Influence of organisational delay risk factors on project critical success factors in construction projects in the UAE

تأثير مخاطر التأخير التنظيمية على العوامل الرئيسية لنجاح
مشاريع الإنشاءات في دولة الإمارات العربية المتحدة

by

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Abstract

Construction sector has witnessed a boost in number of projects in the past decade in the UAE. With the advancement in technology and experts, large number of complex projects are taking shape but has many organisational related risks. Project delays are the most common challenges faced by several construction organisations which leads to major effect on overall project time, cost and quality. The goal of this research paper is to identify the influence of the organisational delay factors causing risks on project success in construction projects based in the UAE. Related literature was studied, the aspects were identified into three vital project bodies such as client, consultant and contractor. Several organisational risks rooted with these parties were recognised. Additionally, the triple constraints are taken into consideration in order to comprehend the effect that lead to the development of the conceptual framework that incorporates the highlighted factors. This is used as a fundamental base for performing the quantitative analysis through questionnaire. The acknowledgment from the analysis resulted in various findings such as project time and cost being hindered most of the time with 46.5% and 37.2% respectively. The three hypotheses that stated contractor organisational delay risk factors have a significant influence in time, cost and quality success factors in construction projects in the UAE, were accepted by making contractors the highest risk generators. Unconventional to the discoveries made in the literature review that were anticipated to be reflected on the findings of the study, it was concluded that least number of risks were originated from the clients, who only affected the duration of the project. Hence, verifying how effectively clients carry out their financial capabilities and selection of specifications. Lastly, another contradictory factor identified which should be given prominent significance is the contractual documentations that has ranked to be the top risk factor. Therefore, this proceeded to recommendations including advices to the project participants and techniques to enhance project success which form a guideline for overcoming the organisational risks in construction projects. Nevertheless, this study implies to raise awareness of the risks which are typically unintentionally excluded during planning, indicate the critical factors to be considered and bridge the gaps towards project success.

نبذة مختصرة

شهد قطاع الإنشاءات في دولة الإمارات العربية المتحدة زيادة في عدد المشاريع خلال العقد الماضي. ومع التقدم في التكنولوجيا والخبراء، يتشكل عدد كبير من المشاريع المعقدة والتي تنطوي على العديد من المخاطر التنظيمية. تأخرتسليم المشروع هو من أكثر التحديات التي تواجهها العديد من شركات الإنشاءات، والذي يؤدي إلى تأثير كبير على الوقت الإجمالي لإنجاز المشروع والتكلفة والجودة. هدف هذا البحث هو تحديد تأثير عوامل التأخير التنظيمية التي تسبب المخاطر على نجاح مشاريع الإنشاءات في دولة الإمارات العربية المتحدة .تم إجراء بحث نوعي من خلال مراجعة الأبحاث المختصة بذات الموضوع، وتم حصرالعوامل في ثلاثة مجموعات وهي العميل والاستشاري والمقاول. وأدى ذلك إلى تطوير الإطار الذي يتضمن عوامل الخطر التنظيمية البارزة وعوامل النجاح الحاسمة للمشروع ليتم استخدامها في بناء استبيان لإجراء تحليل كمي لاستطلاع آراء عينة من المختصين ، حيث كان المستجيبون أفرادا ينتمون إلى مجال العملاء والاستشاريين والمقاولين. نتج عن تحليل الاستبيان تحديد تأثيرات مختلفة للمخاطر التنظيمية على الوقت والتكلفة والجودة تنتهي هذه الدراسة بتقديم إرشادات يجب على الممارسين اتباعها لتخفيف تأثير المخاطر التنظيمية لتعزيز نجاح المشاريع.

Dedication

I dedicate my dissertation to my parents. Their enormous encouragement and guidance has helped me along this journey. I also extent this dedication to my brother for being my support system. Lastly, I am thankful to my friends and loved one for their motivation.

Acknowledgement

I would like to take this opportunity to express my sincere appreciation to my dissertation supervisor, Dr. Khalid Almarri, for his assistance during the progress of my research paper. I would also like to thank all my instructors of the project management programme who have given me appropriate knowledge and understanding of my major. Finally, I would like to thank my classmates for their advice through my journey.

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1. Introduction

1.1. Background

A nation is primarily recognised for its infrastructure, where one of the most significant sectors are buildings. Construction industry aids in the development of an economy as it heightens the GDP, employment, manufacturing industry and financial services as stated by Ibrahim et al., in 2010 (cited in Jia 2015). In the past decade, many countries have been contributing to the growth of their economy with construction projects that help in urban development. In this excursion, many projects fail due to the most common reason of project delay that has an effect on overall project success.

As mentioned by Abdelhadi (2015), it is guaranteed that a project will slip out of its expected duration which leads to undesirable impacts such as deteriorated quality and augmented cost. A study performed by Flyvbjerg and Holm in 2002 (cited in Jia 2015) resulted in a city like Chicago which is known for its iconic structures, 9 out of 10 projects faced schedule delays. Another example specified was of Saudi Arabia, where it was found that only 30% of the projects meet their deadline and typically delays were between 10-30%. Delay is one of the known factors that the construction industry has been continuously facing which is mainly observed in large complex projects. Also discussed by Jia (2015), every project comprises of three key constraints which are time, cost and quality; also known as triple constraints. They are interlinked to each other in a way that if an imbalance occurs to one of them, the other two constraints will have a major impact. Thus, this a sensitive aspect that needs to be managed evidently.

Moreover, project delay is generally defined as a project running beyond its expected completion date which the project parties have agreed upon as described by R and Ramya (2015). Current construction projects have

the involvement of several parties, higher standards and complex technologies which makes the completion close to impossible to be on schedule. There are several reasons of delay in projects, for example design changes, drawing mishaps and failure in structure; these are associated to the three major projects parties such client, consultant and contractor. Braimah (2013) highlighted the impact on each of these bodies are on the client who cannot make use of the project on time, the consultant faces municipal warnings and contractors pays for each day to be under construction. Mostly, the contractor faces major issues but if the changes are incurred by the client then the contractors are not held accountable for extra charges. Construction industry is unique as compared to other industries and they consist of uncertainties that give rise to complex unpredictable factors which highly require a thorough understanding of a project before execution. Therefore, client, consultant and contractor yield the key organisational delay risk factors that have a direct influence on project success factors.

A project is considered successful when it has been handed over to the client within the anticipated time, cost and quality success factors. Delays are one of the most crucial risk factors that result in failing to achieve the targeted goals and deliverables. As discussed by Srdic and Selih (2015), a project consists of numerous interconnected activities carried out by different participants. It also involves encountering unplanned events; and constantly changing project activities, participants and environment stated by Belay, Tekeste and Ambo (2017). The issue starts from the very beginning of the project stage and links to changes to proceeding stages. These stages are planned by the involved individuals who are unaware of the risk factors and eventually face risks. As every project is different from each other and has a specific start and end time, estimated budget; and quality standards, thus, they need to be managed appropriately.

Project management plays a crucial role in carrying out the project stages in harmony and meet its requirement with the application of various knowledge, skills tool and techniques. It has been divided into five process stages also known as the project life cycle that every project go through such as initiation stage, planning stage, execution stage, monitoring and control stage, and closing stage. The one vital process stage is the planning stage, where majority of the risks take shape into catastrophe in the proceeding stages. Project management further comprises of ten areas of knowledge such as integration, scope, time, cost, quality, procurement, human resources, communication, risk management and stakeholder management explained in Pmi.org (2018). In addition to the knowledge areas, time, cost and quality are components of the 'iron triangle' or triple constraints that defines the success level of a project; and is a vital body of project management. If observed closely, all causes of delays are generated from these aspects. When these stages are carefully planned and managed cautiously, the delay risk factors can be avoided.

Furthermore, in the past decade, UAE has rocketed through the recent fall in oil prices by achieving major development milestones. The country has forecasted in diversification of its non-oil sectors with the expected increment in 3.5% GDP by 2020 as reported by Augustine (2017). Being the prominent tourist attraction country with the world's tallest building and largest man-made island, UAE is recognised as a part of the swiftest emerging countries in the GCC. As predicted by Algethami (2016), the country will witness a rise in tourist of 20 million by 2020 as compared to 15 million in 2016, this is in regards of winning to host the Expo 2020 in 2013 that has shifted focus from oil to construction sector. This shift has reduced oil dependence and has initiated a reliance on creating tourist attractions, airports and hotels. But it's no different to other nations that faces construction risks. With the introduction of value added tax (VAT) from January 2018, construction sector is expected to face moderate rise in construction and materials costs forecasted by Shah (2017). In addition

to the cost of construction and VAT, if the projects stay longer under construction it will incur higher total cost. Thus, a project requires to be handled prudently in order to stay within its expected requirements.

1.2. Problem Statement

Delay has become one of the main concerns to the project participants as the swift progression in the construction sector. The progress has strained projects due to large scale and high standards. Delay in projects consequence in obstacles evolved from organisational parties associated with the project, which not only effects time but also causes degraded quality and increased budgets. Several projects have been accomplished until structural phase without prior arrangement of financial details. Some additional causes maybe due to client's variations in design at implementation stage, delay in planning due to lack of expertise and contractor's scarcity in number of resources. Thus, careful preparation should be made from the initial stage to completion stage for organisational contentment. Else, it will outcome in numerous obstacles along the project life cycle. Additionally, in the process of collecting information in the UAE, it was found that inadequate number of studies have been performed on impact of organisational delay risk factors on project critical success factors in construction projects and how to overcome those issues. Insufficient studies have been conducted on how client, consultant and contractor; delay risk factors effect time, cost and quality; project critical success factors. Thus, this research paper is an attempt to enlighten these factors causing obstruction in project success in order to facilitate with appropriate knowledge and understanding.

1.3. Aim and Objectives

The aim of this research is to ascertain the organisational delay risk factors on project critical success factors in construction projects in the UAE, as UAE has a persistent concern on successful completion of projects. Numerous factors emerged that instigate the issue with analysis of several prospective to understand the core. Also to identify and recognise how the

key organisational contributors such as client, consultant and contractor related delay risk factors effect project critical success factors such as time, cost and quality that can lead to project failure. Moreover, the objectives of this study is to deliver a thorough knowledge of the prompting factors, the influence of organisational risks has on the end product. This research will also highlight how delay risks has an impact on each of the components of the 'iron triangle' and suggest suitable mitigation improvements or alternatives to avoid disputes that can be considered to relieve the problem as future reference for the associated project parties. Thus, this study implies in spreading awareness of the risks and success factors amongst construction associated personals that needed to be contemplated during different project phases for a successful outcome.

1.4. Scope of the Study

Literature review from interrelated journals and researches will offer supportive data to categorise the organisational delay risk factors and project critical success factors. Based on the identified aspects from the literature, a conceptual framework is developed which consists of the variables based on which questions are set to perform the survey. The questionnaires will be distributed to several clients, consultants and construction related individuals whose companies are based in the UAE. Investigations are set to be executed and an analysis will be performed with discussion of the results to elaborate the data findings into meaningful information. Therefore, the study is divided into two sections; qualitative (literature review and conceptual framework) and quantitative (questionnaires and results).

1.5. Research Questions

- What are the chief causes of organisational delay that effect the successful completion of a construction project in the UAE?
- How risk factors influence the critical success factors?
- Which critical success factors are utmost influenced by risk factors?
- Which factors are key to a successful project?
- What proper actions must be taken to overcome or minimise the effect?

1.6. Research Structure

The research paper has been chronologically structured in which it has been divided into seven different chapters. Where, the first chapter is the introduction to the paper, beginning with a background knowledge of the research topic. It also states the problem along with what the study is going achieve in the form of aims and objectives. It further explains the scope and chief research questions as mentioned previously.

Moreover, the second chapter consist of the literature review which provides viewpoints of several past researchers on the topic of delay in construction projects. Project life cycle and types of delay are briefly studied. Further explaining the root risks by the major involved project parties and their influence. Along with project critical success factors are also discussed which defines a successful project. These factors are put together in two tables' organisational delay risk factors and project critical success factors table respectively with their resources. Thus, following with the proposed hypotheses of the study.

The third chapter contains the conceptual framework which provides an overall framework for the quantitative analysis in the following chapter. The framework incorporates the qualitative research data such as the identified factors as variables which are structured to help perform a logical data analysis.

Furthermore, the fourth chapter is the research methodology which states how the study is going to be performed quantitatively. It states the form of data collection, the geographical location and the participants.

The fifth chapter covers the data analysis and discussion of the collected data. Here the data is tested to bridge a connection between the identified literature review factors and reality. It further discusses the results of each test.

The sixth chapter consists of recommendations that are derived from the data analysis and discussion. It provides knowledge and understanding about the techniques and procedures that aid in avoiding the issue and ideas to be taken into account in future projects by project managers or related personnel in construction projects.

Finally, the seventh chapter consist of research conclusion which discusses the knowledge gained from the performed study, how the research can be further continued along with limitations encountered in this study.

2. Literature Review

Project delay risks in construction projects are exceptionally common as compared to various types of project in other industries (Gardezi, Manarvi and Gardezi, 2014). This is a repetitive dispute in the engineering system and occurs along the life span of a project which requires professional techniques to handle the scope of a project added by Jude Emeka (2016). Aziz (2013) shares that organisations often fail in critically analysing delays which leads to creation of emergency plans that often hinder time, cost and quality. Thus, Braimah (2013) stated that it is an extremely challenging problem as compared to other issues in a construction industry.

2.1. Previous Studies on Causes of Delay

Recently, various researchers around the world in different regions and backgrounds have conducted in-depth studies on the matter of delays in construction projects. Adekunle and Ajibola W (2015) led a causative assessment in Nigeria. The study was split into four major divisions, each being client, consultant, contractor and incidental related causes. The results showed that incidental related factor, force majeure or act of God played a key role in project delays. Along with other major factors related to contractor incapability in planning and scheduling the activities which led to making improper use of resources and failure in financing the project temporarily. While clients' delay in scheduled payments is the second most critical issue. It was also found that consultants played a minor role compared to other parties but yet contributed due to unfinished detailed drawing, lack of regular site supervision by the site engineer and improper or incorrect design and contract papers. Similarly, James et al. (2014) also held an analysis in Nigeria, where, half of the total percentage (51.1%) was due to client, and the other half with higher percentage (35.5%) was the contractor and the least (13.3%) by consultants. This result support Adekunle and Ajibola W (2015) with additional causes such as feeble communication within client, consultant and contractor. Client indecisiveness on various project stages such as delay in choosing building

materials and employees stop the work due changes in rules and regulations of the organisation or municipality.

Moreover, Srdić and Šelih (2015) survey in Slovenia resulted in two main equally significant causes which were higher authority or municipality hindrance in issuing building permit that directly links to another cause of deficiency in design and specification in the drawings of the proposed building. The study also stated clients' slow decision making and inappropriate contract documentations being the next two major causes along with repetitive changes made by the client. They stated that these factors appear at beginning phases of the project which stops the project to reach the execution stage in several cases. Another study conducted in India by Meena V and Babu (2015) concluded that contractors are key contributors to time overruns holding around 50% of the delay group and labour factors being more than 60% with associated reasons being scarcity in man power, conflicts amongst labourers, lack of skills, technical knowledge and productivity. External factors, equipment and material related equally in the lead by 56%. Top causes were acquiring building permits and act of God, unavailability of latest equipment as a requirement of special project, in availability of materials in the local market leads to importing materials which consumes time; respectively. It is also seen that architects' delay in design and client changes are equivalent to contractors' issues which were also lack in finance and need of modification in construction.

Furthermore, Shah (2016) investigated two case studies based in Australia and Ghana in order to diversify the research. Firstly, it was found that Australia faces major setbacks in their planning and scheduling of the projects by both consultants and contractors instigates reduced performance. Secondly, lack in contractors' methodologies in construction process and poor site supervision by site engineers. Finally, poor labour productivity which seems to be a common reason all around the world.

The second study in Ghana resulted in delay in payments because the country being undeveloped. This reason also links to another factor stated by clients which is improper cost estimation by the contractors as they urge to obtain more profit out of a project. Consultants stated that in majority of the cases the contractors don't understand the complexity of a project they are undertaking. Yet another study performed in Ethiopia by Koshe and Jha (2016) who ranked the project completions. It was seen that 51% never completed within the estimated date and 8.25% completed on time. Further details of the causes were similar to the previously mentioned studies. In addition to that, they added lack in survey and data of the plot before designing the building that lead to changes in drawings and specification in the future upon executing the project.

Finally, Gunduz and Abuhasan (2016) conducted a study in Qatar and is anticipated to have factors comparable to the UAE. The results from the 179 respondents on 42 critical factors were elaborated. Based on relative importance index (RII) the top five factors are deferment in making decisions by client, improper site observation and administration by contractors, lack of available local materials, changes in specifications by clients and shortage of labourers. The survey results were further ranked based on frequency index (FI) values. The top ranked was lack in efficiency of labourers, sub-contractors delay in completion of allocated activities, changes made by clients, longer time taken by clients to approve drawings and lack of skilled labours.

2.2. Overview of Construction Industry in the UAE

UAE is one of the countries which has developed into a hub of international investors for property investment which resulted in the rise of GDP and population as stated by Motaleb and Kishk (2010). Transformation of barren lands to first-class roads, high-rise buildings and airports has amplified in a short course of time in both federal and local levels due to increasing investment-return mentioned by Zaneldin (2006). Conferring to the study Zaneldin (2006), UAE is set to brand Abu Dhabi and Dubai as their tourist grounds, business centres and industries/factories with the construction of residential buildings, amusement parks, commercial projects such as malls, hotels and offices. UAE has currently focused on developing the construction sector despite the global financial crisis which has hindered the economy (Motaleb and Kishk, 2010).

Mensah and Asubay (2015) proclaimed that 5-10% of GDP is contributed by the construction sector and grows around 7-8% per year globally across several countries. Motaleb and Kishk (2010) stated that construction industry has a good share to the GDP. It is a widely known fact that UAE attracts foreign companies and investors to the region due to which there is a fusion of nationalities with different background about construction that sometime lead to delay in projects. Ren, Atout, and Jones (2008) added due to this matter that Dubai encounters complications for its distinctive culture, extraordinary architecture, and superior quality specification, shortage in labour and cultural disagreements. They further investigated the delay causes due to client, consultant and contractor. Client factors were impractical duration which is common as they don't have the knowledge about engineering and the stages; and irregular payment is a key factors that can bring a project to halt or delay project activities. Major consultant factors were stated to be incomplete or improper drawings provided to the contractor that may affect the building composition and not meet the clients' needs; and incorrect contractual

documents which is a major cause of conflict between parties, resulting in delays. It is said that contractors play a most important role in delaying projects such as mistakes in construction and not communicating changes internally within the contractors' employees and externally with client and consultant. In a recent study conducted by Ur Rehman (2015) highlighted top ten causes of delay where lagging in synchronisation of architectural and structural works with mechanical-electrical-plumbing (MEP) works took the first stand. This is a critical issue as in most cases there are clashes between these components during the execution stage. Second, the selection of the lowest bidder (contractor) to perform the construction as the contractor may have provided a lower cost with also being poor in overall project quality. Third, late drawing approvals by the higher authorities. Forth, with increase in requirement margin by the client, delay in supplier delivery puts work on hold. Fifth, client changes in orders either by removal or additional specifications. Sixth, planning and scheduling a project is highly crucial but in order to save time, organisations skip on this stage of a project which leads to unexpected variations. Seventh, in availability of labourers and equipment is the result of poor planning. Eighth, contractor's poor management and characteristic of the end results; creates disputes with clients. Ninth, getting client approvals is one of the least but still contribute to delay. Finally, the least serious issue stated was the unrealistic contract duration which again results due to poor scheduling. Therefore, from the two studies performed by Ren, Atout, and Jones (2008) and Ur Rehman (2015) in different years where 2008 was when UAE faced crisis and 2015 being the latest, it can be observed that there are yet common risk factors that still persist and needs to be appropriately managed.

2.3. Project Life Cycle

Development of a project emerges by succession from one phase to another that is known as the project lifecycle. It constitutes of a start and finish point at either ends of the five stages. It is important to understand the elementary components to gain a better understanding the root of the risks. Thus, Saad (2011) described the cycle. Each of the five phases have been briefed as below (Figure 1):

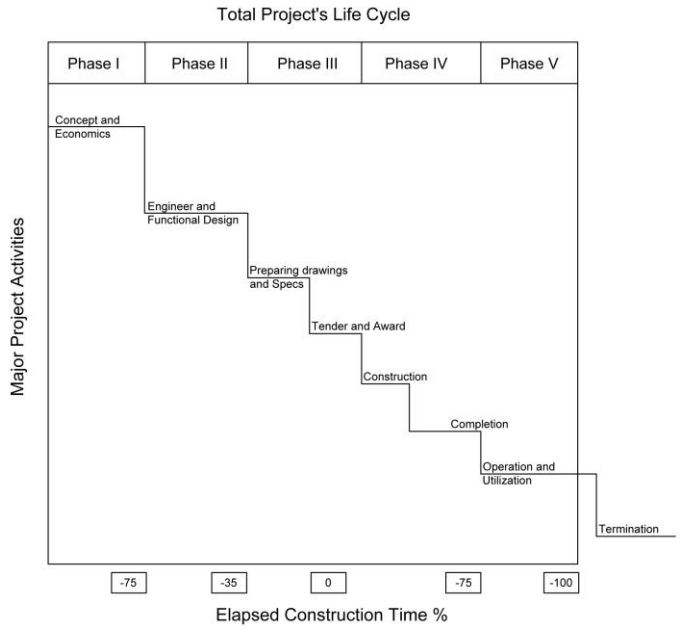

Figure 1 Project Phase Overview (Saad, 2011)

- **Phase I:** Conceptual Planning and Economic (Feasibility) Phase

  Initiation of a project starts due to need of building a facility for clients on a specific site. Some crucial planning such as concept analysis, technical and economic feasibility and environmental factors need to be considered before developing drawings and begin construction by consultants and contractors respectively.

- **Phase II:** Engineering and Functional Design

  In this stage, architects/designers and engineers perform maximum activities along with equal client contribution is crucial, which are divided as follows:

1. Preliminary Engineering and Design

   After Phase I, the current stage comprises of activities such as design concepts, assessment of alternative processes, decisions and financial study.

2. Detailed Engineering and Design

   This is one of the important phases where successive breakdown, structural design is carried out with regards to safety and performance which forms detailed drawings and specifications for the contractor to start construction. These activities are performed by architects/designers, engineers belonging to civil and MEP disciplines.

- **Phase III:** Includes three sub-phases

1. Preparing Drawings and Specifications
2. Tender and Award
3. Procurement

   As soon as the previous phase is completed, the consultant is required to get the approval of the client for authorising the project and organise tender documents for the selection of contractor. After the contractor has proposed a cost which is accepted by the client, the contract is signed. The contract outlines project charter, scope of work, plan management, terms and conditions, technical specification along with final drawings. Thus, raw materials and equipment are arranged to start the project.

- **Phase IV:** Construction and Completion of the Project

  This phase is vital as it takes up maximum of the time of the project; where contractors turn blueprints to reality. Management and administration of employee/labours, raw materials and equipment, duration, finance and quality are handled. Moreover,

with the progression of the project, site supervision is carried out for certain activities and errors are reported for rework. Thus, upon the completion of all the specified work and satisfaction of the client, the project is then closed.

- **Phase V:** Operation and Utilization

  On a course of 20 to 25 years, the operational time of the project after closing, where the client may perform routine maintenance of the facility.

2.4. Classification of Construction Delays

It is highly essential to understand the type of delay that has occurred in order to determine the accountable party such as client, consultant and contractor; and the effect on the project success (Meena V and Babu, 2015). They are classified as mentioned in the diagram below (Figure 2):

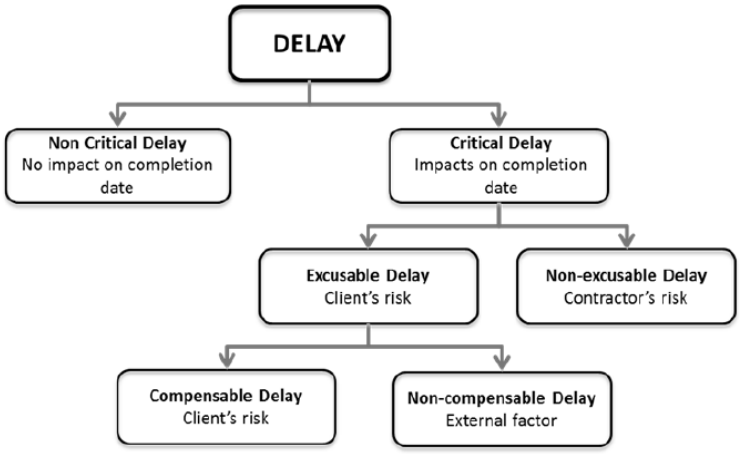

Figure 2 Types of Delays (Prinsloo, 2016)

2.4.1. Critical vs. Non-critical Delays

A delay event that affects the end date of the project is called critical delays. On the other hand, delays that don't affect the completion date are known as non-critical delays (Meena V and Babu, 2015). This delay depends on the project activities that take major durations of the project such as contractors' techniques of scheduling the project in construction phase (Mali and Warudkar, 2016).

2.4.2. Excusable vs. Non-excusable Delays

Events such as force majeure (act of God), fire in facilities, employee strikes, natural disaster, changes induced by the client, technical errors in drawings and site conditions are excusable delays. This type of delay is past the control of the contactors and nothing can be done other than to accept the loss. There are two situations in which the contractor is given compensation and no compensation. When client makes changes to the design in the later stages of the project, the contractor is given compensation along with time extension. Another situation is when labour strikes, unforeseen weather conditions and supplier delay; in this case the time extension is granted without compensation (Mali and Warudkar, 2016). Whereas, non-excusable delays are in control of the contractors or external suppliers and are due to factors of ignorance. Some of them are lack of adequate contractor performance, lack of workers, unmanaged timely supply of materials by suppliers, lack of financial backup of the contractor and internal relation factors within the organisation (Meena V and Babu, 2015). These factors are a part of the agreed contract between the client and the contractor (Mali and Warudkar, 2016).

2.4.3. Compensable vs. Non-compensable Delays

Changes which are induced by the client to the contractor and the contractors is paid for the number of days extended, an example of such case would be additional specifications given by the client that require extra time allowance. Non-compensable delays such as municipality processing delays and material in availability in the market are given time allowance but are not compensated (Meena V and Babu, 2015). These types of delays are clearly stated in the contract which outlines the scenarios of compensation or not (Mali and Warudkar, 2016).

2.4.4. Concurrent vs. Non-concurrent Delays

Delays that occur at the same time by different project activities are known to be concurrent delays (Meena V and Babu, 2015). Concurrent situations occur when clients blame the contractor for two or more activity delays

and contractors also blame the clients for the delay and ask for compensation. If a scenario happens to have excusable and non-excusable delays at the equivalent time, the contractor is entitled to additional time. A case of excusable with compensation and an excusable without compensation happens concurrently, the contractor is also given time allowance (Mali and Warudkar, 2016). Whereas, when two similar excusable with compensation occur at the same time, the contractor is given time plus liquidated damages are handled (Fu, 2013).

2.5. Organisational Delay Risk Factors

Risk is a universal phenomenon which is a part of every aspect of life. Beleiu, Crisan and Nistor (2015) stated that risk factors are the key factors that play a part in a successful project outcome. They are uninvited uncertainties which may have a negative or a positive influence on the project objectives. Risks results in outcomes which are deviated from initially outlined planned goals such as client dissatisfaction, errors and oversights. The level of impact of risks depends on the time and condition of the risk occurrence such as a risk identified at the planning stage will have a lower level of impact on the end product than it being identified at the execution stage of a project which may results in tragedies that have a major effect on the triple constraints. Thus, as Tipili and Ilyasu (2014) mentioned that risks are unavoidable events which requires to be recognised, evaluated and managed accordingly.

As stated by Alagwe and Adegoke (2013), construction projects comprise of several resolutions, divisions and participants which makes it prone to higher rates of risks. These projects are characterised as the most complex form of project as the risks arise from numerous causes. They conducted a study to identify which group of risks factors has highest level of impact on the outcome and it was found that organisation specific delay risks ranked to be the highest. Delay risks are the factors that causes a project to slip in meeting its objectives. Organisational delay risk factors are the

factors that are related to internal risks within the organisation that causes project delays. This study has selected client, consultant and contractor as the chief organisational factors. Additionally, El-Karim, El-Nawawy and Abdel-Alim (2015) talked about circumstances where delays within critical path or not resulted in negative influence on overall project time, cost and quality; and discovered that contractor delays played a key role. Thus, there are numerous risk factors (causes) because of which a construction project faces delay. The top risks which were stated by selected research papers are used as reference; Ur Rehman (2015), Adekunle and Ajibola W (2015), Alsendi (2015), R and Ramya (2015), Meena V and Babu (2015), Srdić and Šelih (2015), Jude Emeka (2016), Gunduz and Abuhasan (2016), Koshe and Jha (2016), Mali and Warudkar (2016), A and Obodoh (2016), Hisham and Yahya (2016) and Alamir and Amoudi (2017). The factors from these papers are divided into categories as follows:

2.5.1. Client Factors

There are several situations when the client doesn't realise how crucial of a factor it is to take late decisions and approve final designs. Many clients don't provide absolute response to the designer which causes delay in the initial design stages of a project and affects the whole project cycle along with decisions related in implementation stage. Another factor which every project faces is changes in design and contract at latter stages of the project. This results in stoppage of current work progress and spend extra time on rework. It may also consequence in changes in scope which wasn't initially agreed upon in the contract. Yet another equally critical factor is the delay in making payments on the completed milestone as the project progresses. These payments could be to the consultant, contractor or supplier. During the planning stage when the detailed project budgeting is performed that generates costs which the client can't fund. This happens when the client takes up a project with insufficient funding and cash flow planning. Some clients may choose consultant or contractor based on

personal choices without making sure if the nominees are qualified to fulfil the project.

Moreover, regular changes in project materials affects the schedule of material delivery and application that results in delay of that particular component along with linked activities. Delay in choosing materials. In some cases, the client imposes specifications which aren't feasible but is obliged to satisfy their needs. Clients' indecisiveness on project scope and lack of basic work knowledge becomes hard to deal with which require extra time in training the client. This factor may also be the source of imposed unrealistic project duration. Lack of communication and coordination with consultant and contractor to be informed about the project issues also kills valuable time. One of the least factors were disputes with project parties on contract or funds that results in work to be hold or suspension. Finally, excessive interference in the project by the client or the representative such random office or site visits. Unnecessary intervention in the ongoing work also causes delay.

2.5.2. Consultant Factors

Late submission of drawing to municipality for approval is one the top most critical factors related to the consultant or designer. This is could be due to delay by the draughtsman or the architect. After submission, errors in drawings and changes in design is another serious factor due to inappropriate drawing review by the architect before submission or not following the rules of local municipality. Yet another factor is incomplete contract documents such missing clauses or signatures. Improper site survey and data collection in the initial stages results in site condition which is not appropriate for a particular design component and requires rework which in return causes delay. Lack of proper site supervision also contributes to delay. Site observation is important in order to keep track of contractor work and make sure all the activities are on schedule. There are cases when the contractors are behind schedule which leads to time overrun.

Moreover, some of the minor factors were selection of contractor with the lowest bid but not inspecting if they have enough qualification and experience to handle the project. Estimating contract durations without proper planning and scheduling, delay in producing bill of quantities (BOQ) and clashes in different drawing divisions such structural components may make it tough to lay MEP components in a specific building location results in rework, thus, delay of project. The common factor amongst all the project parties is the ineffective communication with each other. Ineffective organisational management of the consultant and inefficient project risk analysis also contribute to delays. Lack of consultant experience on managing a project or a particular design along with lack of skilled employees and latest technology are drawbacks on taking the project forward. Finally, one of the least factor was not meeting the client requirements.

2.5.3. Contractor Factors

Contractors have the maximum number of factors comparatively to other parties as they take over a major stage of the project cycle which in the implementation stage. One of the highly rated factor is poor site management and supervision. This is the lack of monitoring done by the civil engineers on the scope and progress of work. Not tracking the efficiency of materials and labourers is a major issue. Shortage of labourers in large scale projects increases project duration. Along with unskilled technical staff and labourers who require training for a specific type of project is time consuming. This in turn may result in low motivation and productivity. Lack of appropriate project planning of activities, scheduling labourer and materials in their designated work also results in time overruns. This also relates to work scheduling with subcontractors. Another critical factor is the lack of fund to run the project temporarily. Errors and mistakes due to poor construction methods of the contractor or subcontractor create disputes with the client and the project loses majority of valuable time.

Moreover, some of the lesser critical factors were lack of construction material quality control, inaccurate estimation of materials, lack of communication and coordination with project parties and lack of experience in certain fields. Finally, the least factors were financial corruption such as misuse of funds by the contractors, lack of coordination with MEP work and unnecessary delay in completion.

Therefore, the organisational delay risk factors are divided into subcategories with their respective sources in the table below:

Organisational Delay Risk Factor	Causes	Source
Client	Delay in decision making and design approval	Ur Rehman (2015) Alsendi (2015) R and Ramya (2015) Meena V and Babu (2015) Srdić and Šelih (2015) Jude Emeka (2016) Gunduz and Abuhasan (2016) A and Obodoh (2016) Hisham and Yahya (2016) Alamir and Amoudi (2017)
	Changes in design and contract	Ur Rehman (2015) Alsendi (2015) R and Ramya (2015) Meena V and Babu (2015) Srdić and Šelih (2015) Jude Emeka (2016) Gunduz and Abuhasan (2016) A and Obodoh (2016) Alamir and Amoudi (2017)
	Delay in making payment	Adekunle and Ajibola W (2015) Alsendi (2015) R and Ramya (2015) Meena V and Babu (2015) Jude Emeka (2016) Gunduz and Abuhasan (2016) Koshe and Jha (2016) A and Obodoh (2016) Hisham and Yahya (2016) Alamir and Amoudi (2017)
	Insufficient project fund and planning	Adekunle and Ajibola W (2015) Meena V and Babu (2015) Jude Emeka (2016) Koshe and Jha (2016) A and Obodoh (2016)
	Nomination of wrong consultant/designer	Adekunle and Ajibola W (2015) Gunduz and Abuhasan (2016) Koshe and Jha (2016)
	Changes in material type and imposed specification	Alsendi (2015) R and Ramya (2015) Gunduz and Abuhasan (2016) Hisham and Yahya (2016) Alamir and Amoudi (2017)
	Poor communication or coordination with project parties	Alsendi (2015) R and Ramya (2015) Meena V and Babu (2015) Jude Emeka (2016) A and Obodoh (2016)
	Delay in material approvals	Meena V and Babu (2015) Jude Emeka (2016) Gunduz and Abuhasan (2016)
	Conflict amongst project parties	Meena V and Babu (2015)
	Work suspension or hold	Meena V and Babu (2015) Jude Emeka (2016) Gunduz and Abuhasan (2016)

	Lack of work knowledge and project scope	Srdić and Šelih (2015) Jude Emeka (2016) A and Obodoh (2016) Alamir and Amoudi (2017)
	Unnecessary or excessive interference	Jude Emeka (2016) A and Obodoh (2016) Hisham and Yahya (2016)
	Unrealistic contract duration	Gunduz and Abuhasan (2016) Hisham and Yahya (2016)
Consultant	Selection of contractor with lowest bid only without qualification prerequisites	Ur Rehman (2015) Adekunle and Ajibola W (2015) Meena V and Babu (2015)
	Non-realistic contract duration	Ur Rehman (2015) Meena V and Babu (2015)
	Incomplete contract document	Adekunle and Ajibola W (2015) Alsendi (2015) R and Ramya (2015) Meena V and Babu (2015) Srdić and Šelih (2015) Jude Emeka (2016) Hisham and Yahya (2016)
	Lack of proper site supervision	Adekunle and Ajibola W (2015) Meena V and Babu (2015) Jude Emeka (2016) Gunduz and Abuhasan (2016) A and Obodoh (2016)
	Errors and changes in design and drawings	Adekunle and Ajibola W (2015) Alsendi (2015) R and Ramya (2015) Meena V and Babu (2015) Srdić and Šelih (2015) Gunduz and Abuhasan (2016) Koshe and Jha (2016) A and Obodoh (2016) Hisham and Yahya (2016) Alamir and Amoudi (2017)
	Delay in estimating project value	Adekunle and Ajibola W (2015)
	Delay in design submittals and approvals	Adekunle and Ajibola W (2015) Srdić and Šelih (2015) Jude Emeka (2016) Gunduz and Abuhasan (2016) Koshe and Jha (2016) Mali and Warudkar (2016) A and Obodoh (2016) Hisham and Yahya (2016)
	Clashes in drawings divisions	Adekunle and Ajibola W (2015)
	Ineffective communication with other parties	Adekunle and Ajibola W (2015) R and Ramya (2015) Meena V and Babu (2015) Gunduz and Abuhasan (2016)
	Ineffective organisational management and structure	Adekunle and Ajibola W (2015) Srdić and Šelih (2015) A and Obodoh (2016)
	Inadequate skilled employees	R and Ramya (2015) Jude Emeka (2016)

	Lack of latest technology usage	R and Ramya (2015) Meena V and Babu (2015) A and Obodoh (2016)
	Insufficient project experience	Meena V and Babu (2015) Srdić and Šelih (2015) Gunduz and Abuhasan (2016) A and Obodoh (2016)
	Improper site survey and data collection	Meena V and Babu (2015) Srdić and Šelih (2015) Koshe and Jha (2016) Alamir and Amoudi (2017)
	Not meeting client requirement	Meena V and Babu (2015)
	Inefficient project risk analysis	Srdić and Šelih (2015)
Contractor	Improper coordination with MEP department	Ur Rehman (2015)
	Lack of competent planning and scheduling	Ur Rehman (2015) Adekunle and Ajibola W (2015) R and Ramya (2015) Meena V and Babu (2015) Gunduz and Abuhasan (2016) Koshe and Jha (2016) A and Obodoh (2016) Alamir and Amoudi (2017)
	Lack of skilled staff and labourers	Ur Rehman (2015) Alsendi (2015) R and Ramya (2015) Meena V and Babu (2015) Jude Emeka (2016) Gunduz and Abuhasan (2016) Koshe and Jha (2016) Mali and Warudkar (2016) A and Obodoh (2016) Hisham and Yahya (2016)
	Lack of labour productivity	Adekunle and Ajibola W (2015) Gunduz and Abuhasan (2016) Koshe and Jha (2016) A and Obodoh (2016) Hisham and Yahya (2016)
	Lack of equipment efficiency and availability	Ur Rehman (2015) Adekunle and Ajibola W (2015) R and Ramya (2015) Jude Emeka (2016) Gunduz and Abuhasan (2016) Koshe and Jha (2016) A and Obodoh (2016) Alamir and Amoudi (2017)
	Lack of quality control in construction material	Ur Rehman (2015) Alsendi (2015) Koshe and Jha (2016)
	Lack of coordination with other project parties	Ur Rehman (2015) R and Ramya (2015) Gunduz and Abuhasan (2016) Koshe and Jha (2016)
	Financial inability	Adekunle and Ajibola W (2015) Meena V and Babu (2015) Gunduz and Abuhasan (2016)

		Koshe and Jha (2016) A and Obodoh (2016) Hisham and Yahya (2016)
	Poor site management and supervision	Adekunle and Ajibola W (2015) Alsendi (2015) Meena V and Babu (2015) Jude Emeka (2016) Gunduz and Abuhasan (2016) Koshe and Jha (2016) Mali and Warudkar (2016) A and Obodoh (2016) Hisham and Yahya (2016) Alamir and Amoudi (2017)
	Lack of adequate project experience	Adekunle and Ajibola W (2015) Alsendi (2015) Meena V and Babu (2015) Gunduz and Abuhasan (2016) A and Obodoh (2016) Hisham and Yahya (2016)
	Inaccurate estimation of materials	Adekunle and Ajibola W (2015) Jude Emeka (2016) Mali and Warudkar (2016) A and Obodoh (2016)
	Lack in keeping labourers motivated	Adekunle and Ajibola W (2015) A and Obodoh (2016)
	Improper work scheduling with subcontractor	Adekunle and Ajibola W (2015) R and Ramya (2015) Meena V and Babu (2015) Gunduz and Abuhasan (2016) Hisham and Yahya (2016)
	Defective method of construction and mistakes	Alsendi (2015) R and Ramya (2015) Meena V and Babu (2015) Jude Emeka (2016) Gunduz and Abuhasan (2016) Hisham and Yahya (2016) Alamir and Amoudi (2017)
	Shortage of labourers	Adekunle and Ajibola W (2015) R and Ramya (2015) Meena V and Babu (2015) Jude Emeka (2016) Gunduz and Abuhasan (2016) Koshe and Jha (2016) Mali and Warudkar (2016) A and Obodoh (2016)
	Financial corruption	Alsendi (2015)
	Delay in construction completion	R and Ramya (2015)
	Dispute with subcontractor	Meena V and Babu (2015) Jude Emeka (2016) Mali and Warudkar (2016) A and Obodoh (2016) Hisham and Yahya (2016)
	Lack of high-tech equipment	Mali and Warudkar (2016) A and Obodoh (2016)

Table 1 Organisational Delay Risk Factors

As the table shows, highest number of risks arose from contractor and consultant causing minor effects and client being the minimum. Firstly, among client factor, three key risks were recognised as strong influence such as delay in decision making and design approval, variations in design and contract; and delay in making payments. Secondly, consultant has a few major causes such as incomplete contract document, errors and changes in design and drawings; and delay in design submittals and approvals. Finally, contractor has been the major factor causing complications with major multiple causes such as lack of competent planning and scheduling, lack of skilled staff and labourers, lack of equipment efficiency and productivity, poor site management, defective method of construction and mistakes; and shortage of labourers were some of the identified organisational risk factors.

2.6. Project Critical Success Factors

Babu (2015) talked about a construction project go through several planned and unplanned incidents comprising of varying contributors, stages and conditions. Every project is different from one another and has unique characteristics. A successful project is said to have fulfilled the requirements of the end and attained its aim. Project critical success factor depend on the type and purpose of the project such as scope, project scale, design specifications, type of man power and technological involvement. As mentioned by Beleiu, Crisan and Nistor (2015), project critical success factors are the variables that determine the how well a project has been accomplished by attaining the objectives and results as planned. Thus, it is crucial to identify the characteristics and take appropriate measure from the start till the end of the project phases in order to be successful.

On the other hand, to achieve a successful project is not a tranquil process. Every stage of a project life cycle brings new uncertainties that have an adverse effect on the success factors where a balance among time, cost and quality acts as the benchmark of an effective project. Devi and Ananthanarayanan (2017); and Olukyode, Mathew and Taiwo (2015) conducted studies on the causes that affect cost factor of a project which identified several internal issues such as financial discrepancy, undefined clear objectives, variations in specification, inappropriate planning and monitoring, delay in construction and decision making. While, Oke, Aigbavboa and Dlamini (2017); and Shobana and Ambika (2016) studies focused on quality factor which also concluded poor planning and scheduling as a major cause along with unskilled subcontractor, poor site supervision, inadequate communication and shortage of labour. Similarly, Mulla and Waghmare (2015) discussed faulty design, lack of coordination among parties and lack of proper management had a negative effect on both time-cost factors.

Moreover, Pal and Pandey (2017) highlighted consultant factors such as changes and errors in design, unclear specification and late drawing approval were the major factors consequently effecting time-cost. It is known that contractors play a major role in a construction project as they are accountable for transforming the building from blueprints to reality and maximum of the causes arise from them as mentioned by Akomah and Jackson (2016). Whereas, Nyangwara and Datche (2015) study concluded in quality holding 83.4% closely related to time with 81.7% ranking the highest. After reviewing the studies led by the researchers, it can be concluded the importance of maintaining a stability in the triple constraints to achieve a successful project.

Furthermore, each project party has its specific critical success factor which defines their accomplishment based on their professional requirements. Babu (2015) mentions that the owners' factor highly depends on the triple constraints which are time of completion, the total cost and end quality of the project. Belay, Tekeste and Ambo (2017) emphasised the significance of time which acts as a major pivot in project success. The triple constraint criteria are extremely important in all aspects of the project and is fundamental to anyone involved stated by both Babu (2015) and Beleiu, and Crisan and Nistor (2015). Some of the other measures are if the project is profitable, functional and has met its purpose and vision. Likewise, the consultant/designer's success depends on client satisfaction by meeting the budget and aim, on-time hand over, high quality design, maintaining good staff engagement, minimal construction obstructions, design that doesn't hinder the community and is regionally appreciated. Similarly, the contractor also measures success by time, the revenue incurred at the end, providing quality project components, maintaining labour needs, safety in the site and overall client contentment.

2.6.1. Triple Constraint

Stojcetovic et al. (2014) and Wilson (2015) mentioned that the triple constraint or the iron triangle is the recognised project management tool used to measure project success which comprises of time, cost and quality as its central elements. It is the fundamental elements to control every stage in the project life cycle. Vasista (2017) states that time is the duration required to produce an output, cost is the amount required to produce the output and quality is the excellence of the output. The three indestructible elements are interdependent with each other in a way that a change in one of them will affect the remaining elements. It is a framework that aids a project manager in assessing and balancing the competitive elements; and prioritising the crucial components in a project.

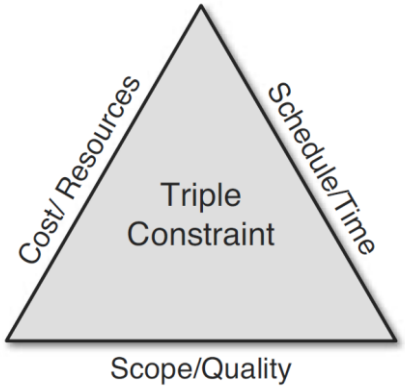

Figure 3 Triple Constraint (Wilson, 2015)

The project critical success factors related to a construction project were classified into three categories by Belay, Tekeste and Ambo (2017), Beleiu, Crisan and Nistor (2015), Gar (2015), Homthong and Moungnoi (2016) and Ribeiro et al. (2013) which are explained as follows:

2.6.1.1. Time

Time is the leading criteria that defines the cost and quality of a project. Inaccuracies in project scheduling can results in increased cost and degraded quality. A study by Ribeiro et al. (2013) showed that time was the second highest project success aspect by weighing 75%. Project participant competencies has the highest rank as a project consists of

several members with various level and capabilities of dealing with a certain issue in a project. Sufficient experience of project parties with proper background knowledge to perform an activity will help increase the chances of a successful project as it will not comprise of any mistakes along the project stages. Committed and involved project parties work towards effective contribution of ideas and are motivated to provide maximum benefits to the project. Efficient site supervision and management can avoid construction mistakes along with keeping track of work progress which can avoid delays. Setting realistic objectives which are feasible, support by the top management in forms of motivation and incentives and appropriate communication amongst project parties. Changes made by the client performed and managed effectively along with rightful and swift decision making take a project towards success.

2.6.1.2. Cost

Cost is the chief criteria on which a project is run. Money performs a significant part in the acquiring the right materials, machinery and outsourcing certain activities. Appropriate cost estimation on a good quality outcome drives a project towards success. Ribeiro et al. (2013) study resulted in cost being the highest aspect with 78% weighing. Relationships within project parties has been highly rated due to the fact that it can help eliminate disputes and enhance problem solving techniques. Better experience can lead to better cost management to avoid cost overrun. Progress meetings which identify the current status of the project progress and review problems in order to avoid extra costs. Adequate communication amongst parties, effectual site management and supervision avoid excessive costs. Resource availability plays an important role in the geographical location of the project as importing resources can be expensive. Efficient material and equipment usage, eliminating wastage of materials and time, appropriate contract management and swift decision making were the properties of project success related to cost.

2.6.1.3. Quality

Quality plays a significant role in construction projects. It can be based on the effectiveness of construction process and efficiency of the resources. It is a criterion which needs to be adapted as a standard to the culture of an organisation in the form of efficient quality assurance standard which can ensure the project meets its goals and objectives. Higher management should encourage high quality process in order to maintain standards and attain positive results with best leadership and commitment qualities. Appropriate monitoring and application of feedbacks by the project parties; and comprising of team members who provide quality work. It is said that a skilled project manager plays a key role in maintaining quality standards in a project. Projects run under extreme weather conditions such high and low temperatures or work environment in the organisation have an effect on quality so favourable working conditions are required. It is known that good quality raw materials and equipment will produce quality outcomes. Cooperation amongst project parties and quality committed management initiate a project towards success.

Therefore, the project critical success factors are divided into subcategories with their respective sources in the table below:

Project Critical Success Factors	Factors	Source
Time	Competency of project parties	Homthong and Moungnoi (2016) Belay, Tekeste and Ambo (2017)
	Adequate experience of project parties	Homthong and Moungnoi (2016) Beleiu, Crisan and Nistor (2015) Belay, Tekeste and Ambo (2017)
	Commitment and involvement of project parties	Homthong and Moungnoi (2016) Belay, Tekeste and Ambo (2017)
	Efficient site supervision and management	Homthong and Moungnoi (2016) Belay, Tekeste and Ambo (2017)
	Realistic goals and objectives	Homthong and Moungnoi (2016) Gar (2015) Beleiu, Crisan and Nistor (2015) Belay, Tekeste and Ambo (2017)
	Support by the top management	Homthong and Moungnoi (2016) Gar (2015) Belay, Tekeste and Ambo (2017)
	Motivating team members with incentives	Homthong and Moungnoi (2016) Gar (2015) Belay, Tekeste and Ambo (2017)
	Effective communication and coordination amongst project parties	Homthong and Moungnoi (2016) Gar (2015) Beleiu, Crisan and Nistor (2015) Belay, Tekeste and Ambo (2017)
	Effective change order management	Homthong and Moungnoi (2016)
	Swift decision making	Homthong and Moungnoi (2016) Belay, Tekeste and Ambo (2017)
Cost	Relationship amongst project parties	Homthong and Moungnoi (2016) Belay, Tekeste and Ambo (2017)
	Adequate experience of project parties	Homthong and Moungnoi (2016) Beleiu, Crisan and Nistor (2015) Belay, Tekeste and Ambo (2017)
	Timely progress meetings	Homthong and Moungnoi (2016) Beleiu, Crisan and Nistor (2015) Belay, Tekeste and Ambo (2017)
	Effective communication and coordination amongst project parties	Homthong and Moungnoi (2016) Gar (2015) Beleiu, Crisan and Nistor (2015) Belay, Tekeste and Ambo (2017)
	Efficient site supervision and management	Homthong and Moungnoi (2016) Belay, Tekeste and Ambo (2017)
	Availability of resources	Homthong and Moungnoi (2016) Gar (2015) Belay, Tekeste and Ambo (2017)
	Competency of raw materials and equipment	Homthong and Moungnoi (2016)
	Eliminate wastage of materials and time	Homthong and Moungnoi (2016) Gar (2015) Belay, Tekeste and Ambo (2017)
	Efficient cost control system	Homthong and Moungnoi (2016) Gar (2015) Beleiu, Crisan and Nistor (2015) Belay, Tekeste and Ambo (2017)

	Swift decision making	Homthong and Moungnoi (2016) Belay, Tekeste and Ambo (2017)
Quality	Efficient quality assurance standards	Homthong and Moungnoi (2016) Gar (2015) Beleiu, Crisan and Nistor (2015) Belay, Tekeste and Ambo (2017)
	Top management leadership skills to encourage quality standards	Homthong and Moungnoi (2016) Belay, Tekeste and Ambo (2017)
	Monitoring and considering criticism by the project parties	Homthong and Moungnoi (2016) Gar (2015) Belay, Tekeste and Ambo (2017)
	Availability of skilled team members	Homthong and Moungnoi (2016) Gar (2015) Beleiu, Crisan and Nistor (2015)
	Top management support of team members	Homthong and Moungnoi (2016) Gar (2015) Beleiu, Crisan and Nistor (2015) Belay, Tekeste and Ambo (2017)
	Skilled project manager	Homthong and Moungnoi (2016) Gar (2015) Beleiu, Crisan and Nistor (2015) Belay, Tekeste and Ambo (2017)
	Favourable working conditions	Homthong and Moungnoi (2016) Belay, Tekeste and Ambo (2017)
	High quality raw materials and equipment	Homthong and Moungnoi (2016)
	Cooperation amongst project parties	Homthong and Moungnoi (2016) Gar (2015) Beleiu, Crisan and Nistor (2015) Belay, Tekeste and Ambo (2017)
	Committed management towards quality improvement	Homthong and Moungnoi (2016) Gar (2015) Belay, Tekeste and Ambo (2017)

Table 2 Project Critical Success Factors

As seen from the table above, it can be clearly identified that time, cost and quality play equally important role in project success. Firstly, time has two pivoting factors such as realistic goals and objectives along with effective communication and coordination amongst project parties. Secondly, cost also had two turning factors which were efficient cost control system and effective communication which was a common factor in both time and cost. Finally, quality has numerous important aspects such as efficient quality assurance system, top management support to the team members, project managers' skilfulness and cooperation amongst project parties were the top critical factors of project success.

2.7. Research Hypothesis

The literature review highlighted the chief organisational delay risk factors and their project critical success factors from which the most reliable with highest number of sources will be selected for data analysis. A hypothesis provides a tentative answer to the research questions which is the main scope of the study it comprises of the independent and dependent variables. It creates a link between the different variables in order to provide a clear understanding of what is planned to be verified. In the case of this study, client, consultant, contractor are the independent variables; whereas project critical success factors which contains of time, cost and quality; being the dependent variable. The hypotheses will be tested for validity and significance in the data analysis chapter. If clear evidence is found on a particular hypothesis, it will be accepted or rejected if found otherwise. It will also highlight which specific critical success factor is being effected.

From the literature review, firstly, it can be clearly understood that clients play a significant role in shifting the project from success such as slow decision making, delay in payments and changes in design specifications as mentioned by Srdić and Šelih (2015), Adekunle and Ajibola (2015) and Ur Rehman (2015) respectively (Table 1); influencing each of the critical success factors. Thus, based on the evidence, the following hypotheses can be proposed:

- ***H1a: Client organisational delay risk factors have a significant influence on time related project critical success factors in construction projects in the UAE***
- ***H1b: Client organisational delay risk factors have a significant influence on cost related project critical success factors in construction projects in the UAE***
- ***H1c: Client organisational delay risk factors have a significant influence on quality related project critical success factors in construction projects in the UAE***

Secondly, consultants are found to also play a substantial role in influencing a project towards not achieving its objectives such as delay in drawing approvals, improper site supervision and insufficiency in certain experience as stated by Jude Emeka (2016), Meena V and Babu (2015) and A and Obodoh (2016) respectively (Table 1). Thus, based on the evidence, the following hypotheses can be proposed:

- ***H2a: Consultant organisational delay risk factors have a significant influence on time related project critical success factors in construction projects in the UAE***
- ***H2b: Consultant organisational delay risk factors have a significant influence on cost related project critical success factors in construction projects in the UAE***
- ***H2c: Consultant organisational delay risk factors have a significant influence on quality related project critical success factors in construction projects in the UAE***

Finally, contractors were discovered to have played a major role in hindering a project's success as their work takes maximum of the activities in project phases. Many factors such as incompetent planning and scheduling, financial inability and inadequacy in skilled staff which were indicated by R and Ramya (2015), Gunduz and Abuhasan (2016) and Koshe and Jha (2016) respectively; reviewed to have strong relation with the critical success factors. Thus, the following hypotheses can be proposed:

- ***H3a: Contractor organisational delay risk factors have a significant influence on time related project critical success factors in construction projects in the UAE***
- ***H3b: Contractor organisational delay risk factors have a significant influence on cost related project critical success factors in construction projects in the UAE***
- ***H3c: Contractor organisational delay risk factors have a significant influence on quality related project critical success factors in construction projects in the UAE***

3. Conceptual Framework

In the UAE, there has been an increased number of local construction companies and international organisations branching out their companies in the region due to the growing number of projects and landmarks. This has hiked the level of competition amongst construction companies which has forced to constantly make advancement to remain in the business. Whereas, companies face several setbacks related to delay in projects due to various factors that prevent a project from being successfully completed. It has been discovered from the literature review that little studies have been performed on this topic based in this specific region that will help spread the knowledge about how the risks relate to project success. This study has aimed to fill these gaps in the literature to better manage projects by the project parties. It has anticipated to highlight the severe factors that causes risks along with which specific project success factor is being effected. Thus, with the help of a detailed data analysis, recommendations for avoiding such problems can be suggested.

As previously discussed, literature from several research papers has provided a fundamental understanding of construction project situations around the world with brief details about construction sector in the UAE. It has also provided comprehensive details of the risk factors and the success factors that relate to construction project delays. On the basis of the material collected in the literature review, the conceptual model has been shaped. It includes the major organisational delay risk factors in each factor of client, consultant and contractor from Table 1. It also incorporates the project critical success factors of time, cost and quality from Table 2. The acknowledged aspects have been filtered to collect the most triggering five aspects based on the evidence discovered from several sources. The two main categories contain three subcategories, each of these subcategories comprise of five aspects which makes a total of thirty aspects. Therefore, these aspects are the variables which are illustrated as a conceptual framework in Figure 4 and are going to be investigated in the form of a quantitative assessment in the following chapter.

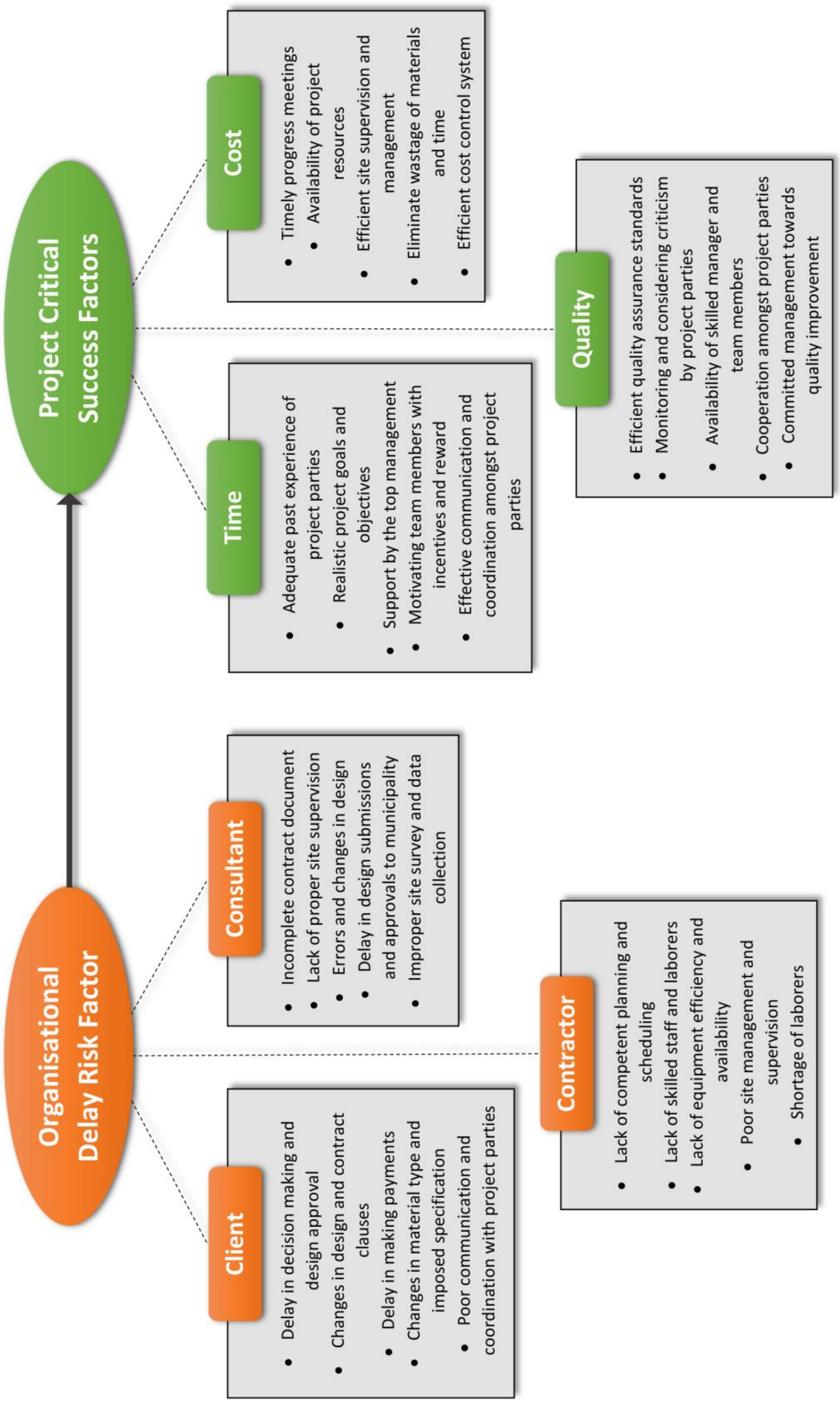

Figure 4 Conceptual Framework Model

4. Research Methodology

Subsequently, after the identification of the various risk factors and success factors in an extensive study in the literature review, the proposed hypothesis will be tested for validity in the form of a quantitative research method as mentioned in the aims of the study.

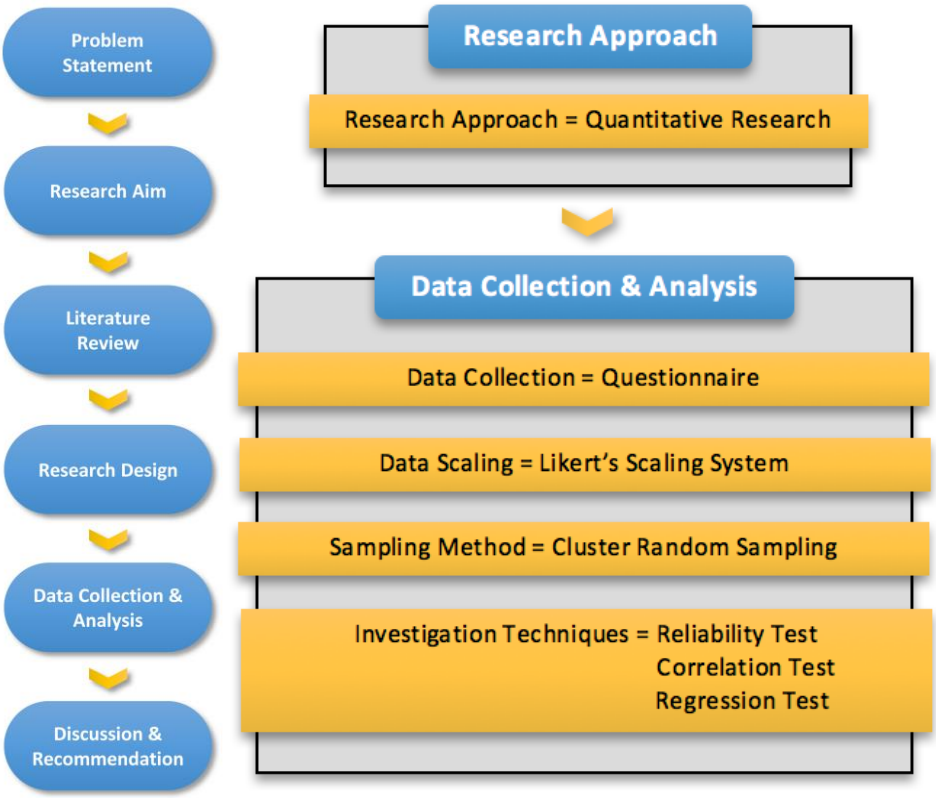

Figure 5 Research Methodology Outline

4.1. Research Approach

In this study, the quantitative research methodology has been adopted due to the factor of time effectiveness compared to qualitative method which involves interviews and personal meetings. Apart from being time effective, it assists in reaching the sample size required for this research and aids in representation of the sample to the population. The hypotheses can be tested without bias and the results are more reliable. It helps in identifying the delay risks that can be objectified and modelled statistically with the elimination of any misinterpretation. Quantitative approach is better since the study is based on investigating relations of the variables

and journals studied in the literature review had incorporated the same. The technique used to perform the research was the questionnaire and the collected data made it easier to be statistically tested.

4.2. Data Collection & Scaling

The questionnaire method has been implemented as the method of data collection due to the ease of managing and reaching respondents from remote locations in the UAE via email. Questionnaire is the best form of data collection for this study as the variables from the conceptual framework can be directly reflected on the questions and eases in clear data analysis without the need of rephrasing. The questionnaires have been critically planned to avoid any confusion or shortcomings in poor response rates, wording and sequence of the questions. The questions are designed for stress-free reading and a reduced amount of time to answer them along with personal questions has been avoided. Open ended questions have been avoided to make the survey time efficient and easy to analyse. The questionnaires are divided into two sections, where the first section is intended to gather general information of the respondent in the form of nominal questions such as type of organisation, job designation and rate of project delay, cost overrun and quality degradation. While, the second section involves ordinal questions related to organisational delay risk factors and project critical success factors. The method of response was designed in the form of Likert's psychometric scaling system (five-point scale) where the respondents specify their level of agreement or disagreement relative to the aspects with the highest scale being 'Strongly Agree' and the lowest scale being 'Strongly Disagree'; this helps in ease of scaling the responses. Likewise, the first part consists of six questions and the second part of the questionnaire contains thirty questions comprising of the fifteen organisational delay risk factors (independent variable) and fifteen project critical success factors (dependent variable) as reflected from the conceptual framework illustrated in Figure 4. Thus, a total of thirty-six questions were put together in the questionnaires.

4.3. Sampling Method

The best form of sampling method for this study is found to be cluster random sampling as only a specific group of sample in a specific region has been aimed to perform the research of the study (Statistics Solutions, 2018). The targeted sample or groups are the clients, consultants and contractors running in the UAE. In which, architects, designers, structural engineers and project managers are the sample from the consultant zone. Similarly, site engineers, civil engineers, structural engineers and technical staff are the sample from the construction companies. Any personnel who are part of the main project party, decision makers and has adequate knowledge in the field are the sample frame of the study. Therefore, the sample size required for the study was sixty completely answered surveys, and the attained responses were sixty-three.

4.4. Investigation Techniques

Data collected from the distributed questionnaires are statistically analysed in the SPSS software. The analysis consists of three primary tests performed on the data which were the reliability test, correlation test and regression test as explained by Statistics Solutions (2018) and Halloum (2010).

Firstly, reliability test is used to determine if the scale is reliable which consists of testing the organisational delay risk factors in Figure 4 (independent variables) such as the Cronbach's alpha as suggested in a similar study conducted by Halloum (2010). This test is considered because it assists in verifying if all the factors are fit to be used in the study. The Cronbach's alpha (α) is used to check internal consistency of the variables where the scales are summed together to form a total score. This total score is the overall reliability coefficient for the set of items (questions) in the survey. The score (α) should be greater than 0.7 in order to be considered reliable. The higher the value of the score, the more reliable it is for the study. Any value (α) lower than 0.7 is considered

unacceptable and will be excluded using 'if item deleted' option in the software and the test will be repeated. Thus, any item found to be unreliable in this test will not be included in the upcoming tests.

Secondly, as further mentioned in Statistics Solutions (2018), correlation is another test that is useful due to the objectives of the study where the influence of one variable on the other is necessary to determine such as the organisational delay risk factors on project success factors in Figure 4. Correlation test is conducted to separately measure the relationship strength amongst independent and dependent variables which delivers the significance of the relationships to accept or reject a hypothesis using the p value. The confidence level is considered 95%, where α is 0.05 to be significant. For Pearson Correlation approach, if the p value is greater than α, there would be no correlation amongst the variables. Thus, any relation amongst the variables with p value less than 0.05 is considered significant and safe for the generalisation of the population. While any p value greater than 0.05 is considered insignificant and has no statistical evidence which will permit to reject that hypothesis.

Finally, regression is used to test relation of a single variable on multiple variables as seen in a similar study by Halloum (2010). This can be used to check the influence of the organisational delay risk factors on one of the single project success factors in Figure 4. Regression test measures the relationship between variables. It is a predictive modelling technique which examines the relation between the dependent (target) and independent variable (predictor). It also indicates the strength of influence of multiple independent variables on a single dependent variable. The correlation coefficient (r^2) determines the proportionality of the variations of the independent variables, it shows the impact of the independent variable on the dependent variable. For example, if the value of r^2 was found to be 0.43, it can be concluded that the dependent variable is 43% affected by the independent variable. In addition, analysis of variables

(ANOVA) was also carried out as a part of the regression test to check if the regression results are reliable. In order to check the linear relationship between the variables, a coefficient (β) value was calculated to check if it can be applied on the entire population because in the case of this study, the test was performed on a certain number of sample. A significant value less than 0.05 will indicate the safety of the generalisation.

Assumptions considered in these tests are the data have linear relationship, each variable is independent of each other, errors are uncorrelated, the data of the variables have equal variances and variables are normally distributed. Thus, the findings from these tests are critically discussed and reflected in the form of guidelines to help avoid time related issues and aid in running a successful project for any personnel related to construction projects.

5. Data Analysis & Discussion

5.1. Data Analysis

Several aspects of construction project delays have been comprehensively discussed in Chapter 2 which were associated to organisational factors. The knowledge attained from this chapter has facilitated in developing the conceptual framework which represents aspects that are going to be analysed in this chapter. The previously discussed chapter explained the type of analysis being adapted in order to investigate the issues discovered from the literature review on the current industry. Based on the outcomes from the quantitative analysis, some recommendations will be developed to be implemented on real projects for future guidance.

Moreover, the data collected through the quantitative analysis is proposed to be tested using the Statistical Package for Social Science (SPSS) software, where three tests will be performed the data which will signify the significance of each factors. The data collection has been based in construction companies that reside in the UAE, where the aim is to gather current status of construction projects, the key project participant in delay contribution and progress towards project success. The samples selected based on cluster random sampling method from top to mid-level employees in an organisation. Thus, the questionnaires were mainly distributed via email with a brief explanation of the purpose of the questionnaire and its significance.

5.1.1. Quantitative Research Approach

Quantitative research has been adapted in an unbiased form in order to collect statistical data about the relationship between organisational delay risk factors and project critical success factors as stated in the aims of this research. This approach gives an opportunity to eliminate any factors that are not relatable which helps in gaining result accuracy. It uses mathematical and statistical tools to develop results amongst independent

and dependent variables with the help of numerical data. The main advantage of this approach is that it can analyse large number of opinions or behaviours of a certain population for reliable outcomes which gives clear indications for further interpretation. The data collected from the questionnaires are entered in SPSS software which are then analysed through three key tests. Where, reliability test is performed to check the dependability of independent variables, correlation test is used to check the relationship strength between independent and dependent variables; and regression test determines the influence of multiple independent variables on a single dependent variable.

5.1.2. Research Variables & Assumptions

The research comprises of three independent and three dependent variables which were tested for their dependability, where the independent variables are the project participants such as client, consultant and contractor, while the dependent variables are the success factors of a project such as time, cost and quality. In order to perform the tests, some assumptions were considered as mentioned below:

- Data have a linear relationship
- Each variable is independent of each other
- Any errors are uncorrelated
- Data of variables have equal variances
- Variables are normally distributed

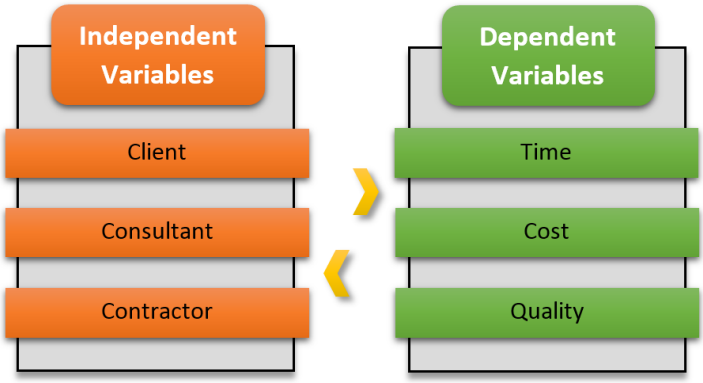

Figure 6 Research Variables

5.1.3. Data Presentation

In this section, the first part of the questionnaire which consisted of general information about the respondents are illustrated and discussed. As previously mentioned, the survey was conducted on organisations based in the UAE. Where 63 completely answered responses were collected, out of which 17.5% (11) were clients; and 41.3% (26) were consultants and contractors respectively as illustrated in Figure 7. Unfortunately, not many clients were easily available to answer the survey. On the other hand, equal and high of number of consultants and contractors responded. This makes it rational as the literature review indicated that most of the risk factors are rooted to them.

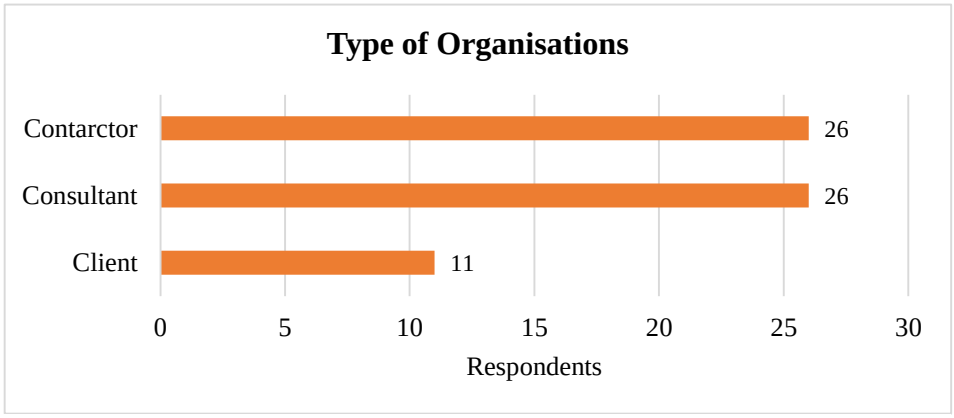

Figure 7 Type of Organisations

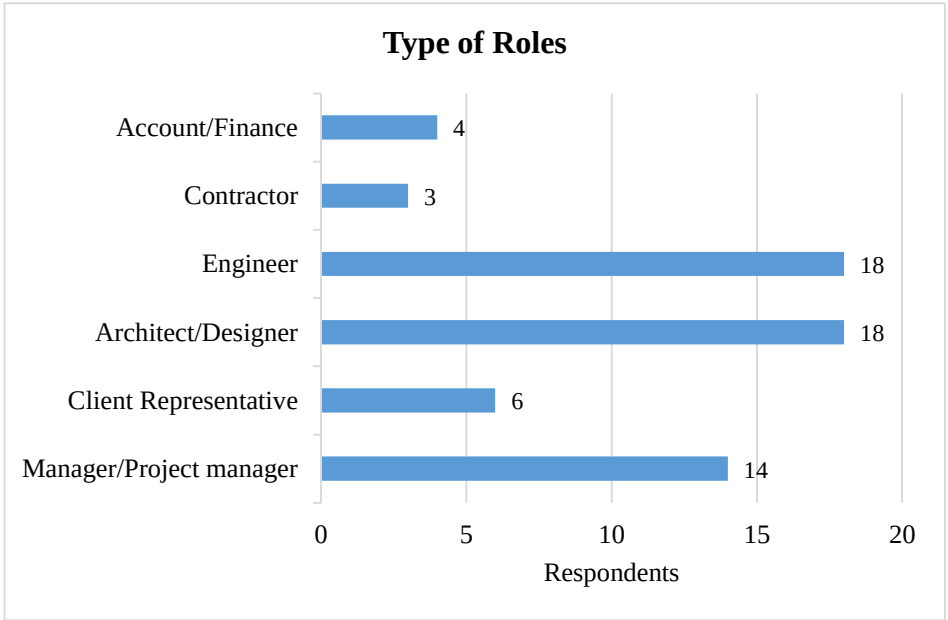

Figure 8 Type of Roles

From Figure 8, highest number of respondents were 18 architects/designers and engineers respectively; and 14 respondents were managers'/project managers. These numbers are an advantage due to the fact that maximum of the key project control and decisions are carried out by the higher authorities of elite knowledge in an organisation who generally are architects, engineers and managers, which makes the collected data dependable.

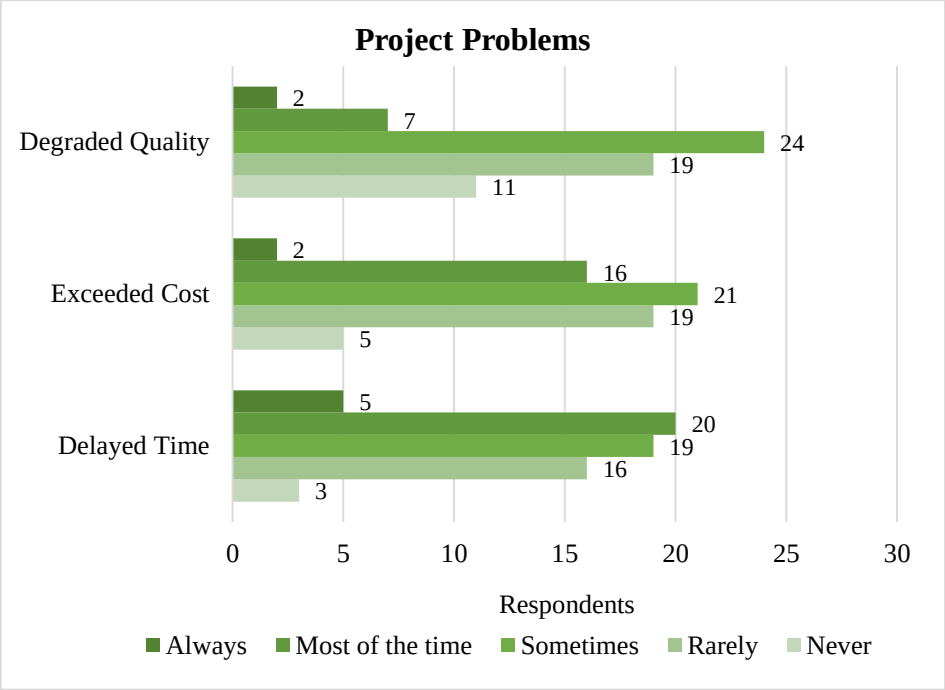

Figure 9 Project Problems

Finally, in order to acquire an overall idea about the current situation of construction projects, the respondents were asked to answer three questions related to the amount of problems related to time, cost and quality. As Figure 9 illustrates, it can be clearly seen that time and cost related problems are faced most of the time, where 46.5% respondents said project duration goes beyond initially planned schedule by placing it in the leading position and 37.2% respondents said projects cost creeps out of initial estimated budget. While quality seems to be the least significant factor with 38.1% respondents said occasional chances of being affected and 17.5% respondents believe to never face project quality deprivation compared to other project critical success factors. Therefore, as time-cost-quality are interlinked to each other, which can assert that time has an effect on cost of a project.

Finally, descriptive statistics test is chosen in order to rank the items to provide a better understanding of the most influencing factors for both type of variables. It was conducted to find out the top 5 factors in each category of organisational delay risks factors (independent variable) and project critical success factors (dependent variable). Therefore, descriptive statistics was performed on each of them and the factor are illustrated.

	Ranks	Items	Mean
Organisational Delay Risk Factors (Independent Variables)	1	Incomplete contract document	2.56
	2	Delay in making payments	2.49
	3	Improper site survey and site data collection	2.41
	4	Lack of proper site supervision	2.40
	5	Lack of equipment efficiency and availability	2.32
Project Critical Success Factors (Dependent Variables)	1	Monitoring and considering criticism by project participants	2.19
	2	Eliminate wastage of materials and time	2.08
	3	Timely progress meetings	2.00
	4	Efficient cost control system	1.97
	5	Motivating team members with incentives and reward	1.95

Table 3 Descriptive Statistics

As seen from the above Table 3, the top 5 factors in the independent variable category were incomplete contract documents, delay in making payments, improper site survey and data collection, lack of proper site supervision and lack of equipment efficiency and availability. Whereas, in dependent variable category, monitoring and considering criticism by project participants, eliminate wastage of materials and time, timely progress meetings, efficient cost control system and motivating team members with incentives and awards. In overall risk ranking contractual disputes was the top most risk factors that needs to be carefully handled by legal authorities along with effective site inspection and monitoring done by the engineers. These rankings show which of the aspects are most hindered and which aspects should be remarkably focused on for a better project outcome. Thus, these will assist in providing intensive recommendations in the proceeding chapter.

5.1.4. Test Findings

In this section, the data collected from the questionnaires are tested in three different techniques in the SPSS software as part of the quantitative method. The standard guidelines for performing each of the tests are concisely mentioned, their findings are briefly explained and those findings are then interpreted in a further meaningful manner as discussion in the later section of this chapter.

5.1.4.1. Reliability Test

The first test consists of testing the independent and dependent variables for their reliability which is Cronbach's alpha. The Cronbach's alpha (α) checks internal consistency of the summed variables by giving a total score, where the total score has to be above 0.7 or higher to be considered reliable. Thus, any (α) value below 0.7 are excluded using 'if items deleted', the test is repeated and the deleted items are not included in the future tests.

		Items	Cronbach's Alpha If Items Deleted	Cronbach's Alpha
Independent Variables	Client	Client1	0.824	0.818
		Client2	0.721	
		Client3	0.775	
		Client4	0.787	
		Client5	0.794	
	Consultant	Consultant1	0.801	0.839
		Consultant2	0.803	
		Consultant3	0.816	
		Consultant4	0.775	
		Consultant5	0.833	
	Contractor	Contractor1	0.883	0.902
		Contractor2	0.859	
		Contractor3	0.888	
		Contractor4	0.883	
		Contractor5	0.887	
Dependent Variables	Time	Time1	0.809	0.816
		Time2	0.765	
		Time3	0.761	
		Time4	0.771	
		Time5	0.790	

	Cost	Cost1	0.844	0.863
		Cost2	0.829	
		Cost3	0.824	
		Cost4	0.835	
		Cost5	0.837	
	Quality	Quality1	0.854	0.848
		Quality2	0.833	
		Quality3	0.807	
		Quality4	0.790	
		Quality5	0.794	

Table 4 Reliability Test (Independent Variables)

Firstly, the test was performed to check the reliability of the items representing the independent Client variable. As Table 4 displays the result taken from the software, where the Cronbach's Alpha is 0.818 which is higher than 0.7 that makes the Client variables highly reliable and internally consistent. Thus, none of the items are required to be deleted.

Secondly, the test was performed to check the reliability of the items representing the independent Consultant variable. As Table 4 displays, where the Cronbach's Alpha is 0.839 which is higher than 0.7 which makes the Consultant variables highly reliable and internally consistent. Thus, none of the items are required to be deleted.

Finally, the test was performed to check the reliability of the items representing the independent Contractor variable. As Table 4 displays, where the Cronbach's Alpha is 0.902 which is higher than 0.7 which makes the Contractor variables highly reliable and internally consistent. Thus, none of the items are required to be deleted.

Moreover, firstly, the test was performed to check the reliability of the items representing the dependent Time variable. As Table 4 displays the result taken from the software, where the Cronbach's Alpha is 0.816 which is higher than 0.7 that makes the Time variables highly reliable and internally consistent. Thus, none of the items are required to be deleted.

Secondly, the test was performed to check the reliability of the items representing the dependent Cost variable. As Table 4 displays, where the Cronbach's Alpha is 0.863 which is higher than 0.7 which makes the Cost variables highly reliable and internally consistent. Thus, none of the items are required to be deleted.

Finally, the test was performed to check the reliability of the items representing the dependent Quality variable. As Table 4 displays, where the Cronbach's Alpha is 0.848 which is higher than 0.7 which makes the Quality variables highly reliable and internally consistent. Thus, none of the items are required to be deleted.

To conclude, as seen from the above mentioned results extracted from SPSS, all of the items representing independent Client, Consultant and Contractor variables and dependent Time, Cost and Quality variables have passed the test with high reliability, internal consistency and none deleted items with Cronbach's Alpha more than 0.7, which makes them an acceptable representation of the independent variables. Therefore, all of the items are included in the proceeding tests of the analysis.

5.1.4.2. Correlation Test

The second test is conducted to separately measure the relationship strength amongst independent and dependent variables which delivers the significance of the relationships to accept or reject a hypothesis using the p value. The confidence level is considered 95%, where α is 0.05 to be significant. For Pearson correlation approach, if the p value is greater than α, there would be no correlation amongst the variables. Thus, all the items were included from the previous test in the independent variables.

		ClientFactor	ConsultantFactor	ContractorFactor
TimeFactor	Pearson Correlation	0.323**	0.380**	0.373**
	Sig. (2-tailed)	0.010	0.002	0.003
CostFactor	Pearson Correlation	0.242	0.272*	0.322*
	Sig. (2-tailed)	0.056	0.031	0.010
QualityFactor	Pearson Correlation	0.363**	0.486**	0.496**
	Sig. (2-tailed)	0.003	0.000	0.000

Table 5 Correlation Test (Independent & Dependent Variables)

Firstly, the relationship between the Time dependent variable with Client, Consultant and Contractor independent variables were test as seen in Table 5. The p values of all the independent variables with Time factor are less than 0.05. Thus, there is significant correlation between the Time dependent variable and all of the independent variables.

Secondly, the relationship between the Cost dependent variable and Client, Consultant, Contractor independent variables were test as seen in Table 5. The p values of all the independent variables with Cost factor are less than 0.05 except Client independent variable which has no significant relationship with Cost factor, since the p value is 0.056 that is greater than 0.05, has slightly missed its significance level. Thus, there is a significant correlation between the Cost dependent variable with Consultant and Contractor independent variables only, without any significant correlation with Client factor.

Finally, the relationship between the Quality dependent variable with Client, Consultant and Contractor independent variables were test as seen in Table 5. The p values of all the independent variables with Quality factor are less than 0.05. Thus, there is a significant correlation between the Quality dependent variable and all of the independent variables.

To conclude, as seen from the above mentioned results extracted from SPSS, Time and Quality dependent factors have significant relation between all of the independent Client, Consultant and Contractor independent variables. However, Cost dependent variable is only significantly related to Consultant and Contractor variables. Therefore, there is no significant correlation observed between Cost and Client variables only.

5.1.4.3. Regression Test

The third test is a predictive modelling technique which measures the relation between dependent and independent variable, along with the strength of impact of multiple independent variables on a single dependent variable. The correlation coefficient (r^2) determines the proportionality of the variations of the independent variables, where value of r^2 found to be 0.43, it can be said the dependent variable is 43% affected by the independent variable. Analysis of variables (ANOVA) was also carried out as a part of the regression test to check if the regression results are reliable and can be applied on the entire population and a coefficient (β) value was calculated to check the linear relationship between the variables. Thus, significant value less than 0.05 will indicate the safety of the generalisation.

Model Summary		
r^2 0.163	Adjusted r^2 0.121	
ANOVA		
Regression	0.014	
Regression Coefficients	**Unstandardized Coefficients β**	**Sig.**
ClientFactor	0.067	0.652
ConsultantFactor	0.125	0.491
ContractortFactor	0.135	0.281
Dependent Variable: TimeFactor Predictor (Constant): ClientFactor, ConsultantFactor, ContractortFactor		

Table 6 Regression Test (Time Factor)

Firstly, the Time dependent variable with Client, Consultant and Contractor independent (predictor) variable were tested to measure their relation. As seen from Table 6, the r^2 is equal to 0.163, which suggests that 16.3% of variations in the Time factor is said to be due to a variance in the independent variables. From ANOVA, the significant value is 0.014 which is less than 0.05. This shows that the regression result is reliable to be safe for generalization on the population. The coefficient (β) values, the unstandardized coefficient beta values displays the effect of changes to the percentage of the Client, Consultant and Contractor independent variables on Time variable can have. Thus, all the values are positive which signifies any changes in the independent variable will have an increased change to the dependent variable.

Model Summary		
r^2 0.109	Adjusted r^2 0.063	
ANOVA		
Regression	.077	
Regression Coefficients	**Unstandardized Coefficients β**	**Sig.**
ClientFactor	0.075	0.642
ConsultantFactor	-0.006	0.975
ContractortFactor	0.198	0.151
Dependent Variable: CostFactor Predictor (Constant): ClientFactor, ConsultantFactor, ContractortFactor		

Table 7 Regression Test (Cost Factor)

Secondly, the Cost dependent variable with Client, Consultant and Contractor independent (predictor) variable were tested to measure their relation. As seen from Table 7, the r^2 is equal to 0.109, which suggests that 10.9% of variations in the Cost factor is said to be due to a variance in the independent variables. From ANOVA, the significant value is 0.077 which is more than 0.05. This shows that the regression result is unreliable to be safe for generalization on the population. The coefficient (β) values, the unstandardized coefficient beta values displays the effect of changes to the

percentage of independent variables on Cost variable can have. Thus, all the values are positive which signifies any changes in the independent variable will have an increased change to the dependent variable; except due to Consultant variable, the dependent variable will face a decreased change.

Model Summary		
r^2 0.274	Adjusted r^2 0.237	
ANOVA		
Regression	0.000	
Regression Coefficients	**Unstandardized Coefficients β**	**Sig.**
ClientFactor	-0.011	.939
ConsultantFactor	0.219	.223
ContractortFactor	0.211	.089
Dependent Variable: QualityFactor Predictor (Constant): ClientFactor, ConsultantFactor, ContractortFactor		

Table 8 Regression Test (Quality Factor)

Finally, the Quality dependent variable with Client, Consultant and Contractor independent (predictor) variable were tested to measure their relation. As seen from Table 8, the r^2 is equal to 0.274, which suggests that 27.4% of variations in the Quality factor is said to be due to a variance in the independent variables. From ANOVA, the significant value is 0.000 which is less than 0.05. This shows that the regression result is reliable to be safe for generalization on the population. The coefficient (β) values, the unstandardized coefficient beta values displays the effect of changes to the percentage of independent variables can have on Quality variable. Thus, all the values are positive which signifies any changes in the independent variable will have an increased change to the dependent variable; except due to Client variable, the dependent variable will face a decreased change.

As seen from the above mentioned results extracted from SPSS, there are some effects of variations in the dependent factors is said to be due to a variance in the independent variables according to the model summary

tables. From the ANOVA tables, it can be said that Time and Quality factor regression results are reliable but Cost factor result is not reliable for population generalization. Lastly, from the coefficients tables, Consultant independent variable will cause a decreased change to the Cost dependent variable while Client independent variable will cause a decreased change to the Quality dependent variable and the rest of the factors will face an increased change.

		Collinearity Statistics VIF
ClientFactor	ConsultantFactor	2.399
	ContractorFactor	
ConsultantFactor	ClientFactor	1.487
	ContractorFactor	
ContractorFactor	ClientFactor	2.402
	ConsultantFactor	

Table 9 Variance Inflation Factor (Independent Variables)

Moreover, Variance Inflation Factor (VIF) test was performed as a part of the regression test in order to detect if there is any degree of inter-correlation between variables in the case of multiple independent variables as briefed by Statistics Solutions (2018). Here, the organisational delay risk factors were tested amongst each other; any VIF values above 3.000 will result to have multicollinearity problems and will be unreliable. From Table 9, the VIF results show that all the variables (2.399, 1.487 and 2.402) are weak and below 3.000, which concludes that there is no multicollinearity amongst the independent variables. Therefore, making the analysis acceptable.

5.1.5. Hypothesis Findings

According to the result obtained from the reliability test, all the factors have passed the investigation. Whereas, in the case of correlation and regression tests, there were some factors that didn't show any effects. These will aid in finalising if a hypothesis will be accepted or rejected which were proposed in Chapter 2. Therefore, the decision this study has landed upon are on the basis of the correlation and regression tests as follows:

Firstly, from Table 5, the correlation of client, consultant and contractor showed significant relationship with most of the project critical success factors but client and cost factor was seen to have no significant correlation with each other due to p value crossing 0.05 significance mark. Thus, making hypothesis *H1b* unacceptable. Moreover, from Table 8, quality factor was seen to have no positive change to the client factor which signifies no influence with an unstandardized coefficient of -0.011. Thus, making hypothesis *H1c* unacceptable. However, client factor had significant influence on time factor that makes hypothesis *H1a* acceptable; from Table 5, 6, 7 & 8.

- ***Accepted*** - *H1a: Client organisational delay risk factors have a significant influence in time related project critical success factors in construction projects in the UAE*
- ***Rejected*** - *H1b: Client organisational delay risk factors have a significant influence in cost related project critical success factors in construction projects in the UAE*
- ***Rejected*** - *H1c: Client organisational delay risk factors have a significant influence in quality related project critical success factors in construction projects in the UAE*

Secondly, from Table 7, cost factor was seen to have no positive change to the consultant factor which signifies no influence with an unstandardized coefficient of -0.006. Thus, making hypothesis *H2b* unacceptable. However, consultant factor had significant influence on time and quality factor that makes *H2a* and *H2c* acceptable; from Table 5, 6, 7 & 8.

- ***Accepted*** - *H2a: Consultant organisational delay risk factors have a significant influence in time related project critical success factors in construction projects in the UAE*
- ***Rejected*** - *H2b: Consultant organisational delay risk factors have a significant influence in cost related project critical success factors in construction projects in the UAE*

- ***Accepted*** *- H2c: Consultant organisational delay risk factors have a significant influence in quality related project critical success factors in construction projects in the UAE*

Finally, according to the two tests, contractor factor showed to have significant influence on all the project critical success factors. Thus, making hypothesis *H3a*, *H3b* and *H3c* acceptable; from Table 5, 6, 7 & 8.

- ***Accepted*** *- H3a: Contractor organisational delay risk factors have a significant influence in time related project critical success factors in construction projects in the UAE*
- ***Accepted*** *- H3b: Contractor organisational delay risk factors have a significant influence in cost related project critical success factors in construction projects in the UAE*
- ***Accepted*** *- H3c: Contractor organisational delay risk factors have a significant influence in quality related project critical success factors in construction projects in the UAE*

5.2. Data Discussion

The variables extracted from the literature review were structured to form the conceptual framework whose items were reflected on the questionnaire, which was used to collect data and test them in order to interpret the relationship characteristics of the independent and dependent variables amongst themselves. After being tested, the analysis will provide appropriate information on influence of organisational delay risk factors on project critical success factors in construction projects in the UAE. Thus, this chapter will transform the test findings into meaningful information and provide supportive explanations behind the results attained in the previous section.

The top risk factors' ranking in Table 3 can be clearly reflected upon the information gathered in the literature review, where, Adekunle and Ajibola W (2015), Srdić and Šelih (2015); and Ren, Atout, and Jones (2008) have mentioned contractual document disputes by consultants and clients. Delay in payments by clients has also been one of the common identified factors which were also stated by Adekunle and Ajibola W (2015), Shah (2016); and Ren, Atout, and Jones (2008). Lack of adequate site supervision and data collection has been frequently specified by also Adekunle and Ajibola W (2015), Shah (2016); and Koshe and Jha (2016). Lastly, lack of equipment efficiency and availability along with lack of skilled employees correspondingly proved to be a positive result whose indication were given by Meena V and Babu (2015), Shah (2016), Gunduz and Abuhasan (2016); and Ur Rehman (2015).

Moving on to the more essential analysis of the factors, firstly, as seen from Table 4, the reliability test resulted in including all organisational delay risk factor items that represented each of the client, consultant and contractor factors with 0.818, 0.839 and 0.902 respectively. Amongst these values, the value of contractor has showed to have the highest Cronbach's Alpha. This proves the high reliability and dependability of the extracted

items for the representation of each factor and also suggests the crucial role contractors play in effecting project success by lack of competency in planning and scheduling, lack of skilled staff, labourers, efficient equipment, poor site management along with supervision of work and shortage of labourers. Similarly, the reliability test resulted in including all project critical success factor items that represented each of the time, cost and quality factors with 0.816, 0.863 and 0.848 respectively. Amongst these values, the value of cost has showed to have the highest Cronbach's Alpha. This proves the high reliability and dependability of the extracted items for the representation of each factor and also suggests the significance of sustaining cost factors by regular meetings, proper resource allocation, effective site supervision, minimal material wastage and resilient cost control system. Thus, all of the items passed the analysis with exceeding results that makes the information collected from literature review acceptable. Also, the variance inflation factor test of the organisational delay risk factors showed no multicollinearity amongst themselves which further makes factors suitable for the study. However, the correlation and regression tests verified the relationship of the risk factors with the critical success factors to make decisions on the hypotheses.

Secondly, from the correlation test results in Table 5, the time factor is seen to have significant correlation with each of the client, consultant and contractor factors with the values being below the 0.05 significance mark. These results support the finding of Adekulnle and Ajibola W (2015), where it was revealed that client's delay in fulfilling scheduled payments, consultant's delay due to unfinished drawings and contractor's playing the most significant role with improper planning and scheduling. It proves that the organisational project participants must take into consideration factors concerned with time such as adequate past experience of project parties to have enough knowledge about the project they are handling, realistic project goals and objectives which are feasible and are agreed upon, top

management support towards lower managing levels. In addition, motivating team members play a major role in keeping an organisation on the run, and have effective communication and coordination.

Moreover, cost factor had a significant correlation with consultant and contractor, while being insignificant with client factor by exceeding the significance mark by 0.056 from Table 5. In the case of correlation with consultant, the results validate the study performed by Ren, Atout, and Jones (2008), where it was mentioned that consultants' improper drawings handed to the contractor resulted in defective building composition and effecting the budget due to rework. Likewise, in the case of contractors, it was also stated that mistakes in construction on site lead to cost overrun. On the other hand, clients' insignificance proves that clients usually follow the right track leading to project success related to cost affectivity because they are major financing body of the project, while consultants and contractors must take into consideration factors concerned with timely progress meeting in order to stay up to date about the project situation and make any kind of resources readily available. In addition, they should also pay attention to site supervision and management with avoiding waste of time and material, and follow strict cost control system. As clients are already playing their role effectively, this provides the evidence for rejecting the hypothesis *H1b* that stated client organisational delay risk factors have a significant influence on time related project critical success factors in construction projects in the UAE.

Furthermore, the data stated at the end of Table 5 show that quality factor is seen to have significant correlation with each of the client, consultant and contractor factors with the values being below the 0.05 significance mark. These values support the findings of Gunduz and Abuhasan (2016), where enforced specification by the client who has deprived knowledge of quality and contractors' inefficient labours can affect the outcome. The results also support Koshe and Jha (2016), where they mentioned improper

surveying before designing by the consultant. Signifying that the organisational project participants must take into consideration factors concerned with quality such as drawing up an effective quality standard rules, and being open to criticism and monitoring them by the parties. Quality is most defined by the people who operate the organisation which requires skilled manager and team members who are cooperative with each other, while strongly committed to ongoing quality developments. Thus, quality standards are easy to follow if every member of the organisation has a basic mind-set towards it.

Finally, moving on to the last set of tests which was the regression test, from Table 6, the unstandardized coefficient has displayed to have positive values which suggests that client, consultant and contractor risk factors will have a significant influence on the time related critical success factor. Any fluctuations in the organisational delay risk factor will have an increased effect on time factors due to all the beta values being positive. This result certainly validates the statement presented by Belay, Tekeste and Ambo (2017), where they mentioned time factor as the pivoting entity for project success. Thus, client, consultant and contractors must reflect upon time factors to overcome delays and have a well-planned schedule of activities with minimum wastage of time.

Moreover, from Table 7, the unstandardized coefficients were positive in regards to client and contractor but consultant was seen to have a negative effect on cost factor with a result of -0.006. So any fluctuations in the organisational delay risk factor will have an increased effect on cost factors due to all the beta values being positive. But fluctuations in consultant factors will have a decreased influence on cost. This supports the points mentioned by Devi and Ananthanarayanan (2017); and Olukyode, Mathew and Taiwo (2015), where internal issues incoming from client and consultant such as changes in specifications and inadequate planning respectively, affect cost. So, clients and contractors must reflect upon cost

efficiency and focus towards actions which avoid exceeding the initial planned budget for project success. While consultants will not aggravate problems to cost affectivity as consultants work closely with clients to satisfy their budget and planning according to the client's financial competency. This satisfies the statement where consultants played the minor role as seen in the study by Adekunle and Ajibola W (2015). Thus, giving the confirmation for rejecting hypothesis *H2b* that stated consultant organisational delay risk factors have a significant influence on cost related project critical success factors in construction projects in the UAE.

Furthermore, from Table 8, the regression test with quality factor resulted in positive unstandardized coefficient values in regards to consultant and contractor, which suggests that fluctuations in the organisational delay risk factor will have an increased influence on quality factors due to all the beta values being positive. The factors that constitute in consultant and contractor were poor site supervision and shortage of skilled workers respectively, these two factors significantly effected quality that was highlighted by Shobana and Ambika (2016). Thus, consultant and contractor must follow quality standards which are mutually agreed upon and commit towards quality enhancement in every step of the project. Whereas, client value was negative with -0.011, so any fluctuations in client factors will have a decreased impact on quality, which displayed have an opposite effect on quality compared to rest. This is due to the reason that the client usually specifies maximum of the materials and resources to be used in the construction so quality is maintained from the initial stages. This outcome was contradictory to Adekunle and Ajibola W (2015) conclusion of client lacking and indecisiveness in specification of in building materials. Therefore, rejecting the hypothesis *H1c* which stated client organisational delay risk factors have a significant influence on quality related project critical success factors in construction projects in the UAE.

To conclude, out of the nine proposed hypotheses, three hypotheses *H1b*, *H1c* and *H2b* were rejected as the insignificant result in Table 5 and negative change values from Table 7 and 8. While, the rest of the six hypotheses *H1a*, *H2a*, *H2c*, *H3a-b-c* were accepted due to clear evidence of significant influences with each other as seen in Tables 5, 6, 7 and 8; the study has concluded on as follows:

- *Client organisational delay risk factors have a significant influence on time related project critical success factors in construction projects in the UAE*
- *Consultant organisational delay risk factors have a significant influence on time and quality related project critical success factors in construction projects in the UAE*
- *Contractor organisational delay risk factors have a significant influence on time, cost and quality related project critical success factors in construction projects in the UAE*

Therefore, it can be observed that clients, consultants and contractors have a major stimulus on time. Client specifically has resulted to have zero influence on cost and quality, while consultant has no effect on cost only but influences time and quality. Whereas, contractor is found to be the key player in having negative influence on all the project critical success factors. Hence, approximately all of organisational delay risk factors have some effect on the project success factors which applies for detailed recommendations for each factor to ensure total project contentment.

6. Recommendation

On the basis of the identified organisational risk factors that impact a project's critical success factors, this chapter intends to provide comprehensive recommendations to the project participants in order to enhance the chances of a successful project. The literature review identified three crucial organisational risk factors such as client, consultant and contractor; who resulted to have an impact on the project critical success factors such as time, cost and quality; as an outcome of the test findings. The recommendations are anticipated to bridge the current gaps in the construction industry in the UAE. It will act as a guideline for a project from its initial to completion stage which will inform the concerned body about the risk and how to mitigate them from the beginning of a project so as to avoid casualties in the later stages. Thus, recommendations are categorised into two sections; where the first section provides guideline to the project parties and the last section provides guidelines to controlling the success factors.

6.1. Organisational Recommendations

This section outlines the mitigating advices to be considered by the key project participants during every stage of a project for a successful project which have been collected from the recourses mentioned in Table 1.

6.1.1. Client Guidelines

- Cash flow complications are a major issue caused by clients or owners which leads to delays by the consultants who design and contractors who execute the project. It is recommended to the clients to perform comprehensive planning of funds before signing the contract. Delay in making payments causes several issues such a stoppage of work, deterioration of construction materials and delay in procurement of resources based on the location of the project. This consequent impacts on time, cost and quality.

- With the help of a competent quantity surveyor, who will plan and control costs from the conceptual phase to be reasonably priced for client to be able to manage and make funds available when required.
- Clients are recommended to have clear idea of the project they are proposing, a well-defined objective and specification is encouraged in order to avoid changes in the later phases of the project as making changes to the scope of the work requires extra time and cost to be added for rework.
- It is extremely crucial to draft the contract with clear language and understanding in each of the clauses. Clients are encouraged to read the contract prudently and clear out any misinterpretations and misunderstandings before the commencement of the project.
- Certain decisions made by the clients has direct impact on the project's success during situations when the client has little knowledge about a certain activity but they interfere in the activity with enforced decisions that do not help but cause problems to the progress. In this situation, it is recommended to allow other participant who has enough understanding of making right choice and swiftly approving designs.
- Clients are not recommended to perform tenders solely on the basis of the proposed cost by the contractor. It is important to choose the contractor who are competent in their quality of work based on past records. This is critical because during construction the quality of work maybe low and the contractor work progress maybe slow.
- It is also recommended to choose a competent consultant based on the requirements of the project and not only on the basis of the price of the design. It is due to the fact that if the design has less errors in drawings, it will ease the work of the contractor in the later stage.
- Clients are advised to maintain a decent communication network with other participants to be informed about the current progress and voice any misinterpretations to make sure all the project activities are performed according to their specifications. It is also important to stay in the loop to avoid any loss of key information with timely meetings.

- Clients are advised to complete their official site documentations and permits with the local government authorities to avoid delays in the initiation of the project.
- If the client does not have the knowledge about a certain concept and facing complications in decisions in the project, it is advised to hire a representative who is capable of sorting out such issues on behalf of the client with his/her approval. It also benefits in making decisions when the client is not available so as to avoid stoppage of work.

6.1.2. Consultant Guidelines

- Site supervision is one of the most important units of a project. Proper supervision by consultants paves the project towards achieving its objectives. It is extremely crucial to perform comprehensive inspection during the execution stage by competent site engineers with the help of a checklist which outlines all the main activities that needs to be inspected during a certain phase of construction and also can take swift decisions on site for the maintenance of quality.
- In the early stages of a project, it is essential to perform adequate investigations of the site in order to collect enough data to carry out feasibility studies and conceptual design of the proposed building in the design phase with the aim of avoiding any challenges in the later stages.
- In extreme cases when inadequate soil investigation is performed leads to structural failure of the building which also leads to reputational damaged along with time and cost increment due to inefficient quality of effectiveness in site survey.
- Accepting change orders from clients must be avoided from a certain point in the project so as to escape the chances of rework. It is recommended to inform the clients or make it a clause in the contract about when is the last stage of making changes in the project shall be accepted.

- Architect and structural engineers must check the drawings thoroughly before submission to the contractors. Especially the structural details must be prudently examined to avoid work suspension or structural failure.
- Consultant must appoint engineers who have the knowledge and understanding to lead a project. Inexperienced staff should not be given technical activities to handle as it may lead to errors and cause a large amount of money, time and quality; if the error is not detected in the early stages. They can be accompanied or assisted by a senior engineer who will spot any errors and right them when confronted.
- Architects and designers must not hastily complete the drawings and bill of quantities without spending enough time on details even when the client enforces to finish the drawings within a specific time.
- During designing stage, consultants must follow the rules and regulations given by the municipality in order to avoid rejections in drawing during the approval stage. Approvals from local authorities are time consuming so it's best to follow their rules to avoid delays.
- Consultants must make sure the contract has been clearly written and the other parties read and mutually agree upon all the clauses to avoid disagreements and disputes amongst each other.
- Consultants play a major role is maintaining a good relation between client and contractor. During cases of disagreements, consultants should maintain a good problem solving attitude and avoid being biased towards any one the parties.

6.1.3. Contractor Guidelines

- Planning and scheduling the construction activities is a vital component in avoiding project delays. Contractors are advised to perform effective scheduling of the activities and resources in order to avoid failing in achieving milestones and shortage of resources such as labor and building materials.

- Contractor must keep track of the quantity of the materials in the inventory and order items in advance. It is advised to schedule building materials to be available just in time on site.
- It is recommended to the contractors to make sure they have adequate cash to carry out the project and manage their expenditures diligently on crucial activities in order to escape chances of running out of funds during execution.
- Contractors should make sure their equipment and machinery work effectively. It is recommended to be up to date with the latest technology in order to ease the workmanship, and avoid quality degradation and delays.
- Contractors must ensure their employees are efficient at work as they play the most crucial role in a project. Proper training in management of a project can be given to rise their competency in work and knowledge of operation of new technology.
- Keeping track of laborers' progress of work and keeping them motivated is highly crucial. This is one of the common complications that is faced by almost every contracting company. Thus, their satisfaction is key as they transform the project of blue prints to reality.
- Human errors are common due to which it is advised to the contractors to check the drawings handed by the consultant. Drawings must be checked for errors and any encountered must be informed as soon as possible so the architect or engineer can make changes without delaying the project.
- Proper safety measures must be undertaken on site according to the rules and regulations of the municipal authorities. It will create a secure environment for the workers and decrease the chances of accidents.
- It is anticipated that contractors plan their work with extra time such as one or two weeks at the end of the project. This allows room for any delays, thus, the contractor won't have to face penalties of every extra day to go beyond the estimated handover date.

- In the case of appointing subcontractors, assigning competent subcontractors based on the type of project they are going to handle. Disputes with subcontractors are common as they are third party and in most cases less significance is given to their work progress until the end of the project, where, mostly their work quality results in disagreement with the specified requirements.

6.2. Controlling Success Factors

This section outlines some brief tools and techniques to be used by consultants and contractors during the planning and controlling stage of a project for evidently managing the success factors as suggested in A guide to the project management body of knowledge, PMBOK® guide (2013) and Halloum (2010).

6.2.1. Time Control Techniques

Schedule control techniques will assist in managing the project activities to be accomplished on time. It will also determine which activities require more time and its importance to be on track. This will also determine the current progress and spot any lags. The tools will illustrate the changes and clashes that can occur during the case of rework and show the approaching milestones.

1. Performance Reviews
   - Trend Analysis

   Trend analysis is a form of graphical analysis that determines if the performance is upgrading or degrading over time by assessing the project performance. It helps in illustrating the current performance and aids in comparing completion dates for future goals.

   - Critical Path Method

   Critical path method is a logical network path which calculates the minimum duration of activities and defines the flexibility in the schedule. This network computes early start, early finish, late start and late finish of every activity without any concern of resources availability. It determines the shortest duration for the longest activities

to avoid any schedule risks and how changes in one activity duration may affect the final date.

2. Resource Optimisation

   Resource optimisation is a technique which is used to make adjustments to the schedule based on the resource availability and project duration. It consists of two techniques as follows:

   - Resource Levelling

   In levelling technique, where the schedule is amended with the objective of balancing resources, where the project start and end dates are adjusted on the basis of resource restrictions. This is useful when there are limited resources or when resources are required to be shared amongst activities which usually brings changes to the critical path with increased project duration.

   - Resource Smoothing

   While in smoothing technique, the resources are adjusted without surpassing the project duration. If there are any delays in some activities due to this technique, it is adjusted with the available float. It regulates resources to be within their limitations.

3. Modeling Technique

   Modeling techniques are used to examine several scenarios of possible risks in order to make amendments to aligning with the initial project plan. It consists of two techniques as follows:

   - What-If Scenario Analysis

   It examines different risk scenarios in order to forecast their possible negative or positive effects on project goals. A schedule network analysis is performed with a question of what if a main activity of the project is delayed and what are its consequences. It probes several scenarios which illustrates its outcomes on project duration that help in coming up with appropriate contingency plans and mitigating techniques to overcome such situation.

   - Simulation

It is a simulating techniques that uses the three-point estimation such as most-likely, optimistic, pessimistic scenarios. Most-likely scenario is when the resources are available and the project runs normally, optimistic scenario is the best-case situation, while pessimistic is the worst-case situation. These determine any uncertainties in the project duration and help in mitigation. A common type of simulation is the Monte Carlo analysis, where probable duration is assigned to estimate probable outcome of the project.

4. Leads and Lags

   It is the adjustment of the activities made in the network analysis that are behind schedule to transform them to align with the projected plan. It maybe the adjustment of certain activities to be started off early in order to be completed with other activities within schedule.

5. Schedule Compression

   As the name suggests, schedule compression is technique to compress or shorten the project duration without hindering the project scope. This is mainly used when clients enforce certain dates or other constraints in schedule. There are two types of compression techniques as follows:

   - Crashing

   It shortens the project duration with additional resources which are done by performing overtime, making extra payments for activities to be completed on the critical path. Although, shortening the duration aids in completing work early but it also increases project cost and risks.

   - Fast Tracking

   This is done when certain activities can be performed in parallel which are traditionally done in a sequential manner. This in most cases results in rework and should only be done to activities that can overlap to reduce time in situations of delay.

6. Project Management Software

   Project management software is project modeling tool that can be extremely useful for any scale of project either small or large. Most common software is Primavera and Microsoft Project that consists of

the above mentioned techniques and many other useful tools for scheduling.

6.2.2. Cost Control Techniques

Cost control techniques help in maintaining projects to be within the estimated budget to avoid exceeding the project cost and managing activities with their resources as mentioned in a similar study by Halloum (2010). It examines the cost performance that will escape the chances of disputes amongst project participants. It eliminates any extra cost that would have been added without appropriate knowledge.

1. Earned Value Management

   Earned value management is the most important method in project management to determine project performance and progress with a combination of information of scope, schedule and resources. It is a methodology that integrates cost and schedule baselines with scope baseline. Thus, monitors and controls the following:

   - Planned Value (PV)

   Planned value is the approved budget that has been allocated to the project at the initial stages. It is the total value of the project which is also named as budget at completion (BAC).

   - Earned Value (EV)

   Earned value is the estimation of work completed based on the approved budget. Here, the EV cannot be higher than PV. It is also calculated to attain the percentage of work completed.

   - Actual Cost (AC)

   Actual cost is the estimation of cost acquired while achieving the earned value in a certain period of time.

   - Schedule Variance (SV)

   Schedule variance is the estimation of schedule performance which is calculated with the difference between EV and PV. It is mainly useful when used with the critical path method in order to determine if the project is ahead or behind planned schedule.

Equation: SV=EV-PV

- Cost Variance (CV)

Cost variance is the measurement to check if the budget is sufficient or insufficient and check cost performance. It is calculated with the difference between EV and AC. This estimation is extremely important define the amount spent with the actual performance to determine status of the project.

Equation: CV=EV-AC

- Schedule Performance Index (SPI)

Schedule performance index is useful to calculate how efficient the project team is in comparison with time. It is calculated with the ratio between EV and PV. If the SPI results in less than 1, it represents that less amount of work is completed compared to the planned. While, if the SPI is more than 1, it represents that more amount of work has been accomplished than what was planned.

Equation: SPI=EV/PV

- Cost Performance Index (CPI)

Cost performance index is the most important tool to measure the efficiency of cost for the accomplished work. It is calculated with the ratio between EV and AC. Where, CPI less than 1 suggests cost overrun, while, less than 1 suggest costs are below budget. It is useful to determine the result of cost and schedule.

Equation: CPI=EV-AC

2. Forecasting

Forecasting is useful when BAC is less practical. It is the forecasting of situations and events that may occur in the future. It is calculated on the basis of current work performance and other information.

- Variance at Completion (VAC)

It is the forecast of the variation of cost to check if the project is under or above budget at the end of a project.

Equation: VAC=BAC-EAC

- Estimate at Completion (EAC)

It is the calculation of total cost for completing all the activities of the project.

Equation: EAC=AC+ (BAC-EV) or EAC=BAC/CPI

- Estimate to Complete (ETC)

This is the calculation of costs that will be incurred for the outstanding work of the project.

Equation: ETC=EAC-AC

3. Reserve Analysis

   Every project must have some reserves that will aid in case of risks. Reserve analysis is the used to determine if the project require to make use of the reserves or if there is need to request for extra reserves. As the project progresses, if certain situations occur that requires the need to use the reserves to mitigate risks; or if no risks occur, the reserves will be subtracted from the budget to reduce cost.

6.2.3. Quality Control Techniques

Quality control techniques will aid in monitoring the quality of work and examine the performance of resources. It benefits in establishing standards that need to be maintained and spot any poor activity so as to recommend ways to eliminate them. It helps to keep track of work to make sure they meet the specification in order to avoid any rework in the later stages.

1. Basic Quality Tools

   - Cause-and-Effect Diagrams

   Also known as fishbone diagrams, it is a type of diagram where the problem statement of the current issue is placed at the head of the diagram from where possible mitigating actions are derived. It is with the process of determining what factors have caused such discrepancy. The problem statement must include a gap or an objective that needs to be filled.

   - Flowcharts

   Flowcharts have a sequence or branches of work which convert the input to outputs. It displays an overall picture of parallel activities,

branches and decision points. It illustrates and provides estimation of the budget of the quality of the anticipated output.

- Checksheets

Checksheets are form of checklist that can be used during inspection to help in the identification of faults on site and it also helps is collecting data about a possible problem.

- Control Charts

Control charts determine if activities are performed as their anticipated performance. This chart comprises of maximum and minimum limits that are acceptable against a specific task. It is used by projects managers who have already determined the maximum and minimum limitations in order to control quality standards; and to take appropriate actions or measures if one goes beyond parameters.

- Scatter Diagrams

Scatter diagrams consist of an X and Y axis such as independent and dependent variable illustrating how a change in one variable may affect another and it displays the possibilities either positive or negative consequences.

2. Inspection

   Inspection is a form of assessment of work to ensure the quality standards are maintained. This can be performed at every activity, milestones and final stage. It helps in identifying any defects in construction activity and material. A competent inspector must be sent to the site with a checklist in order to not miss any elements.

3. Approved Change Requests Review

   After the changes are suggested, they must be approved by the concerned party and an official documentation of it must be made. This change must be reviewed on site in order to confirm the accurate application has been accomplished.

To conclude, this chapter has recommended and given advices to make numerous improvements and adjustments to be made to the current construction organisational practices. It pointed out several advices to be seriously considered by the project participants along with techniques that will support to plan and control the three crucial project critical success factors. In some cases, these suggestions may seem time consuming and costly but it offers the guarantee to enhance the current issues discovered by the survey. With the integration of these practices along with enough training, will serve in the long run by reducing risks such as delay, exceeded cost and degraded quality. Therefore, it is highly essential for the concerned party to take serious action towards project success.

7. Conclusion

The advancement in infrastructure is one of the substantial aspects for the economic development of a country. It's a well-known fact that UAE has been making break-through developments in the past decade in various field of business, technology, roads-highway, artificial environment, high-rise structures and man-made islands. Apart from turning the country into one of the largest tourist attraction location, the vision of the Expo 2020 has also stimulated the surge of construction projects. With the large number of projects being erected, the development also brings several complications along its journey towards completion. The key players of a project are the client, consultant and contractors whose negative effects drives the project towards failure. Thus, due to the lack of adequate research that would help the concerned project party and the identification of construction companies facing constant distress in making their projects successful according to their initial plan, this study was established to enlighten the factors that hinder project success in the UAE.

The study targeted to determine the influence of organisational delay risk factors on project critical success factors in construction projects in the UAE. It was crucial to identify which of the organisational participants such as client, consultant and contractor have major effect on the three success factors such as time, cost and quality. This was accomplished by highlighting which factors has stimulated the most significant influence. The theories of the iron triangle also defined as the project critical success factors in this study, were studied in order to identify how each of the interrelated factors can lead a project towards success. One of the core aims of the study was to spread awareness of the risks which were in most cases unidentified or unrecognised as a critical issue by the associated personals. Thus, leading to the extraction of fifteen leading factors in each organisational delay risk factors and project critical success factors categories respectively which were assessed.

The research analysis proved that time and cost are effected most of the time in an overall point of view as Table 9 stated, where effects to time took the leading position by 46.5%, while exceeded cost was 37.2%. Similar results were observed in maximum of the resources which were reviewed in the study as one of the studies performed by Koshe and Jha (2016), who estimated time overrun by 51%. The three proposed hypotheses linked to contractor related delay risk factors were accepted which signified their upmost influence on time, cost and quality of a project. This outcome was demonstrated in the study of Meena V and Babu (2015), where they mentioned 50% of the delay occurred due to contractors and by El-Karim, El-Nawawy and Abdel-Alim (2015). On the other hand, both client and consultant delay risk factors had no effect on cost factors, while, client had no influence on quality only. Here, the consultants were revealed to play a mediocre role, which wasn't anticipated because from the literature; it was acknowledged that they caused minor effects by 13.3% only, whereas, clients contributed 35.5% of causes instead as found by James et al. (2014). This suggests that client and consultants work closely in developing the project with careful attention given to cost, as funding is the most significant aspect of commencing a project. Similarly, quality is least affected by clients as they specify maximum of the resources and materials to be utilised in the project. Lastly, in the top five risk factors, the leading risk factor which acquired the top rank was incomplete contract documents. This result opposed the study which was based in Dubai by Ur Rahman in 2015, which was followed by delay in making payments, and lack of equipment efficiency and availability.

Moreover, as evidently stated, this study undoubtedly filled several gaps in research that were previously discovered in the UAE. It will also aid in making cautious planning of a project by each of the participants with the help of the comprehensive recommendations which were put forward in order to mitigate the risk factors. Guidance to all the factors were specified according to the identified reason of all the project critical success factors facing more or less impact by the organisational delay risk factors. To conclude, it is crucial to make the suggested alterations in the current project management practices to

overcome such issues and not enforce themselves with time, cost and quality that have surpassed the limits of the initial projected values. Although, people hesitate in making the changes fearing time, cost and training to be devoted on the advancement but in the long run it will demonstrate to bring revolutionary improvements to the present project condition.

Nevertheless, as the location selected to cover for the data collection is limited to factors related to the UAE only but the study may not be useful to compare with other nations outside the Middle East. This study focused on influence of risk factors on success factors to discover how each of the factors effect each other. The technical aspect of project management was studied which were based on the practices to be adapted along project planning and controlling. The risks related to client, consultant and contractors in general were studied. While, the factor of external factors, leadership style factors, cultural factors and procurement factors were not added. Due to time limitations and in availability of respondents to contribute enough time in answering the questionnaire, limited number of factors were incorporated. Interviews may have been conducted to attain a stronger relation of the factors. Also the proposed cost and quality advices are limited to manual implementation only. Finally, the recommendations could be tested in a case study application to check for their viability in construction projects. Likewise, each stage of the project life cycle should be studied separately to identify the issues faced in each cycle and present advices in overcoming issues related to each stage. As the results attained from the data analysis, contractors influence should be studied in details on its effect on each of the project success factors. Construction contractual conduct should be studied as contractual disputes are highly rated. The study could be performed on other countries to make it globally applicable. Project managers' leadership style factor effects on project success along with cultural impact and external factors should be focused. The BIM platform incorporation could be studied for overcoming current issues. Finally, software application could be surfed for enhanced cost/quality planning and controlling as one of the top ranked found in the analysis amongst critical success factors.

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Appendices

Appendix 1: Template of Questionnaire

QUESTIONNAIRE					
Impact of organisational delay risk factors on project critical success factors in construction projects in the UAE					
This 10 minutes survey seeks to obtain your feedback on the impact of organisational risk factors caused by client, consultant and contractor on project success factors such as time, cost and quality. Your responses on the questions will help me study their relationship as a part of my thesis completion. All information and responses provided will remain confidential and will be used for educational purposes only. Your responses will be highly appreciated. Thank you, Project Management student at The British University in Dubai					
Organization type:	☐ Client ☐ Consultant ☐ Other_____ ☐ Contractor				
Your role in the organisation:	☐ Manager/Project Manager ☐ Engineer ☐ Client Representative ☐ Contractor ☐ Architect/Designer ☐ Other_____				
Number of years of experience:	☐ Less than 5 years ☐ 10 to 15 years ☐ 5 to 10 years ☐ More than 15 years				
How often does a project get delayed according to your experience?	☐ Never ☐ Sometimes ☐ Rarely ☐ Most of the time ☐ Always				
How often does a project cost exceed the budgeted amount according to your experience?	☐ Never ☐ Sometimes ☐ Rarely ☐ Most of the time ☐ Always				
How often does a project quality become degraded according to your experience?	☐ Never ☐ Sometimes ☐ Rarely ☐ Most of the time ☐ Always				
Please tick **ONLY ONE** of the empty boxes for each statement according to your knowledge and experience on how each of factor plays a key role.					
Statement	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**

The following are the risk factors that causes delay in construction projects due to the three main project participants as mentioned below:					
CLIENT related project delay factors:					
Delay in decision making and design approval					
Changes in design and contract clauses					
Delay in making payments					
Changes in material type and imposed specification					
Poor communication and coordination with project parties					
CONSULTANT related project delay factors:					
Incomplete contract document					
Lack of proper site supervision					
Errors and changes in design					
Delay in design submissions and approvals to municipality					
Improper site survey and data collection					
CONTRACTOR related project delay factors:					
Lack of competent planning and scheduling					
Lack of skilled staff and labourers					
Lack of equipment efficiency and availability					
Poor site management and supervision					
Shortage of labourers					
The following are the three main project success factors in project management that make a project successful as mentioned below:					
TIME related project success factors:					
Adequate past experience of project parties					
Realistic project goals and objectives					

Support by the top management					
Motivating team members with incentives and reward					
Effective communication and coordination amongst project parties					
COST related project success factors:					
Timely progress meetings					
Availability of project resources					
Efficient site supervision and management					
Eliminate wastage of materials and time					
Efficient cost control system					
QUALITY related project success factors:					
Efficient quality assurance standards					
Monitoring and considering criticism by project parties					
Availability of skilled manager and team members					
Cooperation amongst project parties					
Committed management towards quality improvement					