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The Impact of Project Characteristics on the Success of Projects Completion under Project Constraints

أثر خصائص المشاريع على نجاح المشروع في ظل قيود الميزانية والموارد
البشرية والوقت

by

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**Dissertation submitted in fulfilment
of the requirements for the degree of
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Abstract

The application of project characteristics including technology and functional and location design in construction projects is being investigated for its role in boosting the successful completion of projects under project constraints such as tight budget, limited human resources, and limited time. With inefficiencies such as delays in projects emanating from the existence of project constraints, the UAE construction industry is being encouraged to adopt and implement project characteristics as part of their project work. The objective of this study was to explicate the impact of project characteristics (independent variable) on delivering successful projects under project constraints (dependent variable). In the literature review, the different factors of project characteristics and project constraints are listed with the emphasis placed on the need for construction organizations to adopt project characteristics for application into projects for successful completion. The total variables identified under each factor were 21 and they were all vital for the understanding of the success of projects under project constraints. The quantitative methodology utilizing regression was used in the study with the view of getting valid and reliable results. The study suggests that the application of technology to construction projects as a project characteristic goes a long way into boosting successful completion. Additionally, identifying the functional and location aspects of the project also helps boost completion even when there are constraints. The study faced a limitation because the available literature did not offer an explication of the factors that are primarily available in the UAE. Most of the literature entailed factors from other countries such as the UK. More so, there was a limitation because some respondents did not return the questionnaires. The study offers a set of recommendations that the construction industry could adapt to enjoy success even when there are project constraints.

Keywords: Project Characteristics, Project Constraints, Technology, Location and Functional Design.

الملخص

تشير الإحصاءات إلى أن المشاريع التي تطبق الجانب التكنولوجي والتصميم الوظيفي وتصميم الموقع في المشاريع الإنشائية تعزز من نجاح تلك المشاريع حتى ولو كانت تحت ظل قيود تعيقها مثل الميزانيات المقيدة والموارد البشرية المحدودة وضيق الوقت. ومع أوجه القصور التي تواجه إنجاز المشاريع من تأخيرات جاء اهتمام دولة الامارات العربية المتحدة في تشجيع قطاع الإنشاءات على تطبيق الجانب التكنولوجي والتصميم الوظيفي وتصميم الموقع لكي تكون هذه الخصائص جزء أساسي في أي مشروع. يتجلى الهدف من هذه الدراسة في توضيح تأثير خصائص المشروع (متغير مستقل) على تنفيذ مشاريع ناجحة في ظل معوقات تلك المشاريع (متغير تابع). وفي الإطار النظري وضمانا لنجاح المشاريع فقد أوكلت العوامل المختلفة لخصائص المشروع ومعوقاته إلى المؤسسات الإنشائية من أجل تطبيقها في جميع مشاريعها تلافيا للقصور في إنجاز هذه المشاريع، وكان إجمالي المتغيرات المحددة المدرجة تحت كل عامل 21 متغيراً، جميعها متغيرات حيوية وأساسية لفهم نجاح المشاريع في ظل معوقاتها. لقد تم استخدام المنهج الكمي في هذه الدراسة من أجل الحصول على نتائج صحيحة وموثوقة. وخلصت الدراسة إلى أن تطبيق التكنولوجيا على المشاريع الإنشائية باعتبارها من خصائص المشروع تُحدث تأثيراً كبيراً في تعزيز الإنجاز الناجح للمشروع ، بالإضافة إلى ذلك يساعد تحديد جوانب المشروع الوظيفية وذات الصلة بالموقع في تعزيز هذا الإنجاز حتى في وجود معوقات. لقد واجهت الدراسة بعض المعوقات والمتمثلة في أن الأدبيات المتوفرة لم تقدم شرحاً للعوامل الموجودة بشكل خاص في دولة الإمارات العربية المتحدة واقتصر معظمها على تلك العوامل في دول أخرى مثل المملكة المتحدة. وتُقدم هذه الدراسة مجموعة من التوصيات التي تساعد قطاع الإنشاءات عند تطبيقها على نجاح المشروع حتى في ظل وجود معوقات.

كلمات البحث الرئيسية : خصائص المشروع، معوقات المشروع، الإمارات العربية المتحدة، التكنولوجيا، الموقع والتصميم الوظيفي.

Table of Contents

Chapter 1: Introduction	1
1.0 Intorduction	1
1.1 Background & Rationale of the Study	2
1.2 Problem Statement	3
1.3 Research Question.....	3
1.4 Aim	4
1.5 Objectives.....	4
1.6 Scope of the Study	4
1.7 The Significance of the Research	5
1.8 The Structure and Organization of the Dissertation	5
Chapter 2: Literature Review	7
2.0 Intorduction	7
2.1 Project Characteristics Factors (Independent Variable)	8
2.1.1 Technology Factors	8
2.1.2 Location and Functional Design Factors	9
2.2 Project Constraints Factors (Dependent Variable).....	10
2.2.1 Tight Budget Factors	10
2.2.2 Limited Human Resources Factors	11
2.2.3 Limited Time Factors	13
2.3 Relationship Between Project Characteristics and Project Constraints	14
Chapter 3: Conceptual Framework	16
3.0 Intorduction	16
3.1 Conceptual Model	17
3.2 Hypothesis	18
Chapter 4: Research Methodology	20
4.0 Intorduction	20
4.1 Theoretical Background	20
4.2 Research Strategy.....	21
4.3 Research Approach	21
4.4 Questionnaire Design and Structure	22

4.5 Samples and Procedures	23
4.6 Variables and Measures	24
4.7 Data Analysis	25
4.7.1 Descriptive Statistics	26
4.7.2 Reliability Test	26
4.7.3 Correlation Test	26
4.7.4 Regression Test	27
Chapter 5: Main Findings and Interpretation	28
5.0 Intorduction	28
5.1 Creating Factors	28
5.2 Frequencies Statistics	28
5.2.1 Survey Respondents	28
5.2.1.1 Organization Type	28
5.2.1.2 Role in Organization	29
5.2.1.3 Number of Years of Experience	30
5.2.2 Factors Frequencies	31
5.2.2.1 Technology Factors	31
5.2.2.2 Location and Functional Design Factors	33
5.2.2.3 Tight Budget Factors	34
5.2.2.4 Limited Human Resource Factors	35
5.2.2.5 Limited Time Factors	36
5.3 Descriptive Statistics	38
5.4 Reliability Test: Using Cronbach's Alpha	39
5.5 Correlation Test	43
5.6 Regression	45
5.7 Overall Results	47
Chapter 6: Discussion	48
6.0 Intorduction	48
6.1 Discussion Between Technology and Project Constraints	48
6.2 Discussion Between Location and Functional Design and Project Constraints	49
6.3 Discussion Between Project Characteristics and Project Constraints	50

Chapter 7: Conclusion and Recommendation	55
7.0 Intorduction	55
7.1 Conclusion from Studying Technology Factors	55
7.2 Conclusion from Studying Location and Functional Design Factors	55
7.3 Conclusion from Studying Tight Budget Factors	56
7.4 Conclusion from Studying Limited Human Resources Factors	56
7.5 Conclusion from Studying Limited Time Factors	57
7.6 Summary of Conclusions	57
7.7 Implications	58
7.7.1 Descriptive Statistics	58
7.7.2 Reliability Test	59
7.8 Research Limitations	59
7.9 Recommendations for Further Research	60
Chapter 8: References	61
8.0 References	61
Chapter 9: Appendices	65
9.0 Appendices	65
9.1 Appendix 1: Project Characteristics and Project Constraints Factors Summary Table	65
9.2 Appendix 2: Questionnaire	67

List of Tables

Table 1:	Technology Factors Table	9
Table 2:	Location and Functional Design Factors Table	10
Table 3:	Tight Budget Factors Table	11
Table 4:	Limited Human Resources Factors Table	12
Table 5:	Limited Time Factors Table	13
Table 6:	Organization Type	29
Table 7:	Role in Organization	30
Table 8:	Number of Years of Experience	31
Table 9:	Technology Factors Responses	32
Table 10:	Location and Functional Design Factors Responses	33
Table 11:	Tight Budget Factors Responses	34
Table 12:	Limited Human Resource Factors Responses	36
Table 13:	Limited Time Factors Responses	37
Table 14:	Summary of Factors Descriptive Statistics (Maximum, Minimum, Mean, and Standard Deviation)	38
Table 15:	Reliability Test Using Cronbach's Alpha before deleting items	40
Table 16:	Reliability Test Using Cronbach's Alpha after deleting one items from each variable	41
Table 17:	Reliability Test Using Cronbach's Alpha after deleting two items from each variable	42
Table 18:	Reliability Test Using Cronbach's Alpha after deleting two items from each variable	43
Table 19:	Correlation Test	44
Table 20:	Regression Analysis	46

Table of Figures

Figure 1: Conceptual Model	17
Figure 2: Choosing an Analysis	25
Figure 3: Organization Type	29
Figure 4: Role in Organization	30
Figure 5: Number of Years of Experience	31
Figure 6: Technology Factors Responses	32
Figure 7: Location and Functional Design Factors Responses	33
Figure 8: Tight Budget Factors Responses	35
Figure 9: Limited Human Resource Factors Responses	36
Figure 10: Limited Time Factors Responses	37

List of Abbreviations:

UAE: United Arab Emirates

UK: United Kingdom

USA: United States of America

Chapter 1: Introduction

1.0 Introduction

The construction industry in the United Arab Emirates (UAE) has been doing well over the years with different construction companies adjusting to the changing construction demands. According to Kerr, Ryburn, McLaren, and Or (2013), both Abu Dhabi and Dubai have been beneficiaries of the developing construction industry with the completion of major projects such as Downtown Dubai and the Cleveland Clinic in Abu Dhabi. The key players in the construction projects are mainly the project developer and the contractor. However, Motaleb and Kishk (2010) affirm that the biggest challenge to the construction industry in the UAE is the delays in the completion of projects. The key factors that Motaleb and Kishk (2010) point out as the key causes of delays include poor technical performances, material prices escalation, slowed monthly payments, and poor management of contractors.

Accordingly, a number of factors constantly undermines delivering successful construction projects. Some of the challenges include tight budget, inadequate or incompetent human resources, and time constraint (Rokooei, 2015). It brings about a situation whereby a project becomes plagued with cost overruns and various forms of schedule delays. At the same time, individual with inadequate skills ends up handling projects a factor that compromises its success further. In most instances, these challenges come about because of the uncertain and fragmented nature of the construction industry (Fan, Skibniewski, & Hung, 2014). Nonetheless, these challenges are essential in order to ensure the survival of the projects.

Despite the above-listed challenges, the project management team strives to ensure that they complete the project on time and within budget. The significance of doing so is to ensure a successful project, which is determined by the extent to which it is able to meet the predetermined quality output standards (Mering, et al., 2017). However, effective project characteristics can play an instrumental role in alleviating the impact of project constraints. According to Lau and Kong (2006), project characteristics including effective planning and control are instrumental in managing the project constraints. The understanding of technology and location and functional design factors goes a long way into boosting the management of project constraints that could hamper its completion. Therefore, it is vital for project managers to understand the key project constraints and subsequently employ project characteristics that will help manage these constraints.

1.1 Background & Rationale of the Study

The UAE has various characteristics in its construction industry. These characteristics include cultural diversity, regulation flexibility, increased standards of living and government understanding (Ahbabi, 2014). The UAE has a well-rated quality of life. The industry of construction of the UAE has experienced rapid expansion (Ahbabi, 2014). This stems from recent development whereby Dubai was granted the opportunity of hosting Expo 2020, which gave Dubai the opportunity to boost its construction industry further. This has also been a boost to the UAE specifically for the industry of construction. Large-scale projects as well as projects that need intensive capital ought to be developed. These projects also need responsible construction and delivery (Sunil, C. Pathirage, & J. Underwood, 2017). The major aim of the construction industry of the UAE is the elimination of waste and the elimination of inefficiency. This is with a view of improving not only quality but also profitability. Currently, Dubai Municipality is considered as the initial authority in mandating the implementation of building technology in the UAE (Fazli, Fathi, Enferadi, Fazli, & Fathi, 2014); the mandate of Dubai Municipality in 2014 was for effective construction technology in the development of buildings with 40 floors or more, and all governmental projects.

To make sure that the desirable level of success within the project is attained, Gunduz and Yahya (2018) affirm that project constraints such as tight budget and limited time are handled through the application of management tools. Project management tools are vital to project characteristics that go a long way into boosting the realization of success within the project. The UAE being one of the biggest and most developing markets of project construction in the world, there is always the urgent need to have measures to address the project constraints that affect the completion of the project in the best ways possible. In the views of Gunduz and Yahya (2018), without a proper understanding of the best strategies to deal with the challenges of project constraints, there is always a big chance of the project ending prematurely. The application of project management tools including the application of technology and utilization of the best location and design factors within the course of the project. The effective utilization of resources within the project is also the best way of making sure that the best is derived out of the project despite the challenging environment that evidences the project.

1.2 Problem Statement

The utilization of project characteristics is growing in a slow manner in developing countries. Despite the fact that the benefits of project characteristics such as technology are known to the industry of Architectural Engineering Construction, there are still delays in the completion of projects in the UAE because of the potential constraints (Al-Sabek, 2015). The most significant challenge that the UAE has been experiencing is the problem with handling the project constraints that affects successful project completions. There has been an uncertain way of ensuring that the project constraints are managed in the most efficient manner to improve the completion of projects. According to Lau and Kong (2006), the project constraints have been widely discussed in project management literature, but they have not been explicated in detail. The lack of detail on the explication of project constraints means that relevant project characteristics have not been fully adopted to improve the successful completion of projects in the UAE. The inefficient application of project characteristics to the completion of projects in the UAE has been detrimental to the whole process of working in the projects and ensuring that they attain the desirable level of success in terms of the intended outcomes.

The paper will contribute significantly to the literature. It will help the construction industry of the UAE to analyse some of the challenges that are present within its practical framework. Moreover, based on the fact that various stakeholders lack the awareness of effective project characteristics that are bound to alleviate the negative effects of project constraints including tight budget, limited human resources, and limited time (Ren, Atout, & Jones, 2008) and (Sunil, C. Pathirage, & J. Underwood, 2017). Hence, an assessment of the project characteristics will be carried out to increase awareness of their significance to the project and its subsequent impact on the success of the project in the UAE. Furthermore, the status of the application of project characteristics will also be analysed in terms of the applicability across the globe. Additionally, the investigation of the challenges of projects in the UAE face and the subsequent application of project characteristics and proposing the best strategies that could be adopted for the sake of leading to the success of projects in the country.

1.3 Research Question

There are various research questions that ought to be addressed in this study; these research questions include:

- Does the project characteristics enable successful project delivery under tight budget?

- Does the project characteristics enable successful project delivery despite the existence of time constraint?
- Does the project characteristics enable successful project delivery under inadequate and incompetent human resources?

What is the overall impact of project characteristics on the delivery of successful construction projects?

1.4 Aim

The aim of the study is to investigate how project characteristics can be applied to foster successful project delivery under tight budget, time constraint, and inadequate as well as incompetent human resources, which are generally project constraints.

1.5 Objectives

The following objectives will be essential in fostering the achievement of the aim of the study; therefore, the research objectives include:

- To investigate how project characteristics facilitate the delivery of a successful project under tight budget.
- To investigate how project characteristics facilitate the delivery of a successful project despite the challenge of time constraint.
- To investigate how project characteristics facilitate the delivery of a successful project under inadequate and incompetent human resources.
- To determine the overall impact of project characteristics toward the delivery of successful construction projects.

1.6 Scope of the Study

The scope of this study will cover a comprehensive description of the status of project characteristics in the construction projects of the UAE. The study will also explicate the direct application of project characteristics in construction projects for the sake of ensuring that projects are managed in the best ways possible despite the constraints that they face. Then, the paper will highlight the manners of project characteristics that are understood and applied to the success of projects when there are glaring constraints. Moreover, the paper will also cover the barriers as well as the challenges associated with the application of project characteristics not only in the UAE but also all over the globe. Additionally, the paper will also highlight the

essential requirements that are needed in enhancing the application of project constraints in the construction industry of the UAE.

The construction industry of the UAE is still gradually adjusting to the adoption of project characteristics that are instrumental in alleviating the negative effect of project constraints. The UAE government has remained focused on the incorporation of project characteristics for the sake of ensuring that the project constraints do not affect the success of project completions in the country. However, it is significant to note that the availability of professionals and the accessibility of professionals who are committed to the utilization of project characteristics is limited (Kerr, Ryburn, McLaren, & Dentons, 2014). Therefore, the paper will use various strategies of research in the identification of the most appropriate data for the study.

1.7 The Significance of the Research

The gap in current literature as explicated by Lau and Kong (2006) is that there has been no direct explication of project characteristics and the application to the constraints within the project. Most previous studies have not been thorough in the emphasis on the project characteristics, and they have not been a help in the effective management of projects under project constraints, such as tight budget, limited human resources, and limited time. The research is of significance to the industry of construction not only in the UAE but also for other countries of the world. This is because the study will provide an analysis of project characteristics (Sunil, C. Pathirage, & J. Underwood, 2017). The paper will also provide an analysis of the benefits associated with project characteristics in boosting successful project completions under project constraints. Therefore, stakeholders in the industry of construction will understand the need for applying project characteristics in the construction projects. The paper is also of significance to the stakeholders of the construction industry of the UAE, as they will understand the nature of their industry and the challenges that are present within the industry (Beckers, et al., 2013). They will also understand the scope of the use of project characteristics in the industry. Consequently, they will put into use the provided recommendations in fostering the application of project characteristics into the project for purposes of realizing success.

1.8 The Structure and Organization of the Dissertation

The paper will be divided into various chapters. The first chapter will provide an introduction that will introduce the topic of research by highlighting the point of focus of the

research and providing background on the study. Apart from this, it provides the research question, the major aim and objectives of the research. The chapter also covers the scope of the paper and the problem statement. To add on, the significance of the research and the structure of the study have also been highlighted at the end of the introduction chapter. After that, the second chapter will be the literature review part of the study. Accordingly, the chapter will cover a review of project characteristics and project constraints that will start the chapter with a review on each one individually and ending the chapter by a review on the relationship between them. Then, the third chapter will cover the conceptual frameworks consisting of the conceptual model followed by the hypothesis. Consequently, the fourth chapter will cover the main methodological design used in the paper. The research technique and questionnaire design for gathering data in the research will also be highlighted in this chapter. The chapter will also cover the strategies and the approach used in the research addressing the ethical issues in the paper. Afterward, the fifth chapter will cover the main findings and the interpretations of the paper inducing creating factors and the required test for this research. Therefore, the chapter will provide the main findings and the interpretations of the paper. Subsequently, the sixth chapter will cover the discussion of the paper from the previous chapter. Finally, the seventh chapter will cover the major conclusions that will be made from the study followed by the implications of the study and ending the chapter by listing the limitations and providing recommendations for future studies.

Chapter 2: Literature Review

2.0 Review of Project Characteristics and Project Constraints

The literature review entails the demonstration of the key project characteristics and project constraints that influence the successful completion of projects in the UAE. In the project, understanding all the factors is crucial in setting the project for the discussion of the relationship between the variables. More so, there is the presentation of the factors that relate to each variable in the study.

The construction industry of the UAE had expanded in a rapid manner following the selection of Dubai in hosting Expo 2020. However, the industry of construction of the UAE is still experiencing growing pains despite the above-mentioned remarkable development rate. The growing pains include delays in the running of projects in addition to the increasing costs of project management. This is majorly because the management of projects in the UAE is characterized by increased levels of risks that unique technical and engineering hurdles also characterize it. There is fragmentation in the construction industry of the UAE. The industry has also become increasingly competitive. Thus, the focus of the construction industry of the UAE has changed and focused on the elimination of wastes and the elimination of inefficiency. Therefore, emphasis is placed on improving quality as well as profitability in the construction industry in the UAE.

The industry of construction of the UAE has been gradually embracing the inclusion of project characteristics for purposes of ensuring that the desirable level of success is realized in amidst the constraints that come with construction projects. Therefore, the industry is embracing a wide range of benefits associated with the use of project characteristics. However, the industry lacks the standardization of project characteristics over the nation. It is worth noting that the projects in the UAE put into consideration the standards of the United Kingdom (UK) and the United States of America (USA). Therefore, it is significant to look into the scope of project characteristics in the construction industry of the UAE. This will help in aid in assessing the impact of project characteristics in the delivery of successful projects under tight budget, human resources in addition to time, which are the key project constraints hampering the successful delivery of projects.

2.1 Project Characteristics Factors (Independent Variable)

The application of project characteristics into projects is becoming more popular not only in the UAE but also in other parts of the world. Project characteristics always entail the application of project management tools such as technology and location and design factors to the success of the project under project constraints (Gunduz and Yahya, 2015). The construction industry is benefitting highly from project characteristics through the application of technology to the processes involving the construction projects in the UAE. Thus, goals have been realized easily through the application of project characteristics in the projects.

2.1.1 Technology Factors

The first notable factor that is considered in technology is the construction design that affects the nature of the project in terms of how it will be developed. The other significant factor that is considered is the electrical installations and the electrical equipment within the project that is being constructed in the designated area. More so, active technical systems and the carpentry that is being undertaken within the organization according to Gunduz and Yahya (2015). Technology in the UAE construction industry has been a great advantage since modern machines have consequently been used working towards getting a solution to the limited human resource. In tandem, machinery used in the construction industry have brought about automation where the technical machinery is able to transport construction materials to designated places with ease thanks to the evolution in technology. Mixing construction materials is easily done by the available machines that are available at the construction sites; thus, making work easier apart from ensuring that the problem of budgeting for numerous employees and the unlimited and inexperienced human resource is done. It is evident that technology has emerged to be the best solution to the existing budgetary challenges, inexperienced and unlimited human resource and saving of time by the construction industry in the UAE.

Apart from helping in the whole procedure of construction, technology has also become resourceful in the provision of information that is required by the construction industry by accessing the internet. The architectural designs are easily accessed on the internet; thus, engineers save on time that they would have used on drawing and designing desired designs. Additionally, technology is vital in saving challenges that the construction industry faces in the UAE by ensuring that all the construction records and procedures are properly stored in technological devices. Hence, technology is rated the best factor that will work on the positive

impact of project characteristics in delivering successful projects under tight budget, human resource and time. These challenges initially seemed challenging, but the inclusion of technology in most of the construction procedures has facilitated solving these prevalent challenges.

Technical expertise and skills have also contributed positively to the UAE construction industry by ensuring that the engineers responsible for the major construction sectors are equipped with the latest skills that are needed in these construction industries. Thus, technological skills have helped in the management of time, handling the inadequate number of employees apart from saving on the cost of the budget that could sustain hiring and remuneration all of employees that will be able to do all the construction processes in any construction industries in the UAE. Based on the previous literature review, the following table shows sources of the technology factors.

Table 1: Technology Factors Table

Technology Factors	Source
Construction Design	(Alomari, Gambatese, & Anderson, 2017), (Fan, Skibniewski, & Hung, 2014), (Enshassi, Mohamed, & Abushaban, 2009), (Hussain, Zhu, Ali, Aslam, & Hussain, 2018); Gunduz and Yahya (2015)
Electrical installations and electrical equipment	(Al-Sabek, 2015); (Kerr, Ryburn, McLaren, & Dentons, 2014)
Active technical systems	(Mahamid, 2013); (Faridi & El-Sayeh, 2007); (Sunil, C. Pathirage, & J. Underwood, 2017)
Carpentry	(Mahamid & Dmaid, 2013); (Sunil, C. Pathirage, & J. Underwood, 2017); (Kerr, Ryburn, McLaren, & Dentons, 2014)

2.1.2 Location and Functional Design Factors

In construction projects, the landscape of the construction plays an instrumental role in determining the nature and the completion successfulness of a project. Additionally, the function of the building or the construction also influences the success of the project under project constraints. The other key factors that need to be put into consideration include the use of new materials and the construction site environment that go a long way into determining project success. Location of a construction site will automatically determine the nature of the means of transport that will be used in the transportation of the construction materials. If the construction site is in a rugged place or a rocky place, it will require that many funds are used in leveling of place and clearance of the place before the actual construction process continues. All these

procedures will require a lot of funds, more human resource, and wastage of a lot of time that will be required in finishing the whole process. In tandem, the construction sites and the construction design factors are affected by inadequate human resource, wastage of time and the increased budget, as it is a costly venture if a construction site is located in an inaccessible place or insecure place. In an insecure place, for instance, there will be a need for deployment of the security personnel to ensure peace and stability in the areas before the actual constructions procedure starts. To add on, the security personnel will also have to be there during the whole constructions procedure, which will lead to increased budgetary allocation to the construction industry that might not have been initially budgeted for. Table 2 will illustrates the location and functional design literature sources.

Table 2: Location and Functional Design Factors Table

Location and Functional Design Factors	Source
The construction land scape	(Sunil, C. Pathirage, & J. Underwood, 2017); (Memon, Rahman, Abdullah, & Azis, 2014)
The function of the building or construction	(Al-Sabek, 2015); (Kerr, Ryburn, McLaren, & Dentons, 2014)
Use of new materials	(Memon, Rahman, Abdullah, & Azis, 2014), (Faridi & El-Sayeh, 2007), (Memon, Rahman, Abdullah, & Azis, 2014), (Ahbabi, 2014)
Construction site environment	(Mahamid, 2013); (Faridi & El-Sayeh, 2007); (Sunil, C. Pathirage, & J. Underwood, 2017)

2.2 Project Constraints Factors (Dependent Variable)

Project constraints is considered as the dependent variable and are mainly made up of factors that tend to negatively affect the successful completion of projects. For instance, there are factors such as tight budget, limited human resources, and limited time that affect the success of the project (Kerr, Ryburn, McLaren, & Dentons, 2014). With tight budget, the financial capability of the project is affected. On the other hand, limited human resources ensure that there are fewer people to complete the project. Lastly, limited time means the time given is not adequate. Hence, all these factors constitute project constraints.

2.2.1 Tight Budget Factors

In regards to the budget, it is worth noting that several factors have been known to be key contributors to the tight budget and the need for project characteristics in these projects (Faridi & El-Sayeh, 2007). The key budget factors that have been demonstrated in Table 3 include economic instability, the cost of the equipment that are used within the project, the accuracy of

the bidding documents, the costs of labor that is used within the project, and the budgeting methods used. It is vital to make sure that the budget is set in the best way possible that suits the specifications of the project for success to be realized under a tight budget. Before the beginning of the project, project managers are expected to understand the nature of the project and the budget that has been given for the purposes of completion. The adequacy of the project always has to be weighed against factors such as the materials and the equipment that is expected to complete the project, as well as the extent of the entire project. Larger projects require more budgetary allocations compared to smaller projects (Enshassi, Mohamed, & Abushaban, 2009). Thus, budget constraints could be overcome with appropriate determination of what is required and within what time. Based on the previous literature review, the following table shows sources of the tight budget factors.

Table 3: Tight Budget Factors Table

Tight Budget Factors	Source
Economic instability	(Sunil, C. Pathirage, & J. Underwood, 2017), (Ribeiro, Paiva, Varajão, & Dominguez, 2013), (Ahbabi, 2014), (Al-Sabek, 2015)
Cost of equipment	(Asal, 2014), (Ren, Atout, & Jones, 2008), (Beckers, et al., 2013), (Dozzi & AbouRizk, 1993), (Okafor, 2016)
Accuracy of bidding documents	(Genç, 2014), (McNichol, Cooper, & Sturmy, 2013), (Hussain, Zhu, Ali, Aslam, & Hussain, 2018), (McNichol, Cooper, & Sturmy, 2013)
Periodic payments	(Ahbabi, 2014), (Sunil, C. Pathirage, & J. Underwood, 2017), (Asal, 2014), (Enshassi, Mohamed, & Abushaban, 2009), (Memon, Rahman, Abdullah, & Azis, 2014)

2.2.2 Limited Human Resources Factors

Additionally, factors related to human resources have also been highlighted in the table. The human resources play a direct role in making sure that the project is successful. Therefore, the key factors of human resources that should be understood include the competence of the individuals who are participating in the project, the performance of the project manager, the training of human resources within the project, the shortage of labor, and the total number of employees who might be required to complete the project (Mahamid & Dmaid, 2013). Therefore, in the application of project characteristics to a project, it is vital to consider these factors and ensure that they are carefully analysed at the beginning of the project to the completion time. The time should be measured from the onset of the project based on the

prevailing conditions within the area that the project is supposed to be completed (Hussain, Zhu, Ali, Aslam, & Hussain, 2018). There should be a careful consideration of the supportive nature of the conditions that are available in the area and the significant role that they are going to do in making sure that the project is a success within the time given.

Limited human resource automatically leads to overworking of the available employees who will turn out to be ineffective. In situations where the human resource is inadequate, the project characteristics in the construction industries in the UAE will be affected. To add on, the available human resource should be well equipped with the necessary skills that are needed in the construction industry in the UAE. The human resource comprises of the managers and their subjects. This asserts that there should be varied departments in the construction industry each assigned specific tasks are put under a specific supervisor who will be accountable to the managers. This in tandem opines that there is a need for the employment of enough human personnel to work in the varied existing departments for effectiveness and accountability. Moreover, fewer employees will lead to shoddy work, which can vehemently lead to confiscation of the construction licenses in situations where some of the construction industries may not follow the actual procedures of getting the permission for construction in some given areas. The limited human resources sources literature sources are summarized in Table 4.

Table 4: Limited Human Resources Factors Table

Limited Human Resource Factors	Source
Competency of workers	(Okafor, 2016), (Beckers, et al., 2013), (Beckers, et al., 2013), (Memon, Rahman, Abdullah, & Azis, 2014), (Ribeiro, Paiva, Varajão, & Dominguez, 2013)
Project Manager's performance	(Alomari, Gambatese, & Anderson, 2017), (Fan, Skibniewski, & Hung, 2014), (Enshassi, Mohamed, & Abushaban, 2009), (Hussain, Zhu, Ali, Aslam, & Hussain, 2018)
Training of human resources	(Hussain, Zhu, Ali, & Xu, 2017), (Al-Sabek, 2015), (Sunil, C. Pathirage, & J. Underwood, 2017), (Beckers, et al., 2013)
Number of employees available	(Dozzi & AbouRizk, 1993), (Enshassi, Mohamed, & Abushaban, 2009), (McNichol, Cooper, & Sturmy, 2013), (Alomari, Gambatese, & Anderson, 2017), (Ribeiro, Paiva, Varajão, & Dominguez, 2013)

2.2.3 Limited Time Factors

Time is an important component in the course of project completion. The key time factors that need to be considered with the utilization of the significance of project characteristics in the UAE includes delay in the approval of the documents related to the project, time taken for inspection of the site, delays experienced in the progress payments, shortage of labor, shortage of equipment that leads to the delayed project, and short contract that is given to the completion of the project (Al-Sabek, 2015). If the contract duration is short, then it means the whole project is likely to be delayed. While working on the project, the project manager needs to effectively determine the skills that are needed for employees based on the nature of the project for success to be realized with the guidance of project characteristics.

Limited time emanates from delayed remittance of funds required to be remitted by the government when some contractors win contracts. Limited time may also be caused by hiring inadequate personnel who might not be in a position to do certain responsibilities within a specified period. In this case, where the personnel available personnel might not be in position to complete a particular task, more time will be required which might be beyond the agreed time for the period of the contract to last. Such scenarios eventually affect the tight budget since there will be funds that will have to be used cater for the extra time that was used. Table 5 shows the sources literature of the limited time factors.

Table 5: Limited Time Factors Table

Limited Time Factors	Source
Delay in approval of project documents	(Ahbabi, 2014), (Mahamid & Dmaid, 2013), (Beckers, et al., 2013), (Hussain, Zhu, Ali, Aslam, & Hussain, 2018)
Duration of inspection procedure	(Ahbabi, 2014), (McNichol, Cooper, & Sturmy, 2013), (Beckers, et al., 2013), (Genç, 2014)
Short contract duration for construction	(Hussain, Zhu, Ali, & Xu, 2017), (Beckers, et al., 2013), (Memon, Rahman, Abdullah, & Azis, 2014), (Genç, 2014), (Okafor, 2016)
Delay in progress payments	(Ribeiro, Paiva, Varajão, & Dominguez, 2013), (Enshassi, Mohamed, & Abushaban, 2009), (Al-Sabek, 2015), (Hussain, Zhu, Ali, Aslam, & Hussain, 2018), (McNichol, Cooper, & Sturmy, 2013), (Beckers, et al., 2013)
Shortage of equipment	(Sunil, C. Pathirage, & J. Underwood, 2017), (Beckers, et al., 2013), (Hussain, Zhu, Ali, & Xu, 2017), (Mahamid, 2013), (Al-Sabek, 2015)

2.3 Relationship Between Project Characteristics and Project Constraints

In the previous section, in Table 1 through Table 5, the tables demonstrate and summarize the factors that are measured in this study to explicate the impact of project characteristics on delivering successful projects under project constraints. In addition, the previous tables are encapsulated in one table for a clearer understanding in Appendix 1. It is crucial to put these factors together in a table to show the aspects of the independent variables and the dependent variables to demonstrate the association between the factors. The ultimate result is to demonstrate how they relate to each other in terms of affecting the success of the project. The factors are divided effectively into technology factors, location and design factors for project characteristics and tight budget, limited human resources, and limited time for a project.

The link between project characteristics and project constraints is illustrative of the relationship that exists between the independent and the dependent variables in this study. Linking these factors shows how the independent and the dependent variables interact in the project to boost success. Ren, Atout, and Jones (2008) establish the relationship between project characteristics by pointing out the fact that project constraints including tight construction timelines, limited human resources, and challenges where the project manager has to deal with a tight budget. The connection between project characteristics and project constraints emanates from the understanding that project managers are always called upon manipulating aspects such as technology to attain the best possible goals in their target construction projects (Ren, Atout, and Jones, 2008). Aspects such as delays emanating from project constraints are well handled through expertise on effectively setting up the construction site and identifying the best technology that could help overcome the constraints in the project. Therefore, the overall connection according to Ren, Atout, and Jones (2008) is anchored on the ability of project managers to be open to the application of technology to overcome project constraints. This knowledge helps manage the constraints that could hinder the project from successful completion. Additionally, Al-Sabek (2015) brings out the nature of the relationship based on the planning process that should be undertaken by the project manager in the course of completing the project. By utilizing the desirable scheduling technologies, it is always easy for project managers to overcome the challenges that are associated with the time constraint. This leads to increased success in the organization in terms of completing the project. It is vital for any project

manager and the contractor to work in tandem to understand the aspects that are supposed to go into the project and the best ways of getting quality outcomes from the project. Al-Sabek (2015) and Ren, Atout, and Jones (2008) have a common agreement that the effective application of technology is a determinant in terms of overcoming the project constraints. The whole process of handling the glaring constraints in a project is to apply technology be it on attaining the best out of limited human resources, effective timing, and budgeting within the project. It is critical for project managers to understand the connection between project characteristics and project constraints based on technology application. The construction organization will not experience delays or inefficiencies in terms of completing the project if there is an understanding of the appropriate technological tools that need to be applied to overcome the project constraints. Therefore, linking between project characteristics and project constraints is about the manipulation of technology to complete projects successfully.

Chapter 3: Conceptual Framework

3.0 Introduction

The conceptual framework applied in study is with the use of both the dependent variables and the independent variables. An independent variable is the type of variable that is specifically manipulated by the researcher. The manipulation of the independent variable is aimed at determining the value of the other variables in the research, which are the dependent variables (Al Marri, 2018). In the case of the study, the researcher aims at assessing the impact of project characteristics in delivering successful projects under project constraints including tight budget, human resources, and time in relation to the construction industry of the UAE. Therefore, the independent variable in the study is “project characteristics” while the dependent variable is “project constraints”.

As earlier noted, project characteristics entail the application of the necessary construction technology and the utilization of effective factors of location for purposes of leading to the success of the project in the most effective manner. The project characteristics are always digitally represented and their application into the project is always strategic with the view of attaining the set goals in the project in the most effective manner. These models are usually encompassed of various components that are represented using digital objects that carry data. Therefore, the researcher manipulates this variable by testing it in a wide range of aspects in tandem to the course of project management in the industry of construction of the UAE (Al Marri, 2018). Therefore, the researcher analyses the impacts of the ineffective application of project characteristics in regards to facilitating the delivery of successful projects in the industry of construction of the UAE. The researcher also analyses the application of project characteristics in the industry in facilitating the delivery of successful projects (Ahmed, Opoku, & Aziz, 2016). The manipulation of this variable aids the researcher in making meaningful conclusions in the research. The manipulation of the variable also aids in assessing its suitability for use in the industry of construction in the UAE.

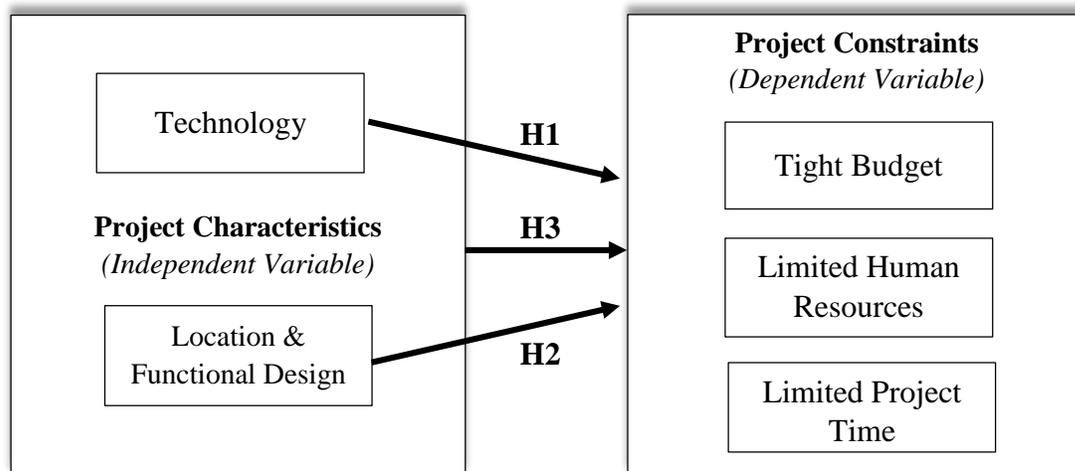
On the other hand, a dependent variable is the type of variable whose value is associated with other variables that is measured in a scientific research. It is also the type of variable that is tested in a research. In this case, the dependent variable relies on the independent variable. It is significant to note that the impact of the dependent variable can be observed. The impact of the dependent variable can also be recorded in a scientific research (Fellows & Liu, 2015). In the

case of this paper, the dependent variable is the project constraints that include several factors such as tight budget, human resources as well as time. Therefore, these variables depend on the manipulation of the independent variable, which is project characteristics. Human resources are significant elements when it comes to the aspect of project management. In fact, the construction industry of the UAE has a wide range of human resources. These human resources are vested with the responsibility of carrying out the various tasks that are associated with the success of the project. Therefore, the activities of the human resources in the study depend on the manner in which the project characteristics are manipulated in the study (Kerr, Ryburn, McLaren, & Dentons, 2014). The aspect of time implies the period of time that is identified for the completion of a project in the industry of construction. Time is a relevant aspect as it directs the activities of the human resources. The human resources have to ensure that they complete their tasks within the specified period. Apart from this, construction projects in the industry need funds for their completion. Consequently, the company ought to allocate sufficient funds for the completion of the project.

3.1 Conceptual Model

The above introduction's aspects depend on the manipulation of project characteristics in the study. The conceptual model that will guide this study is as demonstrated in Figure 1 illustrates both the independent and the dependent variables and the outcome, which is the delivery of successful projects.

Figure 1: Conceptual Model



Therefore, from the conceptual model in Figure 1, there is the demonstration of the view that project characteristics will directly influence project constraints such as tight budget, limited human resources, and the limited time to influence the success of the project. From the literature,

and specifically from the study by Gunduz and Yahya (2015), the link between project characteristics and project constraints emanates from the application of management tools in addressing factors that are bound to delay or hamper the successful completion of projects in the construction industry. The arrow with an indicator of H3 is the link between the project characteristics and the project constraints and illustrative of the fact that a project is only successfully completed when the project characteristics such as technology and location and functional design are applied to the existing constraints. The consideration of the time, human resources, and the time are critical in the conceptual framework because it demonstrates the direction that the project has taken in terms of leading to the successful outcome that is always intended by all project managers in the course of working on their different projects in the UAE.

3.2 Hypothesis

The factors are effectively grouped in the above conceptual model and offering a proper opportunity for the development of the study's hypothesis as demonstrated below.

In the previous chapter of literature review, technology has been picked as of the key factors that have influenced the success of projects even with project constraints. With the need to control costs in the project, affirms that project characteristics emphasize the need to have efficiency in the delivery of successful projects (Sunil, C. Pathirage, & J. Underwood, 2017). The absence of technology makes it difficult for a project to be completed under various constraints such as tight budget. Hence, the first hypothesis as demonstrated in Figure 1 is as follows:

H1: There is a significant influence of technology on the success of projects under project constraints.

On the other hand, the place that the project is located is significant in determining the manner in which it is completed. More so, the design that is undertaken for the project influences its success when there are constraints in the course of its completion. It is always vital for project managers and contractors to evaluate the feasibility of the place and the design factors of the project under project constraints to complete successfully (Ren, Atout, & Jones, 2008). A prior evaluation of the place and design factors is what influences project success. Hence, the second hypothesis as demonstrated in Figure 1 is as follows:

H2: There is a significant influence of location and functional design on the success of projects under project constraints.

Therefore, the global to global factors are the project characteristics factors and the project constraints that affect the successful delivery of projects in different parts. Thus, the early discovery of the general potential factors and the influence each other goes a long way into determining the success of the project (Faridi & El-Sayeh, 2007). The factors should be clearly identified based on the project. Hence, the first hypothesis as demonstrated in Figure 1 is as follows:

H3: There is a significant influence of project characteristics (technology factors and location and functional design factors) on project success under project constraints (tight budget, limited human resource factors, and limited time).

Chapter 4: Research Methodology

4.0 Introduction

Considering a study regarding a particular concern or a problem using scientific methods is called a research. According to the American sociologist Earl Robert Babbie (2013), “Research is a systematic inquiry to describe, explain, predict and control the observed phenomenon. Research involves inductive and deductive methods”. Those research methods are the specific procedures or techniques used to identify, select, process, and analyse information about a topic (University of the Witwatersrand Johannesburg, 2018).

There are three significant types of research. The first type is quantitative research, the second type is qualitative research, and the third type is a mixed research. Quantitative research is concerned with the systematic empirical investigation of observable phenomena utilizing statistical techniques (Bhat, 2018). On the other hand, the qualitative research focuses on gaining opinions and underlying reasons for phenomena utilizing exploratory approach. Lastly, the mixed methods entail both qualitative and quantitative approaches in the research process. The selected research type for this study is the quantitative approach and the justification that it allows for the statistical comparison of the variables (Sunil, Pathirage, & Underwood, 2017). As it is a quantitative research, a deductive research method is considered. The inductive method is used to analyse the observed phenomenon; unlike the inductive research, the deductive method are used to verify the observed phenomenon (Bhat, 2018). The research methodology explicates the data analysis approaches that were used for the variables explicated in the study. The sampling process and the method used for analysis specifically SPSS has also been explicated. In the overall sense, the methodology offers the direction into the steps taken to derive the data used in the study.

4.1 Theoretical Background

In tandem with the literature review, the main variables that influence the success of projects under project constraints such as tight budget, limited human resources, and limited time have been explicated with the focus on the UAE. The impacts have also been explicated, as they relate to other countries such as the UK and the USA where the project characteristics have been applied in the construction industry where there are project constraints (Sunil, C. Pathirage, & J. Underwood, 2017). The comparison of the influence of project characteristics on the effect of the success of project under project constraints is instrumental in understanding the manner in which

different countries are trying to work toward the development of successful projects even when there are constraints. Accordingly, project managers are always tasked with the responsibility of making sure that the projects assigned to them are working toward the desired direction. An important factor to note is that the project characteristics factors such as technology and location and functional design of the construction cannot be generalized across countries and the same applies to the project constraints including tight budget, limited human resources, and limited time that are involved in projects (Al-Sabek, 2015). Therefore, the key factors including tight budget, limited human resources, and limited time have been taken to constitute the constraints, which is the dependent variables while technology and location and functional design relate to project characteristics, which makes up the independent variable. Notably, the identification of these variables simplifies the measurement of these factors in the project and hence and creates a better understanding of the nature of the project in terms of the attainment of the set goals.

4.2 Research Strategy

The flow of the research is as demonstrated in the steps below,

- Introduction and background of the research, the definition of the problem, setting out the research question, aims, objectives, and scope of the study.
- The literature review that entails the identification of the factors for project characteristics and project constraints individually and ending with the relationship between both factors.
- Creating the conceptual framework for the research by creating a conceptual model followed by the hypothesis considered in the study.
- Creation of a questionnaire to gather data needed for the research
- Presentation of the results and analysis using SPSS statistical program
- Interpreting outcome from SPSS by descriptive statistics and other tests.
- Coming up with the overall results followed by a discussion on the outcome of the study.
- The study will end with a conclusion on each of the factors, implications, and recommendations for further research.

4.3 Research Approach

The research approach to be utilized in the study will encompass the use of quantitative methods where it is “confirmatory in nature, the finding of which is obtained through testing the hypothesis which will also be using the concurrent mixed method due to time limitation” (Al Marri, 2018). The research will majorly focus on the provision of primary data for the study. As

mentioned earlier on, questionnaire surveys will be useful in the provision of primary data for the study. Specifically, distributive survey questionnaires will be used. The questionnaires will be distributed randomly on 250 construction project managers, engineers, architects, designers, consultants, and clients in the construction industry from a selected in 10 construction companies within the UAE. The survey questionnaires will be distributed via email, which will prove to be a cost-effective method of collecting data, and hard copy questionnaires will be distributed on ongoing site of personal knowledge. As it is a quantitative research, the key research approach that was pursued was the use of hard copy questionnaires (Bhat, 2018). There was a convenience in using the hard copy questionnaires because of the access to participants in the course of the research. In addition, this method has been preferred given the fact that it will allow for data collection from a relatively large number of participants in a short period. Accordingly, the research participants will be surveyed in order to assess the impact of project constraints on the delivery of successful projects despite the associated tight budget, inadequately skilled human resources, and time constraint. From the research findings that will be made, the study will be essential in illustrating the extent of useful project characteristics in construction projects.

4.4 Questionnaire Design and Structure

To avoid confusion, the questionnaire was effectively designed in a way that gave respondents to first understand the topic under study. The structure of the questionnaire was clear to make sure that the respondents understood every aspect that was included in them. The first part of the questionnaires entailed the background information of the respondents including the organization that they work in and the number of years that they have worked in the organisations. The questionnaire is structured to match both the project characteristics factors and project constraints factors in Table 1 though Table 5 in the literature review. This is to maintain consistency of the study in addressing all variables, as well as meeting the set objectives of the study. Understanding this information was critical in leading to the response to the main parts of the questionnaire. More so, their experience in the organization and the job positions that they hold were also considered as vital aspects of the survey questionnaires and the subsequent response to the questions. In tandem with the tables of factors developed in the literature review, the second part of the questionnaire entailed the development of questions for each factor on a Likert-Scale on a scale from one to five, one being strongly agree and five being strongly disagree. The questions type was close type questions, as participants were only asked

to tick the boxes of each question on what they thought about without writing their opinions in an open-end manner answers. Closed Likert-Scale questions were selected, as it is easier and quicker for respondents to answer. Not only that but also, if open-ended questions were offered it will be harder to compare answers of different respondents and to code and statistically analyse the answers. The development of questions according to the factors also made it easier to have a clear picture of both the project characteristics and project constraints factors.

4.5 Samples and Procedures

The sample population is important because it offers primary data that is needed for research. Out of the population of 250 whom the surveys were distributed on, only 58 responded to the questionnaires. A sample population of 58 respondents offers a wide range of responses that are important for the research. In this section, the hypothesis is verified through the in-depth analysis of the data that was collected through the survey questionnaires. There was a careful consideration of how the survey questionnaires were administered in the study. For this particular study, survey questionnaires were administered to 58 in the UAE construction employees and the survey questionnaires had specific questions focused on both project characteristics factors and project constraint factors in terms of how they influence the success of the projects in the UAE. The survey questionnaires were administered to each respondent and everyone was given the time to read all the questions, understand them, and answer them based on how they deemed fit. The confidentiality and privacy of participants were of great importance in the project and it was protected through making sure participants only used pseudonyms instead of their original names on the questionnaires (Fellows & Liu, 2015). Additionally, there was also focus on making that participants willingly took part in the study without any pressure or undue influence, and this was done by seeking the appropriate permission from them. All this was done to adhere to the research ethical standards.

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4.6 Variables and Measures

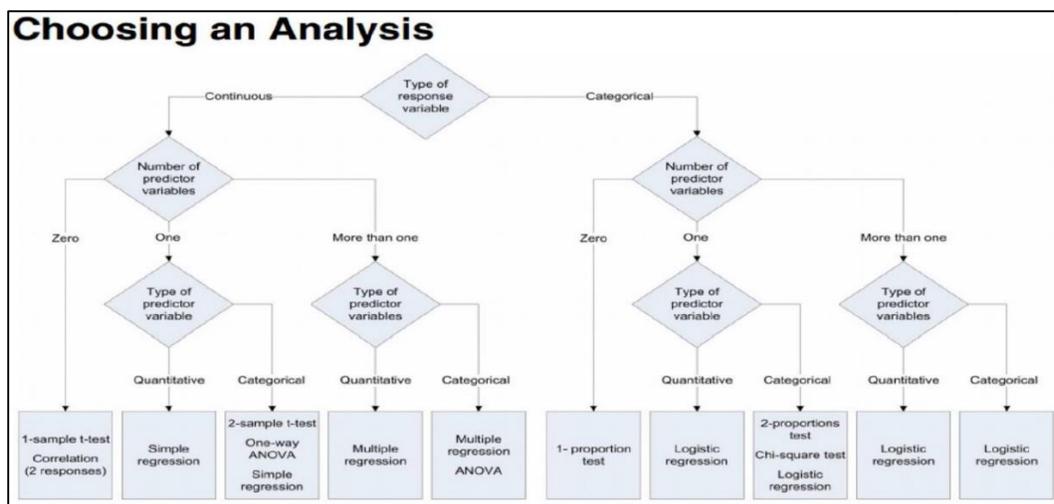
The study was made up of both independent and dependent variables. The project characteristics factors including technology factors and location and functional design factors constituted the independent variables. In tandem with the questionnaire, particular aspects including the construction design, electrical installations and electrical equipment, active technical systems, and carpentry measured the technology factors. Conversely, the location and functional design factors were measured by factors such as the construction landscape, the

function of the building, use of new materials, and the construction site management (Ahhabi, 2014). The factors of the independent variable demonstrate the influence of the project characteristics on the success of the project under project constraints. On the other hand, project constraint factors including tight budget factors, limited human resources, and limited time constitute the dependent variable. Therefore, the aspect of tight budget was measured using factors such as economic instability, the cost of equipment, accuracy of the bidding documents, and the periodic payments. The second factor, limited human resource factors were measured using factors such as the competency of workers, the project manager's performance, training of human resources, and the number of employees in the project (Faridi & El-Sayeh, 2007). Lastly, limited time was measured using factors such as the delay in the approval of the project, the duration of the inspection procedure, the short contract duration for construction, the delay in the progress payments, and the shortage of the equipment in the project.

4.7 Data Analysis

Data analysis is the technique of systematically applying the selected statistical program to the description, illustration, and evaluation of data. In this study, SPSS is the selected data analysis statistical program. The SPSS statistics simplified the process of data analysis in relation to each of the variables in the study. It is worth noting that with SPSS statistics, multiple regression would be used in the analysis of each of the variables to boost their understanding in the study (Ahmed, Opoku & Aziz, 2016). According to Al Marri in Quantitative Analysis – Research Methods (2018), the most suitable model for this study would be the multiple regression as shown in Figure 2 below.

Figure 2: Choosing an Analysis



Multiple regression would also ensure that the factors are effectively analysed and measured because the factors in this case have already been developed and categorized effectively. The suitability of multiple regression to this study is anchored on the understanding of the clear relationship between the independent variable (project characteristics) and dependent variables (project constraints). Through regression analysis, the link between the two variables can be easily established and subsequently explained for the promotion of construction projections under project constraints. More so, the suitability of multiple regression is based on the identification of outliers or anomalies in the study (Weedmark, 2018). Each variable is important and would need to be understood in the manner it influences the success of the study. With multiple regression, it will be simpler to predict the relationships that exist between the independent and the dependent variables that have been developed in this study. Therefore, the findings will be more understandable in this study. Thus, the understanding of the connection between the independent and dependent variables is instrumental in leading to a better understanding of the study's findings and what they mean in explaining the influence of project characteristics in projects that are limited by constraint.

4.7.1 Descriptive Statistics

Descriptive statistics are commonly used to describe the features of data (Heumann and Shalabh, 2017). In this study, descriptive statistics are used to illustrate the frequency scores of the variables of each factor.

4.7.2 Reliability Test

A reliability test is used to show the consistency of the instrument, which in this study is the questionnaire to produce similar results across time (Heumann and Shalabh, 2017). In this study, Cronbach's reliability test is utilized to check the internal consistency of both the independent and the dependent variables.

4.7.3 Correlation Test

A correlation test is a statistical measure that illustrates the extent to which changes in the value of one variable predicts the change in the value of another variable. Positively correlated variables are always characterized by an increase or decrease in a linear direction. The values of the correlation coefficient are always expressed with values between +1 and -1 (Heumann and Shalabh, 2017). In this study, regression is used to determine the strength of linearity for the variables under study.

4.7.4 Regression Test

A regression test helps the researcher establish the strength of relationships between variables. For instance, it gives the researcher the opportunity to test the strength of the relationship between a numerical dependent variable and a numerical independent variable (Heumann and Shalabh, 2017). In this study, the regression test is conducted to test the relationship between project characteristics (independent variable) and the project constraints (project constraints).

Chapter 5: Main Findings and Interpretation

5.0 Introduction

This chapter details the key tests that were conducted to evaluate the relationship between the project characteristics factors (technology and location and functional design factors) and the factors related to the project constraints (tight budget, limited human resources, and limited time). The chapter includes creating factors, frequencies statistics, descriptive statistics, reliability test, correlation test, and regression tests. The reliability test was used to measure the consistency of the results.

5.1 Creating Factors

For the first and the second hypotheses, the factors that are created represent technology factors, location and functional design, and project constraint factors including tight budget, limited human resources, and limited project time. The third hypothesis represents the combination of global factors of project characteristics and global factors for project constraints that influence the success of the project. Thus, the creation of the factors in the hypothesis was prepared in an effective manner with the view of understanding the way in which the independent variables that have been created impact the dependent variables, and it will make it easier for data analysis in the study.

5.2 Frequencies Statistics

The frequency statistics are conducted to demonstrate the tables, frequency counts, and the percentage of variables in the study. The frequency statistics is important because it shows the number of times the data value occurs (Ahmed, Opoku & Aziz, 2016).

5.2.1 Survey Respondents

5.2.1.1 Organization Type

The respondents in the data included clients, consultants, and contractors. The total number of respondents was 58, and it included 15 clients (25.9%), 16 consultants (27.6%) and 27 contractors (46.6%). This shows that the majority of the respondents came from contractors. The number of respondents and their specific titles are represented in Table 6 and a pie chart in Figure 3.

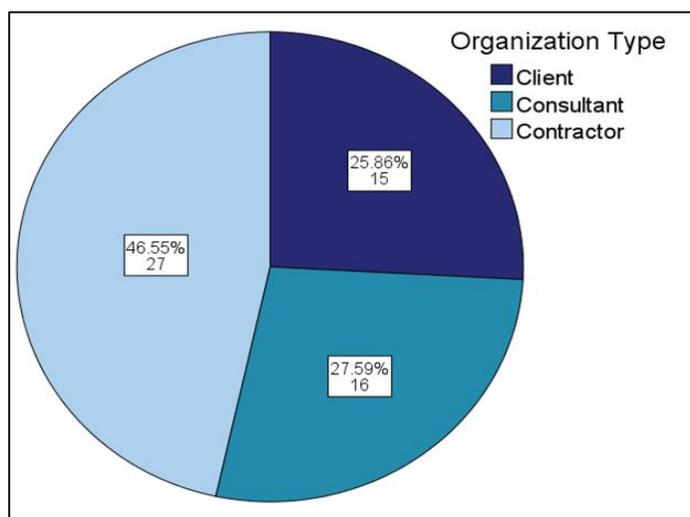
Having respondents from various fields was instrumental for the success of this research because it helped in the comparison of the responses. For instance, 15 clients were an adequate number to understand the perspectives of individuals' whose projects are currently being

undertaken based on the application of project characteristics to project constraints. On the other hand, 16 consultants were vital in the study because they helped explain the real link between project characteristics and project constraints in leading to the success of the project (Sunil, C. Pathirage, & J. Underwood, 2017). Lastly, 27 contractors were a good number because they helped in the understanding of the application of project characteristics to a large set of projects in the UAE. In the overall sense, the numbers of every group of participants were important for the establishment of common occurrences in projects with project constraints.

Table 6: Organization Type

Organization Type				
	Frequency (N)	Percent	Valid Percent	Cumulative Percent
Client	15	25.90 %	25.90 %	25.90 %
Consultant	16	27.60 %	27.60 %	53.40 %
Contractor	27	46.60 %	46.60 %	100.00 %
Total	58	100.00 %	100.00 %	

Figure 3: Organization Type



5.2.1.2 Role in Organization

More so, the role in the organization for each respondent was investigated and the results were as in Table 7 and a bar chart in Figure 4. Regarding the organization role, the Managers/Project Managers were 14 (24.1%), Client representatives were six (10.3%), Architect/Designers were 14 (24.1%), Engineers were 14 (24.1%) and others were 10 (17.2%).

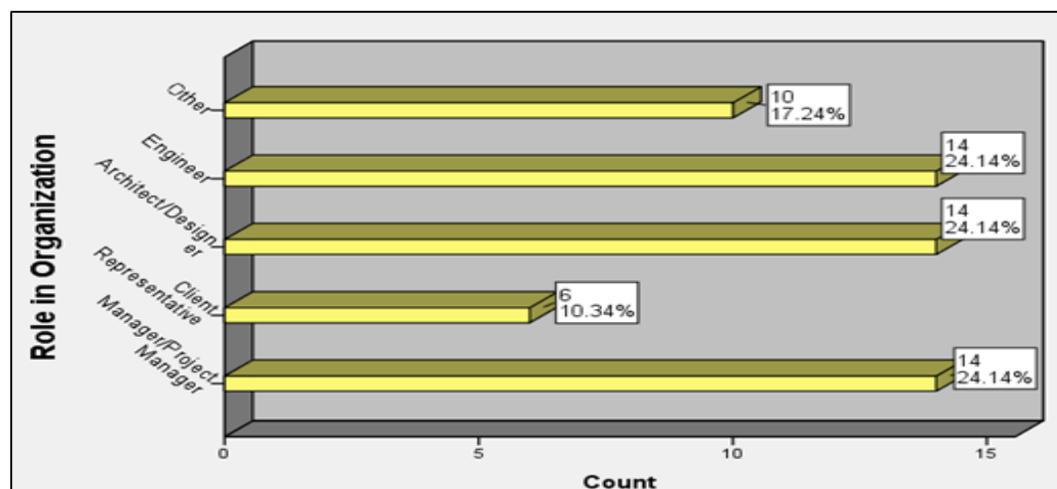
Having individuals drawn from different levels of the organization in the research was good because it helped to boost the understanding of the impact of project characteristics on project constraints. For instance, 14 project managers helped explain how they are managing projects under project constraints through the application of project characteristics. The six client

representatives was also an adequate number that helped understand how they acted on behalf of their clients in regards to understanding how their project managers are pursuing projects under constraints (Ahhabi, 2014). The architects and engineers totaling 28 in number were critical in helping the researcher understand the design aspects that are incorporated into projects with project constraints as part of project constraints. Others were participants who also offered valid opinions on the best ways of managing project constraints through project characteristics.

Table 7: Role in Organization

Role in Organization				
	Frequency (N)	Percent	Valid Percent	Cumulative Percent
Manager/Project Manager	14	24.10 %	24.10 %	24.10 %
Client Representative	6	10.30 %	10.30 %	34.50 %
Architect/Designer	14	24.10 %	24.10 %	58.60 %
Engineer	14	24.10 %	24.10 %	82.80 %
Other	10	17.20 %	17.20 %	100.00 %
Total	58	100.00 %	100.00 %	

Figure 4: Role in Organization



5.2.1.3 Number of Years of Experience

On the other hand, the number of years of experience of the respondents were presented in Table 8 and a bar chart in Figure 5. Those who have worked for less than five years were 29 (50%), those who have worked between five to ten years were 21 (36.2%) and those who have worked for ten to fifteen years were 4 (6.9%) while those with more than fifteen years of experience was 4 (6.9%).

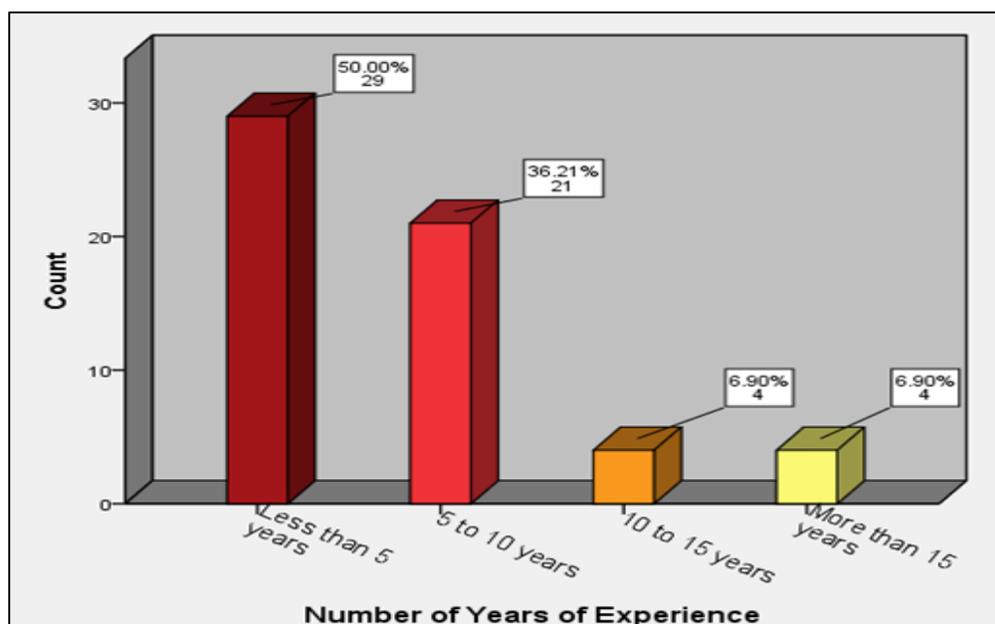
The number of years of experience were representative of the fact that most employees who had worked in constructions for the longest times had the best comprehension of how project characteristics are applied to construction projects with project constraints. Employees

with less experience in organizations did not have a maximum comprehension of the approaches organizations use to overcome these constraints (Kerr, Ryburn, McLaren, & Dentons, 2014). Overall, the application of project characteristics in managing project constraints increases with the years of experience in the organization.

Table 8: Number of Years of Experience

Number of Years of Experience				
	Frequency (N)	Percent	Valid Percent	Cumulative Percent
Less than 5 years	29	50.00 %	50.00 %	50.00 %
5 to 10 years	21	36.20 %	36.20 %	86.20 %
10 to 15 years	4	6.90 %	6.90 %	93.10 %
More than 15 years	4	6.90 %	6.90 %	100.00 %
Total	58	100.00 %	100.00 %	

Figure 5: Number of Years of Experience



5.2.2 Factors Frequencies

This section will show the responses of the respondents on each question in the questionnaire. The section will enable us to know how many people responded with the specific answer on each question.

5.2.2.1 Technology Factors

The statistics for the technology factors presented in Table 9 and Figure 6 show that most of the responses were mainly strongly agree and agree. For instance, for the construction design, the number for strongly agree was 26 and agree was 32. In the case of electrical installations and electrical equipment, strongly agree was 42 and agree was 13. For active technical systems, the

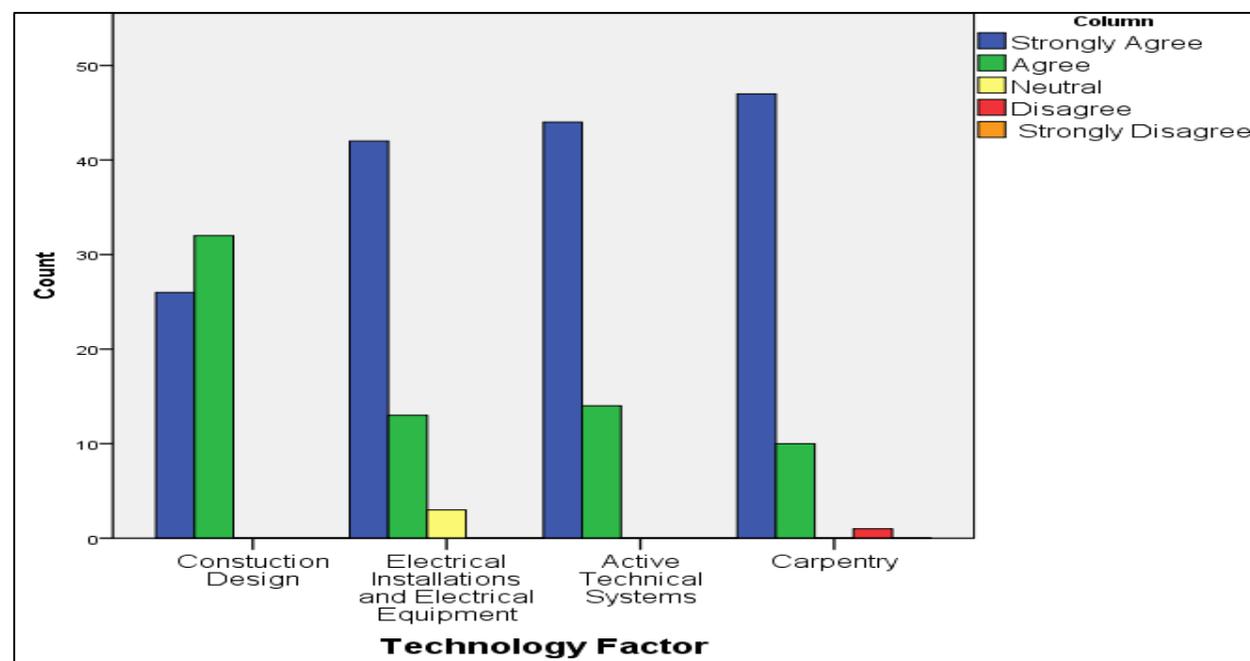
value for strongly agree was 44 and agree was 14 while for carpentry, the value for strongly agree was 47 and agree 10.

Thus, these values mean that all these technology factors are vital in boosting project success under project constraints. Looking at the results from the survey, technology factor had most scores on strongly agree and agree. It is an indicator that technology is an important part of the project characteristics leads to the success of projects under project constraints (Al-Sabek, 2015). The overall meaning is that appropriate use of technology will help overcome the challenges posed by tight budget, limited human resources, and limited time. Thus, human resource managers need to understand the significance of applying technology to overcoming the project constraints that they face.

Table 9: Technology Factors Responses

Technology Factors Responses				
Description	Item 1 Question	Item 2 Question	Item 3 Question	Item 4 Question
	Construction Design	Electrical Installations & Electrical Equipment	Active Technical Systems	Carpentry
Strongly Agree	26	42	44	47
Agree	32	13	14	10
Neutral	0	3	0	0
Disagree	0	0	0	1
Strongly Disagree	0	0	0	0

Figure 6: Technology Factors Responses



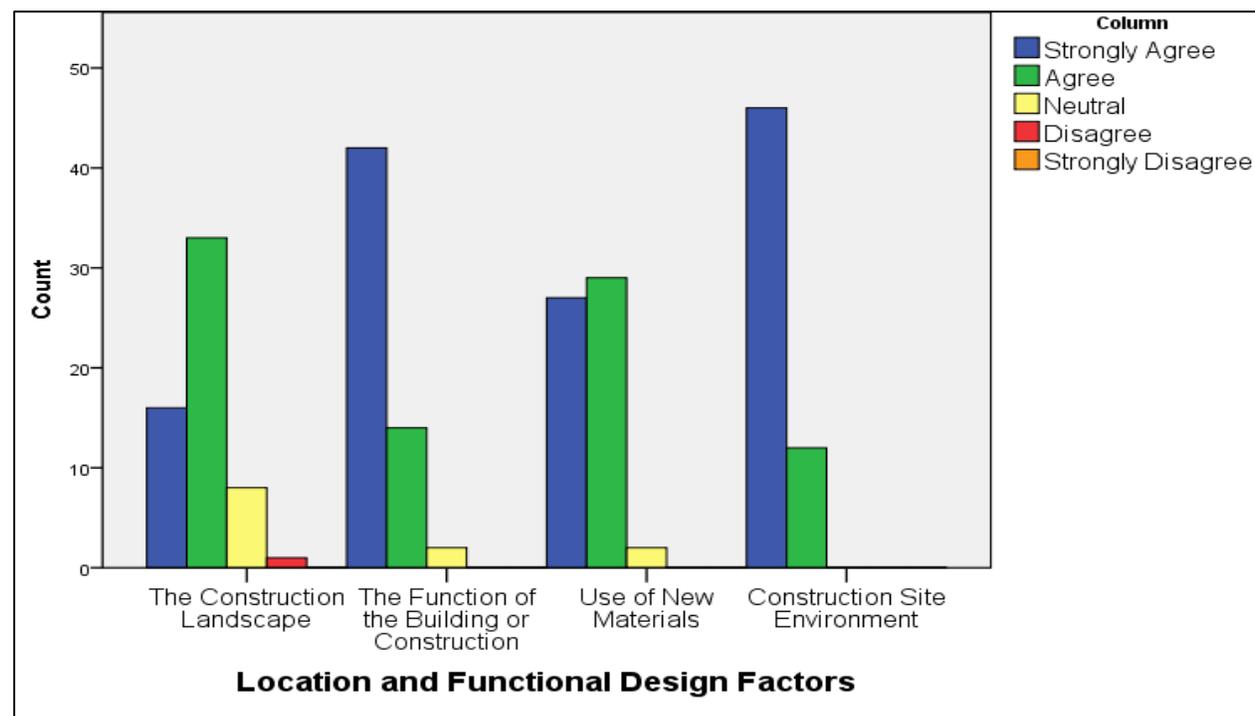
5.2.2.2 Location and Functional Design Factors

In the location and functional design factor, most of the responses for functional and design factors were strongly agree and agree as presented in Table 10 and Figure 7. Specifically, for the construction landscape, the value for strongly agree was 16 and agree was 33. On the other hand, the function of the building or construction had a value of 42 for strongly agree and 14 for agree. The use of new materials had a value of 27 for strongly agree and 29 for agreeing while the construction site environment had a value of 46 for strongly agree and 12 for agree. The meaning here is that all the variables of the location and functional design factors have an impact on project success under project constraints.

Table 10: Location and Functional Design Factors Responses

Location and Functional Design Factors Responses				
Description	Item 1 Question	Item 2 Question	Item 3 Question	Item 4 Question
	The Construction Landscape	The Function of the Building or Construction	Use of New Materials	Construction Site Environment
Strongly Agree	16	42	27	46
Agree	33	14	29	12
Neutral	8	2	2	0
Disagree	1	0	0	0
Strongly Disagree	0	0	0	0

Figure 7: Location and Functional Design Factors Responses



Based on the high number of respondents who strongly agreed and agreed, there is the general understanding that effective consideration of the location and design factors helps in overcoming challenges associated with project constraints. For instance, if the location and required design of the project is well set out, then there is always timesaving and an understanding of how human resources will be planned in helping to overcome project constraints (Faridi & El-Sayeh, 2007). The overall conclusion from the numbers is that project managers must be aware of the needed location and design factors to mitigate the negative impacts of project constraints on the successful completion of projects.

5.2.2.3 Tight Budget Factors

The tight budget factors also got responses of strongly agree and agree except for the cost of equipment as illustrated in Table 11 and Figure 8. Only the cost of equipment had higher values for disagree and strongly disagree. For instance, in the case of economic instability, the value for strongly agree was 49 while agree was nine. The accuracy of the bidding documents had 19 for strongly agree and 30 for agree while periodic payments had 49 for strongly agree and nine for agree. Nevertheless, the cost of equipment differed from the other items as it had 28 for disagree and 17 for strongly disagree. The meaning here is that economic instability, the accuracy of bidding documents, and periodic payments do not significantly affect the budget; on the other hand, the cost of equipment has an effect on the budget.

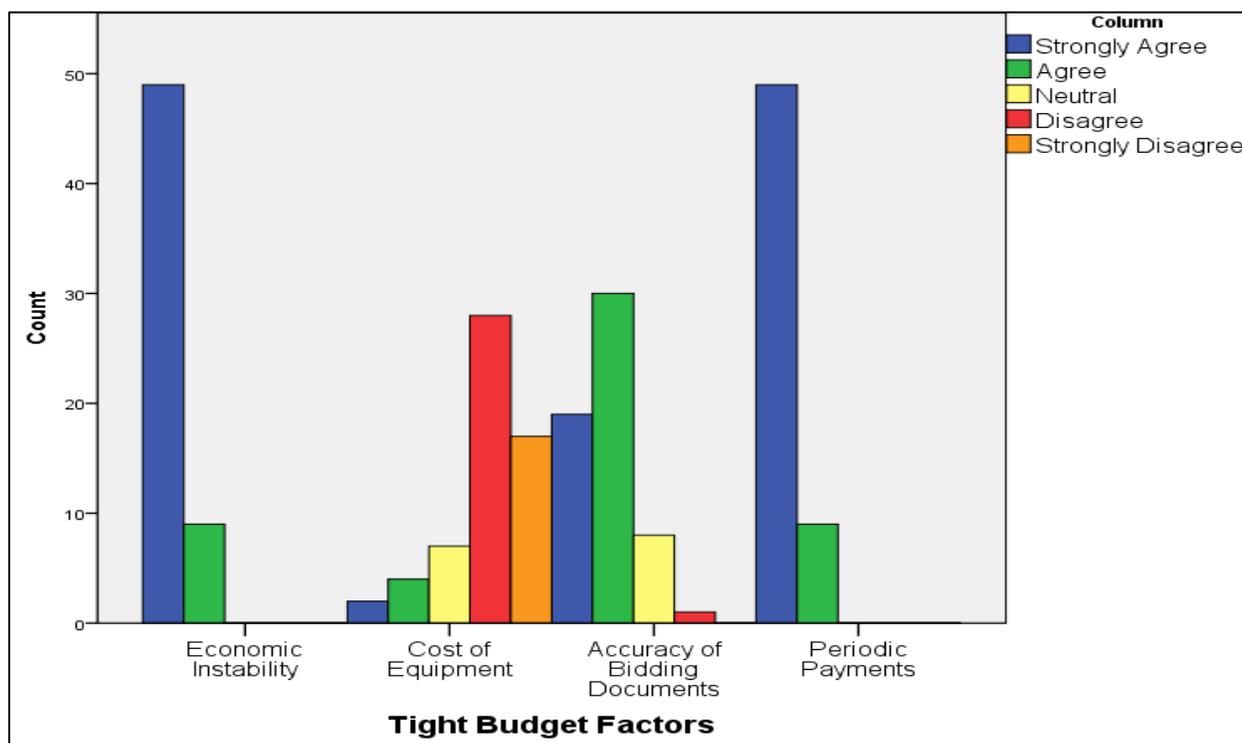
Table 11: Tight Budget Factors Responses

Tight Budget Factors Responses				
Description	Item 1 Question	Item 2 Question	Item 3 Question	Item 4 Question
	Economic Instability	Cost of Equipment	Accuracy of Bidding Documents	Periodic Payments
Strongly Agree	49	2	19	49
Agree	9	4	30	9
Neutral	0	7	8	0
Disagree	0	28	1	0
Strongly Disagree	0	17	0	0

In any given project, there is always a need to get the necessary equipment that is needed to perform the tasks leading to the completion of the project. The need to purchase equipment to apply in the project is an adequate explanation of why the budget is highly impacted by these factors. On the other hand, there is the assumption that project managers always consider the economy and the periodic payments while preparing the budget avoiding challenges in the construction process (Kerr, Ryburn, McLaren, & Dentons, 2014). On the project constraints, the

cost of equipment that is always affected by the economic factors and the nature of the project that is being undertaken always has a significant role in influencing the nature of the budget that is used.

Figure 8: Tight Budget Factors Responses



5.2.2.4 Limited Human Resource Factors

The limited human resource factors mainly got responses in the form of strongly agree and agree as presented in Table 12 and Figure 9. For instance, the competency of workers had 52 for strongly agree and for 6 agree. Manager's performance had 42 for strongly agree and 12 for agree, training of human resources had 40 for strongly agree and 18 for agree while the number of employees available had 36 for strongly agree and 19 for agree. Therefore, all these items have an impact on project success. Their limitation affects the successful completion of projects in the UAE.

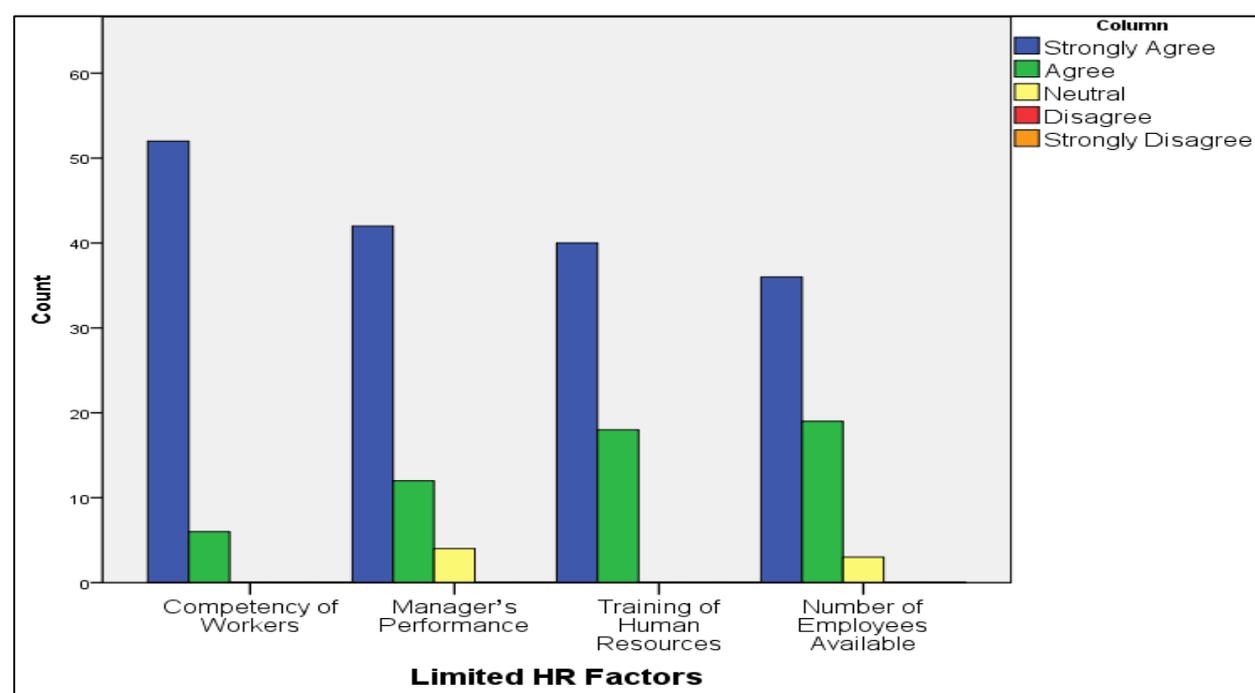
In line with the above findings, there is a strong agreement that employees have a significant role in the successful completion of the project. It is worth noting that human resources are always directly involved in the course of working on the project. The higher the availability of human resources as per the needs of the project, the easier the division of labour and the easier the process of completing the project (Kerr, Ryburn, McLaren, & Dentons, 2014).

Thus, limited human resources are a significant cause of challenges in successfully completing the project because of the inability to deliver the needed tasks within the required way.

Table 12: Limited Human Resource Factors Responses

Limited Human Resource Factors Responses				
Description	Item 1 Question	Item 2 Question	Item 3 Question	Item 4 Question
	Competency of Workers	Manager's Performance	Training of Human Resources	Number of Employees Available
Strongly Agree	52	42	40	36
Agree	6	12	18	19
Neutral	0	4	0	3
Disagree	0	0	0	0
Strongly Disagree	0	0	0	0

Figure 9: Limited Human Resource Factors Responses



5.2.2.5 Limited Time Factors

The variables for the limited time mainly got strongly agree and agree responses as demonstrated in Table 13 and Figure 10. Specifically, delay in approval of project documents had 51 for strongly agree and 7 for agree, duration of inspection procedure had 48 for strongly agree and 9 for agree, short contract duration for construction had 19 for strongly agree and 32 for agree, delay in payments had 50 for strongly disagree and 8 for agree, and shortage of equipment had 45 for strongly agree and 12 for agree. Therefore, the meaning here is that all the

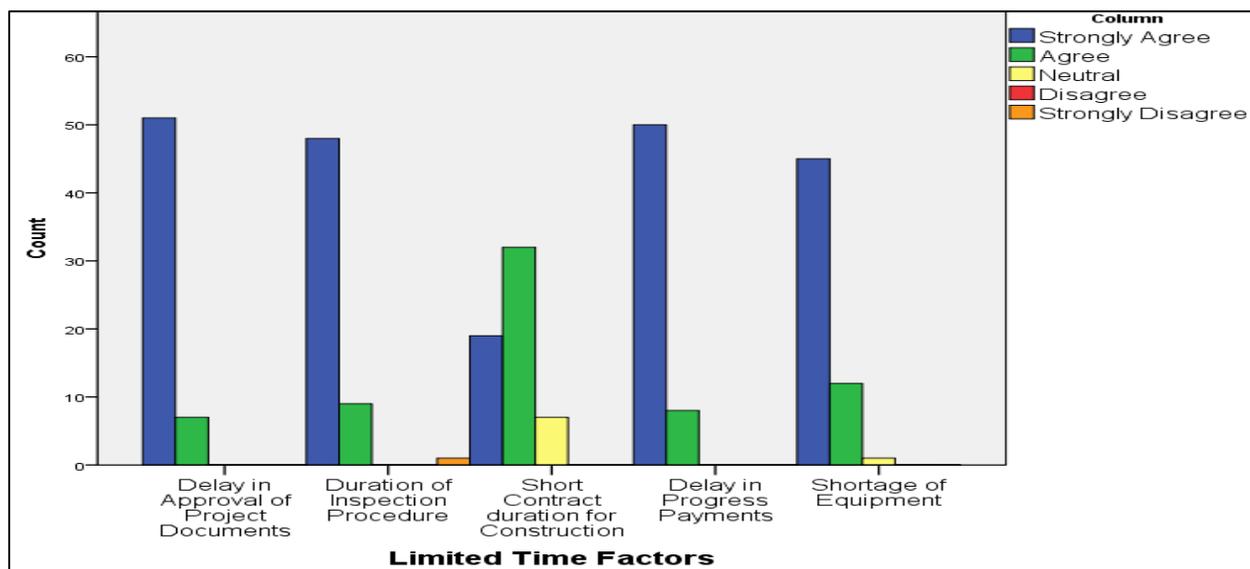
items are important in defining project success. Any limitation of the variables has a significant impact on successful project completion.

Project activities are always completed within the specified timelines. More so, for a construction project, the different phases that are involved are completed independently with the view of leading to quality outcomes. Time is an important project constraint because it sets the ground for the progressive completion of the project. When there is limited time, project managers have to ensure that any limited opportunity is utilized for the process of completing the project in the best ways possible (Ren, Atout, & Jones, 2008). Therefore, from the responses, time is an important factor because it determines the successful completion of the various phases of the project. Any poor utilization of time tends to affect the successful completion of the project.

Table 13: Limited Time Factors Responses

Limited Time Factors Responses					
Description	Item 1 Question	Item 2 Question	Item 3 Question	Item 4 Question	Item 5 Question
	Delay in Approval of Project Documents	Duration of Inspection Procedure	Short Contract duration for Construction	Delay in Progress Payments	Shortage of Equipment
Strongly Agree	51	48	19	50	45
Agree	7	9	32	8	12
Neutral	0	0	7	0	1
Disagree	0	0	0	0	0
Strongly Disagree	0	1	0	0	0

Figure 10: Limited Time Factors Responses



5.3 Descriptive Statistics

Descriptive statistics is a practice that defines the data's primary features in a study. It gives a summarized statistics on the information features gathered to analyse the data. In order to know the maximum, minimum, mean, and standard deviation of the variables, frequencies statistics are conducted in this study. The descriptive statistics will not present a conclusion on the summarized data; hence, an analysis of the information presented is required. The descriptive statistics of the data will be presented a comprehensive table in Table 14 to give a full picture of the data.

Table 14: Summary of Factors Descriptive Statistics (Maximum, Minimum, Mean, and Standard Deviation)

<i>Descriptive Statistics</i>						
	Description	N	Min.	Max	Mean	Std. Dev.
General 1	Organization Type	58	1.00	3.00	2.2069	.83264
General 2	Role in Organization	58	1.00	5.00	3.0000	1.4265
General 3	Number of Years of Experience	58	1.00	4.00	1.7069	.87877
Technology Factor 1	Construction Design	58	1.00	2.00	1.5517	.50166
Technology Factor 2	Electrical Installations & Electrical Equipment	58	1.00	3.00	1.3276	.57393
Technology Factor 3	Active Technical Systems	58	1.00	2.00	1.2414	.43166
Technology Factor 4	Carpentry	58	1.00	4.00	1.2241	.53124
Loc&FunDesign Fact 1	The Construction Landscape	58	1.00	4.00	1.8966	.69306
Loc&FunDesign Fact 2	The Function of the Building or Construction	58	1.00	3.00	1.3103	.53662
Loc&FunDesign Fact 3	Use of New Materials	58	1.00	3.00	1.5690	.56544
Loc&FunDesign Fact 4	Construction Site Environment	58	1.00	2.00	1.2069	.40862
Tight Budget Factor 1	Economic Instability	58	1.00	2.00	1.1552	.36523
Tight Budget Factor 2	Cost of Equipment	58	1.00	5.00	3.9310	1.0063
Tight Budget Factor 3	Accuracy of Bidding Documents	58	1.00	4.00	1.8448	.72067
Tight Budget Factor 4	Periodic Payments	58	1.00	2.00	1.1552	.36523
Limited HR Factor 1	Competency of Workers	58	1.00	2.00	1.1034	.30720
Limited HR Factor 2	Manager's Performance	58	1.00	3.00	1.3448	.60847
Limited HR Factor 3	Training of Human Resources	58	1.00	2.00	1.3103	.46668
Limited HR Factor 4	Number of Employees Available	58	1.00	3.00	1.4310	.59566
Limited Time Factor 1	Delay in Approval of Project Documents	58	1.00	2.00	1.1207	.32861
Limited Time Factor 2	Duration of Inspection Procedure	58	1.00	5.00	1.2241	.62248
Limited Time Factor 3	Short Contract duration for Construction	58	1.00	3.00	1.7931	.64233
Limited Time Factor 4	Delay in Progress Payments	58	1.00	2.00	1.1379	.34784
Limited Time Factor 5	Shortage of Equipment	58	1.00	3.00	1.2414	.47055
	Technology Factors	58	1.00	3.00	1.7414	.47978
	Location and Functional Design Factors	58	1.00	3.00	1.9483	.39392
	Tight Budget Factors	58	2.00	3.00	2.3621	.48480
	Limited HR Factors	58	1.00	2.00	1.6379	.48480
	Limited Time Factors	58	1.00	3.00	1.7414	.47978
Global Factor:	Project Characteristics (IV)	58	1.00	3.00	1.9655	.26261
Global Factor:	Project Constraints (DV)	58	2.00	3.00	2.0172	.13131
	Valid N (listwise)	58				

Table 14 demonstrates the minimum, maximum, the mean, and the standard deviation related to the responses given by the study's respondents in the questionnaire. It is worth noting

that the questionnaire was presented in the form of a Likert-Scale giving respondents the opportunity to respond to questions based on the ways they deemed. Thus, the frequency of responses can be seen in the questionnaire, Appendix 2.

The minimum observation was one in all the questions that were asked. This has the meaning that all the factors can be kept at this minimum. On the other hand, the maximum observation was five meaning the values could be extended. The standard deviation the data points are closer to the mean (Sunil, C. Pathirage, & J. Underwood, 2017). Therefore, there is a significant influence on the project characteristics over the project constraints.

5.4 Reliability Test: Using Cronbach's Alpha

With reference to the questionnaire, there were eight items under two factors for the measurement of the impact of project characteristics on project success under project constraints within the construction industry in the UAE. On the other hand, there were 13 items under 3 factors for the measurement of the impact of project constraints on the project success. Thus, the total items were 21. For the measurement of the consistency of both the factors for the independent and dependent variables, the Cronbach's alpha technique was used to assess the internal validity of all the factors (Ahmed, Opoku & Aziz, 2016). A reliability test is defined as the degree to which the assessment tool is capable of producing results that are stable and consistent when used for the same test several times (Ahmed, Opoku & Aziz, 2016). Thus, the reliability tests below are vital to illustrate the consistency of the variables in the study. Table 15 presents the reliability test before deleting any items.

It is illustrated in Table 15 that all the items of the independent variable "project characteristics" were considered, and the Cronbach's alpha attained was 0.64. In addition, all the items of the dependent variable "project constraints" were considered, and the Cronbach's alpha attained was 0.442. Both the independent and the dependent Cronbach's alphas are considered unreliable, as they are less than 0.7. However, the SPSS survival manual mentions that if the items considered in a study is less than 10 items on a scale, it is hard to reach to 0.7 Cronbach's alpha, and the Cronbach's alpha should be compared to 0.5 "Julie Pallant" (Pallant, 2001). In this research, the items were quite a few. The items were eight items under the project characteristics and thirteen items under project constraints. Hence, the Cronbach's alpha is somewhat reliable if compared to 0.5 (Pallant, 2001). Because of the few items considered, there is a high level of internal consistency. If 0.5 was considered as a benchmark for reliability, then

the Cronbach's alpha would be reliable. Moreover, according to the SPSS Explained book "0.5 to 0.75 is generally accepted as indicating a moderately reliable scale" (Hinton, 2004); the book shows the reliability classifications as follows:

- 0.90 and above shows excellent reliability
- 0.70 to 0.90 shows high reliability
- 0.50 to 0.70 shows moderate reliability
- 0.50 and below shows low reliability

Table 15: Reliability Test Using Cronbach's Alpha before deleting items

Description	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Cronbach's Alpha
Construction Design	10.1034	4.129	.384	.595	
Electrical Installations & Electrical Equipment	9.4310	3.864	.330	.616	
Active Technical Systems	10.0172	3.737	.587	.537	
Carpentry	9.7586	4.642	.115	.668	.640
The Construction Landscape	18.6379	6.446	.175	.422	
The Function of the Building or Construction	15.8621	6.332	-.087	.561	
Use of New Materials	17.9483	6.296	.025	.473	
Construction Site Environment	18.6379	6.130	.354	.387	
Economic Instability	18.6897	6.288	.338	.398	
Cost of Equipment	18.4483	6.006	.177	.416	
Accuracy of Bidding Documents	18.4828	6.289	.170	.420	
Periodic Payments	18.3621	6.165	.130	.431	
Competency of Workers	18.6724	6.400	.238	.413	
Manager's Performance	18.5690	5.969	.180	.415	
Training of Human Resources	18.0000	5.439	.351	.354	.442
Number of Employees Available	18.6552	6.300	.276	.404	
Delay in Approval of Project Documents	18.5517	5.971	.309	.385	
Duration of Inspection Procedure	18.6379	6.446	.175	.422	
Short Contract duration for Construction	15.8621	6.332	-.087	.561	
Delay in Progress Payments	17.9483	6.296	.025	.473	
Shortage of Equipment	18.6379	6.130	.354	.387	

However, if the benchmark considered was 0.7; hence, the Cronbach's alpha is not reliable for both the dependent and independent variables. Hence, in this case, the Cronbach's alpha in Table 15 of project characteristics is 0.64, which is acceptable and considered as a moderate reliability. On the other hand, of project constraints is 0.442, which is considered as low reliability, and if a higher reliability is desired more items can be deleted as per Table 15.

It is illustrated in Table 15 that all the items of the independent variable "project characteristics" were considered, and the Cronbach's alpha attained was 0.64, which is considered unreliable, as it is less than 0.7. Therefore, deleting the item "use of new raw

material” will increase the Cronbach’s alpha to 0.668. On the other hand, the dependent variables all items were used as well to attain a Cronbach’s alpha value of 0.442, which is considered low and unreliable. Similarly, the item “cost of equipment” was deleted from the dependent variables to increase the Cronbach’s alpha value to 0.561. To increase the Cronbach’s alpha value in the independent variable was easier to repeat, as there were 13 items. However, with a value of 0.561, the level of internal consistency is not that high and there may need to delete some items to increase Cronbach’s alpha. However, continued deletion of items will reduce them further and they are few. Table 16 illustrates the outcome deleting both items “use of new raw material” and “cost of equipment”.

Table 16: Reliability Test Using Cronbach's Alpha after deleting one items from each variable

Description	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Cronbach's Alpha
Construction Design	8.2069	3.956	.218	.674	.668
Electrical Installations & Electrical Equipment	8.4310	3.267	.504	.592	
Active Technical Systems	8.5172	3.973	.281	.657	
Carpentry	8.5345	3.551	.404	.625	
The Construction Landscape	7.8621	3.349	.321	.661	.561
The Function of the Building or Construction	8.4483	3.269	.559	.577	
Use of New Materials	Deleted	Deleted	Deleted	Deleted	
Construction Site Environment	8.5517	3.831	.403	.631	
Economic Instability	14.7069	5.720	.274	.534	.561
Cost of Equipment	Deleted	Deleted	Deleted	Deleted	
Accuracy of Bidding Documents	14.0172	5.737	.022	.610	
Periodic Payments	14.7069	5.474	.424	.509	
Competency of Workers	14.7586	5.730	.345	.528	.561
Manager’s Performance	14.5172	5.307	.233	.540	
Training of Human Resources	14.5517	5.585	.240	.537	
Number of Employees Available	14.4310	5.548	.153	.561	
Delay in Approval of Project Documents	14.7414	5.844	.239	.542	.561
Duration of Inspection Procedure	14.6379	5.323	.216	.545	
Short Contract duration for Construction	14.0690	5.083	.289	.524	
Delay in Progress Payments	14.7241	5.677	.322	.528	
Shortage of Equipment	14.6207	5.362	.343	.515	

The results of Table 16 were not enough for a reliable Cronbach’s alpha. In order to move closer to 0.7 and attain a more reliable Cronbach’s alpha, more items were required to be deleted. The best items to delete were as per the Table 16 are “construction design” from the independent variable and “accuracy of bidding documents” from the dependent variable to achieve to reach to 0.674 and 0.610 Cronbach’s alpha value respectively as illustrated in Table 17. However, the level of internal consistency will still be not that high and more items will be

deleted to reach a higher level of internal consistency. However, the limited number of variables cannot allow for more deletions.

Table 17: Reliability Test Using Cronbach's Alpha after deleting two items from each variable

Description	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Cronbach's Alpha
Construction Design	Deleted	Deleted	Deleted	Deleted	
Electrical Installations & Electrical Equipment	6.8793	2.669	.511	.593	
Active Technical Systems	6.9655	3.367	.254	.676	
Carpentry	6.9828	2.859	.454	.616	.674
The Construction Landscape	6.3103	2.744	.319	.679	
The Function of the Building or Construction	6.8966	2.656	.579	.570	
Use of New Materials	Deleted	Deleted	Deleted	Deleted	
Construction Site Environment	7.0000	3.263	.357	.650	
Economic Instability	12.8621	5.033	.348	.577	
Cost of Equipment	Deleted	Deleted	Deleted	Deleted	
Accuracy of Bidding Documents	Deleted	Deleted	Deleted	Deleted	
Periodic Payments	12.8621	4.823	.486	.553	
Competency of Workers	12.9138	5.168	.340	.582	
Manager's Performance	12.6724	4.715	.246	.596	
Training of Human Resources	12.7069	4.983	.257	.590	.610
Number of Employees Available	12.5862	5.054	.122	.628	
Delay in Approval of Project Documents	12.8966	5.182	.298	.587	
Duration of Inspection Procedure	12.7931	4.623	.271	.590	
Short Contract duration for Construction	12.2241	4.773	.196	.613	
Delay in Progress Payments	12.8793	5.020	.382	.573	
Shortage of Equipment	12.7759	4.809	.342	.572	

Even though the Cronbach's alpha is close to 0.7, it is not reliable. Deleting more item might boost the Cronbach's alpha to reach 0.7; however, the items on the independent variable side are quite a few to be deleted. Hence, the decision was to delete one more item from the dependent variable. The most ideal item to be deleted as per the previous table, Table 17, that was extracted from the SPSS is "number of employees available", and that will boost the Cronbach's alpha value to 0.628 as illustrated in Table 18. However, the internal consistency is not that high, but it is allowable for the variables in the study.

Table 18: Reliability Test Using Cronbach's Alpha after deleting two items from each variable

Description	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach Alpha if Item Deleted	Cronbach's Alpha
Construction Design	Deleted	Deleted	Deleted	Deleted	
Electrical Installations & Electrical Equipment	6.8793	2.669	.511	.593	
Active Technical Systems	6.9655	3.367	.254	.676	
Carpentry	6.9828	2.859	.454	.616	.674
The Construction Landscape	6.3103	2.744	.319	.679	
The Function of the Building or Construction	6.8966	2.656	.579	.570	
Use of New Materials	Deleted	Deleted	Deleted	Deleted	
Construction Site Environment	7.0000	3.263	.357	.650	
Economic Instability	11.4310	4.320	.396	.587	
Cost of Equipment	Deleted	Deleted	Deleted	Deleted	
Accuracy of Bidding Documents	Deleted	Deleted	Deleted	Deleted	
Periodic Payments	11.4310	4.179	.496	.569	
Competency of Workers	11.4828	4.570	.297	.607	
Manager's Performance	11.2414	4.186	.200	.633	.628
Training of Human Resources	11.2759	4.449	.197	.624	
Number of Employees Available	Deleted	Deleted	Deleted	Deleted	
Delay in Approval of Project Documents	11.4655	4.464	.347	.598	
Duration of Inspection Procedure	11.3621	3.849	.335	.595	
Short Contract duration for Construction	10.7931	4.132	.195	.638	
Delay in Progress Payments	11.4483	4.287	.449	.579	
Shortage of Equipment	11.3448	4.195	.331	.594	

5.5 Correlation Test

The particular reason for conducting correlation tests is to determine how strongly the project characteristics variables (independent variables) are related to the project constraints factors (dependent variable). The Pearson's Correlation test was conducted with the view of determining the relationship between the project characteristics factors (technology and location and functional design factors) and the project constraints (tight budget, limited human resources, and limited time) and in terms of how they play an instrumental role in leading to project success (Sunil, C. Pathirage, & J. Underwood, 2017). More so, the Pearson's Correlation test was done with the view of determining the strength of the relationship between the project characteristics factors and the project constraint factors, which implies that the relationship can be well characterized by a straight line. Conducting the correlation test was vital for purposes of making sure that the association of the independent and the dependent variables are clearly understood

and more chances of the application into the future projects (Fellows & Liu, 2015). The tests were conducted as demonstrated in Table 19.

Table 19: Correlation Test

Description			Correlation						
			Independent Variable		Dependent Variable			Global	
			Technology Factors	Location & Functional Design Factors	Tight Budget Factors	Limited HR Factors	Limited Time Factors	Project Characteristics	Project Constraints
Independent Variable	Technology Factor	Pearson Correlation	1	.206	.033	.194	.238	.485**	.072
		Sig. (2-tailed)		.120	.809	.145	.072	.000	.591
		N	58	58	58	58	58	58	58
Independent Variable	Location & Functional Design Factor	Pearson Correlation	.206	1	.100	.084	.114	.491**	.357**
		Sig. (2-tailed)	.120		.456	.531	.396	.000	.006
		N	58	58	58	58	58	58	58
Dependent Variable	Tight Budget Factor	Pearson Correlation	.033	.100	1	.045	.259*	.100	.176
		Sig. (2-tailed)	.809	.456		.737	.050	.456	.187
		N	58	58	58	58	58	58	58
	Limited HR Factor	Pearson Correlation	.194	.084	.045	1	.043	.038	.100
		Sig. (2-tailed)	.145	.531	.737		.749	.777	.456
		N	58	58	58	58	58	58	58
Limited Time Factor	Pearson Correlation	.238	.114	.259*	.043	1	.206	.072	
	Sig. (2-tailed)	.072	.396	.050	.749		.120	.591	
	N	58	58	58	58	58	58	58	
Global	Project Characteristics	Pearson Correlation	.485**	.491**	.100	.038	.206	1	.018
		Sig. (2-tailed)	.000	.000	.456	.777	.120		.896
		N	58	58	58	58	58	58	58
	Project Constraints	Pearson Correlation	.072	.357**	.176	.100	.072	.018	1
		Sig. (2-tailed)	.591	.006	.187	.456	.591	.896	
		N	58	58	58	58	58	58	58

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Correlation is the mutual relationship that exists between variables in the study, for instance, the independent and the dependent variables (Fellows & Liu, 2015). As demonstrated in Table 19, there was an emphasis on the correlation of the factors of project characteristics and project constraints in regards to how they influence the success of the project. Correlation is always significant at 0.01 (two-tailed). From the results extracted from the SPSS as illustrated in Table 19, the first correlation between technology and project constraints is ($r = 0.072$, $p = 0.591$). Hence, there is a weak positive relationship between technology and project constraints; however, the correlation is not statistically significant and it occurred by chance, as p is 0.591

and it is greater than 0.01 so there is no strong evidence that this correlation exists in the population. Therefore, H1 is rejected, as there is no significant influence of technology on the success of projects under project constraints.

On the other hand, the second correlation between location and functional design and project constraints is ($r = 0.357$, $p = 0.006$). Thus, there is a strong positive relationship between location and functional design and project constraints, and the correlation is statistically significant at p is 0.006 and it is less than 0.01, so there is there is a strong evidence that this correlation exists in the population. Therefore, H2 is accepted, as there is a significant influence of location and functional design on the success of projects under project constraints.

Lastly, the third correlation between project characteristics and project constraints is ($r = 0.018$, $p = 0.896$). Hence, there is a positive relationship between project characteristics and project constraints; yet, the correlation is not statistically significant and it occurred by chance, as p is 0.896 and it is greater than 0.01 so there is no strong evidence that this correlation exists in the population. Therefore, H3 is rejected, as there is no significant influence of project characteristics (technology factors and location and functional design factors) on project success under project constraints (tight budget, limited human resource factors, and limited time).

Besides the three main correlations stated above, other significant correlations are significant in Table 19. Those correlations are tight budget and limited time, technology and project characteristics, and location and functional design and project characteristics as illustrated in squares in Table 19 are ($r = 0.259$, $p = 0.050$), ($r = 0.485$, $p = 0.001$), and ($r = 0.491$, $p = 0.001$) respectively. The tight budget and limited time correlation p -value is 0.05, so it is significant at the 0.05 level and not at the level of 0.01. However, there is a strong positive relationship in the technology and project characteristics, and location and functional design and project characteristics correlations at the level of 0.01, and the correlation is statistically significant at p is 0.001 are less than 0.01, so there is there is a strong evidence that this correlation exists in the population.

5.6 Regression

The correlations show the relationship between the independent and the dependent variables while the regression model plays a vital role in predicting the value of the dependent variable in the study. Unlike correlation, regression distinguishes the difference between the dependent and independent variable. To predict the value of “project constraints” based upon the

value of project characteristics a regression test is conducted. In the regression test using the enter method, the predictor is the independent variable “project characteristics”, and it was considered as technology factors and location and functional design factors. Since the study has one dependent variable and two independent variables, multiple linear regression will be used in this study.

As demonstrated in Table 20, the values for R^2 and adjusted R^2 for the project characteristics variables (location and design factors and technology factors) are 0.127 and 0.096 respectively based on the enter method. This shows R squared to percentage = 9.6% of the total variability in DV “project constraints” is explained by the model IV “project characteristics”. Taken as a set the predictors IVs account for 9.6% of the variance in the DV “project constraints”. If there is a big discrepancy between r squared and adjusted, it implies that some of the IV “project characteristics” included in the regression model are redundant. However, it is not a precise way.

Table 20: Regression Analysis

Model Summary						
Model		R	R Square	Adjusted R Square	Std. Error of the Estimate	
		.357a	.127	.096	.12488	
ANOVA ^a						
Model	Sum of Squares	Df	Mean Square	F	Sig.	
Regression	.125	2	.063	4.010	.024b	
Residual	.858	55	.016			
Total	.983	57				
a. Dependent Variable: Project Constraints (Dependent Variable)						
b. Predictors: (Constant), Location and Functional Design Factors, Technology Factors						
Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
(Constant)		1.786	.094		18.927	.000
Technology Factors		.000	.035	-.002	-.013	.990
Location and Functional Design Factors		.119	.043	.357	2.774	.008
a. Dependent Variable: Project Constraints (Dependent Variable)						

In tandem with Table 20, the P-value of the F ratio is Sig. = 0.024. It is worth noting that the F-ratio (2, 55) = 4.010 and the p-value = 0.024 is less than 0.05 so there is a strong evidence to reject the null hypothesis and the model has no explanatory power at a confidence interval of

95%. However, if a confidence interval of 99% is considered, then the p-value = 0.024 is greater than 0.01; hence, the null hypotheses is accepted.

Moreover, from Table 20, it is important to understand that coefficients illustrate the relationship between IV and DV of coefficients. In tandem with Table 20, the P-value of the T statistics is Sig. = 0.990 for technology factors and Sig. = 0.008 for location and functional design factors. Technology factors have a p-value of 0.990, which is more than 0.05 and it is more than 0.01. Therefore, the technology factors are not a significant predictor of the project constraints, and it is called a “dichotomous variable” as the technology predictor does not offer any significant amount of unique variance in explaining project constraints. Thus, the hypothesis is rejected. On the other hand, the location and functional design factors have a significant p-value of 0.008, which is less than 0.05 and less than 0.01. Thus, location and design factors are predictors of project constraints, and the amount of unique variance of the location and functional design factors predictor accounts for and is statically significant in project constraints.

5.7 Overall Results

From the overall tests conducted above, there is a high significance between the project characteristics factors and the project constraints in the UAE construction industry. In the reliability test, the Cronbach’s alpha indicates that the variables were below 0.7; hence, it should be rejected. Yet, the further application of the split-half reliability test indicated that no variable should be rejected or rewritten. With this in mind, all factors related to project characteristics and project constraints were included in the project because of their internal reliability.

Regarding the correlation model, it was concluded that there is no significant statistical relationship between project characteristics factors and project constraints. All values were below the significant level of 0.01 except for the location and functional design. For instance, the improvement of technology would make the project successful even when the time given for completion is shorter and indicating this correlation.

The overall results from the regression model also demonstrated this no significant relationship with the values of 0.127 for R^2 and adjusted R^2 of 0.096 and the regression model is redundant. Therefore, the application of project characteristics factors in the construction industry does not boost the attainment of the desired project success under project constraints.

Chapter 6: Discussion

6.0 Introduction

The objectives of the study were to investigate the impact of project characteristics on delivering successful projects under the project constraints such as tight budget, limited human resources, and limited time (Faridi & El-Sayeh, 2007). To make sure that the study was clear in regards to understanding the impact that project characteristics have on the success of a project under project constraints, specific factors were developed for both project characteristics and project constraints. Under project constraints, the major variables were technology and location and functional factors. The technology was further defined by several factors including the construction design, the electrical installations and electrical equipment, active technical systems, and carpentry. On the other hand, the factors that were listed under the location and functional design factors included the construction landscape, the function of the building, use of new materials, and the construction environment. The key variables reflecting project constraints included tight budget, limited human resources, and limited project time. This is similar to what Kerr, Ryburn, McLaren, and Dentons (2014) established pointing out the fact that project constraints tend to lead to delays in the completion of projects. Thus, the specific tight budget factors that were developed included economic instability, cost of the equipment, the accuracy of bidding documents, and the periodic payments. The limited human resource factors that were developed in the study included project manager's performance, competency of the workers in the project, the number of employees available, and the training of human resources. For the last variable of limited time, the specific factors that were developed included the delay in approval of project documents, the duration of the inspection procedure, the short contract duration for construction, and the delay in progress payments (Ahbabi, 2014). All the individual factors are critical in influencing the success of the project in different ways based on their availability.

6.1 Discussion Between Technology and Project Constraints

As seen in the previous chapter there is a weak positive correlation relationship between technology and project constraints. On the other hand, it is evident from the previous chapter that there is a strong positive correlation relationship between technology and project characteristics. Not only that but also, in the regression, the technology factor is not a significant predictor of the project constraints, and it is called a "dichotomous variable" as the technology predictor does not offer any significant amount of unique variance in explaining project constraints. This is an

evidence that the existing constraints in the construction industries in the UAE can properly be handled by first getting their causes. For instance, the main challenges emanate from tight budget, inadequate human resource and inadequate time that should be used to work on a particular project. There is a need to ensure that the challenges facing the construction industry in the UAE are properly looked into to ensure that they do not recur and cause major challenges to the construction industries.

Projects require the use of technology for them to be effective. In this case, there will be a use of computerized systems in construction industries in the UAE, which will help in the monitoring of the whole construction procedure. In tandem, technology has called for the use of digital knowledge in construction practices; thus, there is a need for ensuring that the staff members in the construction industries are conversant with the operation of some machinery. The similar view is brought out in literature where Faridi and El-Sayeh (2007) opine that knowledge in technology is vital in the construction industry as it helps the available human resource to be in a position of ensuring that the best is construction procedures are enhanced and sustained throughout. It is also important to know that technology in the UAE is very much advanced because the country is highly developed and rich due to the extraction and the processing of petroleum within the region. This has ensured that enough funding is done to the construction industry. Oil refining companies, roads, buildings, airports, and even vehicles, which has led to the creation of many industries in the UAE. From this, it is easier to conclude that the construction industry in the UAE is the major economic resource since most of her economy is based on the construction of petroleum manufacturing industries that always under construction whenever oil is discovered in certain areas.

6.2 Discussion Between Location and Functional Design and Project Constraints

As seen in the previous chapter there is strong positive relationship between location and functional design and project constraints. In addition, it is evident from the previous chapter that there is a strong positive correlation relationship between location and functional design and project characteristics and project characteristics. Thus, there is a significant influence of location and functional design on the success of project completion under project constraints. Not only that but also, in the regression, the location and functional design factor is a significant predictor of the project constraints, and the amount of unique variance of the location and functional design factors predictor accounts for and is statically significant in project constraints.

Hence, on the aspect of location factors that are within project characteristics, it is vital to first take note of the construction landscape. A rugged landscape will need a more careful approach to the delivery of successful projects under project constraints. This means that project managers have to be in the leading position when it comes to identifying the nature of the landscape and any modifications that would need to be made for the whole project to run smoothly and to be completed within the shortest time possible (Sunil, C. Pathirage, & J. Underwood, 2017). In the literature by Sunil, Pathirage, and Underwood (2017), the similar role of project managers is appreciated and there is the suggestion of the need to always empower them with the need skills to boost project success. Otherwise, it would be highly challenging on the part of the contractor to move forward with a project on a landscape that has not been evaluated well. A clear understanding of the construction is also vital in regards to leading to the success of the project with the available project constraints. Understanding the function of the building means that the design that will be adopted will work toward directly indicating the function of the building and what it intends to serve. The specific design that will be undertaken will be used to determine the manner in which the whole project will be completed by reflecting the steps that should be pursued to shorten project time (Kerr, Ryburn, McLaren, & Dentons, 2014). Therefore, effectively considering project characteristics factors and responding to the emerging needs of the project is key in making sure that successful project completion is attained even with the existing project constraints. Therefore, efficient utilization of project characteristics is vital in leading to the success of the project especially when attention is paid to the available factors in the project.

6.3 Discussion Between Project Characteristics and Project Constraints

From the regression in the previous chapter, there is a positive relationship between project characteristics and project constraints; however, the correlation is not statistically significant and it occurred by chance. This could be as a result to the small number of items or it could also be due to the 1

In tandem with the research, it was established that project characteristics are concerned with the application of management tools such as technology to overcome the project constraints that might affect the project. With the utilization of technology that is needed within the project, project characteristics have continued playing a significant role in leading to the success of projects under project constraints. The application of project characteristics goes a long way into

supporting the decisions that are made in regards to the design of the construction project that is being undertaken (Al-Sabek, 2015). When the project is set on the ground of technology, there is efficiency in the whole process of working around it in a quicker way to deliver the needed level of success within the required time, limited human resources, and tight budget. Therefore, the ability of project characteristics to envisage technology and capture effective functional characteristics of the construction before its ultimate undertaking is reflecting of the emphasis on the success that is to be delivered even with the available project constraints. This is similar to what is explicated in the literature as Al-Sabek (2015) points out the view that technology makes all activities simpler and works toward simplifying the delays caused by project constraints. However, project managers and contractors should always be able to capture the information that will be assistive in the completion of the project.

The expectation of every project manager is always to work with budget that are sufficient for the completion of the project. There is always a massive challenge when the budget are tight and not in tandem with the requirements of the project and the intensity that comes with the project (Ahbabi, 2014). Thus, it is critical for the project manager to be prepared to manage the tight budget to make sure that the project is successful. Even with factors such as economic instability, it is vital for the project manager to try to manage the available limited financial resources in the budget to facilitate project success. The application of project characteristics comes in handy when it comes to the facilitation of project success with the tight budget. Planning through project characteristics is crucial in leading to the management of all the costs that would be involved in the project and working successfully with tight budget. With project characteristics, the costs of equipment and periodic payments are managed in the best ways possible and ultimately leading to the success of the project under tight budget. From literature, there is the explication of the view that project managers always need to be aware of aspects within the budget that will assist them pushing forward the success of the project in the best ways possible (Sunil, C. Pathirage, & J. Underwood, 2017). Therefore, with tight budget, project characteristics play an assistive role in the planning process while also making sure that there are no overestimations and that every cost that has been set is managed toward the success of the project.

Proper budgeting determines how effective any construction process will be. For a successful construction procedure, the contractors will be called upon to ensure that they

carefully calculate all the budgetary requirements and submit them in order to ensure that all the funds required are sourced before any process of construction starts. This will enhance proper planning. Once a good budget has been prepared, there will be a need for looking for the required construction materials, personnel and the time that the whole construction process will take. Literature agrees with the view that a good plan is what will set the pace for the sake of project success in the organization (Sunil, C. Pathirage, & J. Underwood, 2017). In this case, the budget becomes the driving force and determinant factor of how the process of construction will be and how safe the employees will be. Thus, preparation of the budget is the main aspect that determines the whole process of construction by the industries in the UAE and there should be considerations, which will entail proper training of those who will be responsible for the drafting of the intended budget. Use of personnel that is well equipped with the best skills in the drafting of the budget will help in ensuring that the costs are estimated properly and all the requirements are sourced on time and are the best ones. Preparation of budget by the construction industries requires consultation and the making of comparisons between the UAE and other developed countries. Such comparisons will give an opportunity to pick on the best methods of construction in addition to the nest technological expertise that should be needed once the construction starts.

Human resources are always vital in boosting the success of the project because of direct and the indirect roles that they play within the project. In essence, human resources are always the implementers of the project because they directly participate in the construction process as provided by the project manager and the contractor (Ahbabi, 2014). Thus, limited human resources are always perceived to be a significant constraint to the successful completion of projects. For instance, when human resources are limited, the tasks that need to be completed within a shorter time end up taking the longest time. In some instances, one employee finds himself/herself. However, from the results, it was established that project characteristics have a significant relationship to the limited human resources within the organization. This has the meaning that in situations where project managers are faced with limited human resources, they have to effectively utilize the project characteristics to isolate and define the scopes of work in the project and to effectively divide the work among different employees. With the successful implementation of a project in the organization, it is always easier to deal with the challenge of limited human resources within the project. Proper planning of the limited resources is what sets the project on the course to success (Faridi & El-Sayeh, 2007). Utilizing project characteristics to

plan the available limited resources means that the project will still turn out to be successful especially when all the tasks are well planned with the available human resources within the organization.

Human resource in a construction industry is tasked with varied responsibilities, and they should be enough despite the fact that the emergence of the use of machines in all the construction procedures is properly done. For instance, there is a need for qualified engineers, managers, supervisors and the staff who will ensure that the best practices at a construction site are enhanced. Project Managers are vital as they head different construction departments each one of them assigned areas to manage depending on what they trained for as pertains construction (Ahbabi, 2014). Despite the fact that there is a use of technological machinery at construction sites, it is important that enough human resource who will be even responsible for ensuring that the machinery is properly coordinated and controlled to avoid wastage. Literature is in agreement with the process of making human resources work in tandem with technology to boost successful completion of the project (Ahbabi, 2014) In this case, management of any human resource in a construction industry is easier when proper plans are made and each one of them given a chance to execute their duties independently. Such freedom makes them be productive apart from ensuring that they develop confidence in their work and become effective in their working areas.

On the aspect of limited time, it was established from the results that time is of the essence when it comes to the successful completion of projects. It is vital for the project manager to understand how to handle the issues that are related to the limited time as a project constraint (Kerr, Ryburn, McLaren, & Dentons, 2014). Naturally, it is always expected that a project will be allocated adequate time for completion without any challenges on the part of the project manager and the employees implementing it. The significance of project characteristics is felt on the aspect of time when the project is visualized and approved within the desired period; hence, avoiding any potential delays might come up in the course of project completion. Project characteristics play a helpful role when it comes to making the fundamental decisions that are bound to push the projects to success within the required time. In tandem with literature, there is improved planning based on project characteristics as they offer a clearer snapshot of the project (Sunil, C. Pathirage, & J. Underwood, 2017). When the project manager gets an overview of the project, the limited time that is available is put into good use and the entire project outcomes are

met within this required time. The decrease in reworks in the course of working on the project also works toward ensuring that the project is successfully completed within the limited time that is available. Therefore, as much as limited time might be a hindrance to the completion of the project under ordinary circumstances, but project characteristics ensure that the project is not affected in any way in regards to its completion.

Each time a construction contract is signed between the UAE governments and it is often agreed that the contract should be completed within a specific period. In situations where the contract is delayed and there is no communication, the contract will be given to another contractor who will be ready to embark on the incomplete project. In such circumstances, the initial engineer who could not be in a position to complete the agreed work within the agreed time will likely be fined by the UAE construction industries. Such punishments have made those engineers who win construction contracts to work within the stipulated time to ensure that they do not incur losses of those who sold to them the construction permits. Since people were eager either to complete the construction projects on time in order avoid punishment or avoid losing contracts, the issue of time management is properly and easily managed. Thus, time is a dependent variable to determine the amount of work that will be done by contractors at a particular time. Time has been managed properly by ensuring that the assigned construction projects are done within agreed specific periods (Faridi & El-Sayeh, 2007). Furthermore, to make the contraction processes easier ensuring enough human resource and machinery required is included are essential for time management in the construction industries in the UAE. Hence, time will only be managed properly and construction will be done within the agreed period based on the hiring of enough human resources, proper budgetary allocation and the hiring of enough human resource personnel (Faridi & El-Sayeh, 2007). It should also be understood that the use of technical expertise due to the availability of technological devices, it is easier to work on projects applying project characteristics.

Chapter 7: Conclusion and Recommendation

7.0 Introduction

The main objective of the paper was to investigate the impact of project characteristics on delivering successful projects under project constraints in the UAE. Accordingly, the key budget constraints that were identified at the beginning of the project include tight budget, limited human resources, and limited time within the organization. It is worth noting that this objective was effectively met in the study by measuring the factors such as project characteristics, as the independent variable and the project constraints such as the tight budget, limited human resources, and limited time as the dependent variables in the study. The clarity with which the variables in the study were identified and measured went a long way into setting the ground for the realization of the results in the study. For instance, it was set from the beginning that if project characteristics are effectively applied to the project especially in regards to the tight budget, limited human resources, and limited time, then there will be a delivery of successful projects. With the application of project characteristics, it is easier for the construction organization to realize project success even when the prevailing factors are limited.

7.1 Conclusion from Studying Technology Factors

In regards to technology, it can be concluded that technology is vital for successful project completion under project constraints. The project characteristics factors are associated directly with the application of technology to the process of construction and the utilization of the needed details to frame the location and design factors of the project. If technology is used in the required way within the project, there is always an opportunity that efficiency will be attained and that the goals of the project will be attained properly. For instance, technology emanating from project characteristics will be crucial in dividing the tasks within the organization into manageable activities that can be fulfilled by employees even when they are few in number. Carrying on this study, this research concludes that the technology factors has an influence on project constraints including tight budget, limited human resources, and limited time. However, the results in this study are weak concerning the technology factor. Hence, further studies in the section below could improve the results of this factor.

7.2 Conclusion from Studying Location and Functional Design Factors

Overall, when the location and functional design factors of the organization are considered, there is always an opportunity delivering successful projects under project

constraints. For instance, when the area where the construction is to take place has already been marked and measured effectively, then the project is always bound to move on smoothly without challenges. It is vital to measure the area in terms of the location and the adjustments that could be made to boost the realization of effective project completion in the required manner. Carrying on this study, this research concludes that the location and functional design factors has an influence on project constraints. Even though the data is on a small scale, the location and functional design factors still had a huge an influence on project constraints. Therefore, this shows that the location and functional design factors is important when executing conduction projects as it has an influence on the success of project completion under project constraints.

7.3 Conclusion from Studying Tight Budget Factors

From the tight budget factors, it is concluded that the cost of equipment has the most significant impact on the completion of the project. Other factors such as economic factors and periodic payments always have to be considered in regards to the whole process of project completion. This means that project managers always have to effectively consider the cost of equipment while getting into the course of project completion. Carrying on this study, this research concludes that the tight budget factors have only a slight influence by technology and location and functional design; however, when studying the project constraints together, the influence on technology and location and functional design is greater than when studying only tight budget factors.

7.4 Conclusion from Studying Limited Human Resources Factors

From the study, it can be concluded that limited human resource factors are fundamental in terms of determining the successful completion of the project. Employees are directly involved in the completion of organizational tasks and without the presence of an adequate number of employees it means the whole project completion process is affected. Therefore, human resource factors are direct constraints that affect the completion of the project. Carrying on this study, this research concludes that the limited human resource factors have only a slight influence by technology and location and functional design; however, when studying the project constraints together, the influence on technology and location and functional design is greater than when studying only limited human resource factors.

7.5 Conclusion from Studying Limited Time Factors

In tandem with the study, it is evident that time is a significant contributor to the successful completion of projects. As a constraint, it affects the manner in which different tasks are organized in the organization hence the timely completion of the project. Therefore, limited time factors must always be considered carefully by project managers to avoid glitches in the course of project completion. Carrying on this study, this research concludes that the limited time factors have only a slight influence by technology and location and functional design; however, when studying the project constraints together, the influence on technology and location and functional design is greater than when studying only limited time factors.

7.6 Summary of Conclusions

The study concludes that it is vital for project managers and contractors working on projects to view all the factors within the project equally because they all influence the delivery of successful projects significantly. Hence, from the study, it is demonstrated that no factor is more important than the other and there is a need to pay attention to all the factors in the project as they influence the success of projects. Ignoring any particular factor will mean that the project's success could be compromised in the course of the work process. However, as a limitation, the project factors that have been identified here cut across different countries including the UK, and the USA. There was a need to emphasize only factors that are present in the UAE in order to have outcomes that are more reliable in this project. By emphasizing the factors that affect only the UAE, it will be easier to set the ground for improvements of the construction industry in terms of the project characteristics factors that influence success in the project.

Putting in place mechanisms that reduce constraints that affect the construction industry in the UAE is helpful in ensuring that all the construction procedures are well conducted. This is also to ensure that the buildings that are constructed in the UAE are safe not only for the UAE citizens but also for the foreigners that visit the federation. Some of the buildings have been used as tourist attractions through earning revenue for the country. Comprehensibly, attraction emanates from the Arabic architectural designs that are widely constructed in all the states that make up the UAE. These buildings are made with a consideration that time has to be managed; there should be enough personnel who should understand the significance of applying project characteristics into projects for purposes of success. The construction materials should be

sourced from places that are accessible and well-known in order to ensure that extra costs of funds are not used in the transportation of the materials needed in the industry. Project characteristics are the best strategies that will be used in the construction of proper projects and ensuring that fewer losses are realised. In all construction processes and procedures, the sources of the construction materials are significant. This is due to the fact that the cost of all the construction process will easily be estimated and calculated once the sources of the construction materials have been identified. Consequently, the means of transporting construction materials are also identified in addition to the cost of transportation and the time that will be taken to transfer the construction materials from the source to the construction site.

7.7 Implications

Thus, it is recommended that the UAE construction companies should continue improving their work process and adopt project characteristics into their construction works. The adoption of project characteristics will go a long way into putting the organization in a position to successfully complete projects even with tight budget, limited human resources, and limited time. For the success of construction companies, there should be the understanding of project characteristics because of the role that they play in improving the success of the project while reducing costs, decreasing reworks, dividing tasks effectively, and giving the complete snapshot of the project. Thus, appropriate approaches and technologies to approach construction works should always be selected for the successful delivery of projects under project constraints.

7.7.1 Implications to Research

The most significant implication to research is that it will boost the understanding the significance of including project characteristics such as technology in research concerning construction. Technology in this case entails use of machinery that are naturally automated, and use of computerized systems to run all the construction processes. Machines in the modern construction activities have replaced human labour; thus, they have emerged to be a solution to the existing challenges of inadequate human resource. In this case, machines work faster than human beings and a single machine can only be controlled by one person but will be able to perform tasks that could be done by more people at a particular time that will be shorter than when human labour was depended on. Technology is vehemently the best solution to the existing tight budget, inadequate human resource and the time that can be used for a particular construction procedure to be completed. In the current society, project characteristics work in

tandem with technological expertise, which ensures that the best construction methods and machines are used. For instance, mixing of the construction materials at the construction sites is done by some technological machinery, which makes the whole construction procedure easier and faster as compared to when the process only depended on human labour that might not be enough. Thus, technology has been recommended to be the best variable that will work towards effective work by ensuring that time is not wasted, many funds are not used on hiring of employees apart from the existing problem of having inadequate human resources. The available resource personnel at a construction site should undergo specialized training that will help them get skills that will facilitate easier construction and saving on costs.

7.7.2 Implications to Practice

The key implication to practice is that the UAE construction companies will continue improving their work process and adopt project characteristics into their construction works. The adoption of project characteristics will go a long way into putting the organization in a position to successfully complete projects even with tight budget, limited human resources, and limited time. For the success of construction companies, there should be the understanding of project characteristics because of the role that they play in improving the success of the project while reducing costs, decreasing reworks, dividing tasks effectively, and giving the complete snapshot of the project. Thus, appropriate approaches and technologies to approach construction works should always be selected for successful delivery of projects under project constraints.

7.8 Research Limitations

The study has the following significant limitations;

- The study primarily focused on explicating the impact of project characteristics factors in delivering successful projects in the UAE, but the factors tend to affect projects across the world including the USA and the UK.
- Some of the respondents did not return the questionnaires. This was a limitation because it slightly affected the results that were collected in the study.
- Dishonesty and lack of conscientiousness responses from some of the respondents was an issue as it will automatically reflect on the results in the SPSS output, as seen in the Cronbach's alpha using reliability; it was moderate and the correlation in the regression model had few items that were significant at the level of 0.01.

- Surveys with skipped questions were disregarded as it was a bias, even though an option of having the program ignore unanswered questions, for a better results the surveys with skipped questions were disregarded so the number for the sample size was decreased.
- The concurrent mixed method was used due to time limitation as it is a school research and not a personal research, hence time is a limitation.

7.9 Recommendations for Further Research

Further research recommendations could be,

- Future research should focus on the ways that project characteristics could be manipulated to alleviate project delays caused by project constraints. This means that the research should always go beyond the theoretical explanation of the significant role played by project characteristics, but the manner in which project managers can manipulate them to complete the project successfully. This will lead to more improved project completion under project constraints in the UAE.
- The study primarily focused on explicating the impact of project characteristics factors in delivering successful projects in the UAE, further study could study the same subject however across the world.
- Using the sequential mix method instead of the concurrent mixed method.
- Including construction governmental sector in the survey for better-unbiased data.

Chapter 8: References

8.0 References

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Chapter 9: Appendices

9.0 Appendices

9.1 Appendix 1: *Project Characteristics and Project Constraints Factors Summary Table*

Project Characteristics Factors (Independent Variable)	
Technology Factors	Source
Construction Design	(Alomari, Gambatese, & Anderson, 2017), (Fan, Skibniewski, & Hung, 2014), (Enshassi, Mohamed, & Abushaban, 2009), (Hussain, Zhu, Ali, Aslam, & Hussain, 2018); Gunduz and Yahya (2015)
Electrical installations and electrical equipment	(Al-Sabek, 2015); (Kerr, Ryburn, McLaren, & Dentons, 2014)
Active technical systems	(Mahamid, 2013); (Faridi & El-Sayeh, 2007); (Sunil, C. Pathirage, & J. Underwood, 2017)
Carpentry	(Mahamid & Dmaid, 2013); (Sunil, C. Pathirage, & J. Underwood, 2017); (Kerr, Ryburn, McLaren, & Dentons, 2014)
Location and Functional Design Factors	Source
The construction land scape	(Sunil, C. Pathirage, & J. Underwood, 2017); (Memon, Rahman, Abdullah, & Azis, 2014)
The function of the building or construction	(Al-Sabek, 2015); (Kerr, Ryburn, McLaren, & Dentons, 2014)
Use of new materials	(Memon, Rahman, Abdullah, & Azis, 2014), (Faridi & El-Sayeh, 2007), (Memon, Rahman, Abdullah, & Azis, 2014), (Ahababi, 2014)
Construction site environment	(Mahamid, 2013); (Faridi & El-Sayeh, 2007); (Sunil, C. Pathirage, & J. Underwood, 2017)
Project Constraints Factors (Dependent Variable)	
Tight Budget Factors	Source
Economic instability	(Sunil, C. Pathirage, & J. Underwood, 2017), (Ribeiro, Paiva, Varajão, & Dominguez, 2013), (Ahababi, 2014), (Al-Sabek, 2015)
Cost of equipment	(Asal, 2014), (Ren, Atout, & Jones, 2008), (Beckers, et al., 2013), (Dozzi & AbouRizk, 1993), (Okafor, 2016)
Accuracy of bidding documents	(Genç, 2014), (McNichol, Cooper, & Sturmy, 2013), (Hussain, Zhu, Ali, Aslam, & Hussain, 2018), (McNichol, Cooper, & Sturmy, 2013)
Periodic payments	(Ahababi, 2014), (Sunil, C. Pathirage, & J. Underwood, 2017), (Asal, 2014), (Enshassi, Mohamed, & Abushaban, 2009), (Memon, Rahman, Abdullah, & Azis, 2014)

Limited Human Resource Factors	Source
Competency of workers	(Okafor, 2016), (Beckers, et al., 2013), (Beckers, et al., 2013), (Memon, Rahman, Abdullah, & Azis, 2014), (Ribeiro, Paiva, Varajão, & Dominguez, 2013)
Project Manager's performance	(Alomari, Gambatese, & Anderson, 2017), (Fan, Skibniewski, & Hung, 2014), (Enshassi, Mohamed, & Abushaban, 2009), (Hussain, Zhu, Ali, Aslam, & Hussain, 2018)
Training of human resources	(Hussain, Zhu, Ali, & Xu, 2017), (Al-Sabek, 2015), (Sunil, C. Pathirage, & J. Underwood, 2017), (Beckers, et al., 2013)
Number of employees available	(Dozzi & AbouRizk, 1993), (Enshassi, Mohamed, & Abushaban, 2009), (McNichol, Cooper, & Sturmy, 2013), (Alomari, Gambatese, & Anderson, 2017), (Ribeiro, Paiva, Varajão, & Dominguez, 2013)
Limited Time Factors	Source
Delay in approval of project documents	(Ahbabi, 2014), (Mahamid & Dmaid, 2013), (Beckers, et al., 2013), (Hussain, Zhu, Ali, Aslam, & Hussain, 2018)
Duration of inspection procedure	(Ahbabi, 2014), (McNichol, Cooper, & Sturmy, 2013), (Beckers, et al., 2013), (Genç, 2014)
Short contract duration for construction	(Hussain, Zhu, Ali, & Xu, 2017), (Beckers, et al., 2013), (Memon, Rahman, Abdullah, & Azis, 2014), (Genç, 2014), (Okafor, 2016)
Delay in progress payments	(Ribeiro, Paiva, Varajão, & Dominguez, 2013), (Enshassi, Mohamed, & Abushaban, 2009), (Al-Sabek, 2015), (Hussain, Zhu, Ali, Aslam, & Hussain, 2018), (McNichol, Cooper, & Sturmy, 2013), (Beckers, et al., 2013)
Shortage of equipment	(Sunil, C. Pathirage, & J. Underwood, 2017), (Beckers, et al., 2013), (Hussain, Zhu, Ali, & Xu, 2017), (Mahamid, 2013), (Al-Sabek, 2015)

9.2 Appendix 2: Questionnaire

Questionnaire	
<p>Dear Participant,</p> <p>This Questionnaire will give you the opportunity to express your view on Project Characteristics that ensure successful project completion under Limited Resources. Your answers will enable the research to find strategies for improvement in the UAE construction industry.</p> <p>We assure you that this questionnaire is confidential and for a study purpose only.</p> <p>The questionnaire compares three parts:</p> <ol style="list-style-type: none"> 1. General information 2. Project Characteristics (Technology and Location and functional design) 3. Project Constraints (Tight Budget, Limited Human Resources & Limited Project Time) <p>Thank you for your time and effort.</p> <p>Researcher.</p>	<p>Instructions:</p> <p>Please tick ONLY ONE for empty boxes for each statement according to your knowledge and experience on how each of the aspects play a key role in each section of the questionnaire.</p> <p>The following factors are the Project Characterises factors that ensure successful project completion under limited resources mentioned below:</p> <p>Organization Type</p> <ul style="list-style-type: none"> <input type="radio"/> Client <input type="radio"/> Consultant <input type="radio"/> Contractor <p>Your role in the organization</p> <ul style="list-style-type: none"> <input type="radio"/> Manager/Project Manager <input type="radio"/> Client Representative <input type="radio"/> Architect/Designer <input type="radio"/> Engineer <input type="radio"/> Other <p>Number of years of experience</p> <ul style="list-style-type: none"> <input type="radio"/> Less than 5 years <input type="radio"/> 5 to 10 years <input type="radio"/> 10 to 15 years <input type="radio"/> More than 15 years

QUESTIONNAIRE

No	Technology Factors	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	Construction design affect successful project completion under limited resources					
2	Electrical installations and electrical equipment influence project completion under limited resources					
3	Active technical systems affect successful project completion under limited resources					
4	Carpentry affects the successful completion of projects in cases of limited resources					
No	Location and Functional Design Factors	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	The construction land scape has an effect on the completion of the projection under limited resources					
2	The function of the building or construction influences the successful completion of the project under limited resources					
3	Use of new materials affects the successful completion of a construction project under limited resources					
4	The construction site environment has an effect on the completion of a construction project under limited resources					
No	Tight Budget Factors	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	Economic instability affects successful completion of projects with limited resources					
2	The cost of equipment affects the completion of the project under limited resources					
3	Accuracy of bidding documents has an influence on the success of the project in cases of limited resources					

4	Periodic payments impact the success of the project as under limited resources					
No	Limited Human Resource Factors	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	Competency of workers affects the successful completion of projects under limited resources					
2	Project Manager's performance has an influence on the successful completion of the project under limited resources					
3	Training of human resources influences the successful completion of projects under limited resources					
4	Number of employees available has an influence on the successful project completion under limited resources					
No	Limited Time Factors	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	Delay in approval of project documents affects successful project completion under limited conditions					
2	Duration of inspection procedure has an influence on the successful project completion under limited resources					
3	Short contract duration for construction affects successful project completion under limited resources					
4	Delay in progress payments has an influence on the successful project completion under limited resources					
5	Shortage of equipment affects successful project completion under limited resources					

Thank you ☺