



**Developing a Framework for Managing Variation Orders
in Governmental Projects in Jordan**

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DEDICATION

I would like to dedicate this research study to my father and mother, for their continued support during the years of my life.

Many thanks to my wife for her constant support in order to reach my dreams.

Many thanks to my children, Saba and Zaid

I would also like to thank my brothers and sisters

To my friends and everyone who helped me achieve this thesis.

I ask God, the Most Gracious, the Most Merciful, to grant them

Paradise a reward for their patience and effort.

Waseem Al-adwan

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ABSTRACT

Variation Orders are a common and recurring phenomenon in governmental projects in all countries all around the world. In the variation orders, there is no "optimal solution", but the clients are always trying to get as close to the "optimality" as possible. Most of the previous studies in the field of variation orders in Jordan studied the reasons leading to these changes and/or the effects of these changes, there is a lack of comparison between Jordan with other countries that are more developed in this field.

The research aims to develop a framework that limits changes and their high values and shortens the time required to complete projects, as well as to submit proposals for amending the regulating legislation or reducing the conflict between laws to regulate the implementation of these changes.

To achieve the objectives of the research, mixed research type (qualitative and quantitative) was used, the quantitative type was used for data collected from archival data from the Ministry of Public Works- which represent the executive authority to most of governmental projects- for previous projects, while the qualitative type was used for a compare between Jordanian legislation and legislation in neighboring countries (Saudi Arabia, Kuwait, and Dubai law) and to show the gap in the Jordanian legislation, then formulating interview questions and conducting interviews with

experts in this field (construction and law field), which include most of the parties related to the variation in an attempt to amend the current framework and submit a proposal to amend the regulations for variation orders. This framework can contribute to avoiding changes or how to solve them or reduce its effects in the field of construction projects

The advantage of the proposed legislative framework is that any project must be subjected to a preliminary review before bid assignment. the designs must review and ensured that they are in conformity with reality and away from vague and illogical work. in addition to ensure that allocations are reserved for each project within the budget of the competent department.

The amended framework defines the work of changes and sets an upper limit for these changes, contrary to what is currently in effect, in addition to that this framework includes the best procedural method for dealing with changes and managing them during the stage of their implementation in order to control and reduce the enormous values of change orders. Significant delays in these projects. In addition to studying the actual needs of the owner before bidding and reviewing the designs before submitting the contractor's bid, in addition to that, a unit specialized in change orders was established in each governmental entity concerned with bids to follow up on changes and their procedures within its automated programs.

Some amendments to the current regulations must be taken into account to remove existing contradictions, such as the role of the Prime Minister, as well reviewing the role of the competent authority in approving the changes, and reviewing the engineer's authority to issue the change order to give engineering services (for himself).

CHAPTER 1: INTRODUCTION

1.1 Background

Construction projects are still getting more complex as a result of the new standards levels, advanced technologies, as well as the owners' desires to add and modify their projects, which make the matter more difficult with the increasing complexity of construction systems, documents and contract terms, which increases the possibility of conflicts, conflicting interpretations and hostile behavior between the parties. In addition, there can be no flawless design, construction is not an exact science, and unforeseen events are a frequent occurrence.

The project management triangle is a model of the constraints that define project management. The triangle indicates that the project includes three main factors within the quality (cost, time, and quality) within scope of work, which defining the success of a project. Any change in one of the restrictions directly or indirectly affects the other restrictions. The project management triangle is used to analyze projects. The time constraint indicates the amount of time required to complete the project. The cost entry indicates the amount in the budget allocated to the project. The quality constraint refers to the technical specifications to be achieved for the work items in the project. All of this is within the original scope of the project. That is, expanding the scope usually means increasing in time and cost, and limited time may mean increased costs and reduced scope, and a smaller budget may mean more time and a reduced scope.

The main aim of project management is to provide the tools, techniques, and resources that enable the project team to organize their work to fit these constraints.

Variation orders are one of the most important causes of claims and disputes that arise between the parties to FIDIC contracts (the employer and the contractor), and the original is that the variation orders aim to expedite the completion of projects or reduce their costs, but this is not always the case, the variation orders may result in an increase in cost, whether direct or indirect, as well as the variation orders may result in an increase in the time required to complete the work related to the contract and delay in the delivery of the project, and the exaggeration in issuing variation orders may result in a defect in the quality of the work being delivered or all of the above, so we must stand on the concept of variation orders and their patterns as one of the causes of claims and disputes.

Governmental projects are one of the most basic elements for the progress of any country because they are considered the backbone of most industries and a key factor in the development of the economy. Variation Orders are a common in these projects in all countries all around the world, which occur during any stage of the project and directly affect the three basic corners of the project management triangle (cost, time and quality) and often lead to conflicts between the contract parties, which leads to the impact negatively affects the progress of the project and reduces its ability to complete successfully in a planned time within the project budget. Also, the variation order in many cases causes disputes between the parties to the contract and indirectly affects the stakeholders the project.

In the last years, the term "Variation Orders" has been widely used in projects implemented in Jordan, and according to official statements by the Minister of Public Works and Housing, its cost around (400,000,000) JD during the last ten years in Jordan (Al majali,a 2020)

1.2 Research Problem:

The variation orders are often undesirable, but it is impossible or almost impossible to have a project free of variation orders. In fact, the issue of variation orders is an old and recent issue for which no optimal solution can be found.

In governmental projects and even in most private sector projects, the owner is interested in that the project is implemented within the specified time, budget and within the quality frameworks established in advance. The impact of any changes in the scope of works may lead to affect these three elements, which is unacceptable and unpopular with all those responsible for these projects. Such changes have negative effects in the occurrence of a financing gap, which may multiply from the allocated amounts and also have a negative impact on the time of the project and may also affect the required quality.

In addition, the regulating laws conflict with each other, although each of these legislations is “legal” and “binding” to the parties to the agreement.

Most of the previous studies in the field of variation orders in Jordan dealt with the reasons leading to these variations and/or the results that these variations will lead to. There is a lack of comparison between legislation on variation orders in Jordan with other countries that are more developed in this field.

This research aims to study the causes and effects of variation orders in previous government projects, and conduct a study to compare the law in Jordan and the laws in neighboring countries developed in this field, and then conduct qualitative research by interviewing experts in this field and updating the existing framework to deal with these variations and modernize regulations and the laws regulating these variations in an attempt to reduce its high values and negative effects on projects

1.3 Research Contribution

This research studies the variation orders and its impact on the basic elements of projects, especially governmental projects, as well as to study the legislative systems that rule variation orders and the most important differences between them and their conflict with each other. In the expected results, a framework has been made to be added to the existing legislation and / or amended to the legislation currently in force. This framework can contribute to avoid changes or how to solve them or reduce their effects in the field of construction.

The advantage of the proposed legislative framework is that any project must be subject to a preliminary review before bid assignment, during which the designs are reviewed and ensured that they are in conformity with reality and away from vague and illogical work and ensure that allocations are reserved for each project within the budget of the competent department, and that the legislative framework that limits the work of changes and sets a ceiling for them at a higher limit, contrary to what is currently in effect, and that the proposed amendments and revisions are made to these legislations in order to control the enormous values of the variation orders and reduce the large delays in these projects.

This study finds a way that could help in solving this problem hopefully; the findings will help decision makers to adopt these recommendations with the current laws and regulations.

Among the advantages that this study produced is to enhance competitiveness in projects, reduce financial gaps and the financial deficit to finance changes and complete projects within the prescribed periods and with high quality.

1.4 Research Aim and Objectives:

The research aims to develop framework that limits the changes and their high values, and to reduce the time required for them to complete projects within the fastest possible time, as well as to submit proposals to amend the regulating legislation or reduce the conflict between the laws regulating the implementation of these changes.

These main objectives of this research can be summarized as;

- To investigate the variation orders: reasons, needs and the procedures for issuing them and dealing with them in governmental projects in Jordan.
- To identify variation orders impacts on the projects management triangle (cost, time, and quality).
- Determine the most important reasons that lead to variation orders in government projects and how to reduce these variation orders and reduce their impact.
- Drafting the legislative framework that contributes to limiting changes, proposing an upper limit for variation orders and reducing the conflict between the laws regulating the implementation of these changes.

1.5 Research Questions

This research aims to try to answer the following questions:

What are the variation orders?

What is the need for the variation orders?

What is the effect of the variation orders in project management triangle (time, cost, and quality)?

Where are the conflict points in the laws regulating the work of these variation orders?

What are the matters that must be reviewed and amended in Jordanian laws to suit the actual need for variation orders and reduce the conflict between them?

What are the most important similarities and differences between Jordanian legislation and the legislation of neighboring countries (Saudi Arabia, Kuwait, and Dubai law) regarding variation orders?

1.6 Research Structure

This thesis is organized into five chapters as follows and summarized in Fig.1.1:

- **Chapter One: Introduction**

Chapter one is the general introduction to the variation orders concept and the importance of the variation orders in construction contracts and the effect to the project management triangle. It also includes the problem statement, the thesis objective and research questions and organization

- **Chapter Two: Literature Review**

This chapter provides a review of previous literature and a review of the researches conducted with this study which is to enhance competitiveness in projects, reduce financial gaps and the financial deficit to finance changes and complete projects within the prescribed periods and with high quality. Reviewing the recent procurement system with the previous government works system and comparing it with other laws of neighboring countries (Saudi Arabia, Kuwait, and Dubai law) and the legal procedures for issuing variation orders.

- **Chapter Three: Methodology**

This chapter includes the methodology to be used in the research and explains the type of research, the strategy to be used, and the method of data collection.

- **Chapter Four: Results and Discussion**

This chapter includes the results found and discussion.

This chapter also presents a proposal for improvement over the existing variation orders framework

- **Chapter Five: Conclusions and Recommendations**

The final chapter presents the main conclusions of this study and provides recommendations to improve the framework that deal with the variation orders.

Figure 1 below shows the thesis structure including the five constituent chapters.

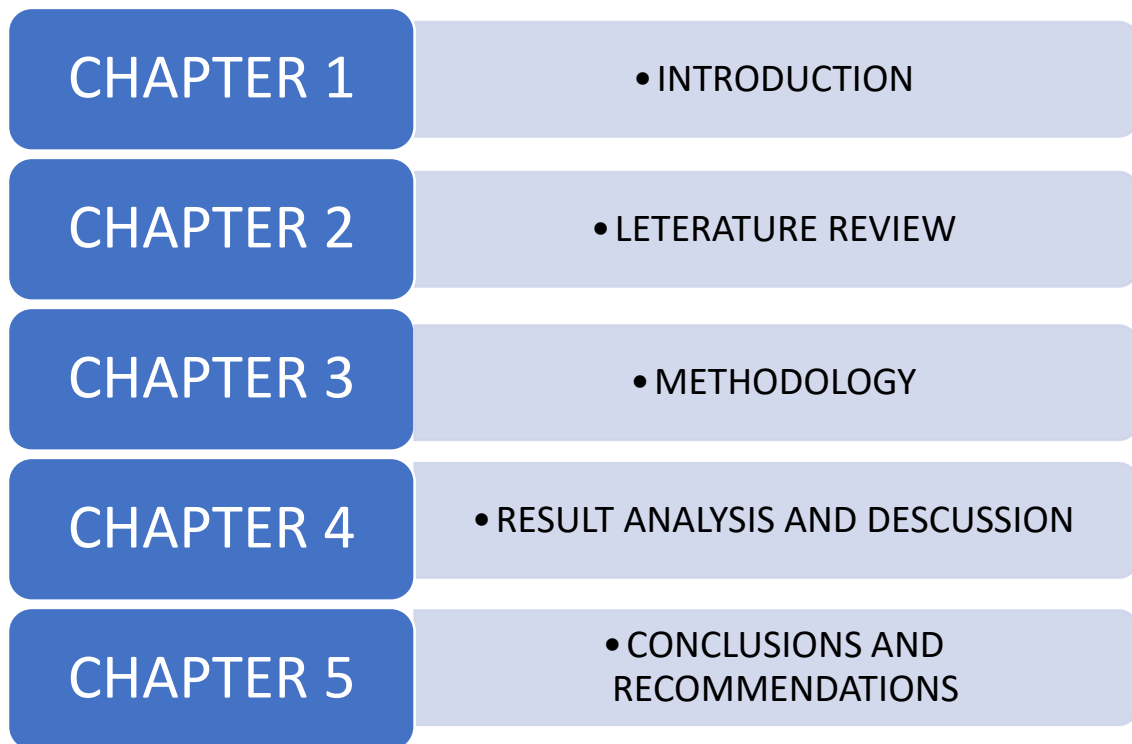


Figure 1.1: Thesis Structure

CHAPTER 2: LITERATURE REVIEW

2.1 Background

Variation orders can be considered as one of the features of construction projects, as hardly any project is devoid of changes in the quantity of work, the quantity of materials, or the method of construction. Therefore, there have been many studies and research in this field because of the great importance of these orders. This chapter is devoted to presenting previous research and studies in the field of variation orders in the construction industry.

The variation order is an authority issued by the owner or his representative in the contract, and the legal form through which changes are implemented within projects. As this order is issued to make modifications or additions to the works within the project, and most of the contracting contracts stipulate in one of their clauses the right of the owner to make modifications to the works stipulated in the contract as a result of any circumstance that may encounter the work, and these changes often have effects in the work plan for the contractor time and cost. It is also often mandatory and sometimes optional for the contractor, according to the laws followed in contracting in each country.

2.2 The Most Important Definitions of Variation Orders:

General conditions of standard contract book for construction projects (2010) defined the variation order as: “Any change in the works that is instructed or approved as a change under the provisions of chapter thirteen.”

Project Management Institute PMI, (2021) defined the change request "is a formal proposal to modify any document, deliverable, or baseline". When any issues are found while project work is being implemented, this change requests may modify

project policies or procedures, project scope or cost or budget or schedule, or quality. The variation orders should cover the needed preventive or corrective actions to resist the negative impact in the project and variation orders can be to repair defects. Any project parties can request a change and can be from inside or outside the project and they can be optional or legally/contractually mandated.

Sun and Meng (2009) define the variation order as “A legal act that operates in the place of the contracting contract, in implementation of the terms of the contract that allow modification by one of the parties without exceeding the general scope of the contract”.

Al-Rasheedat, (2004) stated that the change is “An official document amending some of the basic terms of the contract”.

While Marsh (2001) clarify it as “Any change in business is instructed and approved as a change”.

Mahasneh, (2010) state that “An authority exercised by the engineer in contracting contracts, according to which the contractor is required to make modifications or additions to the work, and these changes are not stipulated in the original contract, and it is considered as an agreement attached to the original contract, and aims to achieve the interest of the project”.

El-Gamal (2012) define the change “An agreement attached to the original contract, which is an agreement amending the written contract that is done in accordance with the amendments clause and signed by the contracting official.”

While Fisk (1988) listed that the change request as "A variation ordered by the engineer, based on the terms of the contract, and giving its source the right to change the price, work schedule, or any other obligations under the contract."

Perhaps the most obvious definition of variation orders is:

"A written order issued by the engineer to the contractor on the initiative of the engineer himself, or upon request the owner, or a proposal from the contractor, with the aim of adding, deleting or modifying - the subject of the contract - in terms of Time, cost, dimensions, quantity, specifications, or quality of materials during the execution of the contract and before the issuance of the work delivery certificate" (Mahasneh 2010).

Al-Asheesh (2000) defined the Changes are a feature of construction projects. Changes occur to modify aspects of the project in response to conditions that occur during the construction process. The changes may be small and well managed, or they may be large as a result of mismanagement, and therefore have huge negative impacts on the project in terms of cost and time.

Making changes in building and construction projects is a common occurrence to the extent that all contracts for these projects include a clause stipulating the right of the owner to make the change he deems appropriate before or during the implementation period, for example making an increase in the field of work or deleting part of it, or a change in the procedures and methods of implementation, or a modification in some specifications of the materials, or the implementation period to other changes.

It is a written agreement between the owner and the contractor for developments in the project documents, and these developments are either modification, addition, deletion or substitution within the scope of work specified in the contract.

2.3 The Main Reasons for Variation Orders.

Abu Neamah (2011) summarized the main reasons for the Variation Orders can be categorized mainly to four categories as shown in Figure No. (2.1):

- reasons related to the owner,
- reasons related to the consultant,
- reasons related to the contractor,
- reasons related to the others (not related to the contract parties),

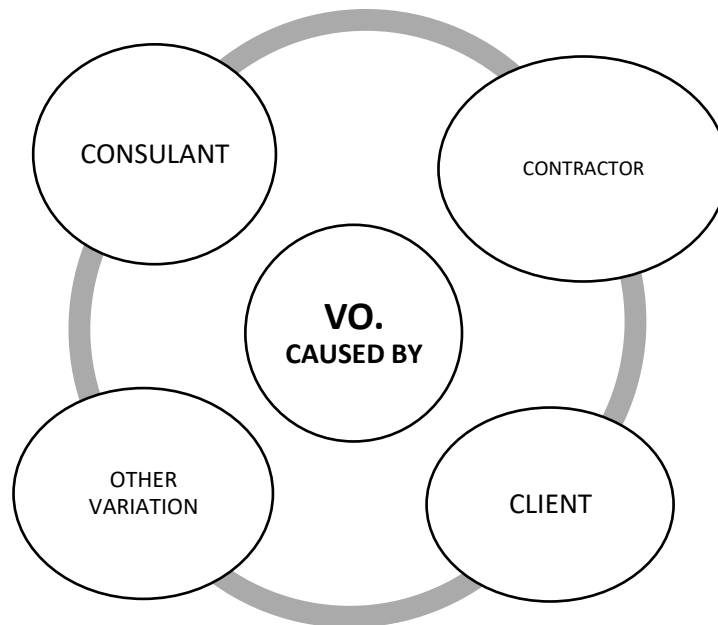


Figure 2.1: The Main Reasons for Variation Orders.

Many main and subsidiary factors fall under all of these main categories differ from one project to another. The Variation Orders are affecting the cost of the project and the delay in completion time and may affect the quality.

2.4 The Impacts of Variation Orders in Project Management Triangle (Cost, Time and Quality)

There are several studies deal with variation orders and how variation orders affect the work on the project.

Msallam (2015) conclude that the impacts of variation orders in road projects in Jordan are mainly to completion schedule delay, increasing cost of the project, and increase in overhead expenses. These variations can be related to four main causes: the owner's related causes, consultant's related causes, contractor related causes, and other related causes.

Abdul Rahmana (2013) conducted a study on the variation order in constructing and find that this VOs are affecting to the performance of quality, time, and cost any kind of projects. Overrun in time and cost is a common issue that is happening every day in the construction field worldwide and the percentage of time overruns is higher compared with percentage of cost overruns but both of them facing overrun more than 50%. For the public sector, only 20.5% of the projects completed within stipulated time and 46.8% of projects completed within the budget.

Priyantha et al. (2011) find that the change caused by the owner, represented in the increase in requirements and strength of mind, was one of the main reasons for the changes caused by the employer, while the changes in designs and defects in the bills of quantities were the main reasons for the changes caused by the consultant, and that there are major unexpected reasons represented in the acquisitions, land acquisitions and arrangements

Doloi (2013) studied eight main factors and identified as being of great importance and affecting the costs of projects. The results showed that the five most influential factors are accurate project planning and control, effective site management, contractor efficiency, design efficiency, and communication. The responsibilities and

roles of employers, consultants and contractors were analyzed with regard to the factors for developing appropriate management strategies, which contribute significantly to reducing the project's excess costs.

Ijaola and Iyagba (2012) make Comparative study for variation order in construction project between Nigeria and Oman. The researchers studied a range of public construction projects in Nigeria and Oman. They studied the most important variation orders issued in each of these projects. Then they made a comparison between the variation orders in the public construction projects in both countries in terms of their causes and effects, the beneficiary in the first place, and the mechanisms for addressing them to reduce their effects. The researchers concluded that the most important reasons for the occurrence of variation orders in public construction projects in Nigeria and the Oman which the owner requests from the contractor during the implementation process. As for the most important effects, they are evident in the claims and disputes in the additional costs and times on the projects in both Nigeria and Oman. As for the beneficiary of the variation orders, he is in the first place the contractor in both countries, as a result of the additional works requested from him at new prices. In order to reduce the negative effects, the researchers suggested some recommendations, including:

- The necessity of having a specialist in calculating quantities and their costs and a good project manager in such projects and not relying on trainees.
- A document should be drawn up that follows the project implementation stages step by step and monitors all changes until the completion of project implementation.

- The necessity of coordinating the projects of the various governmental units and exchanging information among them in order to reduce the conflict between their projects.
- Not accepting the designs of any engineering company without a professional license to do so by specialists.
- The general conditions of construction must be reviewed and updated according to the developments

El-adaway et al. (2016) studied the variation provisions under traditional standard construction contracts including those published by: the International Federation of Consulting Engineers (FIDIC), the Engineers Joint Contract Documents Committee (EJCDC), the American Institute of Architects (AIA), the World Bank, the Joint Contracts Tribunal (JCT), and the New Engineering Contract (NEC). The result shows similarities and differences among the variations mechanism of the contracts.

Saudi Competition and Procurement Law (2020) in Article (69) states that “a government entity may - within the limits of its needs - issue variation orders for an increase in the contract not exceeding (10%) of its value, and it has the right to issue variation orders with a reduction of not more than (20%) of its value.

Taking into account what is stated in Article (69) of the system, the government entity shall, in the event it decides to increase or decrease the contractor’s obligations, or make any modification or change in the works contracted to carry out; Subject to the following controls:

- 1- The additional works shall be subject to the contract and not outside its scope.
- 2- The necessary modifications or changes to the works should achieve the interest of the facility, provided that this does not lead to a breach of the terms and

specifications or a change in the scope of the project or the nature of the contract or its financial balance.

- 3- Ensure that the necessary funds are available to cover the value of the additional works before assigning the contractor to them.
- 4- If the additional works do not have similar clauses or quantities in the contract, the bid shall be submitted to the Bid Examination Committee or the Direct Purchase Bid Examination Committee, as the case may be, to study the request for assignment of those works and the appropriateness of the prices submitted by the contractor. If the contractor does not agree to what the committee concludes, its implementation will be contracted by other bidders in accordance with the provisions of the system and these regulations.
- 5- It is not permissible to assign additional works after the government entity has received the works subject of the contract.
- 6- The person with the authority to award is responsible for issuing all orders related to increasing or decreasing the contractor's obligations and the periods due for additional works.

2.5 Classification of Variation by Responsible Party:

There are many types of changes within the project (Abu Neamah, 2011):

Change directed to the owner (direct changes):

They are changes directed to the owner or his representative, including a change in the plan or specifications, or the implementation of works of more than what is stipulated in the contract. Increases the scope and scope of the basic contract, and the contractor is compensated for it because it is caused by the owner

Change arising from the actions of the owner (necessary changes):

It is a variation ordered by the owner (or his representative), which may result from wrong behavior (by the owner) or a failure to take the correct appropriate action. The changes resulting from the owner's actions may include the following: errors in plans or specifications, misinterpretations issued by the project engineer, demanding a higher level of implementation of what is required by the required specifications, wrong grounds for inspection and refusal of materials and works, changing the method of performance, changing the sequence of implementation and the priority of its operations, impossibility implementation. Changes arising from the owner's actions are a major source of disputes in construction projects.

Design changes:

Also called compulsory changes, errors in the design lead to changes in the construction contracts because they need to be modified and this modification will affect the contractor's work, cost and performance, and modifying errors leads to good changes or harm to the project.

Substantial changes (unavoidable change):

They are changes that lead to a change in the terms of the original contract, and the project deviates from the planned and agreed goal, when the size of the changes is large to the point of changing the nature of the project, and accordingly the original contract becomes unfit to cover these works. This change occurs as a result of giving specific instructions and directions by the owner or his representative to the contractor, or as a result of the owner's failure to give the necessary instructions in a timely manner. There are reasons for this change that lead to its occurrence, which can be summarized in the following points:

- The difference between the owner or his representative and the contractor regarding the interpretation of some of the terms and conditions of the contract, meaning that each of them may interpret the same clause differently from the other in accordance with his interest.
- Deficiencies in plans and specifications or lack thereof and inaccurate information.
- The failure of the owner to fulfill his contractual obligations in terms of cooperating with the contractor and facilitating his task.
- Failure of the execution supervision department to carry out its duties properly, or abuse of powers, for example, failure to carry out inspection on the required dates, excessive refusal or acceptance of works, or delay in appropriations for materials and plans.
- Changing the owner of the sequence of implementation schedule or work program by changing priorities, which leads to confusion and delay.
- Impossibility or inability to implement according to what is stated in the plans and specifications according to the available techniques and capabilities available in the country of implementation

Uncompensated changes:

They are the changes that result from the contractor himself, due to implementation errors or poor quality and lead to rework or cracking and demolishing the executed works and their implementation again, which leads to delaying the implementation of the project

2.6 Variation Orders in Standard Contract Book for Construction Projects / Jordan:

The local contractual terms, which are represented in the standard contract book for construction projects 2010, have been worked out in accordance with the contractual terms in force globally, especially FIDIC Red Book 1999 edition.

The variation order is defined according to Clause 1/1/6/9 of the first chapter of the general conditions of Standard contract book for construction projects (2010) contracts as:

“Any change in the works that is instructed or approved as a change under the provisions of Chapter Thirteen.” These changes may include the following:

- 1- Changes in the quantities for any item of the works included in the contract, or
- 2- Changes in the quality or other characteristics of any item of works, or
- 3- Changes in the elevations, locations and/or dimensions of any part of the works,
or
- 4- Cancel any of the works (unless it is to be performed by others), or
- 5- Executing any additional work, or providing equipment, materials or services
necessary for the permanent works - unless and until there are any related; or
- 6- Changes in the sequence or timing of works execution.

It is noted that this definition was general and uncontrolled, as it did not specify what works may become the subject of the variation order, nor did it specify the authority competent to issue it, and it referred to Chapter Thirteen regarding determining the controls governing it.

The variation order from this point of view is an authority exercised by the consulting engineer in the contract, according to which the contractor is issued an order to make some modifications to the work subject of the contract, although these modifications were not included in the original contract between the contractor and the employer.

The reference and the limits of the powers of the consulting engineer regarding this type of orders, you can find in the terms of the contract, whether public or private. There are some powers implicitly granted to the consulting engineer in this regard, although they are included in the terms of the contract, and they are those that are necessary and related to the implementation of the contract itself. According to the text of Article 3/3 of the General Conditions of the Contract Book for Construction Projects / Jordan, “the engineer may issue to the contractor at any time additional or modified instructions and plans, if they are necessary for the implementation of the works and the repair of any defects therein, all in accordance with the contract.” and this is an express clause in the contract conferring this authority.

The variation order may include a request for additions, cancellation of stages of work, replacement of used materials, whether in quantity or quality, or modification of the time schedule for the implementation of the work by the contractor. From this point of view, the business owner is the grantor of this authority to the consulting engineer, as the contract may include in its special conditions a condition that restricts this authority to the business owner only without the consulting engineer, and the engineer’s powers may be restricted in this regard. When the employer requires the consulting engineer to refer to him and obtain his approval before issuing a specific variation order or all types of variation orders, in this case the consulting engineer must prove to the contractor that

the employer has agreed to issue the relevant variation order, and it is the contractor's responsibility to verify the this is before the variation order is executed.

It should be noted in this regard that the owner, even though he is the grantor of this authority to the consulting engineer, cannot - the owner - issue variation orders except through the consulting engineer. Hence the importance of agreeing on the authority and limits for issuing variation orders, so that this matter does not become a subject of dispute between the parties to the contract, especially cases in which the contractor implements a variation order issued by the engineer, and then the employer refuses to pay the additional amounts incurred by the contractor to implement the variation order, on the pretext of That the engineer is not authorized under the contract to issue the variation order, or that it is outside the limits of what was agreed upon in the special conditions.

The variation order does not necessarily have to be initiated by the consulting engineer himself, as it may come at the request of the employer, or at the suggestion of the contractor himself. In this regard, Article 13/1 of the General Conditions of the Contract Book for Construction Projects / Jordan Model Contract stipulates:

"The consulting engineer may, at any time before the issuance of the handover certificate, initiate changes in the works subject of the contract, whether through instructions issued to the contractor or a proposal from the contractor, provided that any proposal by the contractor requires approval by the engineer to implement it".

2.6.1 Purpose of Variation Orders

The purpose of variation orders is to avoid the need to enter into a new contract, and to avoid canceling the original contract whenever changes appear during its implementation. In accordance with the provisions of paragraph 13/1, any proposal for

modification by the contractor must be approved by the consulting engineer in order to produce its legal effects. The consulting engineer has the authority to accept or reject a proposal. According to the general rules, the idea of amending the contract collides with the consulting engineer in conflict with the principle of relativity of the effects of the contract, which requires that the terms and effects of the contract are limited to its parties, and it is not possible to modify the contract by those who are not a party to it. The contract concluded between the employer and the contractor, although he plays an important and vital role in it, and he may not mitigate or exempt from the duties, obligations or responsibilities included in the terms of the contract, and his role is limited only to exercising the powers entrusted to him and specified for him in the contract and nothing else. Issuance of variation orders by the consulting engineer is not considered an amendment to the contract, even if it is close to it. The variation orders issued by the consulting engineer find their legal support in the idea of requiring the right to amend the contract to a third party, the engineer, and with the consent of the two parties to the original contract, namely the employer and the contractor. Since the inclusion of the two parties to the contract an explicit condition in the contract, which includes the authority of the consulting engineer to issue variation orders on the basis of this special condition, there is no need to search for the capacity of the consulting engineer when issuing the variation order, because in this case there is a third party delegated by the two parties to the original contract under a special condition to amend their contract.

Variation orders in contracting contracts are especially important for large and complex contracts, as completion of the project may not be completed in a satisfactory manner without resorting to these orders. Such conditions have become an accepted custom in construction contracts:

- Avoiding the need to conclude a new contract, and avoiding canceling the original contract whenever changes appear during its implementation.

- To avoid any deficiency or error in the design.

- Provide the opportunity to add any positive idea subsequent to the conclusion of the contract and the start of implementation, which contributes to the completion of the project to the fullest extent.

- Its contribution to accelerating the completion of works or reducing costs.

2.6.2 Patterns of Variation Orders in FIDIC contracts

Variation orders can be divided into two main types: useful and other variation orders, as follows:

First: Useful Variation Orders:

These are those issued by the consulting engineer for the purpose of speeding up the completion of the work, or reducing its cost and reducing unnecessary costs, or improving the quality of the work subject of the contract, or reducing the difficulties and obstacles encountered in carrying out the work, or modifying the quantity of materials used, whether by increase, decrease or Changing its quality and characteristics, or modifying the levels, measurements and locations of any part of the building, or carrying out additional work, or providing mechanical equipment, materials or services necessary for the project, or making records, tests or services necessary for the project, or conducting probes, tests or any exploratory work , or changing the sequence and timing of executing works in order to achieve the interest of the employer. These orders may include modifying the design, correcting it or adding new developments to it, correcting construction errors that appear after the start of implementation, canceling some construction works that have already been

implemented, or making some modifications to address some of the incidents facing the project.

Second: Harmful Variation Orders:

These are orders that negatively affect the project, and lead either to an increase in its cost or a delay in its delivery or reduce its quality. For example, a variation order is issued to use materials of lower price and quality due to the deteriorating financial situation of the business owner, which negatively affects the quality of work and the desired purpose.

2.6.3 Scope of Variation Orders (Additional Works)

The truth is that every additional action is necessarily a variation order, but not every variation order is an additional action. The additional work is often an addition and an increase to the existing one. As for the variation order, it may be an increase in the place of the contract, as is the case in an increase in additions to the building, and it may be removal as demolition, for example, so the variation order is broader than the additional work.

The scope of the variation order when it includes the deletion or cancellation of some works negatively affects the financial rights of the contractor, as the cancellation of some works results in a reduction in costs, which results in a reduction in the contractor's financial dues. Therefore, it is not permissible to issue a variation order to cancel part of the works and assign them to another contractor, because this contradicts the principles of good faith and harms the interests of the contractor.

The variation order may take the form of a change in the method of implementation for reasons related to changing circumstances, resulting in difficulties in implementing the way the work is going. The change may also take the form of an alteration in the

sequence of works, which the contractor included in his schedule, which he presented to the engineer before starting the implementation of the operation under contract. The engineer can issue a variation order that changes the timing of these works - whether by submitting or delaying - taking into account the contractor's entitlement to an additional period or compensation when he incurs additional expenses as a result of this change.

The practical reality is that the engineer asks the contractor to submit a proposal that includes details of the impact of this order, in terms of the modification in the time required to complete the work as well as the additional cost resulting from the variation order, before the engineer issues his decision of the variation order, and the engineer may accept or reject these details, and in In the event of rejection, negotiations are conducted between the engineer and the contractor to reach a satisfactory solution.

The standard contracting contract book for construction projects 2010 clarifies through Article 13/1 that “the engineer can, at any time before the issuance of the works handover certificate, initiate changes in the works, whether through instructions issued by him, or by requesting the contractor to submit a proposal for consideration.” However, this authority was restricted under the provisions of Article 3/1 of the Special Conditions, and a written approval was requested from the employer before making any change, and according to the text of Article 3/1 “the duties and powers of the engineer”:

The engineer exercises the powers specifically entrusted to him in the contract, or those implicitly understood from the contract by necessity, and he must obtain the employer’s prior approval and inform the contractor in writing of that in the following matters:

- 1- Issuing instructions to change.
- 2- Extension of the completion period.

- 2- Determining compensation for delay.
- 4- Approval of the appointment of sub-contractors.
- 5- Issuing the order to suspend work.

It is clear from here that the powers to make the change were not specified, or the upper limit for each change was mentioned. Rather, it was sufficient to give the engineer the authority to make the change and then restrict it with the written approval of the employer before making the change. The powers to effect the change summarized in table 2-1 :

Table 2.1: Authority to Effect Variation (The Standard Contracting Contract Book for Construction Projects 2010):

Entity/person with authority	Value (JD)	The ratio(%)	Notes
The Engineer	not specified	not specified	Conditional on the prior consent of the employer

2.6.4 Conditions for Issuing Variation Orders

According to Standard contract book for construction projects (2010) there are two main types of conditions that most contracts require to be available in order to be able to issue orders to change the laws: **formal conditions**, and **substantive conditions**:

2.6.4.1 Formal Conditions:

The formal conditions can be summed up in two main points:

1- variation orders are issued in writing:

Contract documents state that any variation orders not made in writing are illegal. It is not required that the written variation order be issued in a specific form, but it is sufficient for the engineer to sign the amended plans or minutes of the meeting, or not

to refuse to request written confirmation of the variation order proposed by the contractor. The issuance of the variation order in writing preserves the rights of all parties at the end of the project, whether the owner or contractor. However, there are some exceptions in the absence of a written variation order or written confirmation from the contractor of the engineer's order. Oral variation orders can be relied upon if the writing requirement is waived by virtue of the customary agreement and dealing between the engineer and the contractor, such as the contractor and the engineer meeting several times regarding variation orders and the engineer expressing His immediate approval of the procedures carried out by the contractor. In this case, the contractor is entitled for these additional works, despite the absence of the writing condition (article 3/3 "Instructions of the Engineer").

2- The obligation to inform the contractor of the variation orders:

The engineer must notify the contractor in the event of issuing variation orders, and failure to notify them leads to the contractor not being committed to implementing them or to reserve them, and these notifications must be in writing, as most contracts recommended that the contractor be notified of them (chapter 13: variation and adjustments).

2.6.4.2 Objective Conditions:

There are four substantive conditions for issuing variation orders for construction work and projects:

1- The existence of a condition in the contract that grants the owner or his representative the power to issue variation orders:

In any project, there must be a clause in the contract that gives the power to the owner or his representative to issue variation orders when needed.

2- Variation orders are necessary:

The change must be both desirable and necessary to get the works done. The variation orders must be within reasonable limits in terms of size, value and type, otherwise it will lead to radical changes in the project outside its scope and original objective.

3- The variation orders shall include additional work:

A variation order is broader in its concept than overtime. The additional works included in the variation orders must be consistent with the nature and subject matter of the contract, and must be of the same type as the original works. Additional works mean every modification or addition that was not provided for in the original contract and the project's circumstances required its implementation.

4- Issuance of variation orders during implementation and not after their completion:

Variation orders may not be issued after the work has been completed and delivered. Because the contract has ended and the work is outside the scope of the contract, and then the contractor can refuse to implement it or request a new contract. Therefore, it must be noted that the issuance of variation orders is only during implementation and before the issuance of the initial delivery certificate.

2.7 Variation Orders in the Government Procurement System No. 28 (2019) (last amendments on 2022)/ Jordan:

Article (2) of the instructions for variation orders for works and technical services issued according to the provisions of Article 98 of the Government Procurement

System No. 28 (2019) defines the variation order of works: it is any change in the works that does not necessarily change the nature or scope of the contract, and instructions are issued to implement or approve it as a change inclusive of any of the following:

- 1- A change in quantities (unless it results from the implementation of plans without modification), or
- 2- A change in the quality or other characteristics of an item, or
- 3- A change in the elevations, locations and/or dimensions of any part of the works, or
- 4- Cancellation of any item of work, or
- 5- Executing additional work or providing equipment, materials or services necessary for permanent work, or
- 6- A change in the sequence or timing of the execution of works, or
- 7- Any other changes agreed upon between the two parties to the contract or by which instructions are issued to the contractor to implement them.

These instructions have clarified in detail the powers to effect this change from the supervising engineer through the Secretary-General and the Minister and then the Economic Development Committee / Prime Minister (Article 2, Instructions for variation orders) ("Instructions for variation orders for works and technical services issued according to the provisions of Article 98 of the Government Works Law No. 28 (2019).", 2019) As summarized in table 2-2:

Table 2.2: Authority to Effect Variation (Tenders for Works or Technical Services)

Entity/person with authority	Value (JD)	The ratio(%)	Notes
The Engineer	V.O < 10,000	V.O < 5%	
Secretary General	150,000>V.O>10,000	15% >V.O > 5%	
The Minister	500,000>V.O>150,000	30% >V.O > 15%	
The Minister	V.O<150,000	100% >V.O > 30%	
The Minister	V.O >200,000	V.O > 10%	* Subject to obtaining initial approval from the Council of Ministers
	* The cumulative value total of variation orders exceed 50% of the original bid value		
The Minister	V.O <200,000	V.O < 10%	* Provided that the Council of Ministers is informed if its value exceeds (30,000) JD and the percentage is 5%. * The cumulative total of variation orders does not exceed 50% of the original bid value

2.8 Variation Orders in Government Works Law No. (71) / 1986 and its (last amendments on 2000)/ Jordan:

Article (22) of the law defines the variation order of works: Any modification, addition or change that was not mentioned in any of the bid documents when the agreement was signed and the project's circumstances required its implementation shall be considered as additional work. The increase in the actual quantities of works that are implemented according to the plans shall not be considered additional work, and its implementation does not require the issuance of a variation order.

This law has clarified in detail the powers to effect this change from the supervising engineer through the Secretary-General and the Minister and then the Economic Development Committee / Prime Minister, but in the original law, the powers have

been separated according to the type of services (works or technical services) but in the last amendment at year 2000 this separation have been canceled. (Article 22, Government Works Law No. (71) / 1986 and its amendments (last on 2000)) As summarized in table 2-3 :

Table 2.3: Authority to Effect Variation (Tenders for Works and Technical Services Government Works Law)

Entity/person with authority	Value (JD)	The ratio(%)	Notes
The Engineer	V.O < 5,000	V.O < 5%	
Secretary General	V.O<30,000	15% >V.O > 5%	
The Minister	V.O>30,000	35% >V.O > 15%	Less than 500,000JD
Council of Ministers	V.O>30,000	35% <V.O	

- Noted that the Government Works Law No. (71) / 1986 was canceled by Government Procurement System No. (28)/2019.

It is noticeable that all legislation over the previous years, despite all the amendments and restrictions that were made on the authority holder, did not set an upper limit for the ceiling of the variation orders.

2.9 Contracting in Jordanian Civil Law (1976) and its amendments

Looking at the Jordanian Civil Law of 1976 and its amendments, we note the mention of contracting contracts starting from Article 780 to Article 804, where the relationship between the employer and the contractor and the duties and responsibilities of each of them were clarified according to the contract signed between them.

In Article 780 of the Jordanian Civil law, “contracting” is defined as a contract whereby one of its parties undertakes to make something or perform a work in exchange for a compensation pledged by the other party.

And in Article 794, it clarifies: If the contracting was carried out on the basis of the unit and according to a specific design in exchange for a specific allowance for each unit, and then it was found that the implementation of the design requires a massive increase in expenses, the employer, after being notified of the amount of the increase, may withdraw from the contract with paying the value of the work accomplished by the contractor in accordance with to the terms of the contract or accepting its follow-up with a commitment to increase. If the increase is not significant, but is tangible and necessary to implement the agreed design, the contractor must notify the employer before continuing with the implementation of the amount he expects from the increase in expenses. If he proceeds with the implementation without notification, he has no right to request the increase.

2.10 Variation Orders in Saudi Competition and Procurement Law 2020.

In the Saudi Competition and Procurement Law 2020 Article Sixty-nine states that “a government entity may - within the limits of its needs - issue variation orders for an increase in the contract not exceeding (10%) of its value, and it has the right to issue variation orders with a reduction of not more than (20%) of its value.

Taking into account what is stated in Article (sixty-nine) of the system, the government entity shall, in the event it decides to increase or decrease the contractor’s obligations, or make any modification or change in the works contracted to carry out; Subject to the following controls:

- 1- The additional works shall be subject to the contract and not outside its scope.

- 2- The necessary modifications or changes to the works should achieve the interest of the facility, provided that this does not lead to a breach of the terms and specifications or a change in the scope of the project or the nature of the contract or its financial balance.
- 3- Ensure that the necessary funds are available to cover the value of the additional works before assigning the contractor to them.
- 4- If the additional works do not have similar clauses or quantities in the contract, the bid shall be submitted to the Bid Examination Committee or the Direct Purchase Bid Examination Committee, as the case may be, to study the request for assignment of those works and the appropriateness of the prices submitted by the contractor. If the contractor does not agree to what the committee concludes, its implementation will be contracted by other bidders in accordance with the provisions of the system and these regulations.
- 5- It is not permissible to assign additional works after the government entity has received the works subject of the contract.
- 7- The person with the authority to award is responsible for issuing all orders related to increasing or decreasing the contractor's obligations and the periods due for additional works.

The powers to effect the change summarized in table 2-4 :

Table 2.4: Authority to Effect Variation (Saudi Competition and Procurement Law 2020)

Entity/person with authority	Value (SR)	The ratio(%)	Notes
The Minister	-	10% >V.O	Additional works
The Minister	-	20% >V.O	Canceled works

2.11 Variation Orders in Law of Contracts and Warehouse Management in the Government of Dubai No. (12) / 2020.

In this Law Variation orders are defined as follows: "Orders issued by the governmental authority to the supplier to change or modify purchases, in terms of their quantities, specifications, design, delivery, contract execution dates, or how to implement it, outlining its rules and cases of implementation under the law".

It was stated in Article (57) of the system "Variation Orders" the following:

A- The government entity has the right to modify the quantity, items or specifications of the purchases contained in the contract or purchase order before or during implementation or after extending its term, by virtue of variation orders addressed to the supplier, under the same general conditions, in any of the following two cases:

1. If the variation order will lead to a decrease in the value of the contract, regardless of the percentage of change.
2. If the variation order will lead to an increase in the value of the contract by no more than (30%) of the total amount specified in the contract or purchase order.

B- Variation orders are approved by the competent authorities specified in the following table, according to the type of purchases:

The system also required the following to make changes:

- A- The necessary financial appropriations must be available in the government entity's budget for variation orders in excess.
- B- The process of amending the quantity, items, or specifications of purchases shall be presented to the committee to take the appropriate recommendation and

submit it to the competent authority or whomever it delegates for approval, provided that an annex to the contract or purchase order is organized that includes the prescribed amendments, to be agreed upon between the two parties, including the Final insurance.

The powers to effect the change summarized in table 2-5 :

Table 2.5: Authority to Effect Variation (Law of Contracts and Warehouse Management in the Government of Dubai No. (12) / 2020.

Entity/person with authority	Value (AED)	The ratio (%)	Notes
General Director	Up to 25 million	-	
Director General of the Department	25million >V.O>50 million	-	
The Supreme Committee (the Supreme Committee for Financial Policy),	More than 50 million	-	

As it is clear that the maximum limit for variation orders in this law is 30%, and the law did not specify the maximum percentage of cancellations.

2.12 Variation Orders in Law No. 49 of 2016 Concerning Kuwaiti Public Tenders.

Article (74): “The relevant authority may not issue variation orders in the tender of contracts subject to the provisions of the law that exceed the non-compulsory total of their value, whether by increase or decrease (5%) five percent of the total contract value, except with the approval of the Central Agency for Public Tenders Council on the request. Within a period not exceeding one month from the date of its submission, the approval is issued based on a reasoned memorandum from the relevant authority accompanied by the opinion of the authority supervising the implementation, if any.

Article (76) also stipulated the availability of a financial credit for variation orders, as it stated: “In all cases in which variation orders are issued in accordance with the two previous articles, it is required that there is a financial credit with the relevant authority.”

The powers to effect the change summarized in table 2-6 :

Table 2.6: Authority to Effect Variation (Law No. 49 of 2016 Concerning Kuwaiti Public Tenders.)

Entity/person with authority	Value (KWD)	The ratio (%)	Notes
Tender Public Entity	-	5%	increasing or decreasing
Central Agency for Public Tenders Council	-	V.O>5%	Special exceptions

It is clear that the maximum limit for variation orders in this law is 5% whether by increase or decrease except in exceptional cases, subject to the approval of the Central Agency for Public Tenders Council.

CHAPTER 3: METHODOLOGY

3.1 Introduction

This chapter discusses the methodology used in determining the causes and effects of variation orders as a quantitative study, and then knowing the opinions of experts in the field of construction projects regarding variation orders and how to reduce their effects on projects and discussing the differences between existing legislation and comparing it with the legislation of neighboring countries (Saudi Arabia, Kuwait and the Emirates).

The objective of this chapter is to provide a detailed explanation of the methodology used in conducting this research so that this chapter explains the rationale for choosing the most appropriate research methods and data collection.

To achieve the research objectives, this study designed to conduct six phases: The first phase to review of the global literature. This stage was parallel to all other stages as it was the most important stage for collecting information on the research topic.

The second stage was studying the special legislations for dealing with variation orders in Jordan and comparing with the legislations of neighboring countries (Saudi Arabia, Kuwait and the Emirates). And then clarify the similarities and differences, identify the most important of these differences (gap analysis) and draw the current situation framework and how it deals with variation order.

The third stage was to determine the type of research, where the " mixed research study qualitative and quantitative " was chosen because it's the best research method fits with this type of researches, and quantitative data were collected archival data from Ministry of Public Works and Housing, while qualitative data through interviews with experts and stakeholders in this field, while the fourth stage was the results which obtained from the analysis of the data collected, and the fifth stage was to develop the

suggested framework and the proposed amendments to these legislations based on the results, finally the conclusion and recommendations for this study. Figure No. (3.1) Shows the research methodology used in this thesis.

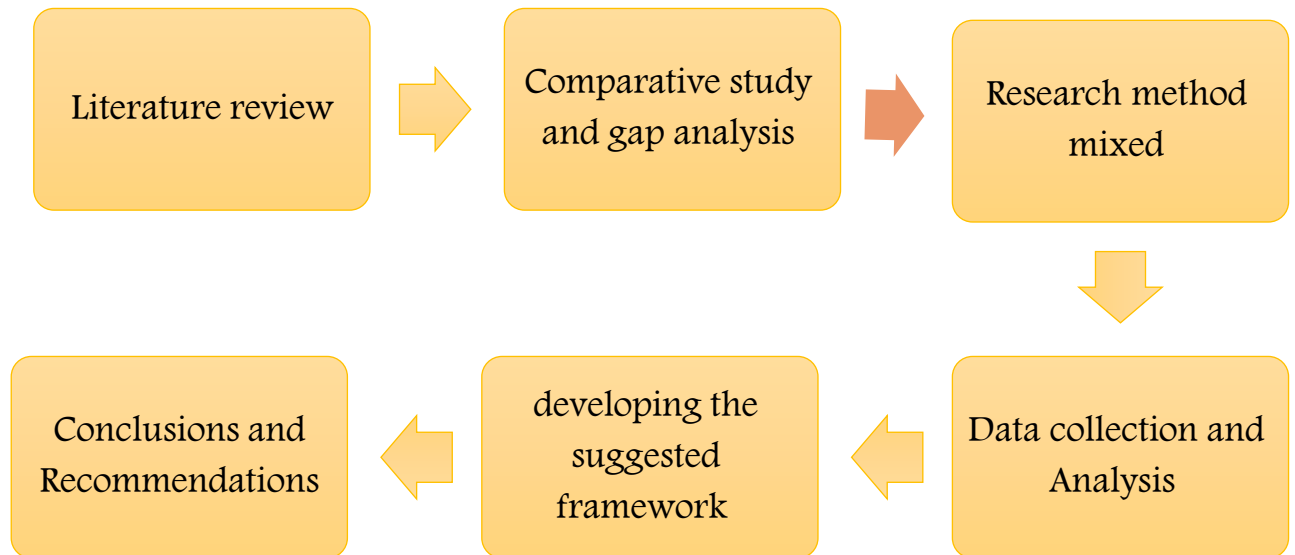


Figure 3.1 : Research Methodology

3.2 Research Methods and Data Collection Techniques.

3.2.1 Research Methods.

Research methods studies can be Qualitative, quantitative and mixed methods, (Bosworth, and Bouter 2020). Quantitative studies give "snapshots" and are used with questions such as how much, what and how much? Therefore, the results are instantaneous or cross-sectional and usually used to focus on meaning and description, while qualitative approaches seek to find out why things happen. Many qualitative studies use data on people's perceptions to investigate aspects of their social world; Others seek to "go deeper" in addressing people's assumptions, biases, etc. to determine their effect on behavior, and hence on performance. it is a study for collecting data from the respondents where the data is not numbers (Fellows & Liu 2021).

3.2.2 Research Data Collection Techniques

To collect primary and secondary data from its source to the researcher, the primary data is collected directly from the respondents, while the secondary data are data and clarifications and can be found, for example, through searches in the archives (Fellows & Liu 2021).

3.2.3 The Tools of Scientific Research

Study tools have an important and effective role in scientific research, and it is represented in the fact that the scientific researcher needs a resource to collect data and information related to the research problem, and that its purpose is to study the problem.

There are many research tools available, and the use of any of them depends on the nature of the research, and study tools are defined in scientific research as the means by which the student or researcher collects certain information, and accordingly, he can obtain accurate results related to research or scientific thesis, and a number of Recommendations and suggestions for solving the study problem. (Turner 2010)

3.2.4 Types of Scientific Research Tools

There are many tools that the researcher resorts to in order to collect information and data on the topic related to the research problem he is studying, and the most prominent of these tools are the following: (Montoya (2016)

Questionnaire: It is a series of questions that the researcher writes in a certain way, and then presents them to a group of respondents to get answers that explain the nature of the problem cited in the scientific research. The questionnaire can be submitted on paper or through websites “electronic questionnaire”.

Observations: It is the use of the scientific researcher's senses, sight or hearing, to identify the entity concerned with a particular problem or phenomenon and follow it closely.

Tests: These are questions that are asked to a group of respondents, to find out their behaviors and attitudes.

Interview: It is a meeting between the researcher and the respondent, where a set of questions are asked and then answers are determined for the purpose of scientific research.

Table 3.1: The Most Differences Between Qualitative and Quantitative Methods of Research

Research methods	Qualitative	Quantitative
Data Collection Techniques	interviews	Questionnaire, analysis documents
Unit of measures	Words or sentences	Numbers, frequent
Uses	Improve or develop something	Testing something
Sample size	Small sample size (5-50)	Large sample size >100

3.2.5 Constructing Interview Questions

The research interview is a face-to-face meeting or mobile call that brings together the researcher and the sample members that he deems appropriate from his point of view, to obtain information on the subject of the scientific research, and this is done directly without intermediaries, and the interview method is one of the most honest study tools.

Some of the most important things that the researcher must consider when formulating the questions included in the research interview include that each question is closely related to a specific objective of the scientific research, and that the question

is clear so that the other party understands and motivates him to answer it, and this is one of the most important steps in designing the interview form.

Turner (2010) listed a number of things that the researcher should pay attention to when conducting the interview, including:

1. The researcher should have a high degree of competence in the dialogue
2. Obtaining information that enriches the subject of scientific research.
3. The academic researcher must obtain the consent of the respondents before conducting the interview, and if any respondent wishes to step down during the interview, the academic research must take this into account.
4. The researcher must prepare well for the questions that will be asked to the respondents before conducting the interview.
5. It is important to identify key objectives before interviewing the sample or respondents.
6. The researcher must write down all the responses and behaviors of the respondents once the interview is completed, so as not to forget any aspect, especially with the large number of interviews.
7. The academic researcher must inform the respondents of the importance of the subject of academic research and the extent of the benefits that accrue to society from its implementation, in order to motivate the respondents to answer the questions that are usually asked.

3.2.6 Steps for Conducting a Research Interview

The first step in conducting the interview is to list the persons or participants, who will be interviewed, and the smaller the number, the better the positive results. The

interview sample must represent the scientific problem under study; therefore, it is necessary to choose the sample of people carefully in order to achieve the goal.

In the second step, the researcher prepares the interview questions and studies them very carefully, to determine the effectiveness of obtaining the information and data necessary to obtain numerical or descriptive results. It is preferable to try the interview questions on two or more people to determine the feasibility of the questions and the extent to which respondents know what is known as the "pilot study", and the test is also important for course correction in case of negative influences (Fellows & Liu 2021).

Pre-testing is an important step to ensure that errors, ambiguities, and repetition are reduced in survey questions. Moreover, it helps greatly in improving data quality and increasing its accuracy. The pretest is often applied to a sample consisting of a small number of respondents out of any data analysis intended to be included in the final presentation (Grim, 2010).

The third step is to determine the time and place of the interview and inform the individuals, while explaining the importance of the interview in solving the scientific problem being studied by the researcher to ensure that the respondents are interested in answering in the ideal way.

The fourth step is to conduct the interview on the basis of the selected random sample with setting a schedule to determine the interviews conducted on the day, taking into account the daily recording after the completion of the interviews, and the researcher can facilitate himself instead of writing the recording by recording the interviews by any means.

3.2.7 Advantages and Disadvantages of the Research Interview

The interview tool is widely used in behavioral and social research related to people, and the reason for this requires a thorough and comprehensive investigation. Therefore,

there are many types of personal interviews that the researcher uses in scientific research, and the advantages and disadvantages of the research interview are numerous, and they are as follows: (Montoya 2016)

Advantages

A major advantage of the interview is that it can be used by the academic researcher with uneducated respondents.

The importance of the personal interview is that it helps to identify the impressions of the respondents and record them with the answers to the questions, to determine their honesty and the factors helping to do so.

Respondents' ability to know the purpose of questions that other study tools such as questionnaires and observation may not provide, which explains the difference between questionnaire, interview and observation.

The interview tool is ideal for learning about the personal and environmental conditions of the respondents.

This method can be implemented without hindrances and at the time specified by the researcher.

Unlike questionnaires and tests, the researcher receives a large proportion of the necessary data.

Disadvantages

One of the main downsides of the interview is that it depends on respondents' willingness to cooperate with the academic researcher, and if they decline or do not answer correctly, it will affect the positivity of the data collected from the scholar.

The interview is considered one of the financially expensive scientific research tools, especially in light of the presence of a group of respondents in a country far from the place of residence of the scientific researcher and it requires large amounts of money.

One disadvantage of the interview is that it takes a lot of time, and getting information from one person becomes more difficult due to a large sample of respondents.

The interview requires special skills and abilities that the scientific researcher must possess.

One of the disadvantages of the interview is the difficulty of classifying and analyzing the data obtained from the respondents against questionnaires or tests.

3.3 This Research Methods and Techniques:

In order to achieve research objectives, mixed research study (qualitative and quantitative) research type was used.

Quantitative were used for:

- Secondary data which collected from archival data from MPWH for previous projects.

Qualitative were used for:

- Comparison between different legislations and their comparison with neighboring countries
- Primary data which collected from experts interviews

3.4 Steps for Building Personal Interview Questions and Proposed Framework:

The researcher prepared on the topic of the research, and followed the following steps for building the proposed framework:

1. Reviewing the previous literature related to the subject of the study, to use them in constructing these questions.
2. The researcher consulted with a number of stakeholders and researchers in this field.
3. Determine the main areas included in the interview questions.

4. Analyze the data of previous projects to identify the reasons for the variation orders in these projects.
5. Analyzing data of previous projects to identify the impact of variation orders on the various elements of the project in terms of time and cost.
6. Draw the current situation framework and how it deals with variation orders.
7. Studying the special legislations for dealing with variation orders in Jordan and comparing them with the legislations of neighboring countries (Saudi Arabia, Kuwait and the Emirates) and clarifying the similarities and differences and identifying the most important of these differences (gap analysis).
8. The interview questions were designed in their initial form.
9. The interview questions were reviewed and revised by the supervisor.
10. The interview questions were presented to the experts for arbitration.
11. According to the arbitrators' opinions, some paragraphs of the interview questions were modified in terms of deletion or addition or editing, so that the interview questions settle in their final form.
12. Develop a proposed framework for dealing with variation orders to address weaknesses.

3.4 Sample Size

Too many articles, books and book chapters recommended that the appropriate number of interviewees range from 5 to 50 and that is sufficient. (Dworkin 2012)

3.5 Interviewers' Profile

Twenty-three experts were invited for an interview and 17 of them responded, the persons to be interviewed were identified, who **represent the following sectors**:

- 1- Ministry of Public Works and Housing (MPWH)
- 2- Ministry of Local Administration

- 3- The Local Tenders Department.
- 4- Contractors.
- 5- Designers.
- 6- Consultants.
- 7- Members of Arab arbitration bodies.
- 8- Executive experts in government projects.
- 9- Regulatory bodies such as: the Audit Bureau and the Integrity and Anti-Corruption Commission.

The experts interviewed had the following characteristics:

- They represent most of the concerned sectors: government agencies, designers, consultants, arbitrators and contractors.
- First-class experts from those bodies: Secretary-General, General Manager, Director, Chairman of the Board of Directors, Arbitrator, Expert Executive Engineer.
- High Experience: 10 to 20+ years in the field.
- Academic degrees: from BA to PhD in engineering and law.

CHAPTER 4: RESULTS AND DISCUSSION

4.1 Introduction:

This chapter includes both types of results: primary (qualitative) data and secondary (quantitative) data results.

The results of the basic (qualitative) data were conducted after interviewing the concerned persons and writing the results of the interviews, an analysis of these answers was carried out (line by line) through keywords and sentences that give an in-depth meaning. These words and sentences were divided into main and sub groups through keywords and grouped these words and sentences that fall under the same group to facilitate their assembly and extract the main ideas from them that will contribute to the development of proposals for the framework to be modified.

As for the secondary (quantitative) results, they were done by searching in the archives of the projects' files and determining the causes and effects of variation orders on construction projects in a timely manner and cost through the reasons recorded in the reports of the specialized committees for these variation orders. This data was analyzed for projects implemented by the Ministry of Public Works and Housing between 2010-2021.

4.2 Critical Analysis

It appears from the above that the book of the unified contracting contract for construction projects 2010 as well as the FIDIC did not include the details of the variation orders and the powers of each percentage of them. Rather, it was satisfied with a statement defining the change and specifying the mechanism for dealing with it under the contracts regarding its scope and its impact on time and on the contractual relationship between the parties.

The contract book gives the "engineer" the authority to make the change and then restrict it with the written consent of the employer before making the change in the special conditions.

When comparing the legislation that regulates the work of variation orders in Jordan (the previous government works system and the current procurement system) and compared it with the legislation in the region (the Saudi system, the Kuwaiti system, and the UAE system (Dubai)), the similarities and differences between them can be studied, which can be summarized in the following table 4.1:

Table 4.1: Similarities and Differences Between Study Legislations:

Legislation		Jordanian Legislations			Saudi Legislation	Dubai Legislations	Kuwaiti Legislation
Comparison		Standard contract book for construction projects	government works system (1986)	public procurement system (2022)			
Definition includes	Quantities	✓	✗	✓	✓	✓	✓
	Quality	✓	✓	✓	✓	✓	✓
	Elevations, locations and/or dimensions	✓	✓	✓	✓	✓	✓
	Items characteristic	✓	✓	✓	✓	✓	✓
	Cancelation	✓	✗	✓	✓	✓	✓
	Additional work	✓	✓	✓	✓	✓	✓
	Sequence	✓	✓	✓	✓	✓	✓
Value		Not specified	varies according to the authority	varies according to the authority (more than before)	-	varies according to the authority	Not specified
%		Not specified	varies according	varies according to	< 10% in additional	✗	< 5% in additional

		to the authority	the authority (more than before	works. < 20% in canceled works		and canceled works. -if more Special exceptions
Authority	The Engineer (after the employer approval)	- Engineer - Secretary-General - Minister - Prime minister	- Engineer - Secretary-General - Minister - Prime minister	- Minister	-General Director. - Director General of the Department -Supreme Committee for Financial Policy	- Minister - Central Agency for Public Tenders Council
Upper limit for additional work	✗	✗	✗	10%	✗	5%
Upper limit for canceled works	✗	✗	✗	20%	30%	5%
availability of funds	✓	✓	✓	✓	✓	✓
Change after receiving the works	✗	✗	✗	✗	✗	✗

The above table shows that the **points of similarity** between these legislations in defining the change are:

- 1- A change in quantities, or
- 2- A change in the quality or other characteristics of an item, or
- 3- A change in the elevations, locations and/or dimensions of any part of the works,
or
- 4- Cancellation of any item of work, or
- 5- Executing additional work or providing equipment, materials or services necessary for permanent work, or
- 6- A change in the sequence or timing of the execution of works, or
- 7- Any other changes agreed upon between the two parties to the contract or by which instructions are issued to the contractor to implement them.
- 8- Requiring the availability of financial allocations for variation orders prior to their issuance in the Jordanian legislation, and neighboring legislation.

The most important **difference points** between the Jordanian government procurement system and neighboring legislation are summarized as:

1. There is no upper limit for canceled works in the Jordanian system.
2. There is no upper limit for canceled works in the Jordanian system.
3. The authority of the Prime Minister - if any - is for exceptions in neighboring legislation

Perhaps what was stated in the Kuwaiti Procurement System regarding the upper limit of variation orders (additional works or cancellations), although this percentage does not exceed 5% is the best, as an exception was made in some special cases to exceed the specified percentage according to the actual needs of the project.

4.3 Current-Situation Framework:

After studying the current situation to deal with variation orders from a procedural point of view and in terms of existing legislation and according to the procedures that are currently taking place with variation orders, the organizational framework for the current situation has been drawn up as shown in the figure No. (4.1) below.

The aim of this study is to study the shortcomings of this framework and try to modify it to reach the state closest to the ideal

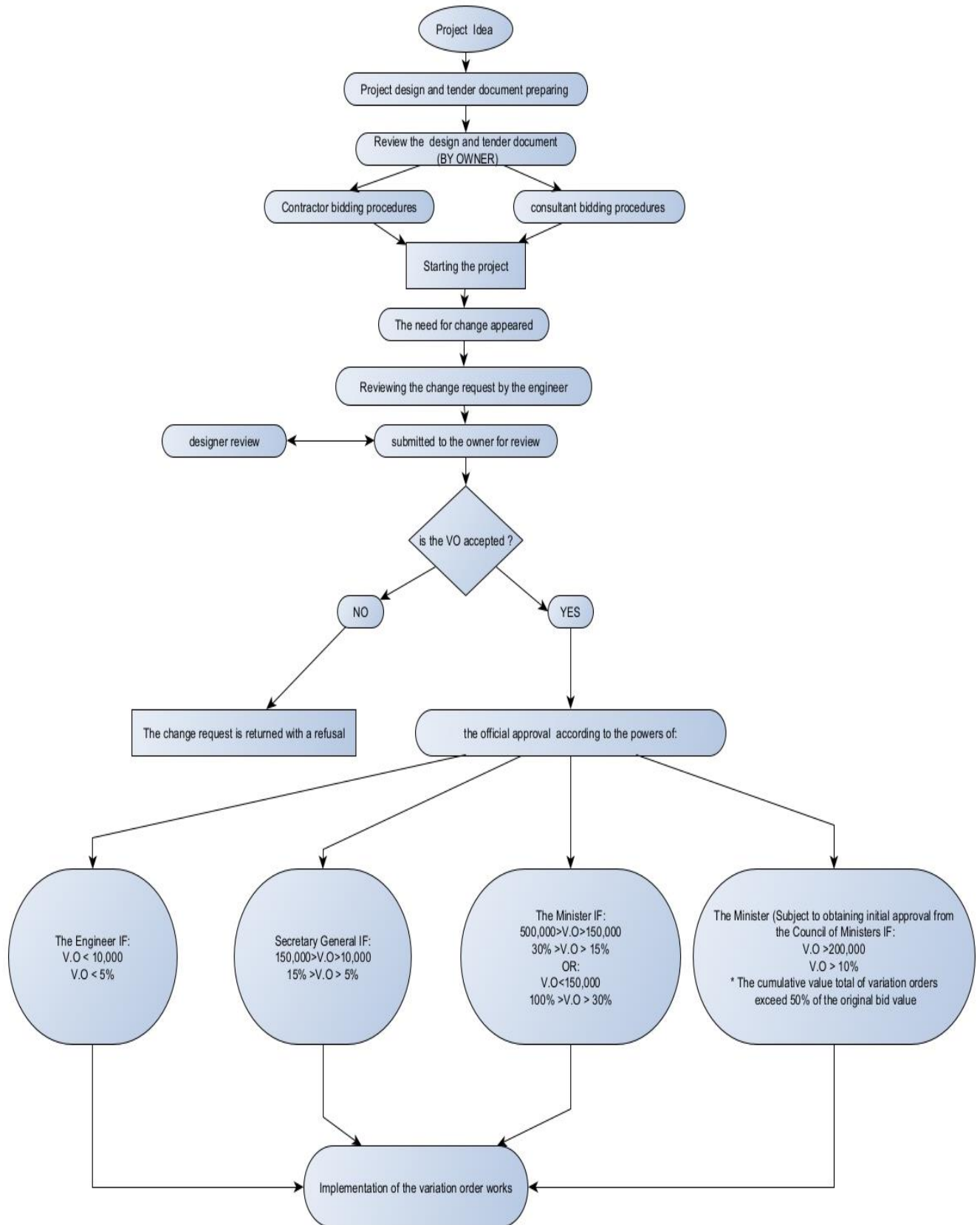


Figure 4.1: The Current Situation Framework for Variation Orders.

4.4 Data Collection

4.4.1 Interviewers' Profile

Twenty-three experts were invited for an interview and 17 of them responded. These respondents have been identified by position and job task as shown in table (4.2).

The time and place of the interview was determined, and the individuals to be interviewed were informed, while clarifying the importance of the interview in solving the scientific problem being studied by the researcher, to ensure that the respondents were interested in answering in the ideal way.

Table 4.2: Persons Interviewed:

Interviewer ID	Position and job task	sector	experience	qualification	Interview conducted type
E1	<u>Supervisory Department Manager:</u> Supervisory Department Manager Responsible for the supervision department - in the private engineering consultancy office - on bids, follow up their implementation and ensure their completion within the specified period	Non-public	+20	MSc	Face-to-face
E2	<u>Company general manager/ Member of the Contractors Syndicate:</u> Chairman of the Board of Directors of a private company working in the field of government contracting and an expert in arbitration cases. Holds two bachelor's degrees: civil engineering and law	Non-public	+20	BSc	Mobile phone
E3	<u>Advisor to the Integrity and Anti-Corruption Commission:</u> Advisor to the Integrity and Anti-Corruption Commission Ensure that the government agency and/or individuals apply the law and that there are no violations or suspicions of corruption in all areas.	Public	+20	PhD	Face-to-face
E4	<u>The director of Roads and Bridges Maintenance department (MPWH):</u> Studying maintenance needs, preparing bidding documents, supervising bids, and following up on their implementation. Executive experts in government projects	Public	+20	BSc	Face-to-face

Interviewer ID	Position and job task	sector	experience	qualification	Interview conducted type
E5	<u>Head of Monitoring Government Bids (Audit Bureau)</u> Verify all bidding procedures in the government entity in all technical and legal aspects, and ensure that the law is applied	Public	+20	BSc	Face-to-face
E6	<u>Supervisor Manager:</u> Supervisor Manager Responsible for the supervision - in the private engineering consultancy office - on follow up the implementation and ensure their completion within the specified period	Non-public	+20	MSc	Face-to-face
E7	<u>Company general manager/ Member of the Contractors Syndicate:</u> Chairman of the Board of Directors of a private company working in the field of government contracting and an expert in arbitration cases	Non-public	+20	MSc	Mobile phone
E8	<u>Managing Director of Roads (MPWH):</u> Managing, auditing and leading the directorates affiliated with this department to help achieve the general objectives of the ministry. Executive experts in government projects	Public	+20	MSc	Face-to-face
E9	<u>President of the Arab Organization for Engineering Arbitration:</u> Chairman of the Board of Directors of a private company working in the field of design and engineering consultancy, and an expert in arbitration cases	Non-public	+20	BSc	Mobile phone
E10	<u>Studies Engineer/ Ministry of Local Administration:</u> Responsible for studies for various projects in the Ministry of Local Administration and for monitoring the work of municipalities	Public	+10	BSc	Face-to-face
E11	<u>Local Tenders Manager(MPWH):</u> Managing, auditing and leading the local bidding process for the Ministry of Public Works and Housing.	Public	+15	BSc	Face-to-face
E12	<u>Arbitration Director:</u> Responsible for arbitration cases of the Ministry of Public Works and Housing	Public	+20	BSc	Face-to-face
E13	<u>Contractual Counselor/Ministry of Public Works and Housing:</u> Owner of a contract consulting office Contractual Adviser to the Ministry of Public Works and Housing Certified arbitrator	Non-public + public	+20	BSc	Face-to-face

Interviewer ID	Position and job task	sector	experience	qualification	Interview conducted type
E14	<u>Company general manager/ Member of the Contractors Syndicate:</u> Chairman of the Board of Directors of a private company working in the field of government contracting and an expert in arbitration cases.	Non-public	+20	BSc	Face-to-face
E15	<u>Design Engineer:</u> Responsible for studies and design of various projects	Non-public	+15	BSc	Face-to-face
E16	<u>Project manager/ Contractor:</u> Project manager for a private company working in the field of contracting. He holds a Bachelor's degree in Civil Engineering.	Non-public	+18	BSc	Face-to-face
E17	<u>Secretary General (MPWH):</u> The tasks are to lead the strategic planning of the ministry and achieve the goals and vision of the Ministry of Public Works and Housing	public	+20	BSc	Face-to-face

4.5 Results

4.5.1 Cause and Impact of Variations on Selected projects

(Quantitative Data):

In order to determine the most important reasons leading to the issuance of variation orders in the projects of the Ministry of Public Works and Housing and to know the extent of their impact on the cost and time of these projects. These projects were implemented in the last 10 years.

The archive of these projects has been fully studied from the moment the contractor obtains the direct order to the moment of initial receipt by the employer. The value of the contracts for these projects ranged 1.14 to 75.2 million dollars, and the most important reasons for the variation orders in these projects were extracted and their impact on the cost and time of these projects was analyzed.

4.5.2 Selected Projects Document for Variation Orders

Because the Ministry of Works is the technical executive direction for all government agencies to implement their projects, such as the Ministry of Health (hospitals and health centers) and the Ministry of Education (schools and others), in addition to the projects of roads, bridges, infrastructure and other government agencies, the projects of this ministry represent complete government sector projects, data for variation orders was collected by reviewing archives from these projects and collecting and analyzing this data to determine the impact of variation orders on cost and time.

4.5.3 Effects of Variation Orders for Selected Projects:

The main impacts of the changes in the selected projects were identified as cost and time overruns as shown in tables 4.3 and 4.4, which summarize the final results of the projects. The results contained in the tables show that the cost increase has reached in project No. (5) and reached (195.5) %, and that the highest impact on time was in project No. (6) and reached (200) %

Table 4.3 :Variations Effect on Projects - Cost Overrun

Project number	Project name	Original contract value (USD)	Variation orders value (USD)	Adjusted contract value (USD)	% of variations to original value
1	Protection works project for bridges on the Dead Sea Road, package I	4154774	1402468	5557242	33.76%
2	Protection works project for bridges on the Dead Sea Road, package II	7222411	4152218	11374630	57.48%
3	Rehabilitation of the desert road (first phase)	75272366	70150421	145422787	93.2%
4	Expansion and maintenance of Rehab / Mafrqa road (stage 2)	5279980	8206618	13486598	155.4%
5	Expansion and improvement of Deir Abi Said / Samoua road	5411188	10581080	15992268	195.5%
6	Implementation of Shafa Al-Amriya Tunnel	11917832	21063787	32981619	176.7%
7	Implementation of the Sahaba tunnel on Queen Alia International Airport road	2180704	1054809	3235513	48.37%
8	Construction of the new Salt Governmental Hospital	56144481	60721974	116866455	108.15%
9	Maintenance of the damaged locations in the Ma'in Resorts	450385	211125	661510	46.88%
10	Malaka health center	1142030	110028	1252059	9.63%

Table 4.4: Variations Effect on Projects – Time overrun

Project number	Project name	Original contract Duration (Day)	Variation orders Duration (Day)	Adjusted contract duration (Day)	% of variations to original duration
1	Protection works project for bridges on the Dead Sea Road, package I	365	299	664	81.92%
2	Protection works project for bridges on the Dead Sea Road, package II	365	347	712	95.07%
3	Rehabilitation of the desert road (first phase)	690	427	1117	61.88%
4	Expansion and maintenance of Rehab / Mafrag road (stage 2)	540	718	1258	132.96%
5	Expansion and improvement of Deir Abi Said / Samoua road	600	690	1289	115%
6	Implementation of Shafa Al-Amriya Tunnel	420	840	1260	200%
7	Implementation of the Sahaba neighborhood tunnel on Queen Alia International Airport road	180	180	360	100%
8	Construction of the new Salt Governmental Hospital	1095	1300	2395	118.72%
9	Maintenance of the damaged locations in the Ma'in Resorts	120	260	380	216.67%
10	Malaka health center	365	228	593	62.47%

After reviewing the archive of these projects and studying them well and reviewing the technical reports that were during the stage of submitting and approving the variation orders and until the final approval of the Council of Ministers to issue these variation orders, and based on previous studies, five main reasons were extracted from which seventeen sub-causes lead to issue variation orders in such projects,

These reasons are:

A- Reasons resulting from "study and planning" include:

- 1- Lack of design, planning and study.
- 2- Errors in estimating quantities well, accurate or close to reality.
- 3- Lack of good arrangement in the terms of the contract related to implementation.
- 4- Conflicts in drawings, diagrams and site terms.

B- Reasons resulting from the intervention of the owner, including:

- 1- Amendment to plans and specifications (levels - dimensions - places - materials).
- 2- A change in the sequence or timing of the execution of certain works.
- 3- Adding new items and works.
- 4- Obstructions and delays in giving responses and approvals and in handing over the work site or part of it.

C- Reasons arising from the supervisory authority, including:

- 1- The lack of experience of the supervising authority in dealing with and following-up projects.
- 2- Many modifications and the lack of coordination with the project owner.
- 3- Delay in disbursing the contractor's monthly payment, which leads to a slowdown in the contractor's performance.
- 4- Suspending some works and delaying the delivery of drawings until the designer is consulted.

D- Reasons arising from the implementing agency, including:

- 1- The lack of experience of the project executing team in carrying out the work properly, such as using a low labor experience, or lack of coordination with the supervising authority in carrying out the work.

E- Reasons arising from the terms and conditions of the site and include:

- 1- Inadequate verification of the site and its specifications.
- 2- Additional requirements to the terms of the site.
- 3- Invisible conditions, weather conditions and climate.
- 4- Unavailability of project materials in the market.

The fish-bone diagrams in figure 4.2 shows the factors that lead to issue variation orders:

Main reasons lead to issue variation orders projects

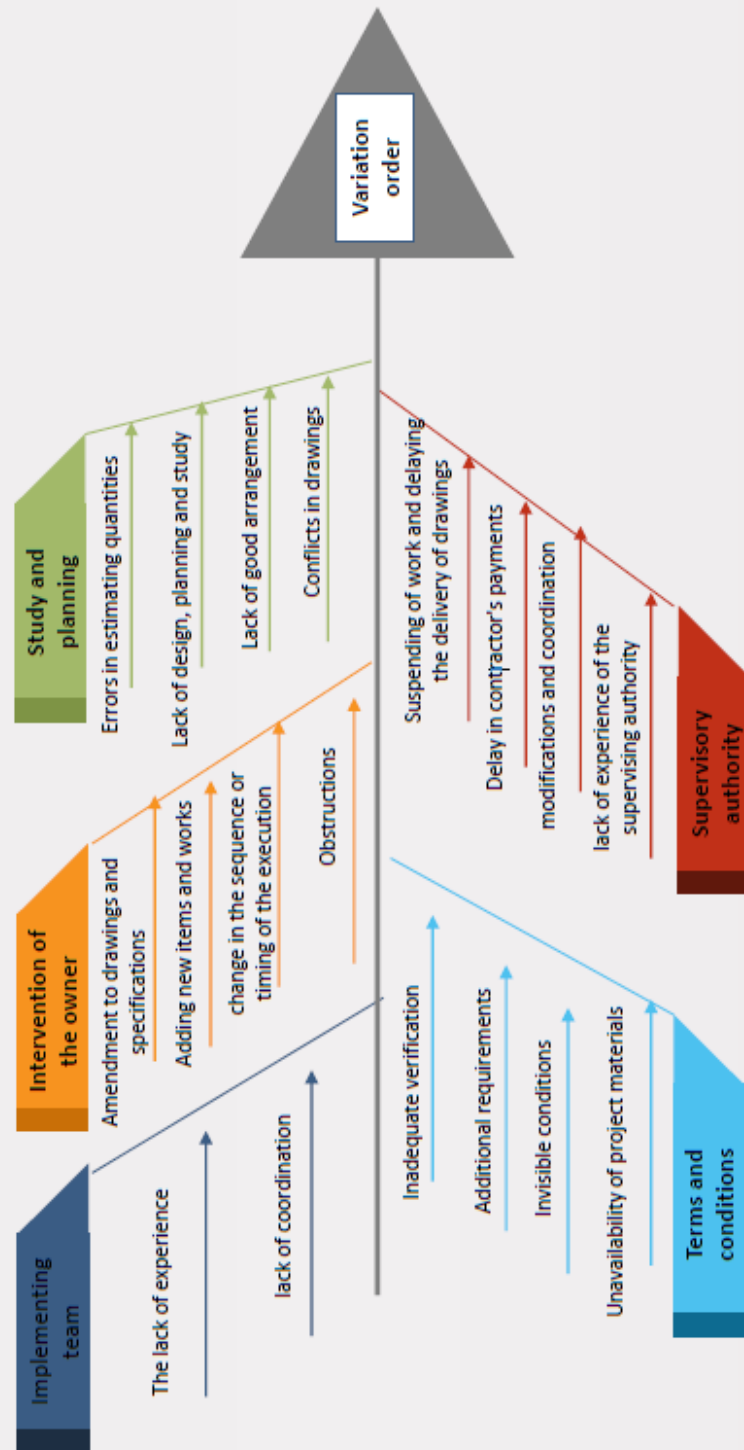


Figure 4.2: Reasons Lead to Issue Variation Orders in the Projects

4.5.4 Primary Data (Qualitative Data):

4.5.4.1 Interview Data Analysis:

After the previous studies of the interviews, the research interview questions were formulated more than once and each of these questions was tested so that the answer to this question gives a clear vision of what is to be achieved from the objectives of this study,

After that, the experts to be interviewed, the invitation was sent directly to these (23) persons. The invitation to the interview was answered by (17) persons, and the place and time of the interview were determined for each of them, and they were provided with the interview forms and informed of a summary of the research and its purpose.

Interviews were conducted with these experts and the results were recorded by audio recording - if this was approved - or by written recording of the answers.

4.6 Data Analysis

Thematic analysis is one of the methods used in the analysis of qualitative data, where the researcher organizes and puts the data into specific topics or categories, and then explains and interprets it analytically to find the answer to his research question. Objective analysis may be done by focusing on the commonalities of the data, but a common or recurring topic may not necessarily be significant or meaningful in and of itself. Thematic analysis is a method of data analysis and is considered a flexible method to a large extent in dealing with research data. Analysis of audio or written conversations does not require adherence to any specific theory or framework, and therefore objective analysis can be applied within a set of theoretical frameworks, where objective analysis focuses on topics and identifiable living and/or behavioral patterns (Jodi 1994). Objective analysis is considered as a useful method for data analysis through: (Victoria and Virginia, 2013)

1. This type of analysis is used with a wide range of research questions, especially those that deal with people's experiences, opinions and ideas, through which we can understand the contexts of those experiences and opinions.
2. This analytical method can be used for different types of data which we get from different sources such as media, interviews or focus groups.
3. This type of analysis can be used with both large and small data.
4. Objective analysis can be applied to produce data-driven analyzes.

To achieve the objectives of this study, after interviewing the concerned persons and writing the results of the interviews, qualitative analysis of these answers (Line-by-line) was done through key words and sentences that give meaning in depth. These words and sentences were divided into main and sub groups through the keywords and collecting these words and sentences that fall under the same group to facilitate their assembly and extract the main ideas from them that will contribute to the development of proposals for the framework to be modified. The interviews results analysis was made by the "coding method", open coding, grouping, and the selective coding are shown in table 4.5 below:

Table 4.5 : Qualitative Data Analyses

Coding	Open coding		Grouping		Selected coding	
	Main category	Incidents	Sub-category	Incidents	Incidents	Themes
Category	Pre-bid stage	<p><u>Q1:obtained</u></p> <ul style="list-style-type: none"> • The problem begins in the stage of design the bid, which may contain errors or omissions, which become a change if it is modified during the implementation stage E10. • In addition, what is learned from previous bids is not necessarily valid for future bids, since each bid has its own privacy E10. • In addition to not involving the implementation engineer in the studies phase leads to errors, because those who design usually do not have implementation experience and are not aware of the nature of the work and the reality of the situation E10. • Time should be taken to study the needs in the pre-bid stage.E11. • There is a better design and design and designs have many problems.E17 <p><u>Q2: obtained</u></p> <ul style="list-style-type: none"> • Take time to identify needs before bidding E1 • Design is fundamental and all problems come because of it E2 • Verification of designs from more than one competent authority E3 • Study plans before they are approved and their suitability E4 • Planning and study for any project must be correct E5 • Realistic and feasible design and study of all needs before approving plans and studies E6 • After the project is designed, the documents are given to a company that reviews these designs and drawings E7 • Separating the execution bid from the Remove conflicting services bid E4 • Focusing on the accuracy of the studies, starting from the surveying to conform to the real needs of the owner E10. • The project must be properly studied at the design stage and before bidding, in proportion to the available allocations E13 • The type of contract is important. If the contract is of a 	Design review and verification	<p><u>Q5: obtained</u></p> <ul style="list-style-type: none"> • Supervision bid be done before the implementation bid E2-E8,E10,E11,E13-E16 • Design-build contracts are the solution, E1. • It is better that the situation remains as it is now E12 • The role of the owner is now the mediator between the designer and the supervisor. This should change and coordination should take place directly between them E13. • in the case of large projects, there may be another party (other than the designer and supervision) reviewing the designs "Design Auditing" .E17 <p><u>Q2: obtained</u></p> <ul style="list-style-type: none"> • Verification of designs from more than one competent authority E2-,E7,E12,E15,E16 • The project must be properly studied at the design stage and before bidding, in proportion to the available allocations E13 • If the contract is of a repetitive type, documents and designs must be updated to reach the best possible condition, and this reduces changes.E14 <p><u>Q1:obtained</u></p>	<ul style="list-style-type: none"> • Supervision bid be done before the implementation bid E2-E8,E10,E11,E13-E16 • Verification of designs from more than one competent authority E2-,E7,E12,E15,E16 • the implementation engineer is not involving in the studies now E10 	<ul style="list-style-type: none"> • Supervision bid be done before the implementation bid to review the designs and drawing • the implementation engineers should be involved in the studies

Coding	Open coding		Grouping		Selected coding	
	Main category	Incidents	Sub-category	Incidents	Incidents	Themes
		<p>repetitive type, documents and designs must be updated to reach the best possible condition, and this reduces changes.E14</p> <ul style="list-style-type: none"> • But if the type of work is other than that, the contract can be of other types, such as the design and construction contract or the added cost E14 • Reduces the value and time by combating the causes leading to the changes, for example, auditing designs, soil tests, developing specifications, and reducing owner requests.E15. • Make a decision quickly E16 • The owner must stop adding new businesses that are not related to the business E16 • Designs must be workable and realistic E16 <p><u>Q3: obtained</u></p> <ul style="list-style-type: none"> • The focus should be on addressing the causes that lead to the variation order, not addressing the procedures E12 <p><u>Q5: obtained</u></p> <ul style="list-style-type: none"> • design and construction contracts is the solution,E1 • I strongly support that the supervision bid be done before the implementation bid E2 • I believe that the supervision bid becomes prior to the execution bid, and this has a very positive effect E3 • I support that the supervision bid be done before the implementation bid E4 • design and supervision is not desirable E5 		<ul style="list-style-type: none"> • design stage may contain errors or omissions E10.E17 • What is learned from previous bids is not necessarily valid for future bid E10. • the implementation engineer is not involving in the studies now E10 • those who design usually do not have implementation experience and are not aware of the nature of the work and the reality of the situation E10 <p><u>Q3: obtained</u></p> <ul style="list-style-type: none"> • The focus should be on addressing the causes that lead to the variation order, not addressing the procedures E12 		

Coding	Open coding		Grouping		Selected coding	
	Main category	Incidents	Sub-category	Incidents	Incidents	Themes
		<ul style="list-style-type: none"> • I prefer that the supervision bid be presented separately and be before the implementation bid E5 • I support that the supervision bid be done before the implementation bid E6 • If the bids (design and supervision) will affect the decision to amend the drawings E6 • if the contract is (design and supervision), this will lead the designer to cover up the mistakes of his designs E7 • If there is a special tender for the project management, whose tasks were to review the designs before implementation this will gives positive effect E7. • If the supervision bid was before the execution bid, this would lead to the mitigation of the variation orders, but in certain proportions and not absolutely E8 • proposal to submit a tender for supervision before implementation E9 • a special executive tender issued to remove services before the road, bridge or basic project is starts E9 • obstacles must be studied from the beginning and take the time necessary to collect data E9 • It is preferable that the supervision bid be made before the contractor bid to review the designs and make modifications if necessary E10 • The designer must be other than the supervising authority. Giving supervision before the contractor's bid is better to correct any error before starting the implementation E11. • Each proposal has its caveats, the process is very complicated because the supervision bid starts with the contractor's bid and the duration of its implementation is the same as the period of executing the contractor's bid. It is better that the situation remains as it is now E12. • The combination of design tender and supervision is good because in the event of errors, they will be dealt with without exaggerating and complicating matters further. If the two bids are separate, then the work of supervision will be to look for designer errors.E13. 	Remove obstacles	<p><u>Q5: obtained</u></p> <ul style="list-style-type: none"> • a special executive tender issued to remove obstacles before basic project is starts E9 <p><u>Q2: obtained</u></p> <ul style="list-style-type: none"> • Separating the execution bid from the Remove conflicting services bid E4 	<ul style="list-style-type: none"> • a special executive tender issued to remove obstacles before basic project is starts E9 	<ul style="list-style-type: none"> • if there is obstacles in the project scope, a special "executive tender to remove obstacles" should be done before the main project is starts
			Take the time to study and investigate	<p><u>Q2: obtained</u></p> <ul style="list-style-type: none"> • Take time to identify project needs E1,E10,E13,E16 <p><u>Q5: obtained</u></p> <ul style="list-style-type: none"> • obstacles must be studied from the beginning and take the time necessary to collect data E9 <p><u>Q8: obtained</u></p> <ul style="list-style-type: none"> • give time for studies and designs E8 <p><u>Q1:obtained</u></p> <ul style="list-style-type: none"> • Time should be taken to study the needs in the pre-bid stage.E11 	<ul style="list-style-type: none"> • Time should be taken to study the needs in the pre-bid stage.E11 	<ul style="list-style-type: none"> • Time should be taken to study the project needs in the pre-bid stage.

Coding	Open coding		Grouping		Selected coding	
	Main category	Incidents	Sub-category	Incidents	Incidents	Themes
		<ul style="list-style-type: none"> • If the two bids are separate (design and supervision), the supervision bid must be modified to start before the implementation bid E13 • The role of the owner is now the mediator between the designer and the supervisor. This should change and coordination should take place directly between them E13. • The idea that the supervision bid before this execution bid is much better. It has been applied in some institutions for large projects E14. • It is a good idea to have the supervision bid before the contractor bid to review designs and make modifications E15 • Suggesting that the supervision bid before implementation be good and better, but this has financial consequences E16. • Supervision is required to review designs without having construction accounts. But in the case of large projects, there may be another party (other than the designer and supervision) reviewing the designs "Design Auditing" .E17 <p><u>Q8: obtained</u></p> <ul style="list-style-type: none"> • It is better to give time for studies and designs E8 				

Coding	Open coding		Grouping		Selected coding	
	Main category	Incidents	Sub-category	Incidents	Incidents	Themes
	Reduce value and time	<p><u>Q2: obtained</u></p> <ul style="list-style-type: none"> • Clear tender documents and drawings E1 • The variation order must be issued quickly and immediately E1 • Examine the actual need for changes E3 • Increasing the percentage of powers to issue variation orders to the engineer, the secretary general and the minister E4 • Excluding the consequences of the application of the specifications from the variation orders E4 • The designer will be held accountable for any design errors E4 • Follow-up to the speedy issuance of variation orders and the reduction of the current bureaucracy E5 • technical and professional mismanagement E8 • a flexible way of dealing with changes must be found E9 • The timing of the variation order is very important E9 • The variation order must also be issued quickly, because the work of the variation order is urgent work E10 • There must also be credibility from officials and stakeholders E10 • Focusing on the accuracy of designs and bidding documents will reduce the value of variation orders and the time required E11 • Designs must be reviewed before submission and their compatibility with reality E12 • There must also be speed in decision-making E12 • Delaying issuing changes on time and leaving them to the end of the project leads to prolongation and disputes (as a result of 	Reduce time needed		<ul style="list-style-type: none"> • . Examine the actual need for changes E3,E10,E11,E13,E15 • If there is upper limit for the variation orders will control these deviations E10. 	

Coding	Open coding		Grouping		Selected coding	
	Main category	Incidents	Sub-category	Incidents	Incidents	Themes
	Satisfaction with the current legislation	<p>not agreeing on additional periods) E13</p> <ul style="list-style-type: none"> The lack of public policies and strategic plans, as the projects are now in place because they result from societal pressure, requests from representatives and dignitaries, and the (reaction) system E13. Not giving enough time for studies and designs E13 <p><u>Q8: obtained</u></p> <ul style="list-style-type: none"> Of course, the presence of an upper limit for the variation orders will control these deviations E10. 	Reduce value	<p><u>Q2: obtained</u></p> <ul style="list-style-type: none"> Examine the actual need for changes E3,E10,E11,E13,E15 Clear tender documents and drawings E1,E11,E15 technical and professional mismanagement E8 a flexible way of dealing with changes must be found E9 credibility from officials and stakeholders E10 If there is upper limit for the variation orders will control these deviations E10. The lack of public policies and strategic plans, as the projects are now in place because they result from societal pressure, requests from representatives and dignitaries, and the (reaction) system E13. 	<ul style="list-style-type: none"> The old system is better E4-E7, E9,E14-E16 <p>The new system needs revision E11, E14,E16,E17</p>	<ul style="list-style-type: none"> The new system must be revised
		<p><u>Q2: obtained</u></p> <ul style="list-style-type: none"> What is now in power is just like a maze E13 <p><u>Q3: obtained</u></p> <ul style="list-style-type: none"> The new system is better E1 The new system is better E2 I don't know E3 The old system is better E4 The old system is better E5 The new system integrates the system of public supplies with the system of government procurement E5 There is a clear bifurcation in the articles E5 the new system increased the powers of change instead of reducing them E5 The new system is worse, because it raised the powers of change instead of reducing it E6 The old system is better because the powers were less E7 	The satisfaction with government procurement system	<p><u>Q3: obtained</u></p> <ul style="list-style-type: none"> Actual allocations must be provided to each department to implement its strategic plans.E17 <p><u>Q1: obtained</u></p> <ul style="list-style-type: none"> The value or time cannot be reduced. Because every project has its own privacy and problems that call for changes. Social pressures cause changes.E17 <p><u>Q3: obtained</u></p> <ul style="list-style-type: none"> The old system is better E4-E7, E9,E14-E16 		

Coding	Open coding		Grouping		Selected coding	
	Main category	Incidents	Sub-category	Incidents	Incidents	Themes
		<ul style="list-style-type: none"> • The new system is better E8 • The old system is better, but its implementation was not correct E9. • Currently the system is not good but the application is good E9 • The new system is better because it gave some powers to speed up the decision to change E10 • But there are other aspects that are not good, such as merging dealing with technical services bids with works bids. For example, the engineer has the authority to issue a variation order at a rate of 5% or 10,000 dinars for a service bid, and he is the beneficiary of this bid! E10. • The new system is better, but it has many flaws that must be corrected, such as: <ul style="list-style-type: none"> - If the contractor disapproves of the bid after the assignment, he is allowed to submit to re-tender the bid. -The powers of the procurement committees for the governorates (which are not highly experienced and technical) amount to two million dinars. As for the powers of the local committees (the Ministry of Public Works, for example) their validity is only 500 thousand dinars (despite having high technical expertise) <p>In addition, there is a text that obliges the committee to inform the bidder of the amendment to the offer in case there are arithmetic errors, for example, and he has the right to object to the amendment E11</p> • Every new law is better E12 • I am only aware of the new system E13 • The old system is better because it has undergone many modifications over the years because it started in 1986 and its last update, I think, is 2016.E14 • The new system needs revision E14 • The old system is better.E15 • The new system was found to remedy the defect in the old system and reduce the impact of variation orders, but it gave high powers to parties not competent in bids (the limit for the 		<ul style="list-style-type: none"> • The new system is better E1,E2,E8,E10-E12,E17 • No idea E3 • There are other aspects that are not good, such as merging dealing with technical services bids with works bids. For example, the engineer has the authority to issue a variation order at a rate of 5% or 10,000 dinars for a service bid, and he is the beneficiary of this bid! E10. • it has many flaws that must be corrected,E11,E16,E17 • What is now in power is just like a maze E13 • The new system needs revision E14,E17 • Change permissions have become very complicated .E15 • The new system has some flaws and contradictions (How can the engineer agree to a variation order related to his bid, and this is one of his powers?) E16. <p><u>Q1: obtained</u></p> <ul style="list-style-type: none"> • The problem now is that there is a difference between the contract signed between the two parties and the procurement system, as there are many contradictions.E17 • There must be continuous development for this work, but in reality there is no.17 		

Coding	Open coding		Grouping		Selected coding	
	Main category	Incidents	Sub-category	Incidents	Incidents	Themes
		<p>institution was 100,000 dinars, it is now half a million).E15</p> <ul style="list-style-type: none"> • Change permissions have become very complicated in the new systemE15 • The old system is better E16. • The new system has some flaws and contradictions (How can the engineer agree to a variation order related to his bid, and this is one of his powers?) E16. <p>The new system is better because it gave the powers to speed up the decision to change, but these powers should not be equal between the Minister of Works (the highest authority in the construction sector), for example, and another minister or university president (not concerned with the construction sector).E17</p>				
	Technical and contractual procedures	<p><u>Q1: obtained</u></p> <ul style="list-style-type: none"> • The procedure is not correct E1 • The procedure is now correct E2 • Apparently correct, but the motives may be wrong E3 • The procedure is now incorrect E4 • The procedures are now 80% incorrect.E5 • generally correct E6 • The procedure is not correct E7 	<p>The satisfaction with Technical and contractual procedures</p>	<p><u>Q1: obtained</u></p> <ul style="list-style-type: none"> • The procedure now is not correct E1, E3, E4, E5, E7, E9-E11,E13,E14,E17 • The procedure is now correct E2, E6, E8,E12,E15,E16 	<ul style="list-style-type: none"> • The procedure now is not correct E1, E3, E4, E5, E7, E9-E11,E13,E14,E17 	<ul style="list-style-type: none"> • The procedure must be developed

Coding	Open coding		Grouping		Selected coding	
	Main category	Incidents	Sub-category	Incidents	Incidents	Themes
		<ul style="list-style-type: none"> • Actions currently taking place are better than before E8 • The procedural method is impractical E9 • The procedures now may be incorrect and have some defects E10. • There is a problem because it costs so much on things that should have been taken into account during the design phase E11. • The technical and contractual procedures are correct and any errors are referred to the concerned authorities E12 • In general, the procedures are correct. • But there is a conflict between the contract (which is the reference between the contracting parties) and the procurement system (which is binding by force of law) E13. • However, some determinants such as the incompetence of the supervising engineer affect the workflow E13. • Also, the presence of numerous committees and the powers of the Council of Ministers complicate the matter and affect the time needed, and this leads to disagreements and thus unnecessary costs E13. • If the procedures were correct, we would not have seen this delay in the projects E14 • The problem is making a decision E14 • Quite good, but always needs continuous development.E15 • There should be a procedural reference in this matter E15 • To some extent, the procedures are correct, but delays in them may occur as a result of not making a quick decision E16. • The current contracts in Jordan are based on the reference in the Red Book, and this contract contains the three parties, the most important of whom is the engineer, who is considered the conciliator between the owner and the contractor. This party must act with all credibility and professionalism.E17 • The problem now is that there is a difference between the contract signed between the two parties and the procurement system, as there are many contradictions.E17 • There must be continuous development for this work, but in 	Qualification and training	<p><u>Q2: obtained</u></p> <ul style="list-style-type: none"> • Lack of experience E5 <p><u>Q7: obtained</u></p> <ul style="list-style-type: none"> • employees in the government sector are skilled E1, E2,E7,E12 • Employees in the government sector are not having enough experience and training needed E3-E6, E8-E11, E13-, and E17. • The public sector is a distasteful environment for work, a good employee does not accept the lack of salaries and the current way of working E14 	<ul style="list-style-type: none"> • Employees in the government sector are not having enough experience and training needed E3-E6, E8-E11, E13-, and E17. 	<ul style="list-style-type: none"> • the government employees sector must have enough experience and continuous training needed
			Same contractor or new contractor ?	<p><u>Q4: obtained</u></p> <ul style="list-style-type: none"> • It is better that the variation to be on the same bid E1-E4, E6,E7,E10,E11,E16,E17 • If possible, it is better to make a new contract E3, E5-E10.E13,E14,E15 • must be a "contract agreement annex" E11 • If the changes are at the beginning of the project, it is better to be with the same contractor, but if they are at the end of the project, it is better to 	<ul style="list-style-type: none"> • If possible, it is better to make a new contract E3, E5-E10.E13,E14,E15 	<ul style="list-style-type: none"> • If possible, it is better to make a new contract than the variation to be on the same bid

Coding	Open coding		Grouping		Selected coding	
	Main category	Incidents	Sub-category	Incidents	Incidents	Themes
		<p>reality there is no.E17</p> <p><u>Q2: obtained</u></p> <ul style="list-style-type: none"> • Lack of experience and lack of awareness of the needs may lead to the issuance of more than one variation order for the same subject E5 <p><u>Q4: obtained</u></p> <ul style="list-style-type: none"> • It is better that the variation to be on the same bid E1 • If the reason for the changes is the presence of unforeseen services, the variation must be with the same contractor E2 • If the projects are large, it is better that the variation to be with the same contractor E3 • the projects that can be separated if they are presented with another contractor, it is better to make a new contract E3 • Being with the same contractor is better E4 • If there is a connection between the work and the current bid, it must be executed by the same contractor E5 • If there is no commitment, it can be implemented through a separate bid E5 • The new work must be with the same contractor E6 • With the same contractor but with controls E7 • If there is no connection between him and the existing contract, a separate bid can be made E7 • It is better to have a separate bid E8 • It depends on the type of the project and the size of the change E9 • if the new contract does not affect the current work, then this is better E9 • If the nature of the variation order requires speedy implementation, it is better to be with the same contractor E10. • But if there is no connection between the original works and 		<p>be with another contractor E12</p>		
			<p>Participati on of the supervisor y authorities / the Audit Bureau</p>	<p><u>Q6: obtained</u></p> <ul style="list-style-type: none"> • will not provide a positive addition E1,E2,E5,E8,E9,E11,E12,E15-E17 • will have a positive addition E3-E4,E6-E7,E10,E14 • the contractor must be a member of such committees, as is the case in the special committee formed to review price adjustments E7 • The role of the Directorate of Internal Control in the ministries is supposed to be, NOT Audit Bureau E12. • Unfortunately, the supervisory authorities are not currently playing their role, but what is actually done is to prove the identity. E13 	<ul style="list-style-type: none"> • will not provide a positive addition E1,E2,E5,E8,E9,E11,E12,E15-E17 	<ul style="list-style-type: none"> • The role of the Audit Bureau must be the same like now.

Coding	Open coding		Grouping		Selected coding	
	Main category	Incidents	Sub-category	Incidents	Incidents	Themes
		<p>the additional works, a new bid can be made with another contractor, provided that it does not conflict with the terms of the original contract E10.</p> <ul style="list-style-type: none"> • That the implementation with the same contractor is better, but there must be a "contract agreement annex" because it will become more mandatory and not to be left like this E11 • Each project has its own needs and changes differ if they appear at the beginning of the project than if they appear at the end of the project E12. • If the changes are at the beginning of the project, it is better to be with the same contractor, but if they are at the end of the project, it is better to be with another contractor E12. • If there is a connection between the original work and the changes, they must be carried out by the same contractor. But if there is no connection, it is better to make a new bid E13. • A bid through another contractor is better, but this needs to be dealing with the bid as a financial value. If it ends, another contractor comes, regardless of the type of works executed.E114 • A separate bid is better than being with the same contractor, but in fact most of the changes are related to the original bid and related to the same work and cannot be divided.E15 • It is better to implement with the same contractor E16. • It is better to implement with the same contractor E17 <p><u>Q6: obtained</u></p> <ul style="list-style-type: none"> • if a representative from the supervisory authorities included in the committees for variation orders it will not provide a positive addition E1 • it will not provide a positive addition E2 • this will have a positive role E3 • this will have a positive role E4 • The current law of the Audit Bureau prevents this E5 • It is better to keep it as it is E5 • I support the presence of a representative from the Audit Bureau E6 				

Coding	Open coding		Grouping		Selected coding	
	Main category	Incidents	Sub-category	Incidents	Incidents	Themes
		<ul style="list-style-type: none"> • I support the presence of a representative from the Audit Bureau E7 • I am also with the contractor being a member of such committees, as is the case in the special committee formed to review price adjustments E7 • this will not provide a positive addition E8 • this will not provide a positive addition E9 • It is preferable for the representative of the supervisory authority to be a member of the committee studying the variation order, because he is now absent from the project and from the procedures and negotiations that take place in the project and the variation orders related to it E10 • It will not have a positive addition, on the contrary, it will complicate matters more E11. • The effect of that will be negative and it will not add anything. And their oversight role after the decision E12 • The role of the Directorate of Internal Control in the ministries is supposed to be, and their delegates should be included in those committees E12. • Unfortunately, the supervisory authorities are not currently playing their role, but what is actually done is to prove the identity. Their role is supposed to be positive to ensure the procedures and the transparency of the process, but the reality is the opposite E13. • Of course good, this will reduce doubt about the variation orders E14 • This will not add to the process E15 • With this idea, but each party must know what their role is in this process E16. • If they have a role in the decision, this contradicts the supervisory nature of them. Their role is supervisory after the decision.e17 <p><u>Q7: obtained</u></p> <ul style="list-style-type: none"> • employees in the government sector are skilled in dealing with variation orders E1 				

Coding	Open coding		Grouping		Selected coding	
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		<ul style="list-style-type: none"> • they have sufficient experience for that, but they must be given the powers to do so E2 • they do not have enough experience for that E3 • they do not have enough experience for that E4 • they do not have enough experience for that E5 • In general, they do not have enough experienceE6 • there are experiences, but they have no authority and are under fear and threat from regulatory authorities E7 • No unqualified E8 • Experiences are now less than they were in the past E9. • The cadres working in the government sector are not qualified enough and the current situation is based on personal judgments and is not based on a contractual or technical basis. The administrator may request procedures on the site and is not aware that what he is requesting is a change and it is not within his power to make it happen E10. • The solution to this is through training, rehabilitation and transfer of expertise. Because this work requires professionalism. E10 • No, they are not aware of the concept of change and its procedures E11. • They need training and rehabilitation E11. • If the right people are chosen to manage it, this department will have a positive addition to the work E11. • Yes, there is enough experience E12. • I am not with the idea of having a directorate for variation orders, because that would add a new episode to the work. If the engineer and the representative of the employer perform their required role, this is sufficient. E12. • The percentage of current competencies may be (20% to 25%) only, and the rest do not have sufficient experience. The remaining percentage must be trained to reach the necessary level E13. • Good, but it needs to be improved.E14 • The public sector is a distasteful environment for work, a good employee does not accept the lack of salaries and the current 				

Coding	Open coding		Grouping		Selected coding	
	Main category	Incidents	Sub-category	Incidents	Incidents	Themes
		way of working E14 <ul style="list-style-type: none"> Not 100% qualified, they don't have enough experience. They should be trained more and experience transferred.E15 In general, they do not have enough experience for this.E16 The solution is to have continuous training E16 At the management level, they are good at this, but at the level of professionals, there may be some flaws.E17 The solution is to train and qualify employees and familiarize them with construction contracts, roles and responsibilities.E17 Against that there is a department specialized in variation orders, because this responsibility is the responsibility of the people currently working.E17 				
	Legislation side	<u>Q1: obtained</u> <ul style="list-style-type: none"> Conflict between contract and purchase system E1 <u>Q8: obtained</u> <ul style="list-style-type: none"> I do not agree upper limit for variation orders (additional or cancellations works) E1 I do not agree upper limit E2 I support the existence of an upper limit for the addition and cancellation to become 20% E3 It is better to have an upper limit E4 I would prefer that there be a percentage for additional works, 20%, and for cancellations, 10%. E5 It is better to have an upper limit for additional works and cancellations, and I suggest it to be between 10% - 20%, according to the value of the project.E6. I support that there be a percentage of additional works and 	The maximum percentage of variation orders	<u>Q8: obtained</u> <ul style="list-style-type: none"> disagree upper limit for variation orders (additional or cancellations works) E1,E2,E8,E13,E17 agree upper limit for variation orders (additional or cancellations works) E3-E7,E9-E12,E14-E16 Limits of additional works between (10-20) %. E3-E7,E9-E11,E14-E16 Limits of cancellations works between (10-20)%.E3-E7,E9-E11,E14-E16 But the ratio alone is not enough, it must be linked to the value of the project and the value of the change E9 	<ul style="list-style-type: none"> agree upper limit for variation orders (additional or cancellations works) E3-E7,E9-E12,E14-E16 Limits of additional works between (10-20) %. E3-E7,E9-E11,E14-E16 Limits of cancellations works between 	<ul style="list-style-type: none"> the upper limit for variation orders (additional or cancellations works) should be in the contracts and the percent should be between (10-20)%

Coding	Open coding		Grouping		Selected coding	
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		<p>cancellations, 20%. E7</p> <ul style="list-style-type: none"> do not agree that there is an upper limit E8 I am with an upper limit for adding and canceling, and I suggest that the percentage be 15%.E9 But the ratio alone is not enough, it must be linked to the value of the project and the value of the change E9 Of course, the presence of an upper limit for the variation orders will control these deviations but there are special cases in which the variation order may exceed this percentage.E10 The upper limit is better and I suggest that it be 10% E11. The ratio can be restricted as follows: If the change is due to the design: 10% But if it is the result of the owner's needs, it must be large: 100%, for example E12. In large and unfamiliar projects, the changes may be significant, and a maximum percentage cannot be set E13. The powers should be great for the minister to make changes, and the cabinet just for information and to provide allocations E13. Yes, the lack of an upper limit is the main reason. for higher values.E14 I think 20% is a good percentage of changes E14 Yes, having an upper limit is a good thing E15 I think 15% is a good percentage E15 Of course, having an upper limit for variation orders will control this.E16 20% for additional works or cancellations is appropriate E16. I do not agree upper limit for variation orders (additional or cancellations works) E17 <p><u>Q9: obtained</u></p> <ul style="list-style-type: none"> The role of the prime ministers is incorrect E1 Their role is supposed to be limited to providing financial provisions E1 The role of the Prime ministers is incorrect E2 It is assumed that their role is limited to exceptions only E2 		<ul style="list-style-type: none"> The ratio can be restricted as follows: If the change is due to the design: 10% But if it is the result of the owner's needs, it must be large: 100%, for example E12 	(10-20)%.E3-E7,E9-E11,E14-E16	
			Role of the prime minister	<p><u>Q9: obtained</u></p> <ul style="list-style-type: none"> The role of the prime ministers is incorrect E1- E11,E13,E14-E17 It is assumed that their role is limited to exceptions and providing financial provisions only E1-E10,E15 I am with that the role of specialized committees, not even of the minister E6 Their role should only be to verify the procedures E7 Yes, what it is currently working on is good E8,E12 A new way must be found for this.E14. The powers of the Minister (minister of public Works) must be absolute and there should be NO role for the Council of Ministers .E17 <p><u>Q1: obtained</u></p> <ul style="list-style-type: none"> Also, the presence of numerous committees and the powers of the Council of Ministers complicate the matter and affect the time needed, and this leads to disagreements and thus unnecessary costs E13. <p><u>Q8: obtained</u></p>	<ul style="list-style-type: none"> The role of the prime ministers is incorrect E1-E11,E13,E14-E17 It is assumed that their role is limited to exceptions and providing financial provisions only E1-E10,E15 This article must be amended and extra cost must be prove E2, E4-E11,E14,E16,E17 Engineer: 2-10%, General Secretary:10-25%, Minister: 10-30% E2,E4,E6,E10,E14,E16 	<ul style="list-style-type: none"> The role of the prime ministers is assumed to exceptions and providing financial provisions only article (12/3) must be amended to match the article as stated in the FIDIC.and extra cost must be prove before the unit rate adjusted the proposed percentage of the powers granted to the relevant authorities: Engineer: 2-10%, General Secretary:10- 25%, Minister: 10-30%

Coding	Open coding		Grouping		Selected coding	
	Main category	Incidents	Sub-category	Incidents	Incidents	Themes
		<ul style="list-style-type: none"> • The role of the Prime ministers is incorrect E3 • It is assumed that their role is limited to exceptions only E3 • With the powers given to the concerned minister E4 • It is assumed that their role is limited to exceptions only E4 • It is not true that they are part of the powers because they do not refuse anything E5 • It is not true that they are part of the powers E6 • I am with that the role of specialized committees, not even of the minister E6 • It is assumed that their role is limited to exceptions only E6 • It is not true that they are part of the powers because the minister represents the Council of Ministers E7 • Their role should only be to verify the procedures E7 • It is assumed that their role is limited to exceptions only E7 • Yes, what it is currently working on is good E8 • No, it may be their turn to override the proposed powers E9 • The role of the Prime Minister should be for exceptions, in addition to providing funding, because it is related to the general policies of the state E10 • The role of the Council of Ministers is a bureaucracy, nothing more, and if the minister represents them, there is no need for their role E11. • Their role now is good, because the high percentage of variation orders, there must be a higher authority for monitoring and restriction, since this affects the budget directly E12. • Incorrect. Their role should be to provide allotments and information only I believe that the role of the Council of Ministers as it is now is incorrect.E14 • A new way must be found for this.E14 • The role of the prime minister is incorrect because the minister represents them E15 • It is not true that they are part of the authorities E16. • The powers of the Minister (Works) must be absolute and there should be no role for the Council of Ministers.E17 	<p>The right to adjust the price according to item (12/3)</p>	<ul style="list-style-type: none"> • The powers should be great for the minister to make changes, and the cabinet just for information and to provide allocations E13. <p><u>Q10: obtained</u></p> <ul style="list-style-type: none"> • Article is correct, but it must be applied fairly (increase and decrease prices) E1,E4,E9-E12,E15,E16 • This article must be amended and extra cost must be prove E2, E4-E11,E14,E16,E17 • this item should not be exploited as it is now E3 • The price adjustment that is currently being done does not match the "spirit" of the article as stated in the FIDIC. The contractor must prove the extent of the effect of increasing/or decreasing quantities from what was stated in the basic bid (prolongation of the project and changing the nature and conditions of the work) E13. <p><u>Q11: obtained</u></p> <ul style="list-style-type: none"> • Engineer: 2-10%, 		

Coding	Open coding		Grouping		Selected coding	
	Main category	Incidents	Sub-category	Incidents	Incidents	Themes
		<p><u>Q10: obtained</u></p> <ul style="list-style-type: none"> Article 12/3 is correct, but it must be applied fairly E1 The price adjustment is not necessarily an increase in prices, but it is possible that the prices will decrease E1 if there is no extra cost on item, there is no justification for adjusting the price E2 this item should not be exploited as it is now E3 If the increase is for the same description and nature of the item and with the same circumstances and reasons, there is no right to adjust the price E4 Adjustments should not only be incremental E4 It is not worth adjusting the price unless working conditions change E5 It is not worth adjusting the price unless it is proven that the prices of materials or transportation or any new costs have changed E6 This article must be amended and the following text added to it: "...and the nature of the business has changed" E7 if the nature of the works has not changed, it is not worth an increase in the price E7 This article did not comply with the FIDIC Model Contract (Red Book) E8 is worth if additional costs are incurred, but the reason for requesting the change must be proven E8 the amendment may be an increase or decrease E9 this increase should not be applied to the entire quantities, but only to the additional quantities E9 the new price should be realistic E9 If it is proven that the description of the item has changed, or the initial cost has changed from what was in the original bid, or that the increase in quantities affected the duration of the project, then this article can be applied and the application must be with an increase or decrease, otherwise it is not worth E10. 	<p>Suggested percentage of powers</p>	<p>General Secretary:10- 25%, Minister: 10-30% E2,E4,E6,E10,E14,E16</p> <ul style="list-style-type: none"> Engineer: 2% for additional works and 5% for cancelation General Secretary: 5% for additional works and 10% for cancelation, Minister: 10% for additional works and 20% for cancelation E5 Engineer and General Secretary: Placement with consent only, Minister: 20% E3,E7 Engineer: 10%, General Secretary: 25%, Minister: More than that E1 As it is now E8 Engineer: 5%,and 10000 JD General Secretary: 10% ,and 50000 JD Minister: 15% ,and 500000 JD E9 Engineer: 0% General Secretary: 5% Minister: 10%.E11 In design causes : Engineer: 1% General Secretary: 5% Minister: 10% E12 but in client-needed causes : Engineer: 5% 		

Coding	Open coding		Grouping		Selected coding	
	Main category	Incidents	Sub-category	Incidents	Incidents	Themes
		<ul style="list-style-type: none"> • If the nature of the work changes, an adjustment can be given to the price, and the adjustment may be a decrease as well, not a requirement that it be an addition only. If the nature of the work does not change, it is not worth an adjustment to the price E11. • This article deals with what has changed from the original agreement rather than the occurrence of disagreements. For example, indirect costs (overhead) are dealt with. If they are due to the contractor E12. • The price adjustment that is currently being done does not match the "spirit" of the article as stated in the FIDIC. The contractor must prove the extent of the effect of increasing/or decreasing quantities from what was stated in the basic bid (prolongation of the project and changing the nature and conditions of the work) E13. • This article is used to compensate for the damage, the damage must be proven to be compensated.E14 • I think this should be explained better than it is nowE14. • He has the right in the event that several things are achieved, including changing the initial costs of the materials and not considering the similarity of the description of the work. But if this article is applied without achieving this, it is not permissible to do so.E15. • The price adjustment is worth if there are additional costs, but this must be proven E16. • This article did not comply with the FIDIC Model Contract (Red Book) E17 • is worth if additional costs are incurred, but the reason for requesting the change must be proven E17 <p><u>Q11: obtained</u></p> <ul style="list-style-type: none"> • Engineer: 10%, General Secretary: 25%, Minister: More than that E1 • Engineer: 5%, General Secretary: 10%, Minister: 20% E2 • Engineer and General Secretary: Placement with consent only, Minister: 20% E3 		<p>General Secretary: 10% Minister: 25% Prime minister: more than 25% E12.</p> <ul style="list-style-type: none"> • Minister of public works: no limits, while other ministers may have some limits .E17 		

Coding	Open coding		Grouping		Selected coding	
	Main category	Incidents	Sub-category	Incidents	Incidents	Themes
		<ul style="list-style-type: none"> • Engineer: 10%, General Secretary: 20%, Minister: 30% E4 • Engineer: 2% for additional works and 5% for cancelation , General Secretary: 5% for additional works and 10% for cancelation , Minister: 10% for additional works and 20% for cancelation E5 • Engineer: 5%, General Secretary: 15%, Minister: 20% E6 • Engineer: and General Secretary: 0%, Minister: 20% E7 • As it is now E8 • Engineer: 5%,and 10000 JD, General Secretary: 10% ,and 50000 JD, Minister: 15% ,and 500000 JD E9 • Engineer: 2%, General Secretary: 5%, Minister: 10% ,E10 • Engineer: 0%, General Secretary: 5%, Minister: 10%.E11. • In design causes: Engineer: 1%, General Secretary: 5%, Minister: 10% E12. but in client-needed causes : Engineer: 5% General Secretary: 10%, Minister: 25% , prime minister :more than 25% E12 • Engineer: It is assumed that the engineer does not have the authority to change, Secretary General: As it is now, Minister: All powers .E13 • Engineer: 5% ,General Secretary: 10%, Minister: 20%.E14 • Engineer: 5%, General Secretary: 10%, Minister: 15%.E15. • Engineer: 10% General Secretary: 15% Minister: 20%.E16. • these powers should not be equal between the Minister of Works (the highest authority in the construction sector), for example, and another minister or university president (not concerned with the construction sector).E17 				

Coding	Open coding		Grouping		Selected coding	
	Main category	Incidents	Sub-category	Incidents	Incidents	Themes
	Administrative side	<p><u>Q7: obtained</u></p> <ul style="list-style-type: none"> • If there is a separate directorate that is responsible for following up on variation orders and its work is automated, this will have a very positive impact E1 • If there is a separate directorate that is responsible for following up on variation orders and its work is automated, this will have a very positive impact E2 • this would not have a positive effect because it would face bureaucratic problems E3 • the following-up directorate is very important for quickly completing the variation orders E4 • I strongly support the existence of a separate directorate to follow up on variation orders E5 • I support the existence of a separate directorate to follow up on variation orders E6 • a positive effect if they work in an automated manner E7 • I disagree that there is a department specialized in variation orders E8 • This department will improve the process E9. • I am with the fact that there is a body competent with variation orders in every government agency working in this field E10. • The idea that there should be a body specialized in the variation orders is good, and it should be in each directorate as a sub-section E13. • The idea of having a variation orders unit is good and will add to the process E15 • I support having a separate unit to follow up on variation orders E16. • Against that there is a department specialized in variation orders, because this responsibility is the responsibility of the people currently working. E17 	<p>Suggested (unit/department) specialized in following up on variation orders</p>	<p><u>Q7: obtained</u></p> <ul style="list-style-type: none"> • If there is separate directorate that is responsible for following up on variation orders and its work is automated, this will have a very positive impact E1,E2,E4-E7,E9,E10,E13-E16 • If there is separate directorate that is responsible for following up on variation orders and its work is automated, this will NOT have a positive impact E3,E8,E12,E17 	<ul style="list-style-type: none"> • If there is separate directorate that is responsible for following up on variation orders and its work is automated, this will have a very positive impact E1,E2,E4-E7,E9,E10,E13-E16 	<ul style="list-style-type: none"> • suggested separate directorate that is responsible for following up on variation orders and its work is automated
			83			

4.7 Discussion

Through the analysis of the results of the interviews, it was found that there are some shortcomings in the process of making changes in construction projects in Jordan. These points came under the following aspects:

The first aspect: the pre-bid stage: This means the beginning of the basic idea of the project, in addition to the design and planning stage, reviewing and approving these designs before bidding for contractors.

Under this main aspect, the following sub-topics fall:

- Design review and approval
- Obstacles and service lines
- The time required to study and design the project

The second aspect: Reducing financial costs and time. The following sub-themes fall under this main aspect:

- How to reduce the financial cost.
- How to reduce time.

The third aspect: Satisfaction with the current legislation / the new government procurement system 2022

The fourth aspect: Satisfaction with the technical and contractual procedures for variation orders: This aspect includes measuring the level of workers in government agencies in the contractual and technical aspects related to variation orders, in addition to a proposed examination that there be a special bid to complete the work instead of the change being with the same original bid. This aspect also included the opinion of the interviewees on the involvement of the Audit Bureau in the committees of variation orders.

The fifth aspect: This aspect included the legislative aspect of the variation orders represented in the government procurement system, examining the weaknesses contained in it and trying to

bridge this defect through the comparison that were conducted for the systems surrounding Jordan (Saudi Arabia, Kuwait and the UAE). Perhaps the most important aspect of this aspect:

The maximum limit for variation orders (which do not exist in Jordanian legislation)

The role of the Council of Ministers in the approval process for changes

Suggested percentages of the powers competent to make the change

This aspect also included Article 12/3 of the Jordanian Contracting Contract Book and the measurement of experts' satisfaction with this article in its current state

The sixth and final aspect dealt with the administrative aspect in ministries and government institutions, which included a proposal to establish a unit/section, specialized in variation orders. Its work is to follow up the accuracy and compatibility of variation orders with legislation, in addition to ensuring the speed of issuing changes and avoiding unjustified delays and with a modern automated system.

What was extracted from this study was formulated and added to the existing framework to update and develop the process of change in projects in Jordan, some of the other findings fall under other recommendations for action or to amend legislation as shown in figure no 4.3:

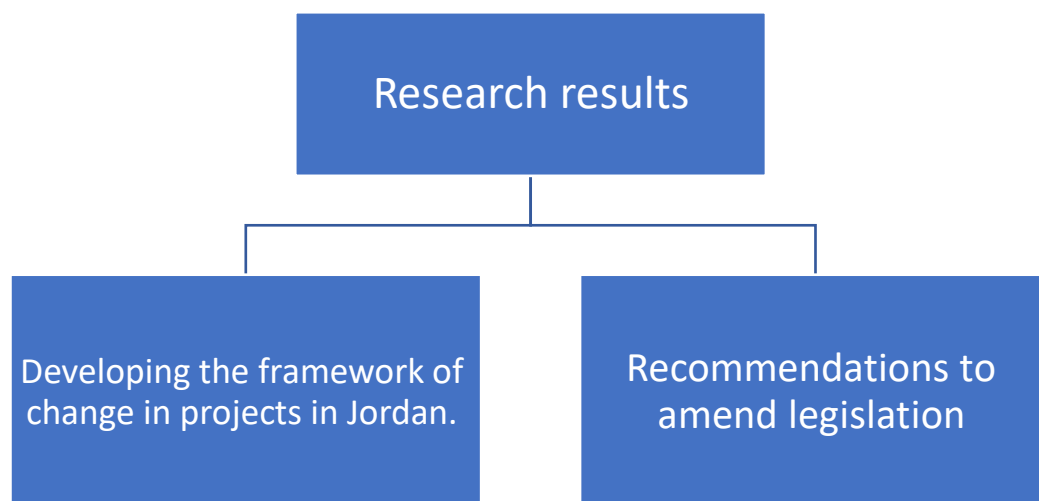


Figure 4.3: Usefulness of the Search Results

The most important modifications to the current framework that emerged as a result of this study can be summarized in the following table 4.6:

Table 4.6: The Most Important Modifications to the Current Framework

Comparison points		Current framework	Modified framework
Design review and approval		The tender for supervision and the tender for implementation is issued at the same stage	The supervision tender is presented before the execution bid. Among the tasks required of the supervision during this stage is to review the designs, modify them if necessary, and approve them before submitting the implementation bid.
The maximum limit for variation orders		No maximum limit for variation orders	An upper limit for variation orders has been set (20%)
The role of the Council of Ministers in the approval process for changes		There is a role for the Council of Ministers in the approval process for changes	The role of the Council of Ministers in the change process is to provide allocations and not as an approval authority
Variation administrative aspect		There is no unit/section specialized in variation orders, and there are no follow-up programs for this	A proposal to establish a unit/section specialized in variation orders. Its work is to follow up the accuracy and compatibility of variation orders with legislation, in addition to ensuring the speed of issuing changes and avoiding unjustified delays and with a modern automated system.
The percentages of powers to effect the change	The engineer	V.O < 5%, V.O < 10,000	5%
	The Secretary-General	15% > V.O > 5% 150,000 > V.O > 10,000	10%
	The minister	30% > V.O > 15% 500,000 > V.O > 150,000	20%
	The minister	100% > V.O > 30% V.O < 150,000	20%
	The minister	V.O < 10% V.O < 200,000 Council of Ministers is informed if its value exceeds (30,000) JD and the percentage is 5%.	20%
	The Council of Ministers	V.O > 10% V.O > 200,000	No power

4.6 Suggested a Framework to Control the Process of Issuing Variation Orders:

Figure (4.4) shows a proposed framework for the process of issuing a variation order within the project. The modifications made to the framework can be seen in red

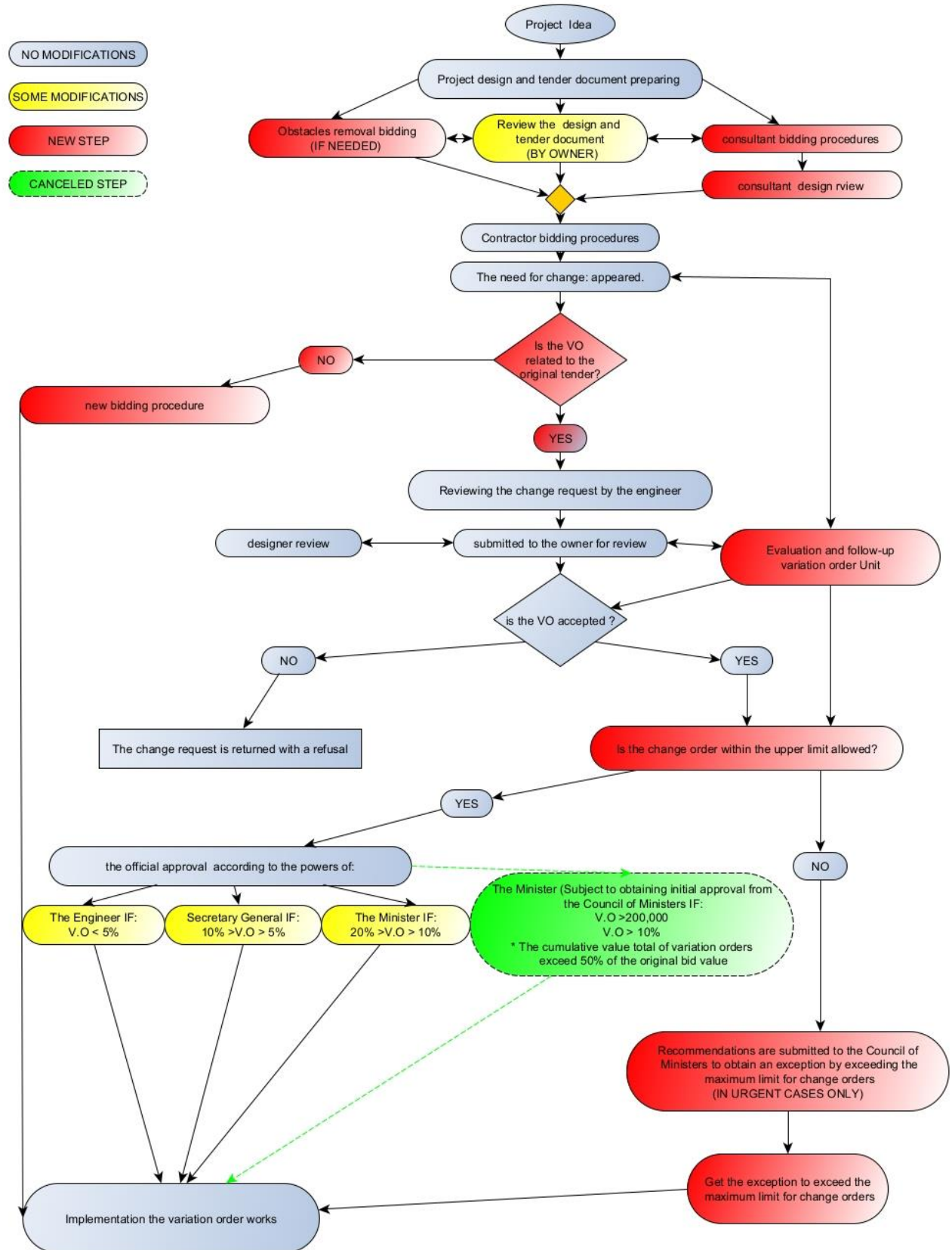


Figure 4.4: Proposed Framework for Variation Orders

The proposed framework aims to avoid postponing works or stopping some items that have undergone changes and not leaving them and compiling them for a final contract addendum, which needs a long period of time to prepare in addition to the time-varying cost of the project materials. Whereas the required change can be made to any item of the original contract, when necessary, at the time correcting errors, deficiencies and emerging requirements of the owner as the project implementation time progresses, which reduces costs and time required to complete the project's work.

Perhaps one of the most prominent content of this framework is also making the supervision bid before the implementation bid for a certain period. The aim is to review the designs before submitting the contractor's bid. This process has a great impact in discovering any deficiency or defect in the designs before starting the bid.

The framework also included a proposal to amend the powers to approve the issuance of variation orders, in addition to higher limits for changes, which are considered an important factor in stopping the material depletion of financial resources and as a precursor to time and in order to achieve integrity, justice and equal opportunities.

This framework also included the existence of a unit/section to follow up on variation orders, which aims to ensure the speedy completion of variation orders and with high efficiency and according to legislation and regulations.

4.7 Verification of the Proposed Framework:

After presenting the framework to a group of specialists with experience in contracts, project implementation and supervision, who are managers, supervisors and students of public sector projects in the Ministry of Public Works and Housing, it was found that they accepted the proposed scheme with some observations they made, which were as follows:

- 1- That the framework is not valid for private sector projects where changes can be implemented quickly without administrative hurdles.

- 2- For public projects, prior approvals must be obtained before starting implementation, which requires a long time.
- 3- Some felt that the procedural process for the changes was long and required time to be implemented.
- 4- Some logical adjustments in relationships were modified after discussions and validated.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

In the variation orders, there is no "optimal solution", but we always try to get as close to the "optimal" as possible. Therefore, this study concluded to identify the most important shortcomings in the process of variation orders and try to develop solutions for these aspects. Variation orders are necessary and indispensable, but they have many negative effects represented in time, cost and lack of competition

The most important conclusions included the following:

1. Amending the legislation related to variation orders so that it sets an upper limit for variation orders (additions or cancellations) so that it does not exceed 20% and not leave the door open to high and illogical values of these variation orders.
2. Reviewing the powers granted to the government procurement system, and amending them to include (the engineer, the secretary general, and the minister) and amending the powers of the Council of Ministers so that they become only for emergency exceptions to the upper limits.
3. Creation of a department/unit in each governmental entity concerned with projects to follow up on the procedures of variation orders and ensure their accuracy and completion on time. The work of this unit/section is preferably within modern electronic software.
4. The supervision bid should be before the implementation bid, and one of his duties should be to review the designs and plans before submitting the implementation bid. This will contribute to reducing changes significantly.
5. Ensure that no additional work is approved in the event that the financial allocations are not allocated to it to avoid a funding gap, and activate the role of the supervisory authorities to prevent any abuses in that.

6. Reviewing designs and contract documents by the competent authorities to review, review and amend these designs and documents before bidding procedures in order to avoid changes.

5.2 RECOMMENDATIONS:

The most important recommendations can be summarized below:

1. A review of the Government Procurement System to remedy the flaw in the legal texts and the conflict between other laws. For example, the engineering services bids should be separated from the business bids, and the engineer (who works as a consulting company within the services bid) should not issue a variation order in his favor!
2. In the event that the scope of the project contains existing services that need to be removed, or there are obstacles in this scope, it is better to submit a separate bid to remove these services before starting the original bid, as this will have a good impact on financial costs and time.
3. In the event that the variation order is not related to the project, it is better to make (completion bids) instead of giving the changes to the contractor himself.
4. Activating Article (8) of the instructions for variation orders for works and technical services issued in accordance with the government procurement system by holding the designer legal and contractual responsibility for any costs and/or any damage incurred by the employer in the event that the variation order was found to be the result of an error or negligence in it.
5. The necessity of coordinating the projects of the various government units and exchanging information among them to reduce conflict between their projects

6. Good coordination between all parties to the study of the project from all disciplines (civil - architecture - electricity - mechanics) to avoid contradictions in plans and specifications as much as possible.
7. Attention must be taken to the design and planning phase of the project by accurately defining the owner's requirements to avoid modification during the implementation phase which leads to increased project cost and delays, in addition to the inconsistencies that may arise due to the result of these additional works.
8. The participation of the project designer with the executive cadres in the ministries concerned with the implementation of the works so that he has a better understanding of the justifications for this design and the amendment of any designs that are not feasible.

5.3 FUTURE RESEARCHES

During the stages of this research, the researcher noticed many doctrinal and procedural topics in the variation orders in Jordan, which were not researched, or that the research published in this field does not rise to the great importance of these topics. Accordingly, the researcher recommends that future research explore these areas:

- One of the proposed future studies is to examine the proposed framework of this study by means of a questionnaire and to indicate its effectiveness on project workers Contracting contract book in Jordan and FIDIC 2017, the new and the importance of keeping pace with global modernization developments in the field of construction contracts.
- Value engineering and its impact on variation orders
- Uses of other types of construction contracts in government projects
- Legal relations between service owners in Jordan and road owners

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APPENICES

Appendix 1

Information sheet for conducting interview with experts

The title of the research

Developing a Framework for Managing Variation Orders in Governmental Projects in Jordan

Researcher

Waseem Al-adwan,

0797016840

Waseemal3dwan@yahoo.com

Dear sir / madam

I am undertaking MSc research in Isra'a University, which aims to compare between the Jordanian approach in variation orders and other regional approaches. Semi-structured interview questions are used.

It is entirely up to you to decide whether to take part of this research or not, if you agree to take part of this research, you give me permission to use the information you provided for the research purposes only. The interview will be tab-recorded; however, that is up to you. in addition , the information provided you can keep , and your participation is voluntary, and you are free to withdraw at any time without giving any reason ,up until the point of write-up/submission .if you would like to participate, please use the attached consent form to inform me that you are agree to take part in this research.

Thank you very much for taking time to read the information, and please do not hesitate to contact me if you require further information.

Appendix 2

Agree to conduct a research interview

I volunteer to take place in a research project conducted by Eng. Waseem Al-adwan from Isra'a University. I understand that the research is about variation orders in Jordan. I will be one of approximately 20 people being interviewed for this research.

- My participation in this project is voluntary. I understand that I will not be paid for my participation. I may withdraw and discontinue participation at any time without penalty. If I decline to participate or withdraw from the study, no one will be told.
- I understand that most interviewees will find the discussion interesting and thought-provoking. If, however, I feel uncomfortable in any way during the interview session, I have the right to decline to answer any question or to end the interview.
- The interview will last approximately 30-45 minutes. Notes will be written during the interview. An audio tape of the interview and subsequent dialogue will be making.
- I understand that the researcher will not identify me by name in any reports using information obtained from this interview, and that my confidentiality as a participant in this study will remain secure.
- I have read and understand the explanation provided to me. I have had all my questions answered to my satisfaction, and I voluntarily agree to participate in this study.

Appendix 3

Interview questions

- 1- Do you think that the procedures that are currently being dealt with the variation orders are correct and sound? If the answer is no what are the shortcomings of it?
- 2- How can the value of the variation orders be reduced, the time period required to issue the variation orders in order to avoid delaying projects in government projects?
- 3- Who do you think is better to deal with variation orders, the canceled Government Works System (1986) or the new Government Procurement System (2019)? And why?
- 4- Since changes are the most important cause of disputes, which lead to the treasury incurring large sums of money annually, what is better to make an appendix to the same contract with the same contractor executing the bid, or to submit a new bid to complete the work?
- 5- Do you think that if the design bid is merged into a bid (design + supervision) it is better than having two separate bids? Or that the supervision bid be presented before the contractor's bid, and that reviewing the designs before submitting the contractor's bid is one of the responsibilities of supervision?
- 6- Do you think that if a representative from the supervisory authorities (the Audit Bureau) were included in the committees for variation orders, this would have a positive addition to the process of issuing variation orders?
- 7- Do you think that employees in the government sector are skilled in dealing with variation orders? And if the answer is no, what is the solution to avoid the effects of this on the projects? And if there are ministries that have several projects (a unit/department) specialized in following up on variation orders, does this have a positive impact on this process?
- 8- Do you think that the absence of an upper limit for variation orders (additional works) and the absence of an upper limit for cancellations of items or the total value of the project (value or percentage) is a reason for the high financial consequences resulting from that in the projects?

What do you think if there is an upper limit, what is the suggested percentage for additions and cancellations?

9- Do you think it is right to involve the Council of Ministers with the powers to approve variation orders? Or is it better that its powers consist of exceptions when the percentage specified in the previous two questions is exceeded?

10- What do you think of the contractor's right to adjust the price according to item (12/3) of the standard contract book if the quantities exceed 25% for the item and the total change is multiplied by the unit price is 2% and if the total difference directly affected the change in the unit cost of this item 1. %

11- In the event that an amendment is proposed to the value/percentage of the powers granted to the relevant authorities, what is the proposed ratio/value for each of:-

A- The engineer:

B- Secretary General:

C- Minister:

تطوير إطار عمل لإدارة أوامر التغيير في المشاريع الحكومية في الأردن

أعدت من قبل

وسيم اسماعيل العدوان

أشرف عليها

د. معاوية احمد النصور

الملخص

أوامر التغيير هي ظاهرة شائعة ومتكررة في المشاريع الحكومية في جميع البلدان في جميع أنحاء العالم. في أوامر التغيير ، لا يوجد "حل أمثل" ، لكن اصحاب العمل دائماً يحاولون الاقتراب من "المثالية" قدر الإمكان. درست معظم الدراسات السابقة في مجال أوامر التغيير في الأردن الأسباب المؤدية إلى هذه التغييرات و / أو آثار هذه التغييرات ، وهناك نقص في المقارنة بين الأردن والدول الأخرى الأكثر تطوراً في هذا المجال.

يهدف البحث إلى وضع إطار عمل يحد من التغييرات وقيمها العالية ويقلل الوقت اللازم لإنجاز المشاريع ، وكذلك تقديم مقترحات لتعديل التشريعات المنظمة أو تقليل التضارب بين القوانين لتنظيم تنفيذ هذه التغييرات. ولتحقيق أهداف البحث تم استخدام نوع بحث مختلط (نوعي وكمي) ، تم استخدام النوع الكمي للبيانات المجمعة من البيانات الأرشيفية من وزارة الأشغال العامة - والتي تمثل الجهة المنفذة لمعظم المشاريع الحكومية في مختلف المجالات. في حين تم استخدام البحث النوعي للمقارنة بين التشريعات والتشريعات الأردنية في الدول المجاورة (المملكة العربية السعودية ، الكويت ، وقانون دبي) وبيان الفجوة في التشريعات الأردنية ، ثم صياغة أسئلة المقابلة وإجراء المقابلات مع الخبراء في هذا المجال (مجال البناء والقانون) ، والذي يشمل معظم الأطراف ذات الصلة بالاختلاف في محاولة لتعديل الإطار الحالي وتقديم مقترح لتعديل اللوائح الخاصة بأوامر التغيير. يمكن أن يساهم هذا الإطار في تجنب التغييرات أو كيفية حلها أو تقليل آثارها في مجال المشاريع الإنشائية.

ميزة اطار العمل المقترح هي أن أي مشروع يجب أن يخضع لمراجعة أولية قبل بدء عطاء التنفيذ. يجب مراجعة التصميمات والتأكد من توافقها مع الواقع والبعد عن العمل الغامض وغير المنطقي. بالإضافة إلى التأكد من أن المخصصات متوفرة لكل مشروع ضمن ميزانية الدائرة المختصة.

يحدد الإطار المعدل عمل التغييرات ويضع حداً أعلى لهذه التغييرات خلافاً لما هو ساري المفعول حالياً سواءاً بالاضافة او الالغاء، بالإضافة إلى أن هذا الإطار يتضمن أفضل طريقة إجرائية للتعامل مع التغييرات وإدارتها خلال مرحلة تنفيذها في من أجل التحكم في القيم الهائلة لأوامر التغيير وتقليل التأخيرات في هذه

المشاريع. بالإضافة إلى دراسة الاحتياجات الفعلية للمالك قبل تقديم العطاء ومراجعة التصاميم قبل تقديم عطاء المقاول ، بالإضافة إلى ذلك ، تم اقتراح إنشاء وحدة مختصة بأوامر التغيير في كل جهة حكومية معنية بالعطاءات لمتابعة التغييرات وإجرائاتها ضمن برامجه الآلية.

يجب مراعاة بعض التعديلات على اللوائح الحالية لإزالة التناقضات القائمة ، مثل دور رئيس الوزراء ، وكذلك مراجعة دور السلطة المختصة في الموافقة على التغييرات ، ومراجعة سلطة المهندس لإصدار أمر التغيير إلى تقديم خدمات هندسية (لنفسه).