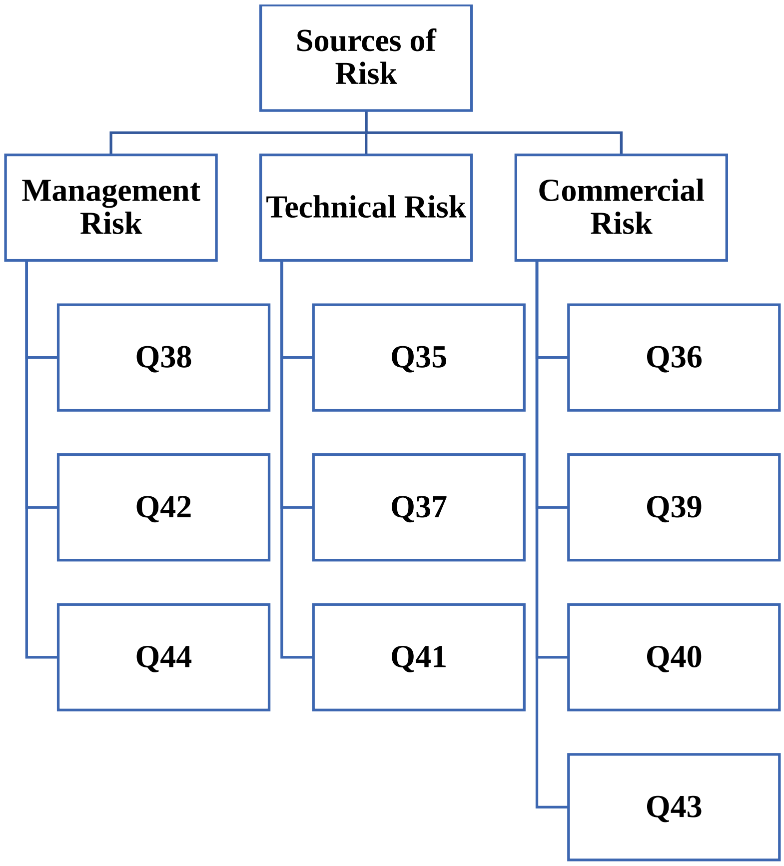

Diagram 3 Risk Breakdown Structure for GSM Rooftop Pole Construction
(Project Management Institute, 2017)

Scale	*Effect*	*Description*	*Probability*
1	Very Low	Very Rare Occurrences	< 1.0
2	Low	Indirect Evidence of the Occurrence of the Risk	1.1 to 2.0
3	Moderate	Direct Evidence of the Occurrence of the Risk	2.1 to 3
4	High	Strong Direct Evidence of the Occurrence of the Risk	3.1 to 4.0
5	Very High	Occurs Frequently	4.1 to 5.0

Table 3 An Illustration of the Probability Assessment Scale
(Venkatesan & Kumanan, 2012)

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Relative	Risk Score
Very low	1
	2
	3
Low	5
	6
Moderate	8
	9
	1 0
High	12
	15
	16
Very high	20
	25

Table 4 **Risk Exposure Scale** (Lavanya & Malarvizhi, 2008)

Project Objectives	Very Low (0.05) or = 1	Low (0.10) or = 2	Moderate (0.25) or = 3	High (0.50) or = 4	Very High (0.85) or = 5
Cost	Cost increase > 0%	Cost increase > 5-10%	Cost increase > 11-25%	Cost increase > 26-50%	Cost increase > 51-85%
Schedule	Overall project schedule > 0 days	Overall project schedule > 2 days	Overall project schedule > 5 days	Overall project schedule > 10 days	Overall project schedule > 20days
Scope	Scope decrease barely visible	Minor areas of scope are affected	Major areas of scope are affected	Scope decrease unacceptable to the client	The project scope is rejected by the client
Quality	Quality defects barely visible	Quality defects do not affect vital functionality	Quality defects require client approval	Quality defects unacceptable to the client	Project quality is rejected by the client

Table 5 **Impact Assessment Scale** (Lavanya & Malarvizhi, 2008)

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Risk Reference No.	Risk Category	Risk Description	Probability	Impact	Risk Score (Probability x Impact)	Risk Response	Risk Owner
1	Project Team (Internal)	Sub-contractors who are not aware of the specifications of the project could lead to installation errors, cost increases and project delays.	5	4	20	Mitigate: Conduct a meeting with sub-contractors to discuss the expectations about the project objectives.	Project Manager
2	Project Team (Internal), Vendors	The Galvanization quality of pole materials that are not checked properly from the source will result in inadequate quality and defects.	5	4	20	Enhance: Request the supplier to provide regular testing with a checklist, signed by the authorized inspector from both parties	Project Manager, Procurement Manager, Warehouse Manager
3	Project Team (Internal), Vendors	Potential errors/defects on poles fabrication are imminent should there be no reference drawings and designs to be followed by the supplier.	4	4	16	Avoid: Conduct necessary briefing with suppliers to be familiar with the notes, terms and conditions stated in the drawing's specifications.	Project Manager, Procurement Manager, Quality Manager
4	Project Team (Internal)	Failure to observe proper safety protocols during site work could lead to a near-miss or a worse scenario.	3	5	15	Mitigate: Require and provide necessary safety training to all staff working at the site.	Project Manager, Health and Safety Manager
5	Project Team (Internal),	The delivery of pole items will be delayed for 1 week, leading to project delay and	5	3	15	Exploit:	General Manager,

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	Vendors	a penalty from the customer for 7 days of extension.				Perform a cash flow analysis on regular basis to monitor and identify the cash flow problems. Then, increase the resources and material quality to impress and satisfy the customer.	Finance Manager, Procurement Manager, Project Manager,
6	Project Team (Internal), Vendors	Incomplete fittings for grounding and earth installation could lead to the compromise of buying low-quality items from other suppliers.	4	4	16	Avoid: Get approval from the customer to validate the other unbranded items to be "approved equivalent" in terms of materials quality.	Procurement Manager, Project Manager
7	Project Team (External), Project Team (Internal),	Different inspectors from the client with different identification and interpretation of materials quality would lead to a potential major punch list during the site inspection.	5	3	15	Accept: If the supporting documents could not justify the quality features the inspectors want to see on-site; then, the contractors must be keen enough to be flexible in delivering quality services while building a good relationship.	Project Manager, Quality Manager
8	Project Team (External), Project Team (Internal)	The delivery of BTS equipment is the customer's responsibility. It will be delayed for 15 days, which means another crane will be used, resulting to project	5	5	25	Share: Get approval from the customer to validate the additional cost to compensate for the expenses being borne by the contractor. Any form of	Project Director (External), Chief Financial Officer (External),

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		delay and extra costs to be borne by the in-house and sub-contractor.				project delay is not to be imposed under contractor expense.	Procurement Manager (Internal) Project Manager (Internal)
9	Project Team (External), Project Team (Internal)	Additional work by the customer could lead to project delay and cost overrun especially when variation orders are not stated or part of the contract clause.	4	5	20	Avoid: Variation cost must be part of the contract clauses. It must be agreed upon mutually during the bid negotiation process.	Project Director (External), Contract Manager (Internal) Project Manager (Internal)
10	Project Team (External), Project Team (Internal)	Site acceptance is postponed for another week which could trigger additional costs and project completion.	2	3	6	Share: The customer must be informed on the same day that any project delay is not the contractor's liability. It must be documented through email.	Project Acceptance Team (External), Project Acceptance Team (Internal) Project Manager (Internal)

Table 6 Risk Register Template for GSM Rooftop Pole Construction
(Lavanya & Malarvizhi, 2008)

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Object 1 Questionnaire from Survey Monkey Website

Adobe Acrobat Document

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