



Client Causes of Variation in Construction Projects in United Arab Emirates

أسباب التغيرات من قبل العميل في مشاريع البناء في دولة الإمارات العربية المتحدة

by

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**A dissertation submitted in fulfilment
of the requirements for the degree of
MSc CONSTRUCTION MANAGEMENT**

at

The British University in Dubai

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October 2017**

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Abstract

The current research paper was set to investigate client causes of variation in the construction projects in United Arab Emirates. The past literatures were studied and a brief primary research was conducted. The study led to the finding of eleven independent variables that are more likely to impact the dependent variable, project variation. As the goal of the project was to identify the client causes of variation, therefore, all the eleven causes are deeply related to the client in some way or the other. The study led to the understanding that involvement of the client with the project, either more than required or lesser, leads to the project variation. The research paper reviewed previous studies that were associated with the topic to identify the causes. In addition, a primary research was conducted to understand the gravity of the causes. The study led to the understanding that the key variation causes that are faced by the stakeholders are size and the complexity of the project, lack of planning and communication, different opinions among clients and other stakeholders, unsatisfied client, and others.

Keywords:

Project Variation, Cross Tabulation, Client Causes

ملخص البحث:

الهدف من هذا البحث هو معرفة أسباب التغييرات من قبل العملاء في مشاريع البناء في دولة الإمارات العربية المتحدة. لذلك تمت دراسة الابحاث السابقة واجراء بحوث أولية موجزة. وأدت الدراسة إلى إيجاد أحد عشر متغيرا مستقلا من المرجح أن تؤثر على التغييرات في مشاريع البناء. وبما أن الهدف من المشروع هو التعرف على أسباب التغييرات من قبل العميل، وبالتالي، فإن جميع الأسباب الأحد عشر ترتبط بطريقة مباشرة او غير مباشرة بالعميل. وأدت الدراسة إلى رسم فهم واضح بان مشاركة العميل في المشروع ، إما أكثر من المطلوب أو أقل، تؤدي إلى التغييرات في مشاريع البناء. تتلخص الاسباب التي تم استنتاجها من الدراسة هي كالتالي: حجم وتعقيد المشروع ونقص التخطيط والتواصل الجيد واختلاف الآراء بين العميل واصحاب المصلحة الآخرين وعدم رضا الزبائن وغيرها.

Acknowledgement

I appreciate the continuous support from Dr. Maria Papadaki who is my supervisor in this dissertation. Also, I would like to say thank you to her and all facility members in British University in Dubai during my study who were helpful and cooperated.

Moreover, I would like to thank the people in my work who support me and were flexible to me during this period.

I would not reach this point to write these words without above supports and help. Thank you to you all!

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Chapter 1: Introductory Chapter

1.1 Introduction

The understanding of the client causes of variation in the construction projects in UAE is important as it is directly associated with the failure or success of particular project in the country (De Meyer et al, 2002). The parties that are generally involved in the construction project are client, consultants, and contractors. The variations in the construction projects occur due to various reasons and the involvement of these three entities are considered as important (Abdul Rahman et al, 2012). Variations are the deviations that occur within the projects from what has been agreed among the stakeholders at the beginning of the project. The deviation from the actual planned project can be of various forms such as removal of certain activity, reduction in the amount defined for the budget, or any changes in what has been written in the contracts (Wang, 2000). Some of the variations can be visible to the stakeholders, while others cannot be seen or assessed.

The current paper understands the variations in the project in the United Arab Emirates using the various research techniques discussed in the research methodology section.

The next sub-section briefly states the research background upon which the entire research study is based. The research background is followed by the research problem that is likely to be resolved through the conduction of this research. The research problem is followed by the research aim which states where the entire research project is heading. The research objectives, after the research aim discusses the aspects that will be touched while moving towards the achievement of the research aim. The research scope will define the premise within which the research will be conducted. The research scope is likely to help understand the limitations of this research paper. The research questions discussed after the research scope will showcase the questions that are to be answered by the end of this research project. This chapter has been summarized in end under Summary section.

1.2 Background: The United Arab Emirates

The United Arab Emirates is the combination of seven emirates and is ruled by the Supreme Council of Rulers. The seven emirates that are under the United Arab Emirates are Abu Dhabi, Dubai, Sharjah, Ajman, Um al-Qaywayn , Fujayrah, and Ra's al-Khayma. In the past decades, the government has invested in various governments run construction projects. The focus has been on

improving the economic situation of the entire country by further bringing them together with the help of infrastructural development.

As mentioned earlier, the variations can be signified by various forms of changes in the construction projects. One of them can be changes in the schedule (Alzahrani and Emsley, 2013). Schedule refers to the overall duration that has been assigned for the completion of project. The changes in the schedule can occur due to factors such as lack of resources, or the sudden occurrence of any kind of risks (Aminbakhsh et al, 2013). It might be related to the desire of some of the stakeholder to extend the deadline or stretch the duration without any reason. In some cases, the variations occur when the parties vary on the requirements that have been defined for the project. The requirements or the things that are to be achieved by the end of the project are generally defined in the beginning of the project. However, due to some changes in the mind of stakeholders or occurrence of any kind of situation leads to the change in the requirements which eventually creates variations in the project.

UAE has been selected as the country of investigation as the researcher is willing to keep the premise of investigation limited to certain region. Moreover, UAE has been the hub of numerous construction projects and researches which will give ample opportunity to conduct the investigation. In addition to this, the resources available to the researcher limit the extension of the research to the external locations as the focus is to conduct primary research also. The current research topic is interesting as it is likely to support the various stakeholders in the construction industry in understanding the causes of the variation and take appropriate measures to handle those causes.

1.3 Research Background

The existence of variations among the construction project activities is inevitable as there are many external and internal factors in play which impact the project progress (De Meyer et al, 2002). Any effort to eliminate the variations is unlikely to be successful. The variations have impacted almost all the associated individuals or entities with the construction projects. The individuals or entities can be project client, the individual who has monetary investment in the project; the consultant, these are the individuals or entities who acts as bridge between the client and contractors; and the contractors, who are the individuals or entities who undertake the construction project activities (Brockmann, 2012). The variations associated with the project are defined as the difference between the time when the particular tasks has to be completed and the time that was actually invested to complete that task. In any form of civil or private construction projects, it is expected in the

beginning that the task will be completed within the defined duration and allotted project budgets. However, this is not how things turnout every time. The changes in the activities, resources, and other factors are always observed (Guo and Shang, 2012). The projects that are of huge size, the changes can be observed easily and their impacts are huge.

It is important that the variations in the construction projects are understood clearly to ensure that the variations can be reduced or controlled, if not completely eliminated. The changes in the construction projects occur due to various reasons. The variations in construction projects have negative impact on the entire economy of the particular country along with the individuals who are engaged in the construction projects such as consultants, contractors, and the clients (Halwatura and Ranasinghe, 2013). The occurrence of deviations, being a common phenomenon, is the indication that the entire construction sector is being challenged with certain causes that are to be identified and appropriately managed.

In general, the works that are started by the engineers or the contractors for the particular client, if faces any kind of changes in the schedule, resources, or other aspects, then such alteration results into the unnecessary extension of the entire project duration and the budget that has been spent on the project. This is very demotivating for all the stakeholders (Hobbs and Besner, 2016). If the government is investing in particular civil construction project considering that the project will be completed in certain time period and within the defined budget, and if it does not happen, then it is likely that the credibility of the government in the eyes of the public falls down. This situation is not only with the government projects. If the private construction projects are considered, then it can be stated if the projects fail to be completed within the certain duration and within the defined budget, then it is likely that the parties will never meet again to work on other similar projects due to the lack of credibility or faith in one another (Hwang and Ng, 2013). Therefore, it can be stated from here that the completion of construction projects within the defined duration and given budget is necessary to ensure that the credibility is built and better projects are developed.

The United Arab Emirates has witnessed numerous construction projects in past few decades. Many infrastructural developments have been done in the country (Ponzini, 2011). Moreover, not only the government, but the private entities have largely invested in the construction projects around the country. At present, there are hundreds of construction projects that are on-going and there are many yet to come in existence. In such scenario, it is important that the variations in construction projects are understood to ensure that the future or existing projects progress successfully.

1.4 Research Problem

The variations in the construction projects are a major challenge for all the construction activities that are being conducted in the United Arab Emirates. The construction projects face challenge in appropriately managing the construction projects and leading the project activities towards successful completion. The variations in the construction projects have been considered as the challenge that is being faced by the stakeholders. There are various studies that have been conducted with reference to the variations in the construction projects (Lee et al, 2015; Lindhard, 2015; Muhammad et al, 2015). The projects have resulted into poor quality output, completion of the projects far from their intended duration, and the excess expenditure of money on the project which is generally beyond the recommendation of any of the associated stakeholders. In the United Arab Emirates, some of the projects are still on hold because the duration of the project passed beyond thinking and now require unprecedented amount of investment which is not acceptable to any of the stakeholders.

One of the major reasons behind the increased investment in the construction projects from the one estimated is the continuously changing economic situation of the country and the world (Taroun, 2014). It has been identified that in some cases, the construction projects are of such a huge duration that the prices of raw materials are witnessed to varying much during that duration. These fluctuations generally increase the overall cost of investment in the project from what has been intended. There are multiple studies undertaken to ensure that causes of variations are understood which will be discussed in the literature review section. However, it can be observed that many of the researches have been generic and provide limited core understanding of the issue. The lack of specificity in the causes that are resulting in the research project variations is likely impacting the decisions that are made the stakeholders that are associated with the construction project management.

The client of any construction project is an integral part as it is the sole investor in the project and for whom the other two major stakeholders – consultants and contractors – conduct the various activities (Walker, 2007). Therefore, it becomes important that the requirements of the clients are met while attempting to complete the construction project activities. It has been identified that the effective coordination among these individuals or entities are important to ensure that the project completes successfully and within the planned resources. However, it has been witnessed that the challenge in the project variation occurs when there is some input from the client when the project

is progressing. This creates major challenge in completing the project within the stipulated time and defined budget. Therefore, it becomes an important aspect to understand the client causes of variation in construction projects. As the focus of the current research project is the United Arab Emirates, therefore it is likely that the client of causes of variations will be understood from this country's point of view.

The variation challenges can occur from any side or anywhere, either it can occur due to the changes in the external environment which might be related to the economic, political, environmental, societal, technological, or others, or it can be internal to the construction project that is from the stakeholders (Walker, 2007; Wambeke et al, 2017). The focus of the current research project is to understand the client causes of variations, therefore limited focus will be given on the other associated factors that are likely to cause the variations. The focus is to investigate the causes of variations. Therefore, all the causes will be identified with the help of literature review and the primary research. The reason is that it is important to understand one important reason for the project variations appropriately then generalizing the entire research project objectives that is less likely to yield any fruitful output.

1.5 Research Aim

The aim of this research is to understand the client causes of variation in the construction projects in the United Arab Emirates. The client of any construction projects is an integral part and understanding this aspect is likely to help reduce the magnitude of variations occurring from this aspect. In general, the clients are found to be suggesting changes when the construction projects have taken off or the construction projects are about to complete (Yan and Chen, 2013). Such changes create issue for the other stakeholders such as the contractors or the consultants. The issue is associated with the various aspects of the projects such as required changes in the human resources, extension of the budgets, extension of timeline, and other such aspects. Therefore, it has been considered to pursue this aim through this research project.

1.6 Research Objectives

Based on the research aim discussed above, there are certain research objectives that have been considered for this research project. These research objectives are likely to act as guide in completing this research paper. Given below are the research objectives devised for this research paper:

1. To investigate the causes that are leading to the variations in the construction projects, with the particular focus on the client causes of variations and the civil engineering projects with the help of literature review.
2. To investigate the factors that are mostly impacting or prevalent in the occurrences of variations in the construction projects with the help of primary research.
3. To investigate the impact of the variation causes on the civil construction projects in the United Arab Emirates with the help of primary research.

1.7 Research Scope

The scope of the research is focused on understanding the premise that has been considered while moving ahead with this research project. The aspects that are outside the defined premise, despite their indirect relationship with this research paper, have not been considering the available duration and budget of this project. The scope is oriented towards keeping the research paper feasible enough for conduction. Given below are some of the research scopes that have been developed for this research project:

1. The first scope is to understand past researches that have been conducted in association with the research topic under consideration in this paper. This will be conducted to understand what has been identified by the previous researchers and only those papers have been picked that are likely to aid in the achievement of the research aims and objectives.
2. The second research scope is to understand the methodology that is to be adopted in conduction of this research. There are multitudes of methodologies that can be adopted for particular research and selection of suitable ones is important.
3. The third research scope is to understand the individuals who will be selected for the conduction of this research. The respondents are likely to be from the United Arab Emirates and further understanding of them will be dealt with later.
4. The fourth research scope is to understand the statistical tools that will be applicable on the research data that are likely to be collected during the research process.
5. The fifth research scope is to understand the way data will be analysed and suitable conclusions will be reached that are likely to be of benefit to the individuals or entities that are active in the construction industry in the United Arab Emirates.

6. The sixth research scope is to recommend strategies or ways that can be implemented to improve the issues associated with the variations in the civil construction projects in the United Arab Emirates.

1.8 Research Questions

The research questions that have been identified for this research paper is likely to keep the researcher on track to achieve the research aim. The research questions are likely to be answered by the end of this research through the processes to be discussed in the methodology section. There is high possibility that some of the answers to some of the research questions might be achieved during the conduction of detailed literature review. Given below are the research questions that have been developed for this research paper

1. What are the main causes that are leading to the variations in the construction projects and the client causes of variations in the civil construction projects in the United Arab Emirates?
2. What is the impact of the variation causes on the civil construction projects in the United Arab Emirates?
3. What are the strategies or ways that might be adopted so that the variations in the civil construction projects can be reduced?

These research questions will be the focus of this research paper. The research questions will be answered by the end of this research in the conclusion section.

The current research paper has been designed as shown in the diagram below:

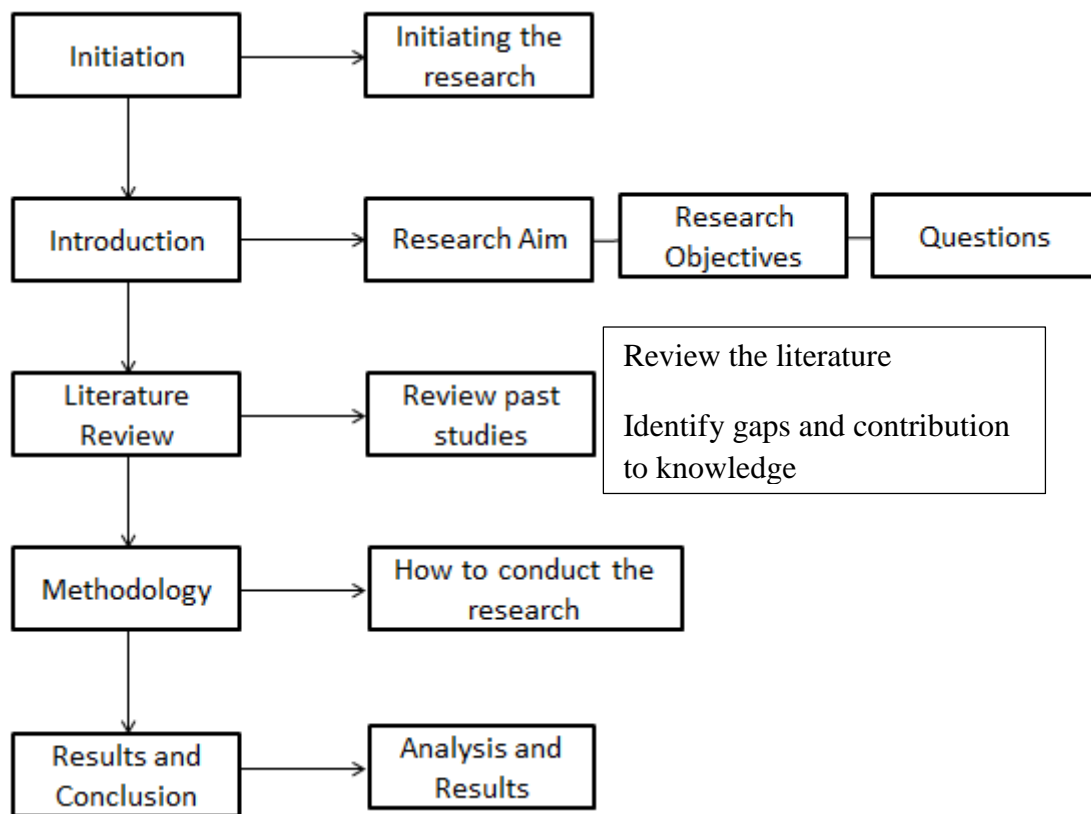


Figure 1: Research Paper Design (Libguides.usc.edu, 2017)

1.9 Dissertation Overview

Chapter 1: The first chapter has given the reader an overview of entire research paper. It is the introduction chapter that covers the background of the research, the research aims, objectives, and the research questions.

Chapter 2: The second chapter of this research paper is focused towards assessment of various research papers and books developed by researchers and academicians that address the variations in the construction projects. This chapter conducts the literature review of the past researches that are directly or indirectly associated with the current research topic. The purpose of this chapter would be to identify the variables of variations along with the development of suitable framework.

Chapter 3: The third chapter of this research paper is focused towards understanding the research methodology that has been considered for the conduction of this research.

Chapter 4: This chapter is followed by the results and analysis chapter that details on the analysis of the data collected from the respondents.

Chapter 5: This chapter is on research discussion and analysis. Here, the results obtained from the study has been analysed considering the objectives of the research.

Chapter 6: The chapter is on recommendation and conclusion. The Recommendation sub-section details on the ways or the strategies that should be adopted to counter the client causes of variations identified in the results and analysis section. The sub-section on Conclusion section gives conclusive remarks on the entire research study with the answers to the research questions identified earlier.

1.10 Summary

The consideration of client causes of variation in the construction projects in the United Arab Emirates is important to understand as the variations in the construction projects have become a challenging aspect within the construction projects to be managed. The stakeholders associated with any kind of construction projects are finding it challenging to ensure that the variations do not occur. The variations in the construction projects are impacting the timeline of the projects and budgets that are predefined for the projects. The unnecessary delays in the budget and timeline also lead to loss in credibility and bad relationship among individuals and entities. The United Arab Emirates has numerous on-going construction projects that require adequate understanding of the variations that take place. These construction projects are either government financed or of private companies. Though the major focus of this paper is to understand the variations in terms of civil construction projects, it is most likely that the private construction projects will be equally benefitted from this research assessment.

Chapter 2: Literature Review

2.1 Introduction

The literature review chapter makes an investigation of the client cause of variation in the construction projects in United Arab Emirates in order to identify gaps in the literature research papers and other form of studies that have been conducted in relation to the research topic. The purpose of this chapter is to come up with the variables that are associated with the variations. The variables or the causes identified after the study has been summarized in the end.

2.1.1 Understanding Project Variation

The researchers have identified that the construction project variations has become a challenging aspect that requires proper attention before it worsens the situations further (El-Sayegh, 2008). The variations are referred to as the difference that takes place among the actual and decided durations of the project. The variations have been identified to be occurring in various aspects of the construction projects such as schedule, budget, human resources, risks, and others (Arain et al, 2006). The variations have been found to as the alteration in the situation from what was intended. It has been identified that the challenges associated with the variations is dire in the countries that are still developing and lacks enough proper system and procedure to handle and maintain the large sized construction projects (Choy and Sidwell, 1991). Some of the researchers have showcased concern regarding the negative impact that is placed on the construction projects. The presence of limited resources is sometime attributed as the reason for the unnecessary variations (Faridi and El-Sayegh, 2006; Wang, 2000). If all the factors are ideal, then it is expected that the project under consideration will finish as per the plan. However, the countries like United Arab Emirates have witnessed construction projects that run late in terms of cost and timeline (Halloum and Bajracharya, 2012).

There are various researches that have taken place in order to understand the causes behind the variations in the construction activities. These studies have defined variations as the change that is not in line to the intention of the stakeholders who are associated with the particular project. The variations in the construction projects have become so common that the stakeholders rarely get bothered by its occurrence. The stakeholders that are integral to the construction projects are clients, consultants, and contractors (Abdul Rahman et al, 2012). There are also other types of stakeholders, but these are the key ones. These stakeholders have been found to be creating variations in the construction projects at various levels. Though deep assessment has rarely been made on any of the

particular stakeholders, the generic understanding of the causes is available in few of the researches (Gamal et al, 2000). It can be stated here that the better understanding of the variables impacting the variations require deeper assessment of each aspects.

2.1.2 Project Variation Types

The project variation orders occurring in the project can be of various types. As per Cox (1999), there are three forms of variation orders, namely, formal, productive and principal change. The formal change refers to the use of document to be sent to the client to approve the required project changes. In this change order, the modifications in terms and plans of the contract can be witnessed. Another is productive change where the workers perform extra work as directed by the client due to the changes brought in by the client. The third change order takes place when it is found that the project requires huge change consideration. On the other hand, Ndiokubwayo (2008) puts the variations in two categories. The first is beneficial variation where the variation takes place to improve the project quality or to reduce the cost being incurred. The second is detrimental variation where the variation negatively impacts the project quality, progress, cost, and other aspects of the project.

2.2 Causes of Project Variation

There are some causes that have been identified from the literature review that leads to the project variation. These causes are discussed in this sub-section. These causes can also be called as the reasons or the factors to the project variation as these are what lead to the variation in the project.

2.2.1 Project Activity Change and Variation

Some of the researchers have identified that if the schedules of project activities are changed then it is likely to vary the project (Shuan, 2007). The reason is that the rescheduling requires reallocation of resources which in case of huge construction projects are time consuming. The change of schedule can be initiated on any end, it can be either the client willing to change the duration or the contractor is unable to complete the predefined project duration. It has been identified that such changes require engagement of additional resources in most of the cases and some of the resources have been found to be getting redundant. Another important aspect that leads to the variations is the changes in the scope. Some of the researchers have identified that the reframing the project scope has been significant reason behind the variations in the construction project (Chan and Chan, 2004). The changes in the scope are generally initiated by the client for whom the project is being developed. In most cases, the contractors rarely engage in the scope changes as it most likely

impacts the project cost. The changes in scope occur mostly due to the failure of the concerned parties in developing appropriate plan in the beginning of the project. It has been asserted by some of the researchers that if the client or the client of the project is not involved adequately when the project is being designed, then it is likely that the scope will require changes in the later stages.

2.2.2 Client's Finance and Variation

Apart from the above, researchers have identified that in some cases, the clients' financial challenge lead to the variations in the project progress. If the client is failing to fulfil the financial requirement of the contractors that are required to procure the resources or to meet the other need of the contractors, then it is most likely that the project will suffer with variations. The financial challenges impact the work schedules and also the quality that is expected from the particular construction project (Akintoye and MacLeod, 1997). It has been also identified that if the concerned stakeholders of the project are unable to make decisions as quickly as possible, then it is most likely to impact the project progress. The quick decision making ability among the stakeholders ensure that the project does not suffer any form of delay. The failure to do so is most likely to increase the duration of the projects and eventually the cost. The decision making delay can be from the client, consultant or contractor side (Salama and Habib, 2009).

The researchers have also identified that the distribution of power among the stakeholders directly engaged in the project development is important to ensure that project moves ahead successfully (Lee et al, 2015). The development of construction project requires that the key stakeholders such as client, consultant, and contractor work together in conjunction to achieve the project output. However, it has been found that the clients hold more power than the other stakeholders and unnecessary assertion of power leads to disruption in the conduction of project activities which eventually convert to variations in the project activities (Wang, 2000). Moreover, if the client or client puts forth certain changes in the specifications, then it is most likely to alter the project path and bring huge variations. The alteration in the project specifications have been identified as being common in the construction projects. Such specifications are generally the resultant of poor project objectives. The attention to the new specifications certainly impact the project brings variation.

2.2.3 Consultants' Actions and Variations

On one hand, the role of client is crucial to variations in the construction projects, the actions of consultants also result into the project variations (Oladapo, 2007). It has been identified that the consultants bring changes in the construction designs as the factor of design improvements. The

changes in the project designs are considered mostly in the projects that take off without clear consideration on the design aspects. Those are generally come in the category of design and build construction projects with numerous alterations or variations from the actual. Such changes heavily impact the project duration and budget. Moreover, the conflicts that occur in the documentation of the contracts also sometime result in the variations. It has been identified that the clients interpret particular statements in a contract differently than what has been interpreted by the contractors. This leads to the conflict and the resultant settlements of conflict generally leads to variation in project. The lack of clarity in the construction documents with less sufficient details also creates confusion among the stakeholders.

It has been identified that the consultants engage in the changes of the project specifications. This aspect has become a major concern as clients and consultants, both engage in some form of changes in the specifications, and collectively it hugely varies the project. In some cases, it has been found that the equipment that is required by the contractors is not available with the concerned parties or not available in the market. This leads to unnecessary delay in the project duration. Apart from that, the less number of human resources working on the project is also the common challenge. The presence of unskilled labour is less challenging than the presence of skilled man power (Keane et al, 2010). The United Arab Emirates have recently witnessed influx of number of skilled and unskilled manpower from outside the country on short term contract. The manpower is the key in the development of various construction projects around the country. It has been identified in most of the cases, the lack of manpower to adapt to the improved processes of constructions lead to the changes in the duration that is taken to complete the projects.

2.2.4 Project Planning and Variation

The position of project planning in the construction project is very high. If the project is not strategically planned, then it is most likely that the project will suffer delay or budget challenges. The strategic planning refers to the adequate allocation of resources and actions considering various challenges that are likely to impact the construction project progress. The strategic planning should be done considering the various stakeholders that are directly or indirectly associated with the project and likely to have adverse or positive impact on the project progress (Guo and Shang, 2012). It has been identified that the adequate designing of the construction project is important as it directly impacts the variation in the project. The designs that are not adequately designed, that is,

the design that has not covered all project requirements are likely to attract attention from the clients which might lead to variations.

The researchers have identified that the variations associated with the construction projects are normal phenomenon. Despite efforts from the concerned stakeholders, the variations surfaces in some way or the other. It is an inevitable element that impacts the productivity and project progress of the construction activities. The key element of the project that is most impacted by the variation is time taken to start the project and the overall duration of the project. In this, the project deviates from what has been assigned or planned in actual. In any construction activities, there are numerous activities that are completed before moving onto the next activity. Therefore, it seems an obvious understanding that the variation in the duration of one activity subsequently impacts the other activities in the project. In addition to this, the extended duration considered by a particular task impacts the progress of the other tasks. It is the responsibility of the project manager of the project and the executives to ensure that the effective coordination is maintained in the project and to ensure that the project completes as per the planned duration and the budget. Moreover, it has been identified that the project manager should be considering the effort and coordination of the project team members and ensuring that resources are performing their tasks appropriately. The project manager should be assessing the perceptions of the project members and responding in accordance to it. The perceptions of the employees whenever there are changes or variations in the project from the external entities such as the client. This eventually slows down the overall project progress as it might impact the motivation level of the employees. The reason for this consideration is that their efforts if combined together will help complete the project on time.

2.2.5 Project Contractor and Variation

In some cases it has been found that the contractors lack enough financial backing to complete the project at hand. The construction projects, being labour intensive activities, require that the contractors keep paying the hired labour even if they do not have projects in hand. Moreover, in some cases, the contractors have been found paying the labours when the project is stalled for certain period of time. These generally create financial challenges to most of the contractors which in turn impact their ability to procure resources when they get new project or when the stalled project take off (Thomas, 1995). Apart from this, if workmanship displayed by the responsible party is not adequate and of quality, then it is likely that the construction might have to be demolished for redevelopment. Also, it has been identified that the resources that are to be procured from the

suppliers should be of high quality and must reach the construction venue on stipulated time to ensure that it does not lead to the delay in the project development. However, if there is fault in the procurement activity, then it is mostly likely that the variation in the construction project is occurring.

As per the Thomas et al (2002), the variation in the construction project is the absolute value obtained after differencing the daily and the baseline productivity of the resources. There are various entities within a construction project that impacts the variability in the project apart from the client and they are consultant, contractor, and mixture of various causes (Arain, 2005). The similar entities have been identified by Gbeleyi (2002) that causes the variability in the construction projects. The researcher identified that the contractor impact the variation due to the presence of defects in the construction. The similar defects are the reason that calls for contribution in variation from consultants (such as architects and the designers). Some other causes of variations identified here are unseen situations, conditions of the site where the construction is being done, financing of the project, delayed material supply, local laws and associated challenges, routes acquired to bringing in the resources, mistakes in developing the construction designs, and others.

In addition to the above causes of variation, Ramus and Birchall (1998) came up with certain form of situations that sometime becomes the reason behind the variation. The first situation is the desire of the architect to bring any changes in the earlier construction design due to some potential reason. The second situation is the identification of discrepancies in the contract documents. The third situation is the difference arising in the clauses placed in the contract documents and the statutory requirements. The fourth is that if there is any error in any part of the contract, then it can be reason for the variation in the project.

2.2.6 Stakeholder Intention and Variation

In addition to the above, Atkinson (1999) has identified that if bringing variations in the project is providing benefit a party in the project, then it is likely that the variation will take place. The similar observation has been made by Al-Seadan (2004) that in the case of variations contractors would always make effort to increase their profit from the project and reduce the cost, and this leads to challenging negotiations. The contractors would prefer to increase the costs associated with the variation orders. The variation in the orders are happening in almost all forms of construction projects due to various factors and from which some of them were mentioned earlier. However, all the factors do not come into play at the same time or at the same pace. These factors change

depending on the project types and associated elements (Arain and Pheng, 2005). The level of intensity with which particular factor brings in project variability depends on the project nature, level of complexity of the project, and the methods that are used to procure the required resources of the project.

2.2.7 Project Complexity and Variation

Segawa et al (2002) asserts that if the construction project is complex, then the associated stakeholders of the project should expect potential variation in the project. The variation can begin from the design phase and might traverse to the implementation phase. The construction designs and specifications are likely to change depending on the orientation of the client of the project or the other stakeholders. It might be possible that the project client or client does not like the project design or the contractors, who will be handling the implementation, will not be able to deliver what has been specified in the design. The variation of such form are not common in the construction projects however the frequency with which they occur might be different from project to project. As per Charoenngam et al. (2003), the variation of the project can also be characterised in different way. That is, it is possible that the change brought on the project by the contractor is not mentioned in the contract and thus the contractor would not be liable to get paid for the same. A study conducted by Love (2002) led to the identification that the projects that require huge amount of renovation activities witness increased frequency of variation. The reason is the level of complexity related with such activities.

The study conducted by Gidado (1996) led to the understanding that the more the project will be complex, more there will be chances of variation. Moreover, the variations in the project occur due to the demand from the client to increase the speed with which the construction activities are going on or demand to reduce the cost being incurred on the project activities. In addition to these, the concerns associated with the health and safety of the workers performing at the site also impacts the project variation. This element mostly comes into play when the project planning does not successfully consider the risks associated with conducting the project. The project complexity level can be either low medium or high depending on the factors associated with it (Ireland, 2007). Moreover, Ireland asserts that the increasing complexity of the project similarly increases the chances of variation. It has been found that if the variation occurring in the project is due to the complex nature of the project, then it is likely that the stakeholders of the project will take

comparatively longer duration in understanding the situation to come out with a viable plan or solution.

2.2.8 Project Size and Variation

In addition to the above, if the project size is huge, then the instances of variations occurs significantly (Hao et al, 2008). The project size is considered as the key element that leads to the variation due to the inclusion of various factors such as increased number of stakeholders, routes to procure resources, budget, timeline, and others. It has been stated that if the size of the project is huge, then the project strategies should be considered in detail along with the inclusion of ample contingency provisions. Sidwell (1993) asserts that the size of the project is among the key factors that impact the level of variability. The size of the projects can be defined based on the value it carries or in its physical characteristics. The projects that are large carries increased complexity which eventually leads to variation (Akinsola, 1997).

There are various studies conducted to understand the impact of the variations in the project (CII, 1994; Arian and Pheng, 2005). Any form of variations that occur in the project, first impacts the overall progress of the project is the impacted activity has no slack time (Assaf et al, 1995). In another word, if there is variation in the project then there is high chance that the project will be delayed from what was planned. However, the impact on the duration varies from project to project depending on the project size and the level of variation occurred. In addition to the impact on the time, the project variation also impacts the costs associated with the project. The cost varies widely depending on the variation occurred. As for instance, the change in the project design is likely to impact the cost and the contingencies associated with it (Clough and Sears, 1994; Assaf et al, 1995). In such situations, it is important that right amount of contingency funds are pre-planned before engaging into the project.

2.2.9 Employee Inclusion and Variation

In addition to the above, if the project requires addition of few more trained professionals, then it also impacts the project variation. Moreover, if the project has employed new professionals, then the variations in the projects require that more trained professionals are taken board to resolve the issues. In such scenario, the new professionals are removed from the project (Fisk, 1997). The project variation also increases costs that are not directly associated with the construction such as costs incurred in conducting reviews of the situation and framing the new plan, use of other collaterals like paper work, and others. These are called overhead costs of the projects (O'Brien,

1998). The payment delays are the other resultant that occurs due to the variations in the project. If the variations in the project are taking place in increased frequency, then along the whole project progress almost stalls for a while and the associated resource providers fail to get timely payment. Here, this can also have some serious implication such as complete non-payment to the subcontractors as the project is delayed from what was defined (CII, 1990 and 1995).

2.2.10 Method of Client Approval and Variation

Along with the impact on the project variation caused by the client's desire, the method approved by the client for the procurement also impacts the project variation. The understanding of the mechanics behind the variation orders and the management of such variation, it would be preferable to understand the methods of procurements considered. It has been stated earlier that a particular construction project consists of multiple stakeholders such as clients, consultants (comprising architects or designers), contractors, and others. The methods that are adopted to implement the project are different. The procurement routes considered by the project development states the type of contract agreement among the concerned parties of the contract. It has been found that the different procurement routes leads to different level of variations in the project (Love, 2002). As per research conducted by Love (2002), the procurement route that is non-traditional is witnessing more variation. However, it has been found that the variability in the costs associated with the project procurement routes are not of major difference.

The variation orders are issued by any party involved in the project. However, it should be ensured that the variation order should be in the written form (Charoengngam et al, 2003). The approval of variation orders takes time depending on the size of the project and the number of stakeholders involved in the project directly. After the approval of the particular change order, the new change order acts as the replacement for that particular clause mentioned in the original contract. The characteristics of a good construction project contract is that it includes all the appropriate measures that deals with the variation orders of the project and the processes required for dispute settlement.

2.2.11 Methods for Procurement and Variation

As stated earlier, there are two methods for procurement. First is traditional and another is non-traditional. Segawa et al (2002) asserts that the traditional procurement methods witnesses increased variations in comparison to other procurement methods. In the traditional method the client would generally consult the consultants to develop the required design for construction and the use of

quantity surveyor is facilitated who engage in documentations that will be later used by the contractor.

As discussed so far, the causes of variations for a project can be multiple depending on circumstances and the individuals involved in it. The researchers have found that in some of the construction projects, the stakeholders are also required to take necessary permits from the local authorities to ensure that the construction activities are taken further. The process to get approval for the construction can take little or more time. It entirely depends on the level of influence enjoyed by the client. Moreover, due to the complex governmental procedures, it sometimes becomes challenging to break the bureaucratic barriers to take the approval even for the legitimate constructional activities. In such situations, the delays in the projects become a common place. It has been identified that the stakeholders involved in the project activities should be appropriately aware of the function of the government and understand the methods to utilize to get the approval. Almost all the construction projects cannot begin without appropriate approval from the governmental department.

2.2.12 Client Satisfaction and Project Variation

Another key aspect is the satisfaction of the client regarding particular project activity. It has been found that in some cases, the client of the project asks to redo or further improve the particular activity which consumes additional time and resources. This approach of the client of amending activities lead to the variations in the overall project. The researchers have identified that the appropriate planning in the beginning can be the key to ensure that the project is not derailed. Moreover, in these circumstances, the expectation of the clients should be made clear on both the sides. The reason is that it has been found that the clients ask to amend things or improve on the project activities once it does not meet the expectation. It has been found that the lack of communication between the clients and consultants is likely to result into such situation where the client is expecting something else but the consultants are not getting the clear picture. This further leads to the greater gap as in most cases the consultants communicate with the contractors. Therefore, if the communication gap is with the client then it magnifies further and the contractors get different picture of the things that are to be developed.

In some cases, it has been found that the ability of a design to be constructed is minimal. This can be due to the lack of practicality of the design that has been demanded by the client or the consultants have built something else. In most cases, the design demand of the clients fails to stand

completely to the reality and it becomes challenging to execute. In some cases, the design team fails to understand the ground reality or the constructability of certain design aspect and put the entire project in jeopardy. The researchers have come to the understanding that such situations can be improved if the design and its aspects are considered based on what has been achieved in the past and the capability of the current construction team.

There are other elements that are not directly associated with the project clients but impact the project at various levels. One such element is human resources that are engaged in the project activities. The human resource is the most volatile aspect of the project, whose management - if the project is large and complex - becomes critical. The researchers have identified that the management of the individuals who are working for the project is critical for the success of the project. The human resources are likely to showcase absenteeism, loss of productivity, strike, turnover, and other such elements. Therefore, to ensure that human resource as per the expectation, it is important that the contractor is active towards it.

2.3 Variation Impact

The variations in the construction projects have been found having adverse impacts on carrying out the particular projects. This aspect is common to any project that is being undertaken, whether smaller or bigger in size. The countries like United Arab Emirates are hugely oriented towards development of strong infrastructure for the public which requires substantial resources (Zaneldin, 2006; Halwatura and Ranasinghe, 2013). The development of multi-stage infrastructures leads to the complex environments. Moreover, it has been identified that the large construction projects require resources that are substantial in quantity and investment. Therefore, any likely changes due to potential variation causes, heavily impact the on-going project on the financial aspect. The implementation of the construction projects also requires better relationship among the project stakeholders. This is important as it ensures that the each of the stakeholders understand and communicate the project requirement carefully. The presence of limited communication mechanism within the project has also been found as impacting the project progress.

The client has been considered as the most important entity in the construction project activities. The clients are those for whom particular project is being developed or who is making monetary contribution to the project development (Halloum and Bajracharya, 2012). The projects, either it is associated with the civil construction or any other field, are required to fulfil the requirements that have been laid down by the clients. In such scenario, it is imperative to understand the client

requirements carefully as it become the key reason behind the variation in the project management. Apart from the successful development of the project requirements, it is also important that these are successfully communicated to the other important stakeholders such as consultants and the contractors (De Meyer et al, 2002). The project contractors are the acting partner of any particular construction projects, and therefore it is important that they understand the requirement carefully. It has been identified that the failure of contractors to understand the requirements of the clients has also resulted into major variations. Such variations are considered as huge as in some cases it requires redevelopment (Kang and Kim, 2015). Therefore, the lack of proper communication of requirements has been identified as one of the causes of variations in the construction projects. The communication ensures that the stakeholders on the project are aware of all the progresses so that they can make appropriate decisions. However, with the lack of communication, few will be aware of the project aspects and this may lead to chaotic situation (Newcombe, 2003).

2.3.1 Variation Impacting Final Output

Moreover, the variation impacts the final output of the project. As per CII (1995), if the variations occurring in the project are frequent, then it is likely that the quality of the project will be impacted and there is high probability that the project output will not be something that was decided in the beginning. Also, the productivity of the human resources employed in the project fall down. The variability causes the unnecessary shortage of materials and particularly information on which the resource will work. The work starts to lose sequence and creates confusion. Ibbs (1997) asserts that the variation orders of the project and the level of productivity is negatively associated with each other. Thomas and Napolitan (1995) came to the conclusion that the disruptions are caused in the project due to the variations which is closely associated with the productivity. These disruptions can be caused by internal factors or external entities such as client. The variations also lead to the delayed procurement and it is a common resultant (Haster et al, 1991; O'Brien, 1998).

The variation of the project also leads to demolishing something which was built and rebuilding the same thing with new specifications. It is obvious that considering the occurrences of variations in the project implementation leads to destruction and reconstruction of particular part. However, it has been observed that in some cases the project has been demolished at particular part even after the completion (CII, 1990; Clough and Sears, 1994). Moreover, the variations in the project also lead to the delays in the logistical process of the project (Hester et al, 1991). The new tools, equipment, and materials required for the project are generally reaches the site late when the

variability takes place. In addition, this also damages the reputation of the organization that is handling the project planning and implementation. The reason is that the variations in the projects are considered as the beginning to the different claims or the disputes made by the concerned parties.

2.3.2 Project Variation Impacting Employee Safety

The project variations also challenge the safety provision for the employees working in the project. The level of safety for the employees can be impacted if the frequent variations take place (O'Brien, 1998). As for instance, for the heavy construction, if there is variation, then it might require changes in the tools and equipment which will further require that the equipment specific safety measures are considered (Arain et al, 2004). As stated previously, the variations in the project progress damages the reputation and along with it, it also impacts the relationships among the various parties engaged in the project. In such situation it becomes important that a middle ground is identified instead of moving towards the court (Arain et al, 2014). Moreover, the pay for the contractor increases if the change has been induced from the client's side or from the consultant's side. In both these situations, the client has to pay the price. Therefore, it has been found that contractors prefer to suggest client of variations and it is considered as the usual source of increased work and source of income earned by the contractor.

The professionals engaged in the project also strain their mutual relationship due to the variations in the project. The variations lead to the state of confusion in projects that are of complex nature and the pressure from external entities to resolve the situation lead to poor relationship. Along with this, as stated earlier, the project also impacts the time required to complete the overall project. The impact on the schedule is considered as the direct output generating from the project variations (Ibbs, 1997; Zeitoun and Oberlender, 1993). A study conducted by Kumaraswamy (1998) led to the finding that the around 50% of the construction projects that have been delayed are the result of the variations occurring in the project in some way or the other.

2.4 Conceptual Framework

Based on the overall assessment of the various aspects of the variations considering the research papers developed by the other researchers, a framework has been developed which will be used to build certain hypotheses. These hypotheses will be proved further using the primary data.

The image below is the framework that has been developed based on the overall discussion above. The causes listed are the impacting the variation of the project.

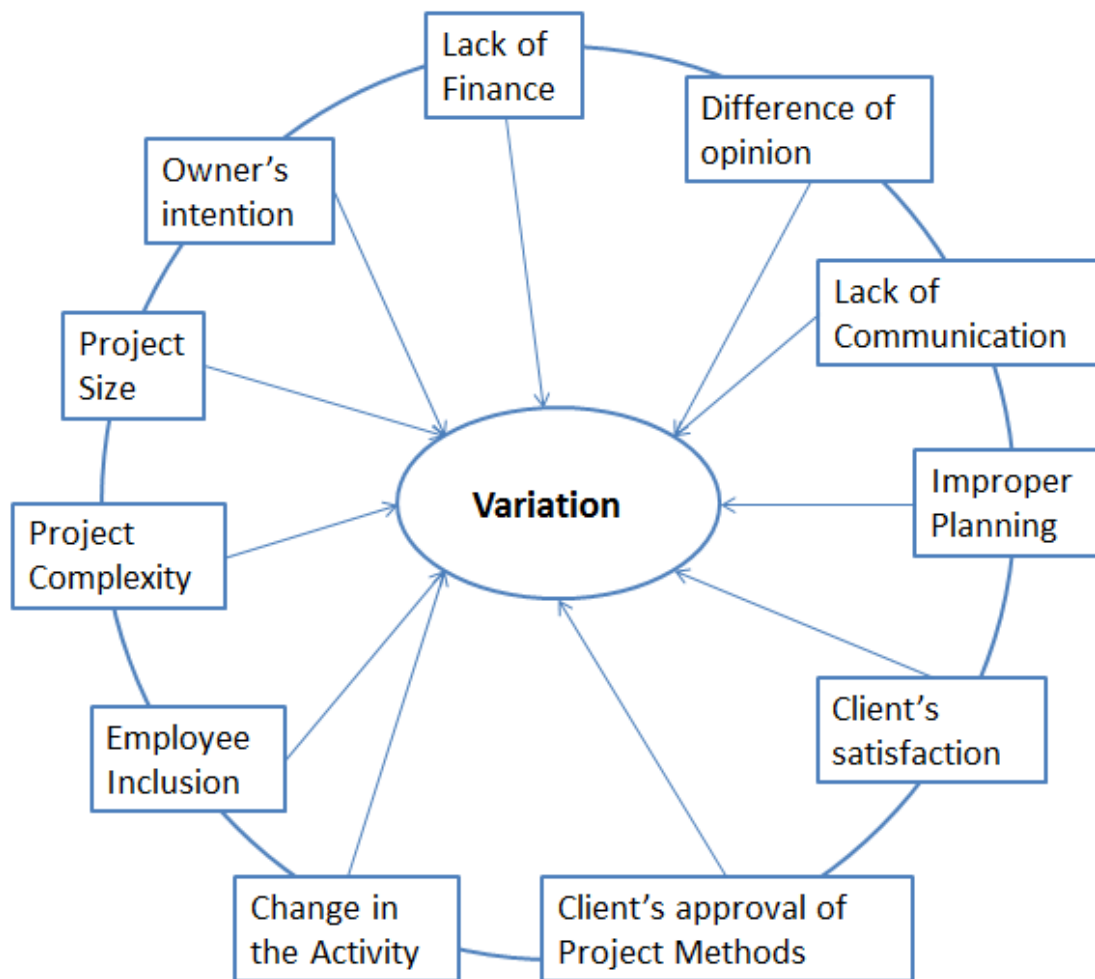


Figure 2: Framework

The factors are listed in the table below. A brief description of the factors have been included adjacent to each of these.

Client causes of variation	Description
Lack of Finance	Client lacks enough money to complete the project
Difference of opinion	Client has different vision to conduct the activities than other stakeholders
Lack of communication	Consultants and contractors are unable to capture

	what exactly is being communicated by the client.
Improper training	Individuals hired on the team are not properly trained
Client's satisfaction	Client is not satisfied with a particular activity or design and willing to change
Client's approval of project methods	Client is approving different method for project conduction or material procurement
Change in activity	Activities needed to be changed
Employee inclusion	Induction or elimination of talented employees
Project complexity	Project is complex for the stakeholders
Project size	Project is of substantial size and handling is tough
Client's intention	Client has different intention than other parties involved.

Table 1: Identified Causes from Literature Review

Based on the study so far, there are certain hypotheses that have been developed which will be further proved or disproved considering the data analysis. These hypotheses are given below:

- H1: There is positive correlation between lack of finance and project variation.
- H2: There is positive correlation between difference of opinion and project variation.
- H3: There is positive correlation between lack of communication and project variation.
- H4: There is positive correlation between improper planning and project variation.
- H5: There is positive correlation between client's satisfaction and project variation.
- H6: There is positive correlation between client's approval of project methods and project variation.
- H7: There is negative correlation between client intention and project variation.
- H8: There is positive correlation between change in the activity and project variation.
- H9: There is positive correlation between employee inclusion and project variation.
- H10: There is positive correlation between project complexity and project variation.
- H11: There is positive correlation between project size and project variation.

Chapter 3: Research Methodology

The current chapter is focused on assessing the research methodologies that will be used to conduct this research. The initial section of the chapter will focus on understanding the various methodologies of the research and then the suitable one will be selected for the research. The theoretical aspects of the research methods will be reviewed in this chapter.

3.1 Primary and Secondary Research

The focus of this research paper is primary research. The research, in generally, is divided into primary research or secondary research. The primary research is concerned with the collection of primary data directly from the respondents and then analysing those data to reach possible results for the research aims (Glass, 1976). The primary research method involves use of good amount of time as collection of data is time consuming. The benefit of primary research is that the researcher has the freedom to select the suitable data as per the requirement and ignore the rest. Though there are certain amount of monetary investment is involved in this process, but outputs are better than the secondary research method. The secondary research on the other hand, involves collection of data from the secondary resources. In this form of data collection, the researcher depends on the already collected and refined data of other agencies and researcher. Therefore, the researchers do not get enough opportunities to make changes in the data. The secondary research limits the freedom as per the data is concerned.

The current research paper has considered both the method to ensure that good aspects of both the form are used. The secondary research method is used to assess the previous researches done by the other researchers. This has been used to develop the literature review in the previous section. The literature review has given ample opportunity to understand the studies that have been conducted in the past. The study has led to some appreciable findings as stated in the summary section of the literature review chapter above. This has paved way for the further research. The next stage of the research is the consideration of primary research. The primary research will be conducted in the UAE only. The primary research will include the development of research questionnaire which will be distributed to certain number of respondents. The details on this aspect are discussed ahead. Along with the above, the paper has considered quantitative data for the assessment. The quantitative data has been picked from the questionnaire sent to the respondents.

3.2 Research Design

There are various research designs that can be used for a particular research. In this dissertation, the researcher will use non-experimental research design. This study will not manipulate particular situation or circumstances. The study will measure different variables with the help of survey results. The non-experimental research design is also called as the correlational design (Johnson, 2001). It will be used to identify and understand the relation among different variables.

3.3 Saunder's Research Onion

The current section will focus on research onion developed by Saunders et al (2009) to ensure that the right strategy is selected for the research. The selection of the appropriate research strategies will ensure that the suitable methods are used to prevent from the misleading results in the end. Saunders et al (2009) have developed this onion to identify the process for conducting the research. There are six levels in the research strategy. Each of the levels various components that can utilized for the research. However, not all will be suitable. Therefore, comparative analysis will be conducted for each level and the suitable element will be selected for the research.

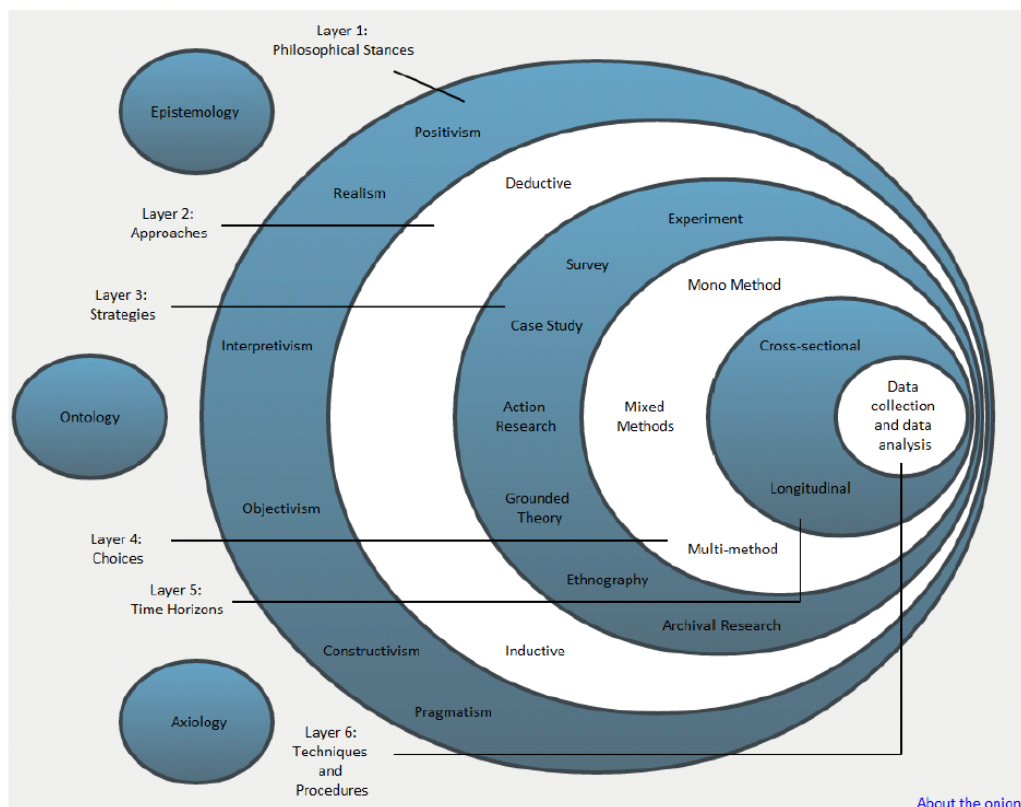


Figure 3: Research Onion (Saunders et al, 2009)

3.3.1 Philosophical Stances

The philosophical stance is the first level in the research onion which covers various elements such as positivism, realism, interpretivism, objectivism, constructivism, and pragmatism. The positivism and interpretivism is most used form of orientations which will be discussed here to choose from (Antwi & Hamza, 2015).

The orientation of positivism is that the individuals are built with the help of various societal factors and therefore the behaviour of the individuals can be explained considering those factors and understanding them. Some of these factors are ethnicity of the individual, gender, social class, and others. The interpretivism approach, on the other hand suggests that the individuals are not the puppets and they are self-conscious beings that are intricate and full of complexity. Therefore, covering the understanding of the human aspects within certain fact based assessment would not be enough. As per the positivism orientation, the focus of the research should be on uncovering the laws that are governing the behaviour of the humans. Moreover, the quantitative is the preferred approach in the positivism. The interpretivism approach asserts that the individuals are required to be understood on the empathetic ground. It is important to understand why they acted in a particular manner. Therefore, the consideration of quantitative method will not suffice. The use of qualitative method has been suggested in this approach.

Considering the discussion above and the requirement of the current research paper, it can be stated that the positivism will be the appropriate method (Moon & Blackman, 2014). The reason is that the qualitative research is expected to take considerably more time and resource than the quantitative research. Moreover, understanding the responses in quantitative form would be easier to integrate and understand considering the experience level of the researcher. The qualitative research requires that the researcher has considerable experience in the field of manually understanding and assessing the individual respondents.

3.3.2 Approaches

There are two research approaches that are considered for the research in general. They are inductive research and the deductive research (Ormston et al, 2014). The approach of the deductive method is moving from the generalized pattern to the specific elements. The top down approach of the deductive method allows the researchers to consider the various theories that have been developed in the field and then narrow towards few hypotheses. These hypotheses are further tested

considering primary or secondary data. The testing of the hypotheses leads to either the confirmation of the theories or it leads to the development of the new theories or ideas.

Inductive reasoning on the other hand, has quite opposite orientation from the deductive reasoning. In the inductive reasoning, the researcher moves from the particular observations and builds theories (Eisenhardt et al, 2016). This also referred to as the bottom up approach. There are various observations made in the inductive approach that are measured to understand the patterns. These patterns or the regularities are considered to build hypotheses that are further taken to develop generalized conclusions (Woo et al, 2017).

In the current research, the deductive research approach will be considered. The literature review in the previous section was to understand what has been identified in the research papers or studies. These studies have been used to develop certain hypotheses has stated in the end of the literature review section (Creswell & Poth, 2017). The hypotheses are based on the framework that is developed using the literature review. The hypotheses then will be tested using the primary data. The data will help in understanding whether the hypotheses hold true or there is difference in what has been identified in the theory and in the reality.

3.3.3 Strategies

Strategies are the third level in the research onion. In the research onion, there are various aspects that are covered, namely, experiment, survey, case study, action research, grounded theory, ethnography, and archival research (Sekaran & Bougie, 2016). This section will take a brief view on each of the aspect and will define the suitable one for the current research.

The experiment is used by the researchers to conduct study in the controlled environment. The researchers block certain variables from impacting the test participants and then observe the response. This method of study is not suitable for the current research as the understanding the response in the open environment is fruitful (Dehejia, 2015).

The second method is the survey. In this method, questionnaire is developed which is then distributed to the identified respondents, who then respond as per their feasibility (Neuman & Robson, 2014). The survey method is time consuming but it can be less costly if the researcher utilizes technologies. The current research involves collecting data from the respondents who are involved in the construction field. Most of them are active on the internet and uses new

technologies such as smartphones and computers. Therefore, the researcher will use this method to collect the required data (Vattam et al, 2013).

The case study method is used by the researchers to observe particular situation and investigate the underlying issues. The method is suitable when solution to a particular issue is expected or some closed situation based study is done (Yin, 2013). The current research covers the wide diaspora of construction activities and therefore case study approach will limit the orientation. Therefore, the research paper will not consider the use of this research study method (Algozzine & Hancock, 2016).

The next research method is the action research. The action research method is used by the researchers who are willing to implement some actions and study the impact of such actions. The action research method is used by the researchers mostly in the low cost format where the changes are less likely to bring any negative impact if not positive (Smith, 2015). In the current research, the implementation of particular action to observe its impact is not feasible financially. Therefore, this method will not be considered for the current research.

Another strategic approach is grounded theory. In this approach, the systematic research or studies of the data is considered for the generation of the theory (Morse et al, 2016). This considers the inductive approach of research method which is quite contrary to what has been considered for this research (Birks & Mills, 2015). Therefore, this method will not be used in the current research.

Another research strategy is ethnography. Ethnography research method is broad. However, basically it covers the observation of certain number of participants (Lahlou et al, 2015). The current research paper is considering the survey approach which is likely to contradict this approach. Therefore, this method will not be used.

The last strategic method is archival research. The archival research is concerned with investigation of past records regarding particular topic. The archival research method is used by the researchers to unearth evidences are unique in nature and requires extensive effort from the research. The current study is towards the future prospects and improvement in the construction aspects after understanding the possible causes of variation. It is less likely that the archival research will benefit the current research. Therefore, the current research will not consider this method.

Finally, it can be stated that the survey has been picked for the strategy which will be used taken further in the study.

3.3.4 Choices

There are three research choices that can be considered by the researcher, namely, mono method, mixed method, and multi-method. The mono method refers to the use of only one of the method, either quantitative or the qualitative research methods. The quantitative research method is concerned with the collection of quantitative data and use of statistical tools for their interpretation (Takhar-Lail & Ghorbani, 2015). On the other hand, the qualitative research is concerned with the collection of non-numeric responses that are assessed to reach the required results. As stated earlier in the discussion, the quantitative research method will be considered for this research.

The mixed method is concerned with the use of both the methods together to understand the overall response of the clients. The quantitative and the qualitative research methods are used together to ensure that the respondents give response to the things that cannot be covered in the quantitative method (Frost & Shaw, 2015). As the current research will not consider the qualitative research method, therefore, the use of mixed method is discarded.

3.3.5 Time Horizons

As per the time horizons of the research is concerned, there are two approaches, either cross-sectional or longitudinal. In the cross-sectional research approach, the different data are considered for the study at the one point in the time (Stride et al, 2014). On the other hand, the longitudinal study is concerned with the collection of data from the different time horizons. The current research paper will collect the data from one point in time using the respondents from the UAE.

3.3.6 Techniques and Procedures

The techniques and procedures is the sixth layer in the Saunders' research onion. This layer is concerned with the data collection and data analysis methods.

Data Collection

The data collection for the research involves usage of conventional sampling. The conventional sampling method comes under non-probability sampling. The conventional sampling method allows the researcher to select the respondents as per the convenience (Rodríguez-Ramos et al, 2013). One of the major risks in the conventional sampling is associated with the researcher bias. Here, it is possible that the researcher might select the respondents who are more likely to conform to the

orientation of the expected results. In the current paper, it will be ensured that the researcher considers the respondents based on the past experience. The respondents will be relevant to the research and as per the criteria defined for the respondent selection.

The total number of questionnaire that will be sent for the data collection is 100. It is expected that all the hundred respondents fill the questionnaire in completion. However, it is possible that few of them will not respond or few will respond with partially filled questionnaire. Therefore, it will be ensured that the additional questionnaire is sent to more respondents so that the total completely filled response is 100.

Research Tools

- Questionnaire

The questionnaire shown in the Appendix is to be sent to the respondents. The questions are targeted towards understanding the significance of the factors identified in the literature review that is targeted towards client variation (Patten, 2016). Moreover, it is expected that the questionnaire will assist in proving or disproving the hypotheses.

- Survey Method

The survey method will be used, as stated earlier, for the data collection. The online tools will be used to conduct the survey. The respondents will be connected using the existing social media network of the researcher. Moreover, few personal contacts will be used to ensure that the respondents are connected through emails. The questionnaire will be mailed to the respondents in the MS word which they will fill and revert back in certain time frame. The collected data will be then be compiled in the MS excel and transferred to SPSS software for further analysis.

- Respondent Selection

The respondents will be based on few selection criteria. The first selection criterion is that the respondents should be working in the UAE construction industry for the past 10 years. This is necessary to ensure that the responses of the respondents cover ample backing of their personal industry experiences. The working profile of the respondents who will be selected for the data collection should be contractor or project manager, consultants, and clients. The reason is that these three profiles are the key in any construction projects and they are at the top of the pyramid in the construction activities. Therefore, gaining direct responses from these individuals will be an appreciable effort towards conducting this research. Other than these two, there are no additional criteria that can be used by the researcher in the selection of the respondents. Another important

aspect is that the respondents should be reachable so that the researcher can make them fill the responses appropriately. The target group are the project managers, consultants, and clients who have more than ten years of experience in this field.

Data Analysis

The analysis of the collected data will be conducted using the SPSS software. The SPSS version 16.0 will be used to analyse the data (Pallant, 2013). The tool will allow the researcher to conduct all required analysis from the statistics. The statistical tool to be used to analyse the data is descriptive analysis and cross-tabulation. The cross-tabulation analysis will help in proving or disproving the hypotheses made earlier. The p value will help in understanding that whether the particular cause is significant. Also, the cross-tab value will help understand whether the cause impacts the variation.

3.4 Pilot Study

Pilot study is conducted to test whether the questions are straightforward and whether the respondents are facing any issue in filling the questionnaire (Rowley, 2014). The pilot study is not to the core of the research and therefore it has been conducted separately and not included in the chapter discussing the ‘finding’.

The questionnaire was initially sent to ten respondents. The responses that came led to certain modifications in the questionnaire. The following table shows some of the elements that were identified by the respondents.

Weakness	Improvement
Few questions were repetitive in nature	Two questions were asked twice in two different ways.
Words were confusing	The identified sentences were improved. The heavy academic terms were toned down to ensure that the meanings are clearer and less confusing.
Minor grammatical issues	Minor grammatical errors were improved using Grammarly, an online grammar checker.

Table 2: Questionnaire Pilot Test

3.5 Ethical and Moral Considerations

Prior to conducting the research, it is important that the ethical and moral aspects of the research are taken into considerations as the research results are likely to impact the greater number of

shareholders who are interested in the research. The current paper has not considered any form of human trials or will not engage in any form of experimental or quasi-experimental activities and, therefore, it will not impact any humans at the research stage. The researcher of this research paper will take all the important elements of ethics under consideration and will not disclose any personally identifiable information to the third party. The collected responses will be used only for the statistical analysis and no further assessment of the data will be done.

The researcher will ensure that no form of researcher bias is involved in the research which might impact the research results. From the research methodology, it is clear that the researcher will consider convenience sampling for the study, however, it will be ensured from the researcher's side that the selection of the respondents are completely rational. There are no premeditated results in the mind of the researcher that will be tried to be achieved. The researcher is open for the results that are likely to arrive after the assessment. It can be concluded that the consideration of ethical aspects should be there as it impacts the usability of the research.

Chapter 4: Results

The current chapter will analyse the data that has been collected using the questionnaire. The total received responses were more than 123 and the completely filled questionnaire was 100. In this chapter, two statistical aspects will be considered, namely, distribution of data and the cross-tabulation. The question number five in the questionnaire was intended to know whether the respondents have experienced project variation in the past ten years. Out of the 100 completely filled questionnaire, 20 of the respondents said that they have not experienced project variation. All the 100 questionnaires are selected for the analysis. SPSS 16.0 is used to analyse the data. The graph is shown below:

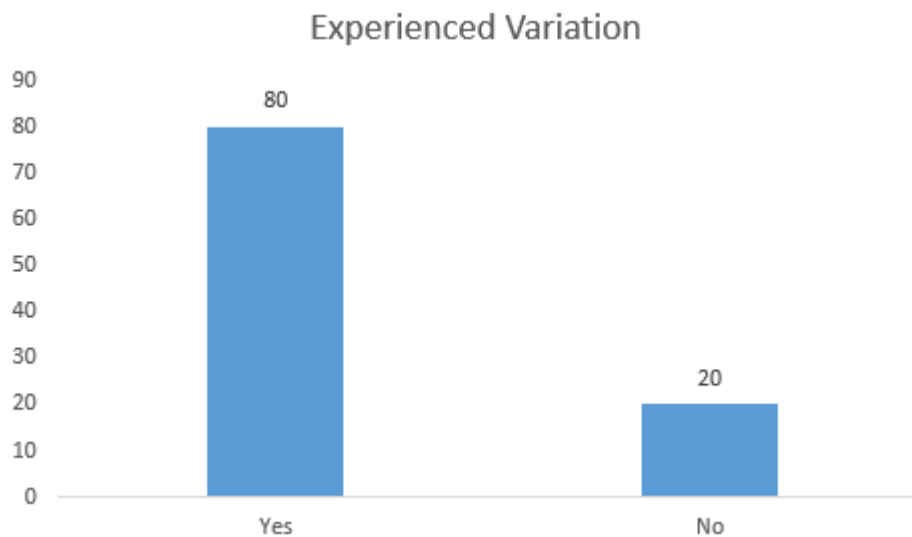


Figure 4: Experienced Variation

Here, the variation in the project is the dependent variable and the rest of the factors surrounding the Figure 1 in the literature review are independent variables. All the responses selected for the assessment had the respondents who had more than ten years of experience in the project.

Among the total number of selected respondents, it has been found that 32% were working in public sector and the rest were from the private sector. The frequency diagram below shows the visual data. It is quite likely that the individual engaged in the private sector might face different experience than those who are working with the government. Therefore, this data can be handy in segregating the experiences ahead.

The further assessment of the data led to the understanding that among the 100 respondents, 33% of the respondents has been active as the client, 25% of the respondents has acted as consultants for the various projects, and 42.00% of the respondents acted as contractor. It is interesting to note that from all the respondents' profile, only contractors (42%) have worked with the public sector. The figure below shows the visual representation of the data.

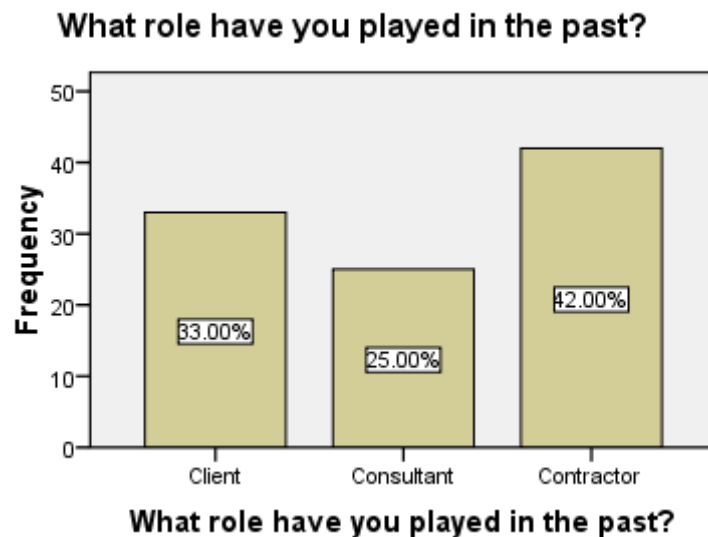


Figure 5: Role Played

The assessment of the data led to the understanding that from the total 100 respondents, 80% of the respondents experienced some form variations in the project. Whereas, the rest of the 20% of the respondents stated that they have not experienced project variation. The data has been presented in the visual representation in Figure 5 below:

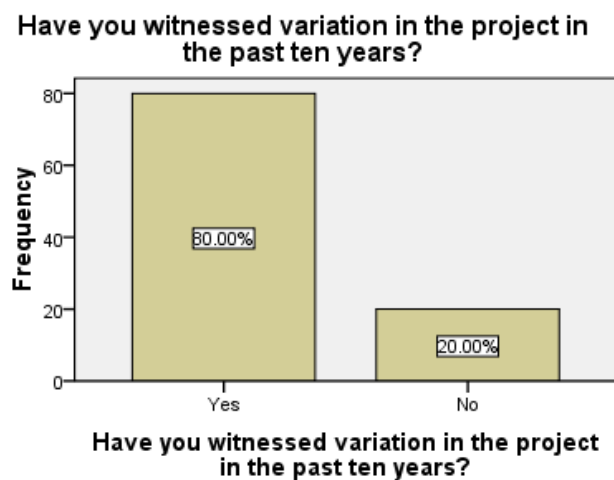


Figure 6: Witnessed Variation

Now further, the cross-tabulation and the chi square test will be considered for the analysis.

Now the assessment of the Lack of Communication is being considered. From the assessment, it is identified that the lack of the communication is one of the reasons that lead to the variation in the project. The Figure 6 below shows the responses.

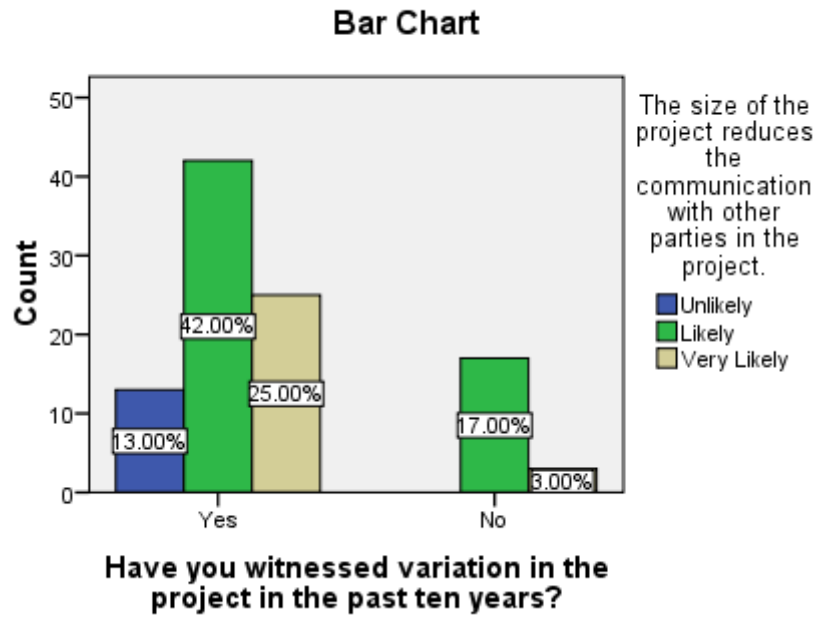


Figure 7: Project size and variation

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.623 ^a	2	.022
Likelihood Ratio	10.157	2	.006
Linear-by-Linear Association	.523	1	.470
N of Valid Cases	100		

Table 3: Chisquare

a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is 2.60.

Considering the Figure 6 and the Table 3, it can be stated that the more than 65% of the respondents are of the belief that the variation in the project is caused due to the reduction in the communication with the other parties. On the other hand, 17% of the respondents do not think so. The relation seems significant considering the p value. Therefore, the hypothesis gets proved.

The next element is associated with the variable “Lack of Finance”. The assessment of the data led to the understanding that if the client fails to make the payment as required then it is likely that the project variation will occur. The Figure 8 below shows the data in the visual representation.

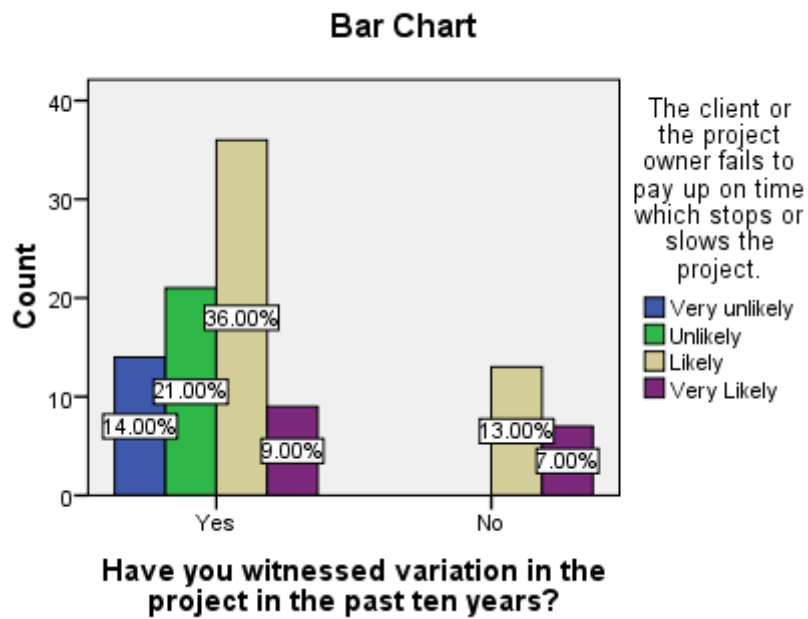


Figure 8: Lack of Finance

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	15.697 ^a	3	.001
Likelihood Ratio	21.454	3	.000
Linear-by-Linear Association	14.607	1	.000

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	15.697 ^a	3	.001
Likelihood Ratio	21.454	3	.000
Linear-by-Linear Association	14.607	1	.000
N of Valid Cases	100		

Table 4: Chisquare

a. 3 cells (37.5%) have expected count less than 5. The minimum expected count is 2.80.

The data above shows that the project is likely to observe variation in case the owner fails to pay. Also, the chi square test shows that the study is significant. From the Figure 7, it can be inferred that more than 45% of the respondents are of the view that lack of finance leads to variation. On the other hand, only 13% of the respondents do not believe so. Moreover, the 21% of the respondents did not say anything on this. Here, it can be stated that the lack of finance is positively correlated with the project variation. Another result identified from the study was related to whether the clients decide to do something else other than predefined activities.

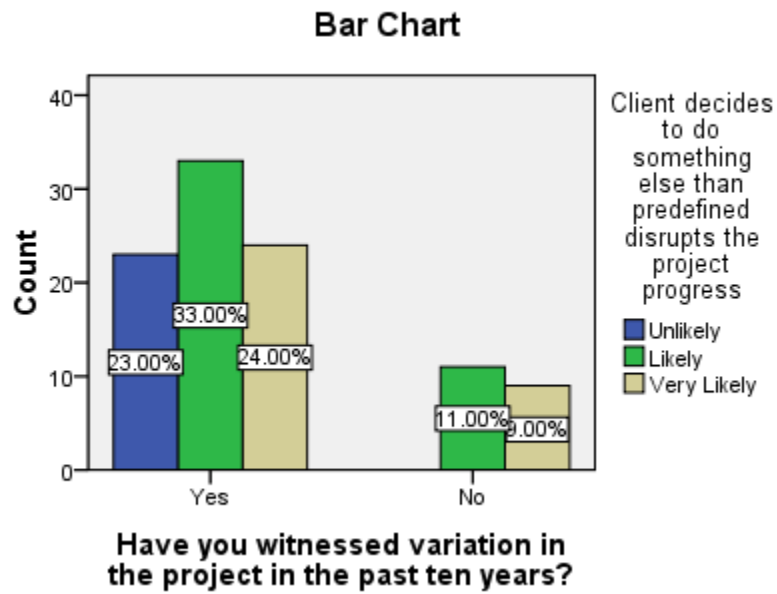


Figure 9: Clients Intention

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.528 ^a	2	.023
Likelihood Ratio	11.922	2	.003
Linear-by-Linear Association	6.752	1	.009
N of Valid Cases	100		

Table 5: Chisquare

a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is 4.60.

The Figure 8 above is the result from the survey that states that 24% of the respondents agree that it is very likely that clients decide to do something else. And the 33% says that it is likely that similar has happened in the past. Though looking at the chi-square test, it can be stated that the result is not significant enough.

The study has also found that as per the complex projects are concerned, it leads to the project variation. The Figure 9 below shows that 41% of the respondents agree that the project complexity causes the variation.

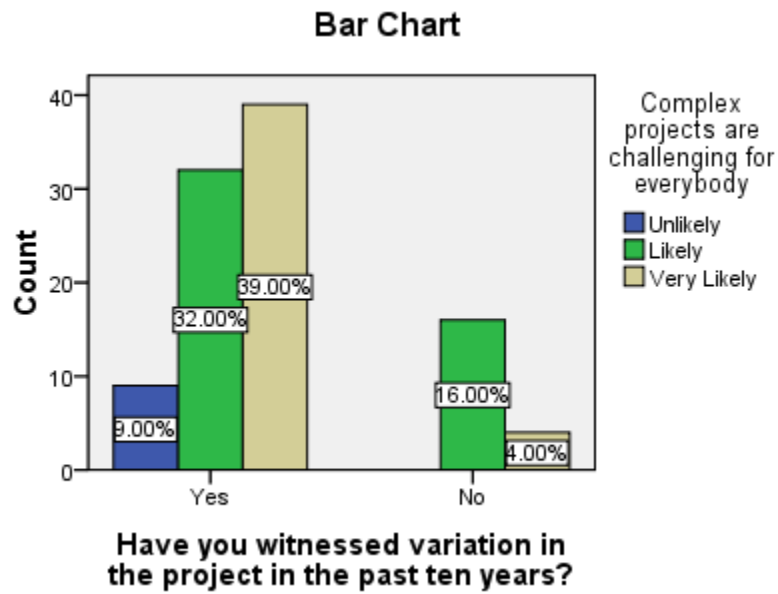


Figure 10: Project Complexity

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.659 ^a	2	.005
Likelihood Ratio	12.360	2	.002
Linear-by-Linear Association	.085	1	.771
N of Valid Cases	100		

Table 6: Chisquare

a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is 1.80.

Only 39% of the respondents are of the understanding that the project complexity does not result into variations in the project. The chi-square states that the result is significant. Here, it can be stated that the complexity of the project is one of the cause behind variation which satisfies the hypothesis.

The similar assessment of the other aspects of the data using the cross tabulation and the chi-square test led to the finding that the causes that were identified in the literature review, do impact the project variation. Therefore, here, it can be stated that all the hypotheses made at the end of the literature review section holds true. The causes that were identified earlier shows that they impact the variation of the project.

Chapter 5: Research Discussion and Analysis

In the beginning it was stated that the focus of the current research paper was to investigate the client causes of variation in the construction projects in the United Arab Emirates. The study used literature review and the primary data to reach certain conclusive points. The study helped in the identification of eleven causes that lead to the variation in the project. The financial challenge has been one of the key causes that bring variation in the project. The study has found that if the client fails to complete payment in time to the various stakeholders such as the human resources, suppliers, and associated consultants, then the project will delay to a greater extent. Therefore, the availability or assessment of the availability of the project budget should be ascertained in the initial phase of the project to ensure that the project does not vary. This cause was also identified by other researchers and the current primary study reinforced the finding.

Another aspect that is likely to bring negative variation in the project is mismatching opinion among the client and the contractor and consultants. If the opinions do not match, then it is likely that the client will not get what is expected from the contractor and the interference is likely to increase which will eventually vary the project progress. The failure to communicate with all the stakeholders is also another cause that increases the chances of variation in the project. The communication is the key to any project as it ensures that everyone is on the same page as per the project progress and the project future is concerned. If the communication fails, then the project does not get delivered as per the expectation of the client. To ensure that the project gets delivered with minimal variation, then the communication should be there. This will ensure that the clients are aware of the project progress and future. This will also help make clear the intention of the owners towards the project. The presence of appreciable level of communication mechanism within the project will help the contractor stay aware of the intentions of the contractor.

The plans should also be made available to everybody in the project and the key project stakeholders should ensure that the project is as per the plan. The study has found that the projects also vary due to the improper planning. The planning for the project should not be half-hearted, that is, every aspect of the project should be covered. This will ensure that all the requirements are identified in the beginning. Other than that, the contractor within the project has to ensure that the project results satisfy the clients. If the contractor fails to satisfy the clients, then this results into extended project activities which bring in project variation. The presence of communication within

the project will help the contractor know what is expected by the client and the same can be delivered by the end. Also, it should be ensure that all the project methods are in knowhow of the clients. The study has identified that in some cases the clients interfere to change the methods if they are not aware of the same in the beginning. The major cases were found in the procurements of the resources.

In some cases, it has been found that the clients volunteer to change the certain activity of the project. Though the reasons for the change in the activities from the clients' side have not been ascertained through the primary research, but it is found that it is the prevalent challenge that leads to the project variation. It is found that the projects, engaged in frequent inclusion or exclusion of the employees, face variations. The employees in the projects are changed based on their inefficiency or requirements, which in some cases vary the project as the new employees require some time to learn and adjust to the project environment. The project size and the complexity is another reason that leads to the variation. The substantial size of the project becomes difficult to be managed and despite the presence of factors such as communication and efficient employees, the project gets delayed.

As per the literature research conducted in the second chapter and the causes identified, it can be stated that the variation in the project can be caused due to multiple factors such as the complex nature of the project, changes in the activities within the project, and others. The same causes have been clearly identified through the primary research study on certain number of respondents.

Chapter 6: Recommendation and Conclusion

6.1 Recommendations

The study led to the identification of several aspects. It is recommended that the presence of communication among the key stakeholders of the construction is the key driver for the successful completion of the project. The implementation of project communication plan can be a fruitful step if the need of communication is felt. The owner or the client of the project should be able to finance the product within the defined time. If this is not considered effectively, then it is most likely that the project will be delayed. The stakeholders other than the client or owner are recommended that they should first understand what client is expecting from the project. If the other key stakeholders, such as contractor or consultants, fail to understand what exactly clients want with the project, then more than required changes might occur. It is recommended that the project stakeholders should give increased attention to the project if the size of the project is big. The increase in the size of the project and the increasing complexity directly relates to the project variation. Therefore, improvement in the attention is necessary. In addition, it is recommended that the employee hiring for the project is done appropriately as the project cannot handle the employee inclusion or exclusion at the later stage. This will impact the project variation.

6.2 Conclusions

The overall assessment of the research papers developed by the researchers in the past and the responses gathered from the data led to the understanding that client plays vital role in the variation of the project. The factors identified in the literature were also identified as hold appropriate ground as per the data analysis is concerned. The assessment led to the further understanding that it is most likely that there have been no improvements in the field of management of variation since the development of the papers that were assessed.

The assessment of the first cause, lack of finance, led to the understanding that the clients fail to make the payment on time which creates variations in the project. From here, it can be inferred that there can be possibly many reasons for the failure of the payment. Some of them can be lacklustre attitude, doubt over the other parties, or the unavailability of the fund. However, these are the elements which can be the material of future assessment. Another key element is the difference in the opinion that occurs among the clients and the other stakeholders. After the assessment, it led to the understanding that the opinion of the client and the other stakeholders do not fall on the same line in most of the cases and which results into the project variation. In this case, there can be

various possibilities such as lack of communication which can further be the resultant of poor communication infrastructure. Though this aspect has not been considered in this research and can also be the element of future research. However, it has been identified in this research that the lack of communication does impact the project variation. Most of the respondents have agreed that the lack of communication impacts the level of variation. In addition to this, even the previous researchers also led to the understanding that the appropriate communication is the key to the successful project and if there are variations, then there is likely that the project will derail from its path or show variation.

Another key element is the lack of planning or the improper planning. The data analysis led to the understanding that the project stakeholders have often witnessed changes in the project plan after the project takes. Here, it has been indemnified that the new orientation or suggestion from the client is the reason. Moreover, few studies led to the understanding that the lack of appropriate or detailed plan also results into such situation. Moreover it has been found that the satisfaction level of the client is also the key in the project variation. If the client is less satisfied then they are more likely to intervene in the project. Their intervention is more likely is to bring the changes that can lead to the increase in the satisfaction. Such effort, in most cases, lead to the variation in the project.

Some of the research questions were identified in the beginning of the research. Those research questions with their respective answers are mentioned below as identified through the research.

What are the causes that are leading to the variations in the construction projects?

The study has helped in understanding that there are various causes that lead to the variation in the construction projects. If the client is low on budget, then the payment to the resources and suppliers gets hampered and the project delays. It has been found that in some cases, clients fail to clearly communicate to the contractor about what they want. Here, the contractor rarely realizes what exactly is expected by the client. This lack of transferability of the client's vision to the stakeholders is a challenge that translates into project variation. In addition to this, in some cases employees have been found as less trained. The untrained professionals often lead to degraded output which either converts into redoing the entire element or slower progress. Clients have also dictated numerous changes to suit their satisfaction level. This leads to constant iterations in the projects which eventually lead to the variations in the project. In addition, if some of the activities are required to be changed, then it is likely that the project duration has to be adjusted which is another cause to the

variation. Also, if the project is complex and of huge size, then the managing become tedious and key elements are missed on the way and then the project variation occurs.

What is the impact of the variation causes on the civil construction projects?

After conducting the literature review and the survey, it has been found that the key area impacted by the project variation is the untimed completion of the project and the added cost. The project variation can either be positive if a particular unnecessary activity is identified and eliminated which saves time and budget. On the other hand, it can have negative impact if an activity is required to be completed again or various other causes takes place as mentioned earlier. The study has helped in understanding that in most of the cases, the impact has been negative and there are numerous causes that result into variation which cost additional time and money.

What are the strategies or the ways that might be adopted so that the variations in the civil construction projects can be reduced?

The effective management of the causes mentioned earlier is the possible way that can help reduce the variations in the civil construction projects. Clients have to ensure that the financial elements have been arranged prior to kick-starting the project processes. An appropriate communication mechanism should be implemented that can help the stakeholder connect and communicate on all the key aspects to reduce the opinion differences. This will also convert to proper project vision transferability from the clients to the contractors. The hiring mechanisms have to be robust to ensure that skills and resources that are not required do not on board. A constant communication with the clients is established from the initial phase of the project.

In addition to the above, it has been found that the clients generally try to approve the procurement routes that they consider will be the best. This can be induced by various other factors which have not been the element of this study at present. However, it is clear that the involvement of the client in the procurement of the supplies sometime lead to the variation in the project. In addition to this, it has been found that the client make efforts to change some of the activities that they do not like. These changes are either done intentionally or unintentionally. They are done based on the consideration that they need new things in the project. The changes in the project designs, in most cases, lead to the major overhaul in the project, which further becomes the reason behind the project variation.

Moreover, the other factors, employee inclusion, project complexity, and project size have been the key that led to the variation in the project.

Here, in the end, it can be stated that there are several detailed study can be done on each of the causes that have been identified in this project. There are certain limitations to the project which is important to be considered. One of the limitations is that the project has been done in the UAE and therefore it cannot be stated that the project results will be similarly effective outside the country. Moreover, the sample size considered for the assessment was only 100. Therefore, it can be stated that if the similar study is done at the bigger scale, then it is likely to give more detailed results. Therefore, it would be recommended to carry out this study at bigger scale. Overall, the goal was to identify the client causes of variation and with the help of literature review and primary analysis, it has been found that the lack of finance, communication, planning, client satisfaction, and others led to the variation. Also, in this section above, all the research questions have been addressed considering the overall studies. All the hypotheses held true with the help of primary research which was conducted on 100 respondents.

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Appendix

Research Questionnaire

Dear sir/madam,

Thank you for giving us your precious time. The purpose of this questionnaire is to investigate the client causes of variation in the construction projects in United Arab Emirates. We expect this research to be of use to the individuals like you who are involved in the construction field. Please fill the questions as deem fit to you. No answers to the questions are wrong or right. Stay assured that we are collecting no personally identifiable information and the current information filled by you will be solely used for the research purposes alone.

1. Name (Optional)

2. Whether you work with public or private project?

i) Public ii) Private

3. What role have you played in the past?

i) Client ii) Consultants iii) Contractors iv) Others

4. Have you witnessed variation in the project in the past ten years:

i) Yes ii) No

5) Please tick the box you best resonate with in the table below:

	Very Unlikely (1)	(2)	(3)	(4)	Very Likely (5)
a. The size of the project reduces the communication with other parties in the project.					
b. The client or the project owner fails to pay up on time which stops or slows the project.					
c. Client decides to do something else than predefined disrupts the project progress					

d. Complex projects are challenging for everybody					
e. Client fails to understand complex projects and disrupts more					
f. Loss of employees slows the project					
g. On-boarding of talented employees speed up the project activities					
h. Clients rarely talk to the contractors					
i. Consultants do not understand the client's viewpoint clearly in most of the projects					
j. Clients are tough to satisfy which leads to multiple activity changes or improvements					
k. Client intentionally improvises the project design which calls for new meetings and re-planning.					
l. Client approves different route to procure the resources than what is defined by the other parties which creates issues					
m. Big size project gets derailed from the duration					
n. Opinion of clients and other parties do not match well					
o. Plans keep changing during the project.					