

T.C.
İSTANBUL AYDIN ÜNİVERSİTESİ
INSTITUTE OF SOCIAL SCIENCES



**PROJECT MANAGEMENT: INVESTIGATION ON CAUSES OF DELAY IN
CONSTRUCTION PROJECTS IN BENGHAZI MUNICIPALITY - LIBYA**

THESIS

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Department of Business Administration
Business Administration Program

Thesis Advisor: Prof. Dr. Akin MARŞAP

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DECLARATION

To my lovely father and mother, may allah bless their souls, to my brother, sisters, friends and those who have always give me the greatest support and inspiration, to the peace, love and beauty in this world. I dedicate this research.

Zuhir BUSNEINA



FOREWORD

At the beginning of this research, thanks to Allah Almighty for giving me the courage and power to accomplish this research.

I am pleased to express my thanks and deep gratitude to all those who assisted me in accomplishing this thesis and special thanks to my supervisor Prof. Dr. Akin Marsap, who honored me with his encouragement, guidance and valuable advice throughout the preparation of the thesis.

I would like to thank Istanbul Aydin University, the College of Graduate Studies and Scientific Research, the administration and teaching staff, and especially the professors of the Department of Business Administration for their help and hard work in the course of my career in the field of education.

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As I am at the last stages of getting my degree, I would not forget my professors, doctors and the teaching staff at the Department of Civil Engineering in Benghazi University. For all of them I extend my deepest appreciation and gratitude.

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September 2018

Zuhir Busneina

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ABBREVIATIONS

BM	: Benghazi Municipality.
PMI	: Project Management Institution..
FIDIC	: International Federation of Consulting Engineers.
FI	: Frequency Index.
SI	: Severity Index.
II	: Importance Index.
CI	: Construction Industry.

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PROJECT MANAGEMENT: INVESTIGATION ON CAUSES OF DELAY IN CONSTRUCTION PROJECTS IN BENGHAZI MUNICIPALITY - LIBYA

ABSTRACT

Benghazi Municipality has a problem in finishing the construction projects in due time which has a negative impact on the success of these projects such as, exceeding the time limit, increasing the cost estimates. These negative effects reflect themselves on the different spheres of life and the whole society in general. It is important to investigate this phenomenon in the period between 2013-2017 through studying the causes behind it.

This research aimed to investigate the main causes of delay in the completion of construction projects in Benghazi Municipality in Libya, and to identify the average of time overrun. It also analyzed and ranked the most important causes of delay according to their FI, SI and the importance index II from the point of view of contractors and consultants.

The method used for the analysis was mixed method research design (quantitative & qualitative) as a research approach for this research, while the interview tool and case study were selected to collect qualitative data and a questionnaire tool has been designed to collect the quantitative data. The field survey of a questionnaire contained 69 possible causes for the delay categorized into four major groups. The questionnaire was distributed to the sample of the study that included 54 participants, which is at the same time the population. The population included 36 contractors and 18 consultants which represents two main parties in construction projects, and the interview tool was selected to study one case with a project exposed to time and cost overrun.

The research showed delay in many construction projects conducted for BM during the period between 2013-2017, where there was a delay in 54 projects out of 104, and this represent 51.9% of the projects. Moreover, the study indicated that the average of time overrun is between (10% and 30%) of the original time of the projects. The study also showed that 41.7% of the respondents believe that the main reason of the delay is the contractor. However, the results concluded that the following are the top five delay causes arranged according to the II:

- The delay in paying the financial dues to contractors by the client.
- Award project to lowest bid price (the contractor who has the lowest bid).
- The delay in due payments to the suppliers by contractor.
- Difficulties in financing the project by the contractor.
- Dispute with neighbors.

Keywords: *Frequency Index (FI), Severity Index (SI), Importance Index (II), Benghazi Municipality (BM), causes of delay, construction projects, Libya*

PROJE YÖNETİMİ: LİBYA-BENGAZİ BELEDİYESİNDE İNŞAAT İŞLEMLERİNİN GECİKMESİNİN SEBEPLERİ HAKKINDA SORUŞTURMA

ÖZET

Bingazi Belediyesi, inşaat projelerini zamanında bitirme konusunda bir sorun yaşamakta, bu da zaman sınırını aşmak, maliyet tahminlerini arttırmak gibi bu projelerin başarısını olumsuz yönde etkilemektedir. Bu olumsuz etkiler, kendilerini hayatın farklı alanlarında ve genel olarak tüm toplumda yansıtır. 2013-2017 yılları arasındaki bu fenomenin arkasındaki sebepleri inceleyerek incelenmesi önemlidir.

Bu araştırmada, Libya'daki Bingazi Belediyesi'nde inşaat projelerinin tamamlanmasında yaşanan gecikmelerin başlıca nedenleri araştırılmış ve zaman aşımının ortalaması tespit edilmiştir. Ayrıca, yüklenicilerin ve danışmanların bakış açısından FI, SI ve önem indeksi II'ye göre en önemli gecikme nedenlerini analiz etmiş ve sıralamıştır.

Analiz için kullanılan yöntem, bu araştırma için bir araştırma yaklaşımı olarak karma yöntem araştırma tasarımı (nicel ve nitel) iken, nicel veri toplamak için görüşme aracı ve vaka çalışması seçilmiş ve nicel verileri toplamak için bir anket aracı tasarlanmıştır. Bir anketin alan araştırması, dört ana gruba ayrılan gecikmenin 69 olası sebebini içermiştir. Anket, aynı örneklem grubundaki 54 katılımcıyı kapsayan çalışmanın örneklemine dağıtılmıştır. Temsil ettiği nüfus 36 müteahhitleri ve 18 danışman dahil İnşaat projelerinde iki ana taraf ve BM'de 3 bölüm inşaat departmanı ile yapılan görüşme aracı, aynı zamanda zaman ve maliyet aşımına maruz kalan proje ile bir vaka çalışması üzerinde çalışmaktadır.

Araştırma, 2013-2017 yılları arasında BM için yapılan pek çok inşaat projesinde gecikme olduğunu, 104 projeden 54 projede gecikme olduğunu ve projelerin %51,9'unu temsil ettiğini gösterdi. Dahası, çalışma, zaman aşımının, projelerin orijinal zamanının (%10 ila %30) arasında olduğunu göstermiştir. Çalışma ayrıca, katılımcıların %41,7'sinin, gecikmenin asıl nedeninin yüklenici olduğunu düşündüklerini göstermiştir. Ancak, sonuçlar, aşağıdakilerin II'ye göre düzenlenmiş olan ilk beş gecikme nedeni olduğuna karar vermiştir:

- Finansal borçları müşteri tarafından yüklenicilere ödemekte gecikme.
- En düşük teklif fiyatına Ödülü projesi (en düşük teklifi vardır yüklenicinin seçilmesi).
- Yüklenici tarafından tedarikçi nedeniyle ödemelerde gecikme.
- Yüklenici tarafından proje finansmanında zorluklar.
- Komşuları ile uyumsuzluk.

Anahtar Kelimeler: *Frekans Endeksi (FI), Şiddeti Endeksi (SI), Önemi Endeksi (II) Bingazi Belediyesi (BM), Gecikme Nedenleri, İnşaat Projeleri, Libya.*

1. INTRODUCTION

1.1 Introduction of the Study

For centuries, the construction industry has been an important factor in the economic field in all countries, it is one of the main sections that afford important elements for the growth of the economy.

The construction industry (CI) in Libya gives less to the nation's economy than other services or manufacturing industries. Formally, the CI represents 5.2% of the Libyan gross domestic product (GDP) (Ngab, 2010:201). The success of the construction project requires completion within the specified time and cost, and to achieve the appropriate quality (Burke, 1999:1).

According to Assaf & Al-Hejji (2006:349-350) The construction projects are subject to many fluctuations, variations and unpredictable factors which resulting from the performance of the parties involved in the project like esources availability, environmental conditions, contractual relationships, and other factors affecting the project, which causes delay in project completion and failure to complete on time.

Cost and time overruns in construction projects are a common global phenomenon in all countries and it is is one of the most common problems in the construction sector which effect negatively on project accomplishment in terms of time, cost, quality and safety moreover, it has negative impacts on project parties (owner, contractor, consultant) in terms of aggression between the parties, mistrust and the existence of courts and advocates (Ahmed et al., 2003:2).

Through the study of Tumi et al. (2009), which conducted in Libya to study the causes of delays in construction projects, it showed that the cause of delay is a common phenomenon in the construction projects in Libya. Hence, this study is an attempt to identify the main causes behind cost and time overruns, which leads to delays in the completion of construction projects in Benghazi city to avoid, control and reduce these causes in the future.

1.2 Problem of the Statement

In Libya, construction projects suffer from delays in completion within the specified time, therefore the researcher visited the city of Benghazi to discover the presence of delay problem in the completion of construction projects and found that the city of Benghazi is facing time and cost overruns in construction projects.

Delays has many reasons and has adverse effects on projects In terms of increasing time, costs and low quality of the project, these undesirable effects are reflected on the aspects of the society as a whole, which calls for the study of this problem by identifying the main reasons of the delay in completion of the construction projects implemented in Benghazi city by identifying the time span of these delays, depending on the frequency of occurrence and degree of severity and evidence of the importance of these causes from the perspective of both parties of the project (contractor and consultant).

1.3 The Significance of the Research

The importance of the research to the city of Benghazi is by seeing the results and recommendations of this study and to know the most significant causes for the delay in the completion of construction projects to bring these reasons trying to reduce them in the primary stages of the project life cycle or through the implementation phase, to complete the projects within the specified cost and time.

The construction projects implemented in the city of Benghazi contribute to the growth of the economy and affect aspects of life of the citizens, delays in these projects will reflect negatively on the local community, reducing the loss of community opportunities to take advantage of these projects services.

The importance of research to the two parts of the construction project (contractor and consultant) is to see the main reasons for the delay which causes by them and fall under their responsibilities, thus to avoid these reasons and try to alleviate them during the implementation phase, which reduces the incidence of disputes between the two parts of the project or any fines, excesses of costs, entitlements or any other problems caused by the delays.

1.4 Research Objectives

This research designed to identify the main causes of delay in the execution of construction projects in Benghazi City in Libya, and to find the average of time and cost overrun. The intentions of this research are:

- To identify the main causes of delays and cost overruns in construction project in the city of Benghazi, Libya.
- To identify the effects of cost and time overruns in construction project.
- To identify the greatest party responsible for the occurrence of delays in construction projects.
- To recommend approaches for improving project finishing based on the findings of the study.

1.5 Research Question

This research searching to answers the following questions:

- What are the causes of delay in the construction projects implemented in the Municipality of Benghazi depending on previous studies and parties related to construction projects?
- The five main causes of delay and in the completion of construction projects implemented in the Municipality of Benghazi depending on the frequency of occurrence , degree of severity and importance?
- Who is the greatest party responsible for the delay in construction projects implemented in the Municipality of Benghazi?
- How long does it take for delays in construction projects to be implemented?
- What are the most significant causes of delay in construction projects that executed in the period between 2013 to 2017 according to the head of the department?

1.6 Scope of the Research

This research conducted in the city of Benghazi in Libya, the study will focus humanly on both sides of the project (contractors and consultants), who participated in the execution of construction projects which had a delay in the Municipality of Benghazi.

This research was to identify the causes of delays in finalizing projects in the city of Benghazi, which was limited to this study on the construction projects implemented in which a delay occurred.

1.7 Research Structure

The current research contains five chapters as follows:

Chapter 1: contains the general framework of the study, which consists of: introduction, problem, importance, objectives, questions, scope, the structure of the study and procedural definitions.

Chapter 2: The literary review of the current study, including the Previous studies.

Chapter 3: Contains the methodology of the study and its procedures included: the design of the study, and population of the study, data collection sources, study tools, statistical methods used and constraints that the researcher encountered.

Chapter 4: Presenting the results of the study, which answer the questions of the study and discuss them.

Chapter 5: Present the summary and findings of the study results and recommendations of those results.

1.8 Definition of the Key Terms

- Delay

Delays are defined as exceeding the time specified to complete the project, whether the owner allows the time to be extended or not allowed or the delay will result in a penalty or a fine (Trauner, 2009:25).

- Project

A temporary activity that is initiated to create a product, service, or result, that has a specific beginning and end, which is accomplished when project objectives

are met or when the project is stopped because goals cannot be achieved (PMI, 2013:3).

- Construction projects

The construction project is an idea by the owner, planned by the designers, and produced by the contractor, where the contractor implements it as required to the owner (Chitkara, 2014:8).

- Contractor

A person or firm that starts a contract to afford labor or materials to perform a service (PCU, 1994:14).

- Owner

A person or firm that is responsible for implementing the listed project within its budget and plans (FIDIC 2017:1).

- Consulting engineering

Is the party whose responsible for the project designs and supervising the contractor's work and to ensure that the project is implemented according to the contract (FIDIC 2017:1).

2. LITERATURE REVIEW AND THE PREVIOUS STUDIES

The second chapter reviews the research literature related to the subject of the research through reading books, articles and scientific researches in the Libyan, Turkish and international universities libraries which found on the internet.

This section includes two sections; the first topic provides the theoretical part of the study, the second topic provides the previous local and international studies, which are relevant to the subject of the study.

2.1 Literature Review

The main objective of this chapter is to identify the concept of project management and the project characteristics, objectives, life cycle, types, and construction industry, and to identify the concept and types of delays and its relationship with cost overruns and its causes.

2.1.1 Introduction

Construction delays are important issues in the construction sector, where the construction sector contributes to Libya's national economy, thus the construction industry must be dynamic to be able to react to the variations that faces the world continuously from social and economic challenges which requires the use of project management successfully and effectively, the progress of any enterprise determined on how well project management is implemented at the specified time and cost while maintaining the quality required.

2.1.2 Project management

2.1.2.1 The definition of project

The project is an arranged problem, and the problem means it is in a positive and negative ways. For example creating a new product is a problem from a positive point while a project environmental problem is a kind of negative type (Heagney 2012 :2).

According to (PMI 2013:3) The project is a short-term activity that is initiated to make a product, service or result, with a specific beginning and end, where the end is accomplished when the project goals are met or when the project is stopped because the goals can not be achieved or when the project is no longer exist.

The project is also defined as an organized human activity that aims to accomplish a precise objective within a limited period of time, which has its start and end, using the various resources of workers, technical supplies, energy, raw materials, financial resources, data and necessary information to the finish the project.

Meredith and Mantel (2009:9-11) made a distinction between the following terms Project, Programs, Task, and Work Packages, where the program point to a very large and long-term goal that is split into a group of projects which are fragmented into tasks that are divided into workflows composed by work units.

In another context, the project is a definite task to be achieved, whether at a great or small level or short or long term where that's not appropriate, but the appropriate is that the project can be realized as one item. What distinguish the characteristics of a projects are the clarity of purpose, life cycle, interventions, uniqueness and conflict.

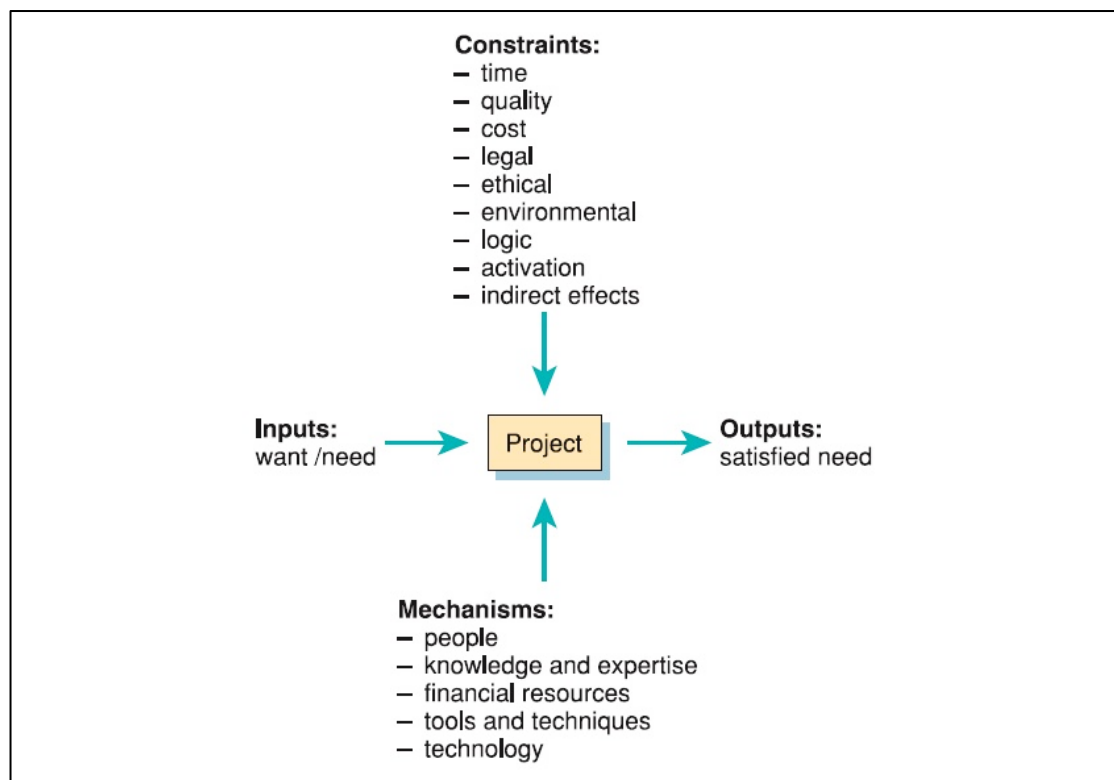


Figure 2. 1: The ICOM Model (Maylor, 2010:30).

The concept of the project under the ICOM model is the process of converting certain types of inputs into specific outputs under a set of constraints using different mechanisms to complete and finish the project, as shown in Figure (2.1).

2.1.2.2 The definition of project management

Is the function that includes responsibility for determining objectives, organizing, planning, controlling, scheduling, budgeting, and monitoring to achieve technical, temporal and financial criteria for the project.

Project management is defined as the administrative process that takes advantage of all the available resources to complete the project efficiently and effectively, at a the specific cost and time (Heagney 2012:4-5).

2.1.2.3 Characteristics of the project

Each project has features that distinguish it from the rest of the activities inside the enterprise and the most significant of these features as demonstrated by delay and cost overruns as follows:

- **Importance**

The most important feature that characterized the project is the adequate attention by the senior management. In order to establish a exceptional managerial unit outside the organization's structure, and the lack of attention of senior management leads the Project to failure.

- **Purpose**

The project has a specific activity occurs only once to achieve the desired final results, one of the complex characteristics of a project requires fragmentation of the project into partial tasks that must be implemented.

- **Life Cycle**

The project is like an organic entity with a life cycle that starts slowly and progresses to its structural size, and accelerates to reach the peak and then begin to decline to finish with the completion of the project, Projects usually resist termination.

- **Interdependencies**

There is usually overlap between projects which implement by the parental organization at the same time, also there is an overlap with the functional

divisions of the Organization such as marketing, finance, manufacturing, etc., and the project manager must have a clear picture of these overlaps at each stage of the project to prevent conflict and crisis.

- **Uniqueness**

Each project has its elements, which is unique from other projects, there are no construction projects or research and development projects that are quite similar, most of the construction projects are more routine than research and development projects, in addition to the existence of risk, projects naturally cannot be reduced to become purely routine, so there is flexibility in dealing with reality because there are many exceptions.

- **Conflict**

The project manager lives in a world characterized by conflict more than the rest of the managers, Projects compete between departments for resources and individuals, also within multi-project organizations the project conflicts with the rest of the projects on the distribution of resources of the organization, conflict arises as a result of multilateralism which interested in the project Such as (project team, parent organization, suppliers, financiers, etc.).

- **Resources**

What distinguishes projects is that they have limited budgets both for individuals and for material or informational resources, which is the focus of conflict between departments and sections.

2.1.2.4 The main objectives of the project

Any project has basic objectives that must be achieved based on the requirements of the client or customer and to accomplish balance between them, there are those who call it restrictions which is based on the three objectives identified on each of the three axes, as shown in Figure (2.2).

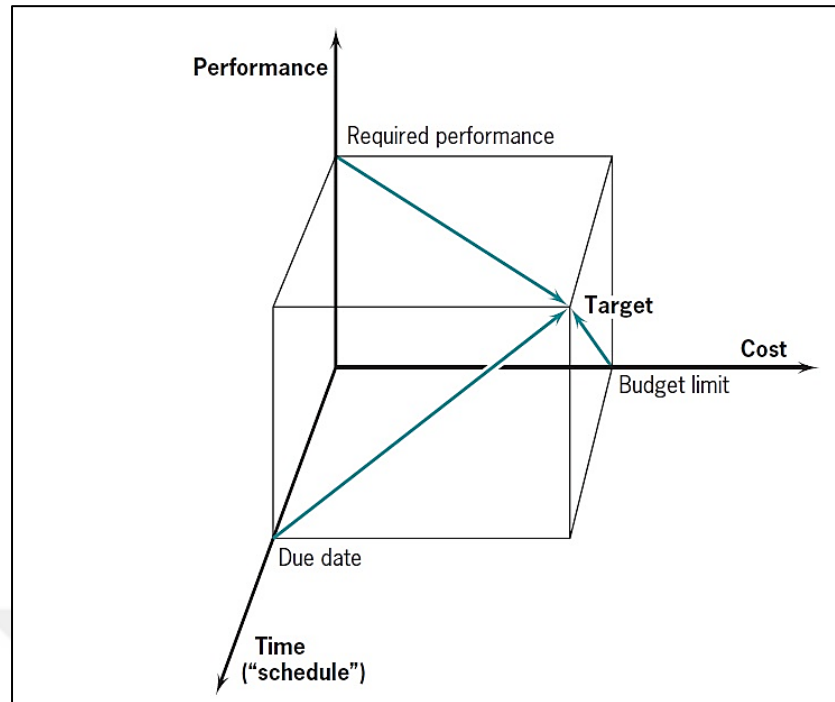


Figure 2. 2: Direct Project Goals (Meredith, 2010:4).

some have replaced Performance with Scope like Mantel (2001:7), the researcher will explain the concept of each project objective based on Heravi (2014) and Fewings

(2005) which replaced Performance with quality as follows:

- Time
All projects are limited by a specific period of time to complete the project, Finishing the project on time is a huge challenge to project management and a key criterion for project success by the owner, contractor and consultant (Bowen et al. 2002:48).
- Cost
Financial resources are key to the sustainability of project implementation, Bowen et al. (2002:48-49) noted that the owner considers that the lower the cost of the project, the higher the profit. Hence, many owners evaluate and select offers based on the price provided by the contractor.
- Quality
quality is the approved criteria for acceptance of the final product or project and its implementation stages and identically to the required specifications.

2.1.2.5 The relationship between project objectives

There are strong relationships between project objectives (time, cost, quality) during project implementation as the expansion or reduction in one of the objectives affects the other party, thus any change occurs on one element, the other element is probably to be affected by that change. For example, if the time period and the timetable needed to complete the project are reduced, it will require additional costs and raises the budget to accomplish the project in shorter time, if there is no capability to rise the budget, the scope or quality may be decrease to deliver the same product or project in shorter time with the same budget. There are risks arising as a result of changes in project requirements, the project crew must be able to calculate the condition and to balance the requirements in order to make the project success (PMI 2013:5-6).

The cost of changes and error correction decreases when the project starts and increases as the project ends and closes. Correspondingly, the risks and uncertainties which comes to the investors reach their highest levels at the start of the project and these factors reduces throughout the lifetime of the project until it reaches the bottom level once the project finishes. Figure (2.3) illustrates this relationship:

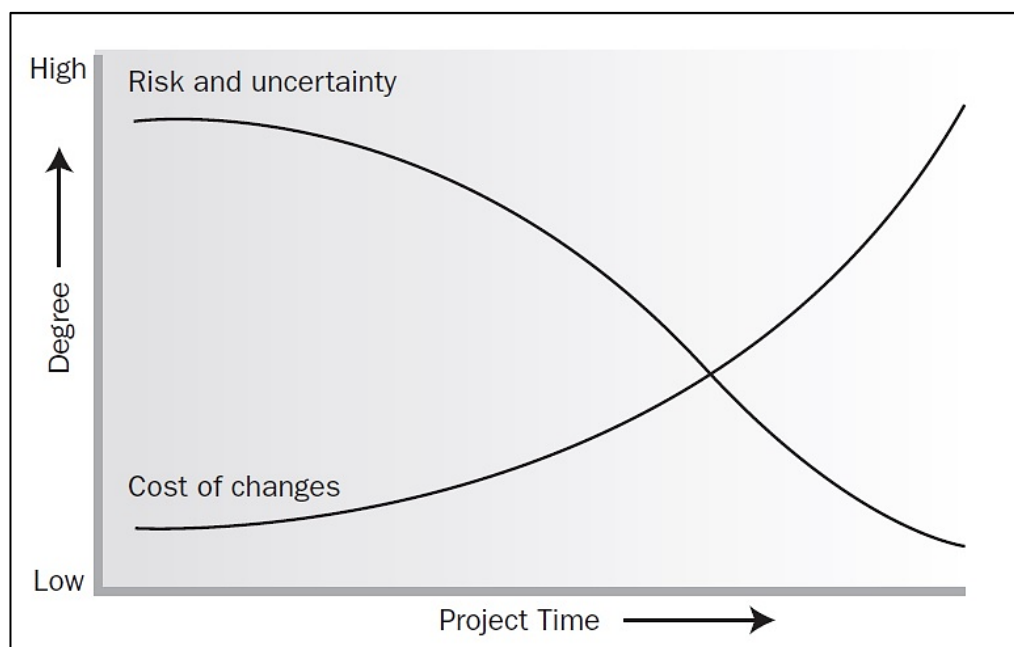


Figure 2. 3: Variable Effects During Project Time (PMI 2013:40).

2.1.2.6 Project life cycle

Most of the projects passes through different phases of development throughout their lifetime, and these phases are usually sequential and sometimes done simultaneously.

These phases are called the project life cycle, moreover no standard life cycle suits all projects every project is different from one to another. The quantity of these phases throughout the life cycle of the project depends on the nature and scope of project implementation besides the management or organization that participate in the project.

The unique aspects of the industrial or traditional organization used in the project can determine the life cycle of the project, the project has a definite beginning point and a definite endpoint and some specific activities that occur among these two points that are related to the project (PMI 2013: 38).

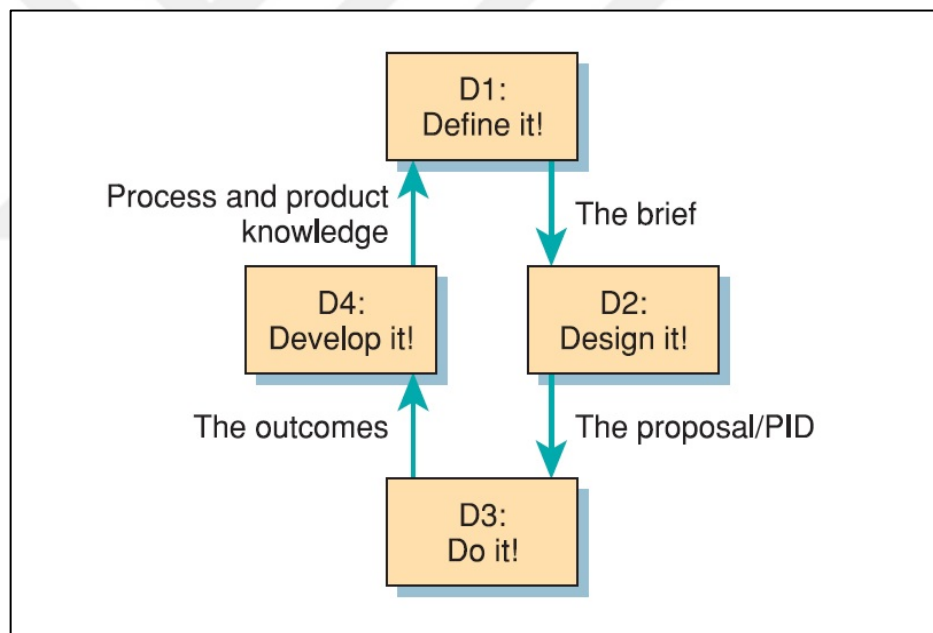


Figure 2. 4: Four phases of project lifecycle (Maylor 2010:32).

The phases of the project life cycle are four phases as mentioned by (PMI 2013) as follows:

- Starting the project.
- Organizing and planning.
- Implementing the project works.
- Finishing the project.

Figure 2.4 shows the four phases of the project life cycle as indicated by (Maylor 2010)

2.1.2.7 Factors affecting project implementation

A number of factors as noted by Al-Fadl and Al-Abidi (2005:33-37) that affects the project environment, as follows:

- External factors

The elements that affect the environment and perimeter of the project, also affect the phases of its implementation, and contains:

- Political Factors: battles, coups, fights and political situation.
- Economic Factors: such as recession, economic affluence and inflation.
- Social Factors: traditions, and desires towards the scheduled projects.
- Geographical Factors: such as environment or climate conditions.

- Internal factors

are the factors that emanate from inside the organization that implements the project or from within the project itself, and contains:

- Organizational factors: centralization and decentralization of authorities, duties, organizational culture and organizational performance, leadership, administration, extension and organizational contraction.
- Human factors: employee skill, certified and practical experiences.
- Technological factors: such as modern technologies used by the organization which implementing the project.
- Financial factors: such as financial resources used to fund the project.

2.1.2.8 Types of projects

Management specialists see different divisions of projects in real life depending on the nature of the sector or the project goal, and some of these divisions as mentioned by Al-Fadl and Al-Abidi (2005:40-44) as follows:

- Economic Projects: for example, anti-economic recession program, unemployment and anti-inflation programs.
- Social Projects: social solidarity campaigns and anti-crime campaigns.

- Scientific Projects: processing a scientific problem or design information system.
- Service Projects: marketing a new product.
- Industrial Projects: factories, laboratories or shipbuilding aircraft or production lines.
- Construction Projects: construction of residential buildings or roads, bridges, dams, stadiums, hospitals, universities and facilities.

2.1.3 Construction industry

The construction industry is defined as a set of activities and various sorts of events and products including the new construction of structures and accommodations as well as the maintenance and reconstruction of current and old buildings.

Construction is also the key to the governments in their ongoing quest to improve the standard of living of individuals, it has a wide and increasing growth as a part of the economic growth. In addition, construction is a center for attracting many human and material resources represented by manpower and capital, it can be described as an industry and service profession at the same time.

2.1.3.1 Construction project

The construction project as Chitkara(2014:8-9).defined it, is an idea by the owner, developed by the engineers, and manufactured by the contractor, where the contractor returns it after implementation as required to the owner.

Construction projects are one of the most shared projects, such as construction of residential buildings and their annexes, construction of roads, bridges, dams, electric power, stadiums, hospitals, universities, schools and building foundations for the entire projects, whether industrial, service or scientific, and some calls it the infrastructure of the project (Fadl and Al-Abidi, 2005:11-14)

- Contract
Means the Contract Agreement, the Letter of Acceptance, the Letter of Tender, these Conditions, the Specification, the Drawing, the Schedules, and the future documents (if any) which are listed in the Contract Agreement or in the Letter of Acceptance.

The contract agreement is the agreement between the contractor and the employer.

The Letter of Acceptance is the official acceptance signed by the employer for the Letter of Tender, containing any memorandums agreed upon between the parties, and signed between them. If the letter of acceptance is not issued, the term means "Contract Agreement". The date on which the "Contract Agreement" is signed is the date of issue of the Letter of Acceptance.

The Letter of Tender is the document that includes the presentation of the works signed by the contractor and delivered to the employer works.

The specifications shall be the document that contains the specifications of the works covered by the contract, including any adjustments in line with the contract (FIDIC 2017:1-6).

- Commencement date

It Is the date on which the commencement of work is specified. (FIDIC, 2017:26).

- Time for completion

The completion period is the calculated period specified from the Date of Commencement, as indicated in the Letter of Tender, which the contractor should complete all works or any part of it including the successful completion of tests and all works specified in the contract as required (FIDIC, 2017:26).

2.1.3.2 The parties of the construction project

The construction project has three main parties the owner, the contractor and the consultant; in this paragraph, we will clarify the concept of each of these parties.

- Owner

The owner can be a person or a large organization that wants change in response to the industrial growth, and may be a municipality seeking to improve its structure to make money by filling the markets need, whatever motivate , some owners initiate at the start of the project, and the source of finance determines the sort of owner who involve in the construction

progression, whether if it's general or private owner (Gould & Joyce 2009:19-22).

- Consultant engineer

It is the party responsible for the project designs and supervising the contractor's work, to ensure it to be implemented in according to the official papers, plans and project contract (Falqi 2004:38).

- Contractor

The contractor is any natural or legal person practicing construction contracting (PCU 1994:14), also FIDIC (2017:2) defined the contractor as the person that named in the Letter of Tender "Contractor" which approved by the employer of the work.

- Subcontractor

Means any individual called in the contract as a subcontractor, or any individual that is hired as a subcontractor to perform all or part of the works. Subcontractor may be in form of a person or company. (FIDIC, 2017:2).

- Contract

Is a contract for constructing, operating and maintaining buildings, roads, facilities and all types of engineering projects. (PCU 1994:15).

2.1.3.3 Fields of construction contracts

The fields of construction contracts includes five areas as follows:

- Roads.
- Buildings.
- Electromechanical.
- Water / sewage.
- Public works and maintenance.

2.1.4 Construction delays and cost overruns

2.1.4.1 Introduction

Delays and cost overruns in construction projects is a public phenomenon due to the inputs variety and resources variety.

The delay is a multifaceted, expensive and risky problem, where the time is very significant for the owner performance, and for the contractor money.

The delay in closing or finishing of construction projects regularly leads to aggressive relationships among participants (owner, contractor, consultant) and distrust, lawsuit and arbitration, also the common sense of fear from the parties of the project towards each other (Ahmed et al., 2003:4-5).

Ndekugri, Braimah and Gameson (2008:3-5) Noted that the delay affects the development of contractor's effort or reduce it competently than it is assumed, that effect the quality of the project.

2.1.4.2 The concept of delay

Delays in construction projects are described as the variation or time variance between the date of completion of the project listed or indicated inside the contract and the real date of completion of the project (Falqi 2004:16).

The delay in the construction projects is also known as exceeding the time beyond the finishing date stated in the contract, or later than the date agreed by the participated sides to finish the project, whether the owner allows the extension of time or not, or to issue a penalty (Al-Ghafly 1995:17-18).

The delay appears as extra working days, or later start of a process, and possibly or not include modifications in scope and contract timeline. Project delays make the completion time of the project late (Al-Gahtani 2007:393-396).

2.1.4.3 Types of delays

Some researchers have categorized delays in construction projects in two main categories; Non- Excusable delays and Excusable delays such as Ibironke et al. (2013) and Tumi et al. (2009) as shown in Figure (2.5).

Also there are some studies have divided the delays into three main types, such as a Hamzah et al. (2011), Ahmed et al. (2003), Alaghbari et al. (2007) and Majid (2006). Which are Non- Excusable Delays, Excusable Delays and Concurrent Delays as shown in Figure (2.5).

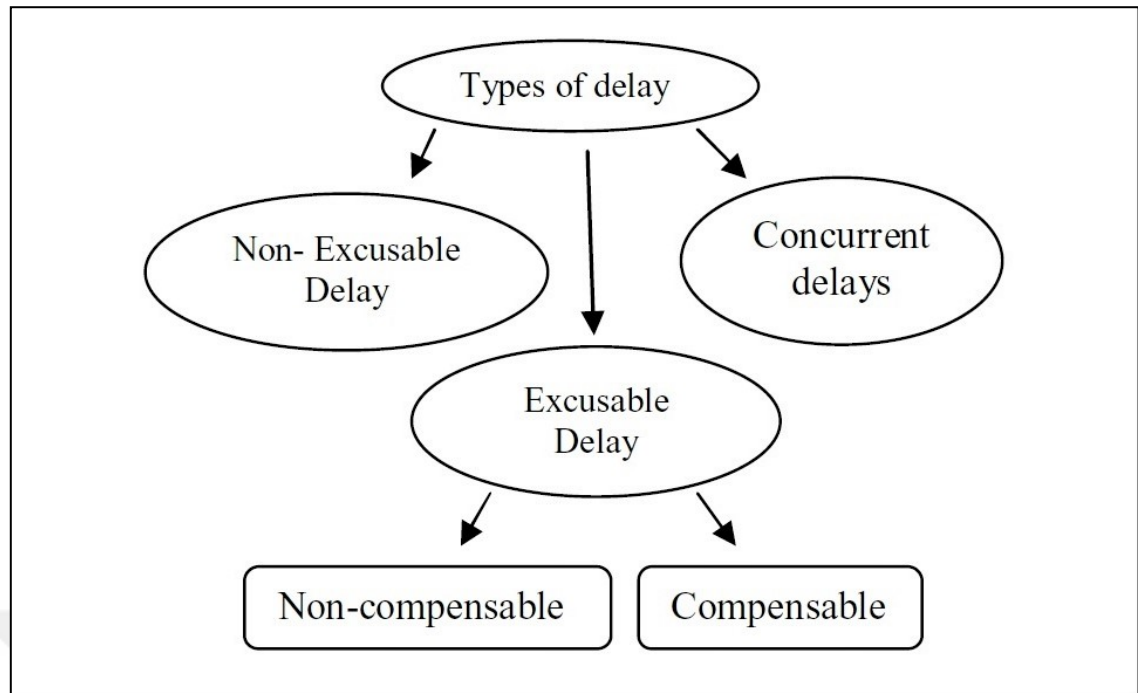


Figure 2. 5: Types of Delay (Hamzah et al. 2011:491).

- Non-excusable delays

Non-excusable delays or unexplained postponements are suspensions caused by the contractor or its supplier or subcontractor or its representative, whether by the act of the contractor or by his failure to act (Kraiem & Diekmann 1987:592-593).

The definition of Non-excusable delays was defined as events falling under the control of the contractor, these delays are public in numerous projects and causes significant damages to project parties which is considered as a break of the contract by the contractor, thus the contractor can get a compensation from the supplier or sub-contractor (Ibironke et al., 2013:55).

The damages that caused by the contractor cannot allow him to have a compensation or exemption from the owner moreover, the contractor is not allowed to extend the period or obtain the extra costs that results from the delay (Trauner, 2009:27).

Therefore, the contractor faces two cases as Mohammed & Isah (2012:789) demonstrated that the first case the contractor has to compensate the owner on the lost time through accelerating the process of the project to avoid paying any fines on the delay of project completion thus, this may cost the contractor extra expenses. while in the second case, the situation remains the same which causes the project to delay accordingly, the contractor pays the fines for delaying the project.

A fine is charged to the contractor under the terms and conditions of the contract, and can be deducted from the dues (Mubarak, 2015:314-315)

Examples of causes of delays as seen by Hamzah et al. (2011:493) as follows:

- Poor site managing and supervision by the contractor.
 - Problems in funding the project by the contractor.
 - Poor qualifications of the contractor's team or labors
 - The contractor failed to provide sufficient labors to finish the project on time.
 - Delays due to lack of materials and equipment required for work.
-
- Excusable delays

Excusable Delays are delays that happen as an outcome of events outside the control of the contractor or the subcontractor, they are often unexpected.

Some examples of the reasons for the Excusable Delays are: labor strikes, fires, floods, changes occur with the owner, unpredictable weather, error in charts and specifications like design hitches, changing location circumstances or unseen situations, unusually weather conditions, Intervention by third parties, failure to take an act by government assistances such as checkup and construction investigation (Trauner, 2009:27).

There are three major cases of Excusable delays as demonstrated by Kraiem and Diekmann (1987:592):

- Unforeseen events: These are reasons for future events that do not currently exist and beyond the control such as unpredictable weather, fatalities, and earthquakes.
- Events beyond the control of the contractor: These are the causes that occur and can not be controlled by the contractor or are not within his duty like strikes.
- Events without fault or negligence: The proceedings in which the contractor is guiltless and has nothing to do with changes by the owner.

Excusable delays are divided into two classifications: compensable delays and non-compensable delays as shown in Figure (2.6) which explains one of the explanations in the categories of delays.

- Compensable excusable delays

Compensable delays are the delays produced from the owner and are within his control or by his representatives, which resulting from a fault of the owner or negligence or results from the owner's engineer or consultant. (Hamzah et al., 2011: 492).

Regularly this kind of suspension causes an extension in the length of the project, and the owner is exposed to material damages and requests by the contractor for compensation.

The Contractor have the right to request an extension for the time or financial compensation for damage caused by such delay, where in some cases and under special circumstances, the compensable delay does not mean giving the contractor the right to increase the duration of the project and sometimes only compensatory costs applied (Hegazy, 2012:5-6)

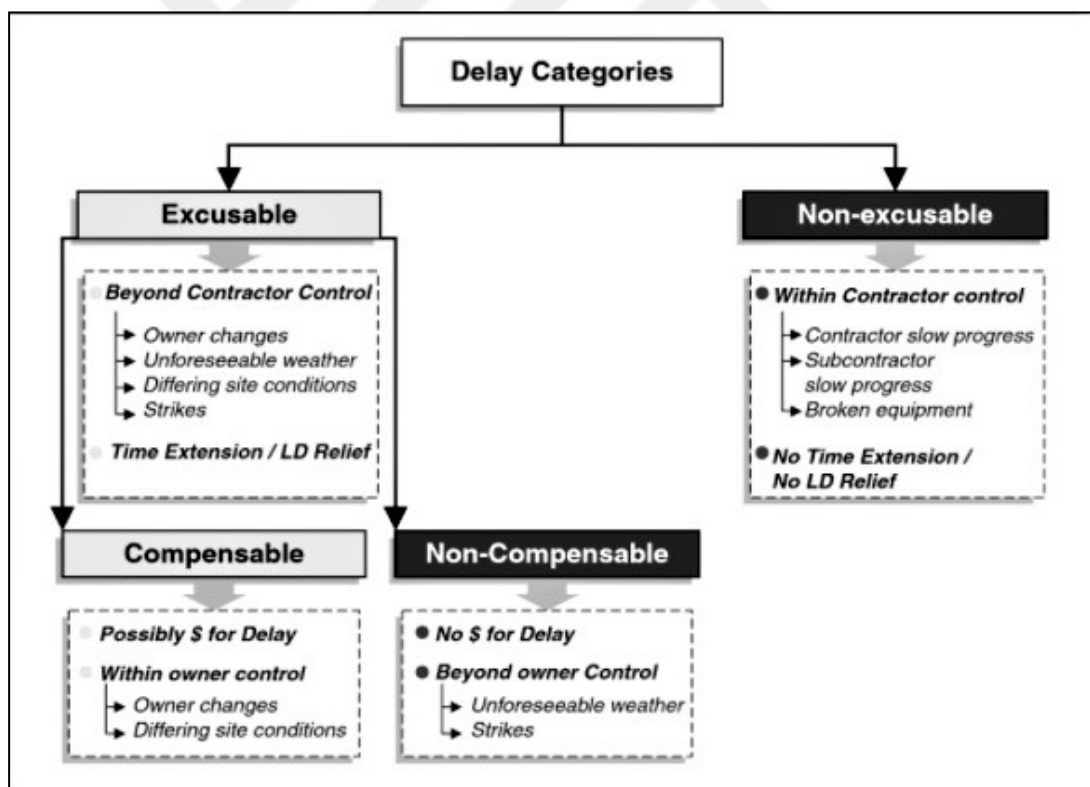


Figure 2. 6: The Excusable and Non- Excusable delays (Trauner 2009:26).

Ahmed et al. (2003:5-6) noted that one of the reasons for compensable delays is the changes made by the owner or the different conditions of the site, or the suspension of work by the owner. There are also examples of the causes that lead to the

occurrence of this type of delays as mentioned by Hamzah et al. (2011:492-493) as follows:

- The owner is late in delivering the work to the contractor.
- Delay in reviewing plan papers and official papers by the client, delay in approval of executive drawings and material samples, slow decision-making by the owner, work postponement by the client and financial problems of the owner.
- Flexibility of consultant, delay in reviewing the design papers and documents by the consultant contract modifications, lack of experience with the consultant. documents are incomplete and absence of consultant on the work site.

Occasionally the owner sets conditions in the contract in terms of what is called "No Damage" to explain the compensation and responsibility falls on him in order to prevent any responsibility to compensate the contractor, these terms and conditions place the risks and damages of delay above the Contractor, where the owner is required only to extent the time as compensation (Trauner 2009:28).

- Non-compensable excusable delays

Non-compensable delays are described as delays caused by the third party or because of accidents which is not relative to either party the contractor or the owner, in such delays, the contractor is allowed to gain an expansion of the contract term as considered by the owner or the engineer without paying the accompanying damages, Each party to the project, whether the owner or the contractor, must pay its quota of the cost resulting from the delay (Ibironke et al., 2013:55-56).

Falqi (2004:18) mentioned some examples for this delay like injuries, climate, unexpected weather, environmental disasters, wars, and governmental procedures.

- Concurrent delays

Concurrent delays are the delays that occur as a result of two or more factors delaying the construction project and occurring in the similar time period or there is an overlap between them, or is the delay that describes two or more delays occurring at the same time where either of them, if it occurs individually, affects the completion date of the project. (Al-Aghbari & Abdulmoghni 2005:195).

Rubin (1983:22-25) presents three conditions of concurrent delays:

- If excusable and non-excusable delays take place at the same time, only an extra period is allowed to the contractor.
- If excusable compensable and excusable non-compensable delays occur synchronously and at the same time the contractor is allowed to extend the time but no compensation for the harms.
- If two excusable compensable delays occur together, the contractor have the right for both, time extension and damages compensation.

2.1.4.4 Causes of delays and cost overruns

The study of Shi et al. (2001:62-64) explained the major causes of delay of the project and its connection with the closing of the project, taking into account the order of procedures and actions. The project consist of a set of deeds, and the accomplishment of any action may be delayed because of the late start of it or because of the extension for its time period. Delays in a given activity are sometimes caused by delays in a previous activity, which causes delays in subsequent activities, which in turn delays the completion of the overall project. The causes for the delay differ from one study to another, where there isn't any particular model that can be used to classify the reasons of delays, each study had a different concept in dividing and classifying the causes of delay (Falqi 2004:31). Most recent researchers have been used to classify the causes of delays based on earlier studies in this area, and this research will list most of the categorizations which was adopted in dividing the causes of delays into sets as reported in previous studies.

The study of Sweis et al. (2008:667) collected and divided the causes of delays depending on Drewin's Open Conversion System as shown in Figure (2.7), where (42) possible cause of delay in the completion of housing projects was divided into three main groups:

Input Factors:

- Labor.
- Materials.
- Equipment.

Internal Environment:

- Contractor.

- Owner.
- Consultant.

Exogenous Factors

- Weather.
- Government Regulation.

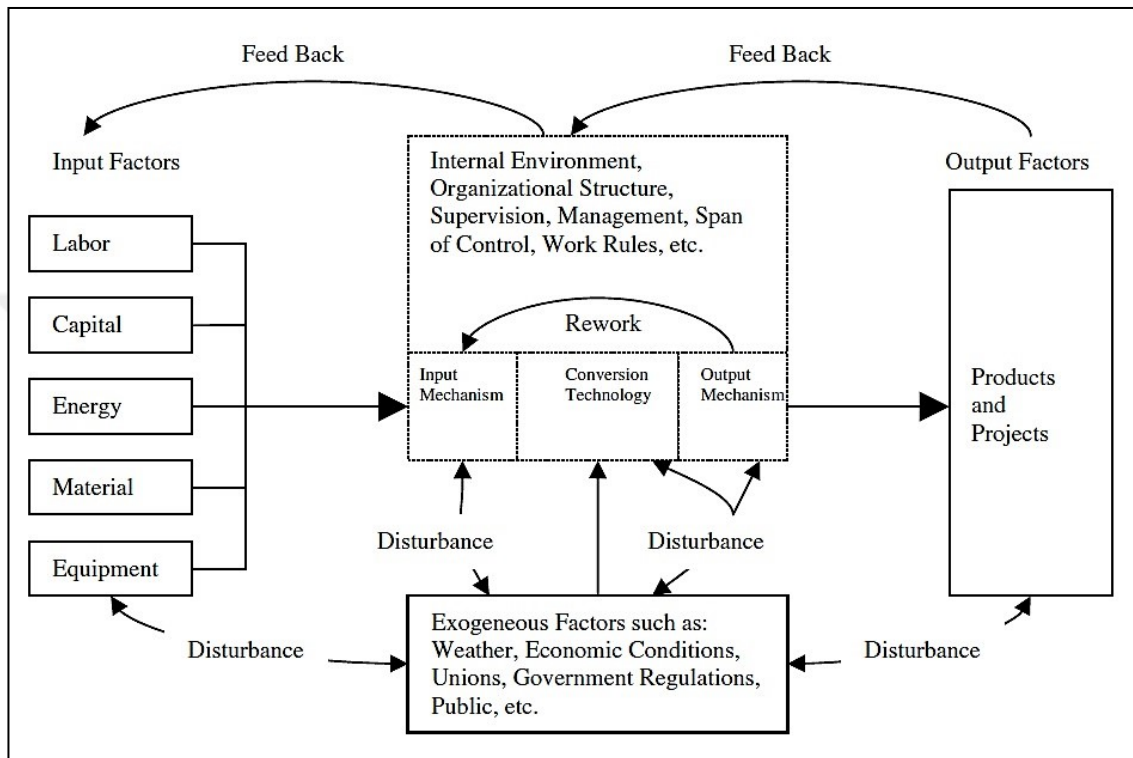


Figure 2. 7: Drewin's Open Conversion System (Sweis et al., 2008:667).

2.1.4.5 The categories of causes of delays

The main and sub factors which was adopted by the researcher in classifying and categorizing the causes of delay was based mainly on Falqi (2004) study where the causes of delay are separated into four main sets in terms of their basis as following:

- Contractor related factors

The contractor is the party responsible for the project works and takes the full responsibility for the construction of the project, the contractor has the full managerial responsibility for the project and the protection of the landlord from delaying the project and must have the ability to complete the project in the scheduled time. The contractor's job is very complex comparing to other business, and the level of responsibility differs

according to the contract signed with the client. This set is distinct as all the causes that cause the delay in the finishing the project on time, which is because the contractor, and includes five subgroups as follows (Falqi, 2004:32).

- Materials

This group includes all the reasons that cause the delay in closing the project on time due to the materials delivered by the contractor to finish the project such as shortage of necessary materials, delay in the availability of materials and change in material specifications.

- Equipment

Is the collection of causes that remains to the gear acquired by the contractor and can be categorized according to its work as operational machines that remains in the work site like winches, graders and trucks to transport materials from and to the site, these equipment may be rented or often owned by the contractor because it is used on a regular basis, and the selection of the appropriate sort of equipment is the contractor's task, and breaking down of this equipment leads to delay in project completion (Falqi, 2004:33).

- Manpower

Is the collection of causes because of the human resources mandatory for the project, that cause delays in project accomplishment. The unsuccessful selection of the quantity and class of the labors severely effects the quality, cost and progress of the project and might lead to a complete failure of the project.

- Project management

A set of reasons resulting from the performance of the project management by the contractor which causes delays in completing the project on time, and the success of any project requires the contractor to plan, design, coordinate and schedule. (Burke, 2003:3) defined project management as the art of guiding and organizing material and human resources thought the project life, by using the recent technologies, to

achieve specific goals, in a way that enables the completion of the project, By implementing the contents of the project and taking into consideration quality, time and cost factors.

- Project finance

Is the set of reasons resulting from mishandling of project sponsoring by the contractor which causes delays in finalizing the Project on time, and the hitches that the contractor might express are delays and incapability to pay direct and indirect costs, where direct costs include materials, labors and expenditures of the internal contractor, while indirect costs are costs that funding direct proceedings, likewise supervision and storage. The contractor also faces problems with suppliers due to payment, therefore Falqi (2004:38) demonstrated that all these causes can add the delay in finishing the project. Hence, the contractor must confirm that he has enough funds to allow him to complete the project.

- Consultant related factors

Is the group of reasons that are results from the consultant and cause delays in completing the project on time according to the contract. According to Falqi (2004:38-39) The owner hires a consultant to implement the tasks of the project and the consultant's job is to design the project, prepare project documents, project preparation and arrangement, budget approximation and quality control.

- Owner related factors

Is the set of reasons that results from the owner that leads to a delay in the project completion, because the owner does not have sufficient knowledge of project management, he often employs a project manager as a representative. The duration of implementation in the contract is unrealistic is a one of the examples of delay (Falqi 2004:39-40).

- Others factors

A collection of causes that do not belong to any other collection of previous groups and consists of two subgroups:

- Early planning and design

These are the causes that cause delays in the accomplishment of

construction projects throughout the implementation progression and because of planning and primary design process, where the quality of initial planning and design impact the project life cycle (Carnell 2000:183).

- External factors

A group of uncontrollable causes from the main parties of the project which are unpredictable, like weather, ...etc. (Ahmed et al. 2003:9).

2.2 Previous Studies

This section of the study targets at identifying the most significant local and foreign studies that discussed topic of delays in the construction projects and the intentions and society of each study, also the most essential outcomes reached by these studies in terms of the most important causes of delay, and includes these topics:

- The Local Studies.
- The Foreign Studies.

2.2.1 Local studies

- Tumi et al. (2009) "Causes of Delay in Construction Industry in Libya"

This research was to analyze the reasons for delays in completion of construction projects in Libya from the perspective of the project parties (owner, contractor, and consultant). The factors for the delay were determined by reviewing the previous literature such as books, journals and articles, where a questionnaire was designed and developed covering (43) possible causes of delay that were divided into (6) Main categories: acts of God, design related factors, construction related factors, financial/economic, management/ administrative, code-related factors.

The study found that the most important (7) causes makes delays in the completion of construction projects in Libya from the perspective of the three parties of the project are Incorrect Planning, Absence of Effective Communication, Design Mistakes, Scarcity of Resource i.e. steel, concrete, etc., Slow Decision Making, Financial Problems and Unavailability of Material.

2.2.2 Foreign studies

- Study of Mahamid et al. (2012) "Causes of Delay in Road Construction Projects"

This research aimed to recognize the causes of delays in road construction projects in Palestine and aimed to categorize the severity of the reasons of delays from the perspective of consultants and contractors, also aimed to check the agreement in the order of severity of the causes of delays from the point of view of contractors and consultants. The study identified the causes of the delay by reviewing the studies literature and relevant review of some of the parties to the project and using the questionnaire to collect data.

The targets in this study are consultants and contractors with lawful registering of the Palestinian Contractors Union in the specialization of highways in Palestine, where the questionnaire was spread to a random sample of participants from the list obtainable by the Palestinian Contractors Union. The survey included (34) contractors and (30) consultants, and did not include owner questionnaire, because most of the road construction projects and public projects are financed by the government (the client), this means that there is only one client. The research included (52) causes of delay, It was spilt in (8) main groups according to the source of the delay: the project, the client, the contractor, gear, supplies, employment, plan, external factors.

The study found that the average time for delay in construction projects in Palestine from (10% to 30%) of the real project period, from the perspective of (75%) from the contractors and (70%) from the consultants, also found that the top five causes of delay in finishing road projects in Palestine are the political situation, limited movement between regions, selecting of the lowest price of contractors, delayed payments by the owner, and lack of equipment.

- Study of Al-Najjar (2008) "Factors Influencing Time and Cost Overruns on Construction Projects in Gaza Strip"

The aim of this study was to calculate the elements that effect the time and cost overruns in construction projects in Gaza Strip, the information were gathered to achieve the objectives of the study in two ways, the first was through designing and developing a questionnaire, which was spread to the

construction companies, consulting agencies and organizations in Gaza Strip, and the second was through studying five separated cases of projects that had time and cost overruns, the questionnaire was distributed to (66) contractors, (31) clients and (27) consultants, the questionnaire included (152) factors, of which (110) factors affecting the time overrun, in addition to (42) factors affect the cost overrun, where the causes effecting the time overrun in construction projects determined in (12) group, these groups are: related projects, of contractors responsibility, consultants responsibility, owners responsibility, professional management, design and documentation, materials and execution, employment, equipment, contractual relationship, government relationship and external factors.

The most significant results of this research, which relate to the most significant causes for the delay in construction projects, from the perspectives of the parties of the project (the owner, the consultant, the contractor), are the closure of the crossings Israeli strikes and invasions on the sector, the scarcity of materials in the markets, and delays in the sector delays in the supply of resources to the site, cash flow problems during the contractor's construction process, lack of materials, site construction, mismanagement of the site by the contractor, failure to comply with storage standards at the workplace, humble economic situations (exchange, inflation rate, etc.), major interferes and dialogues, postponement of work by the client or contractor, insufficient staff of the contractor.

- Study of Kazaz A (2012) "Causes of Delays in Construction Projects in Turkey"

This study was performed to find the main influences that causes delays in executing construction projects in Turkey from the perspective of contractors, to recognize the importance of these factors and to compare them with other neighboring countries. The study collected (49) reasons for delays in construction projects through an initial questionnaire and verified by interviewing a sample of contractors who are members of the Turkish Contractors Association, where (15) elements and causes were subsequently removed and remained a total of (34) factor causing delays in Turkish

construction projects, among the reasons that have been removed, heavy rain and flood in bad weather conditions factor. The researcher divided the causes of delays in construction projects into (7) major groups and ordered them as follows: environmental elements, financial elements, labor-based elements, administration elements, client-based elements, project-based elements, resource-based elements. The final questionnaire was distributed to (149) companies operating in this field, where (71%) responded to the survey request, (55.6%) of them were project managers and (44.4%) site managers.

The most significant results of the study are that the essential reasons for the delay are: changes in design and supplies, followed by delayed payments, cash flow difficulties, financial difficulties of the contractor and poor employment productivity. The most important sets were the financial elements and Labor-related elements, while environmental factors were the least active in delays, as well as the study cleared that managerial reasons are one of the main causes for delaying projects in developed and developing countries, while financial reasons have been experienced only in developing countries.

After reviewing all the previous studies the researcher notice that the methods used in the previous studies differed and varied, where a number of studies have used the field survey method to investigate the opinions of the project's parties by using the questionnaire like the study of Tumi et al. (2009), in addition to the questionnaire Al-Najjar (2008) studied five cases of construction projects. The previous studies have varied in surveying the opinion of the study community which some of them included the three parties of the project (contractor, owner and consultant) such as (Al-Najjar 2008; Tumi et al. 2009), and there are some studies that surveyed the opinions of the consultant and the contractor like Mahamid et al. (2012). There are studies that investigated the contractor's opinion only as a party of the project and excluded the owner and consultant like Kazaz (2012) hence, this difference between the studies is due to the diverse of construction sectors that have been studied, as there were various construction sectors that have been studied also some studies have included a specific type of construction projects, where the study of Mahamid et al. (2012) focused on construction projects in the field of roads.

The key causes for the delay in the completion of construction projects varied in the previous studies from the perspective of project parties, where it was based on the environment and location of study, but most studies indicated that financial difficulties are the most common causes of project delays.



3. RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the methodology of the research and the procedures to implement the practical side of the study. The main aims of this research is to detect the most important reasons of cost and time overruns that results a delay in the construction projects in Benghazi city, by gaining the necessary information to implement the statistical analysis and to find the results of the study.

This chapter contains the research approach and its techniques including research design, population and sample research, sources of primary and secondary information gathering, the used research tool, the techniques which used in building the research tool, the tests in order to verify the validity of the tool and its stability and the statistical methods used.

3.2 Research Methodology

Based on the nature of the research, the researcher used quantitative and qualitative methods to achieve the objectives of this research, which is based on the study of the phenomenon as it exists in fact and is concerned as a precise description and expressed in quantitative and qualitative method.

The qualitative expression defines the phenomenon and explains its characteristics and advantages, while the quantitative expression gives a numerical description that shows its extent or size or degree of association with other phenomena.

The researcher used the Mixed Method Research Design (Quantitative and Qualitative), where interviews and case studies were used as tools to assemble qualitative data and the questionnaire used to assemble quantitative data.

3.3 Research Design

Research design states making and developing a plan or strategy to establish scientific research to gather and examine data and attain the goals of the study (Polit & Hungler 1985:176).

To avoid confusion of any part of the research and to offer a full understanding of all basics of the study in a rational order far from uncertainty, the researcher conduct the study based on five basic stages as follows:

Phase 1: includes choosing the subject, writing thesis proposal, defining the problem, setting goals and research questions, limits, population and the methodology of the study and growth of the research idea, with revising the literature and the previous study.

Phase 2: Design and development of the study tool (interview, questionnaire and case studies).

Phase 3: The field survey contained the final distribution of the questionnaire and interviews with the heads of construction departments in the Municipality of Benghazi.

Phase 4: Includes the implementation of statistical analysis of data using the computer, Statistical Package for Social Sciences (SPSS) program and (EXCEL) program to reach the results.

Phase 5: results and discussion, summarizing conclusions and recommendations.

3.4 Research Population and Sample

3.4.1 Description of the construction projects implemented in Benghazi

The municipality of Benghazi is the largest owner of the construction projects in the city, therefore the research focused on the municipality, because it represents the entire city.

The researcher visited The Municipality of Benghazi and identified the types of construction projects and found that there are four types of projects that the municipality implemented, which are construction of buildings and facilities, road projects, sewage system projects and water system projects, where each of these projects includes consultants to implement and supervise on the construction projects and they are part of the research population.

The researcher conducted interviews with the heads of departments in the Municipality of Benghazi, where an interview was held with the head of each department and the researcher asked the following questions:

- How many construction projects have been implemented in the department during the time period between 2013 and 2017?
- How many construction projects have been implemented in the department in which a delay occurred during the period between 2013 and 2017?
- How many contracting companies participated in the delayed construction projects implemented during the time period between 2013 and 2017 in Benghazi municipality?
- The number of consultants involved in the implementation of the delayed construction projects which implemented by the Municipality of Benghazi during the period between 2013 and 2017?

To answer the previous questions in paragraph (3.4.1) each department administrator in the municipality of Benghazi referred to the archives and records of construction projects in the municipality of Benghazi and based on the information obtained by the researcher and found that the departments that implemented the construction projects during the period between 2013 to 2017 is the Department of Architecture and Projects, Department of Roads and Bridges and Department of Sewage.

The researcher also found that the Department of Water did not implement any construction project during the period mentioned above. Based on this, it was found that there are three types of construction projects implemented in Benghazi municipality according to their departments.

Table 3. 1: Construction projects executed by BM 2013 - 2017.

No.	Construction Department	Type of the project	Total implemented projects	Percentage of implemented projects
1	Department of Architecture and Projects	Building and facilities projects	52	% 50
2	Department of Roads and Bridges	Road projects	37	% 35.6

Table 3.1: Construction projects executed by BM 2013 – 2017 (Cont.).

No.	Construction Department	Type of the project	Total implemented projects	Percentage of implemented projects
3	Department of Sewage	Sewage network projects	15	% 14.4
The total number of implemented projects			104	% 100

In the table shown above the amount of construction projects implemented during the period from 2013 to 2017 were (104) construction projects, divided by the section and type of the project implemented As follows: Department of Architecture

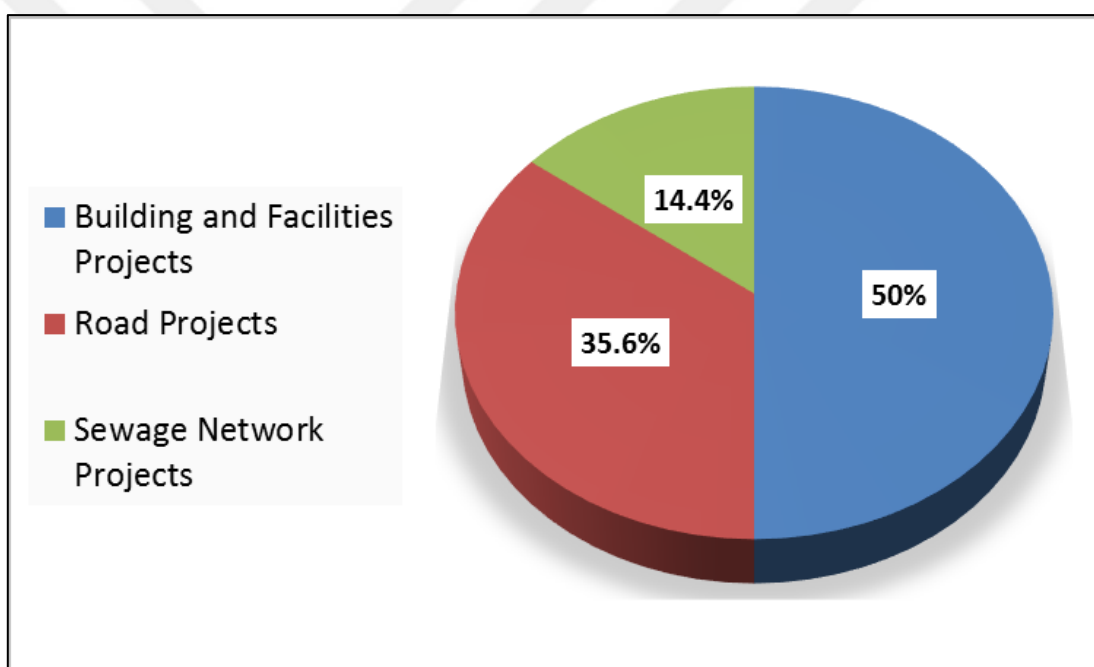


Figure 3. 1: The Percentage of Implemented Construction Projects.

and Projects (52) construction project which is (50%) of the total number of projects implemented, Department of Roads and Bridges (37) construction projects which is (35.6%) of the total number of projects implemented and in the Department of Sewage (15) construction projects implemented which is (14.4%) of the total number of completed construction projects in Benghazi Municipality.

The total amount of construction from 2013 to 2017 is (104) construction project. The amount of delayed construction projects reached (54) projects which is 51.9% of the total implemented projects.

The number of Non-delayed construction projects that did not have a delay in time, according to the contract are (50) which is (48%) of the construction projects implemented in the municipality of Benghazi.

The following figure shows the percentage of construction projects implemented in the municipality of Benghazi depending on the sort of the project.

The researcher found that the proportion of delayed projects to the total number of completed projects, gives an indication that the delay is a phenomenon in the Municipality of Benghazi.

Table 3. 2: Percentages of delayed and non-delayed construction projects.

No.	Construction Department	Project Type	Non-Delayed projects	Delayed projects	Total completed projects	Delayed projects %
1	Department of Architecture and Projects	Buildings and facilities projects	27	25	52	48 %
2	Department of Roads and Bridges	Road projects	17	20	37	54 %
3	Department of Sewage	Sewage network projects	6	9	15	60 %
Total			50	54	104	

Table 3.2 shows the amount and percentages of delayed projects according to the construction departments in Benghazi Municipality were as follows:

The department of Architecture and Projects implemented (52) construction projects where (25) projects were delayed, which is accounted for (48%) of the total number of projects implemented in this department.

In department of Roads and Bridges (37) construction projects were completed, the amount of delayed projects were (20) projects which is (54%) of the total number of projects implemented in this department.

The department of Sewage have completed (15) projects, of which (9) projects were delayed that represents (60%) of the total number of completed projects.

Figure (3.2) shows the number of construction projects that completed on time without delaying and the number of delayed construction projects implemented in the Municipality of Benghazi according to the type of project.

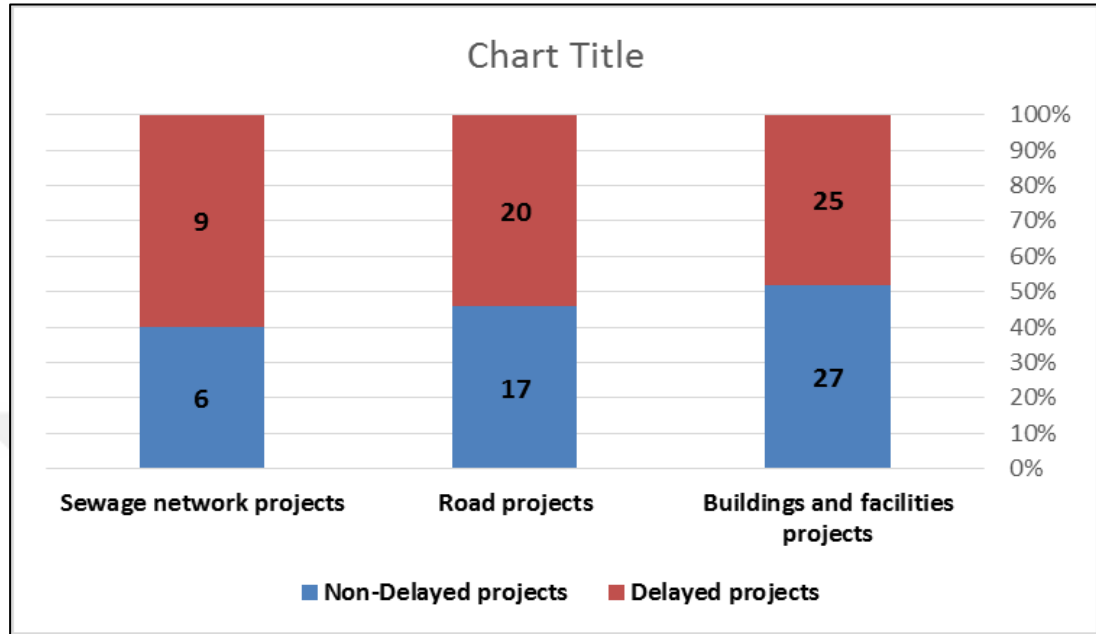


Figure 3. 2: The Amount of Delayed and Non-delayed Construction Projects.

3.4.2 Research Population

Based on the information in Table (3.2) which shows the number of construction projects Implemented by The Municipality of Benghazi during the period between 2013 and 2017 in which there was a delay of (54) projects, the researcher identified the research Population which are the main parties of the construction project or who participated in the implementation of these projects from contractors and consultants, where the owner was excluded because of representing one entity.

Based on the information in paragraph (3.4.1) that obtained through the interview with the heads of the construction projects departments about the number of contractors and consultants involved in the construction projects executed during the period between 2013 and 2017, the researcher found that the research population consists of two sub-groups depending on the role played by each individual in the construction projects which in their totality represent the total research population, within the scope of this research, as follows:

- All contracting companies worked in the delayed construction projects executed by the Municipality of Benghazi from 2013 to 2017 and they are (36) contractors.
- All consultants or engineers participated in the delayed construction projects which implemented by the Municipality of Benghazi from 2013 to 2017 are (18) consultants.

The researcher found that the Municipality of Benghazi did not appoint any external engineering companies or consultant offices to implement the delayed construction projects, but its engineers have supervised and implemented these delayed construction projects. In addition, the researcher found that the heads of the three sections (buildings, roads and sewage) in The Municipality of Benghazi works as consultants and supervisors in the construction projects during the period from 2013 to 2017.

- The owner which is the Municipality of Benghazi, was excluded because it represents one side and is not suitable for the statistical analysis also the project parties from the water section were excluded due to the lack of water projects.

3.4.3 Research sample

The researcher considered that the research sample should be the entire research Population which is 100% of the size of the total study population, due to the limited research population involved in the construction projects that implemented by the Municipality of Benghazi in the period between 2013 and 2017.

(54) Contractors and consultants participated in the implementation of (104) construction projects, where the researcher adopt the use of the comprehensive survey method on the research population to collect the primary data.

After determining the size of the sample of the comprehensive survey, the researcher designed a questionnaire for the contractor and consultant together. The following table shows the number of distributed questionnaires, the number of retrieved and excluded questionnaires, the number of questionnaires valid for the statistical processing, and the response rate:

As shown in Table (3.3), the number of questionnaires distributed was (54) of which retrieved (54), with a total response rate of (100%) and the percentage of valid questionnaires is (100%).

Table 3. 3: Number of distributed, retrieved, excluded and valid questionnaires.

No.	Category	Contractors	Consultants	Total	Percentage
1	Distributed Questionnaires	36	18	54	100 %
2	Retrieved Questionnaires	36	18	54	100 %
3	Excluded Questionnaires	36	18	54	0 %
4	Questionnaires valid for the statistical processing	36	18	54	100 %
	Response Rate	100 %	100 %	100 %	100 %

This percentage resulted due to the researcher sitting with each member of the sample in the form of interview to define the elements of the questionnaire and to provide a clear response to each paragraph in it.

3.4.3.1 Distribution of the research sample

The researcher distributed the research sample according to the role played by each member of the sample in the construction projects in Municipality of Benghazi as shown Table 3.4.

It is clear from Table 3.4 that the number of contractors participating in construction projects in the period from 2013 to 2017 are (36) contractors implemented (54) construction projects, where (20) contractors participated in (25) Buildings and Facilities projects, (10) contractors participated in (20) Road projects and (6) contractors participated in (9) Sewage projects.

The number of consultants participating in construction projects are (18) consultants supervised over (54) construction projects, where (9) consultants participated in (25) Buildings and Facilities projects, (6) consultants participated in (20) Road projects and (3) consultants participated in (9) Sewage projects.

Table 3. 4: Numbers and percentages for the distribution of the research sample.

No	Construction Department	Project Type	Delayed Projects	Contractors	Consultants	Total	Percentage
1	Department of Architecture and Projects	Buildings and Facilities	25	20	9	29	53.7 %
2	Department of Roads and Bridges	Road projects	20	10	6	16	29.6 %
3	Department of Sewage	Sewage network	9	6	3	9	16.7 %
Total			54	36	18	54	

The researcher found that the previous results indicates that the contractor who participated in the delayed projects has contracted with the municipality of Benghazi more than once.

3.5 Sources of Data Collection

The sources of data which used by the researcher for assembling data for this research were obtained from two sources:

- The secondary sources:

The sources that gave the researcher with data through reviewing information from previous researches, studies and literature, also reviewing all new or old books, references, PhD and Master theses, scientific articles, websites, and published scientific journals, which are related to this study.

- The primary sources:

The sources that gave the researcher the direct and field data of the study, through designing the questionnaire to survey the opinions of participants who involved in the construction projects implemented during the period between 2013 and 2017,

moreover using the interview with the heads of departments to describe the projects and to recognize the most important causes of delay.

In addition, the researcher studied two cases of delayed construction projects implemented during the period from 2013 to 2017.

As well as reviewing the documents and archives of Benghazi Municipality and conducting interviews with the parties of the project (contractor and consultant).

3.6 The Research Questionnaire Survey

The questionnaire has been developed as follows:

- Primary structure of the questionnaire through accessing to secondary data sources (previous studies) to determine the sections and dimensions of the research and identify the causes of delays in the construction projects and then discussed with the supervisor to ensure that it covers the topic of the study.
- Interviews and discussions made with experts and some contractors, consultants and project managers who have experience in the construction projects in the Libyan environment to take their opinions on the causes of delays collected from former studies.

- These causes were filtered from (111) causes to (69) possible causes of delay in implementing construction projects by the Municipality of Benghazi.

The inappropriate causes were removed such as "delay in delivering the site to the contractor" Where the researcher found that the commencement of work begins after the contractor receives the site and the cause of "difficulties in obtaining licenses" was removed because the researcher found that this cause does not affect the delay of construction projects Because the municipality is the one to issue such a concession, also unsuitable and repeated causes were removed and some has been edited and moved from one group of causes to another.

- The primary questionnaire was presented to an expert, to ensure that the statements contained in the questionnaire were relevant to the dimensions of the study and to ensure that they were comprehensive and covering different aspects of the study, also if it is suitable for both parties of the construction project (contractor and consultant) and making some editing on it.

- A pilot test for the questionnaire has been proceeded and distributed to a sample of five individuals, consisting of three contractors and two consultants from the formerly known research sample.

The opinions were taken into account, the validity and consistency of the tool was verified, then the questionnaire was drafted once more and offered to the supervisor. After approval, the questionnaire became in its final form, where one model was used for both contractor and consultant, see Appendix A.

3.7 Questionnaire Format and Sections

The researcher was guided in writing the questions and paragraphs of the research questionnaire by considering the questionnaires of (Al-Khalil & Al-Ghafly 1999), (Falqi 2004), (Assaf and Al-Hejji 2006), (Albogamy et al. 2012) and (Marzouk and El-Rasas 2014) afterward reformulating these questions, modifying and removing some of them to be appropriate and relevant to the research purposes and objectives.

The questionnaire was created in its final form as shown in Appendix A in two sections as following:

Section 1: This section contains questions related to the performance of the delayed construction projects in Benghazi Municipality, in which the participants contributed during the period from 2013 to 2017, which is represented in questions from 1 to 3 in the first section of the questionnaire.

- The project delay rate related to the duration of the basic project contract and has five levels (Less than 10% of project time, from 10% to 30%, from 31% to 50%, from 51% to 100%, more than 100% of the project time).
- The rate of delayed time that Benghazi Municipality ignored which caused by the contractor and it has five levels (The full delayed time, 75% of the delayed time, 50% of the delayed time, 25% of the delayed time, did not ignore any time and the contractor paid the delay fine for all the delayed time).
- The largest party is responsible for delays in construction projects, and it has four levels Contractor, consultant, owner and other parties.

Section 2: This section contains a list of (69) possible causes. These causes are grouped according to its source. The researcher designed and divided the causes of

delay into four main groups and nine subgroups, where Table 3.5 shows the main and subgroups and the number of causes in each group.

Table 3. 5: List of main and sup-groups for causes of delay.

NO.	Main group	No.	Sup-group	Number of causes	Total number of causes
1	Contractor Related	1	Materials	3	32
		2	Tools	6	
		3	Man power	5	
		4	Project management	15	
		5	Project financing	3	
2	Consultant Related	6	Consultant related	9	9
3	Owner Related	7	Owner related	13	13
4	Other causes	8	Early planning and designing	4	15
		9	External causes	11	
		Total		69	69

From the previous table, the main group (Contractor related delay causes) has five sup-groups which are Materials, Tools, Manpower, Project management and Project financing. Each of the next two main groups has one sup-group of causes, whereas the fourth main group (Other causes) has two sup-groups which are Early planning and designing and External causes.

The following table shows the detailed list of causes of delay.

Table 3. 6: List of Causes of Delay.

No.	Factors Causing Delay
1. Contractor Related	
Materials	
1	Shortage of required materials
2	Delays in the supply of materials to the work site
3	Change in material specifications
Tools	
4	Shortage of required equipment

Table 3. 6: List of Causes of Delay (Cont.).

No.	Factors Causing Delay
5	equipment breakdowns
6	Shortage of equipment spare parts
7	Low equipment productivity
8	Improper selection of equipment (not appropriate)
9	Incorrect distribution of project equipment
Manpower	
10	Shortage of skilled labor in the market
11	Insufficient skill of labour
12	shortage in number of site workers
13	The personal arguments between the workers and the management team
14	Poor distribution of workers at the workplace
Project Management	
15	Lack of administrative staff at the contractor
16	Lack of experienced staff in the contractor company
17	Poor communication of contractors within the parties involved in the project
18	Poor coordination of contractor with other parties in the project
19	Poor control of the contractor on the subcontractor
20	Ineffective scheduling and planning of project by contractor
21	Ineffective control over the progress of the project by the Contractor
22	Inefficient quality control by the Contractor
23	Interruption between Contractor and other parties
24	Use of bureaucracy in organizing work within Location
25	Spend a lot of time finding subcontractors at the lowest price to implement project activities
26	Lack of understanding by the technical staff of the contractor for the consultant's position
27	Contractor's failure to comply with Consultant's instructions
28	Contractor depends on a newly graduated engineer for all responsibilities in the site
29	Lack of experience of the contractor
Project Financing	
30	Financial difficulties in financing the project by the Contractor.
31	Delays in payments to subcontractors.
32	Delays in payments to suppliers.
2. Consultant Related	
33	Poor qualification of consultant/ engineer's staff assigned to the project
34	Consultant's late approval of contractor's requests
35	Poor communication between the consultant and the other parties in the project.
36	Poor coordination between the consultant and the other parties of the project.

Table 3. 6: List of Causes of Delay (Cont.).

No.	Factors Causing Delay
37	Delay in inspection, performing and testing by the engineer/ consultant
38	Non-compliance of the consultant's staff with the official attendance.
39	Late response of consultant to contractor entitlements
40	Consultant's late approval of contractor materials
41	The existence of previous conflicts between the consultant and the contractor
3. Owner Related	
42	The duration of the contract is insufficient "short"
43	Owner's late approval of contractor's requests
44	Suspension of work by owner
45	Delay in change orders by the owner
46	Delay in progress payments and settlements by the owner
47	Poor communication with other project parties
48	Poor coordination by the owner with other project parties
49	The bureaucracy in the owner's administration
50	Changes in the project contract by the owner (change in Specifications or works ... etc).
51	Assigning the contractor additional work from time to time
52	the owner gives oral instructions
53	Choosing the contractor with the lowest bid and lowest price
54	Shortage of owner's consultants
4. Other Causes	
Early Planning and Designing	
55	Design errors
56	Changes in project scope
57	Unclear specifications
58	Graphics are incomplete
External Causes	
59	Extreme weather conditions on the work sit
60	Ground conditions (soil type, water levels)
61	Traffic restrictions on the work site
62	Effects of social and cultural conditions on the workplace
63	Inappropriate infrastructure in the workplace (water supply, electricity / telephone, etc.)
64	The security situation of the work site
65	Exchange rate fluctuations "Currency"
66	Changes in the banking policy for loans
67	Changes in material prices
68	Problems with neighbors
69	Financiers controls project orientation

There are two scales processed in the second part of the questionnaire to determine each of the causes of delay based on previous studies such as (Al-Khalil & Al-Ghafly 1999), (Falqi 2004), (Assaf and Al-Hejji 2006), (Albogamy et al. 2012), (Marzouk and El-Rasas 2014) and they are as follows:

First measurement tool is used to measure the Frequency of Occurrence. In other words, is to which range these causes occur during the construction of a projects.

Second tool is used to measure the Degree of Severity, that means in which range this cause affects the delay of completion the construction projects in the municipality of Benghazi according to the date specified in the contract, The Frequency of Occurrence and the Degree of Severity are classified in a five-point scale, as shown in Table 3.7.

Table 3. 7: Classifications of the frequency of occurrence and the degree of severity.

Frequency of Occurrence		Degree of Severity	
Scale	Description	Scale	Description
1	Never	1	None
2	Rare	2	Neutral
3	Sometimes	3	Moderate
4	Often	4	High
5	Always	5	Very high

3.8 The Interview

The researcher used the interview tool with the heads of the three departments in Benghazi Municipality, Department of Architecture and Projects, Department of Roads and Bridges and Department of Sewage, in order to collect qualitative data. The interview consisted of six questions, where the researcher asked each heads of departments these questions to identify the population and the construction projects as shown in the APPENDIX B.

The heads of departments were asked about the highest causes of delay in construction projects in Benghazi Municipality from 2013 to 2017 from the point of view of each head of department.

3.9 The Case Study

The researcher used the case study to assemble the qualitative records by studying two cases of delayed construction projects which implemented by Benghazi municipality during the period from 2013 to 2017.

Where the researcher reviewed the municipality records for information about the project to get a precise description and for obtaining the required data to show the exceeding time and cost of each case and to show the procedures used in evaluating the tenders and the selection of the contractor by the municipality.

The interview was used with the parties of the project (contractor and consultant) to take their opinion on the main causes of delay in each case.

3.10 Stability of the Questionnaire

The stability on the precision gauge is defined as the capability of the tool to offer the similar outcomes if the measurement is repeated on the same individual numerous times in the same circumstances, where the stability of the tool depends on the internal consistency, which means that the paragraphs of the questionnaire are all applied to the purpose of the research (Carmines & Zeller, 1991: 28-30).

A number of statistical methods are used to measure stability. The most common method is Cronbach's Alpha Coefficient, which depends on the internal consistency of the paragraphs with each other and with all the paragraphs in general.

The researcher calculated the internal consistency coefficient of the questionnaire paragraphs, which include the frequency scale and the severity scale for each causes of delay, using the Cronbach's Alpha Formula that applied using the SPSS, and the results are shown in the following table:

Table 3. 8: Cronbach's Alpha for subgroups.

No.	Subgroup	No of causes	Cronbach's Alpha (Frequency)	Cronbach's Alpha (Severity)
1	Materials	3	0.730	0.610
2	Tools	6	0.877	0.861

Table 3. 8: Cronbach's Alpha for subgroups (Cont.).

No.	Subgroup	No of causes	Cronbach's Alpha (Frequency)	Cronbach's Alpha (Severity)
3	Man power	5	0.836	0.799
4	Project management	15	0.950	0.927
5	Project financing	3	0.814	0.688
6	Consultant related	9	0.837	0.794
7	Owner related	13	0.834	0.834
8	Early planning and designing	4	0.897	0.859
9	External causes	11	0.630	0.786
		69	0.950	0.938

The data in the previous table indicates that the value of the Cronbach Alpha coefficient is high, where it ranged between (0.610 – 0.950) for each paragraph of the questionnaire. The value of the Cronbach Alpha coefficient for the frequency of occurrence is (0.95), and for the degree of severity (0.938), indicates that the paragraphs and the causes of delay in the questionnaire have a very high level of stability comparing with the minimum level (0.6) to accept the value of the Alpha Cronbach coefficient (Sekaran 2003, which indicates the accuracy and stability of the measured questionnaire, and its validity to analyze the results.

3.11 Statistical Processing:

After collecting the data by the questionnaires, the researcher reviewed it, then entered it into the computer. In order to accurately analyze and process the data, the researcher used the statistical program (Statistical Package for Social Science-SPSS), where the researcher entered the data and gave them numbers converting the answers from verbal to digital.

In the second section of the questionnaire, the researcher used two factors to calculate each of the causes of delay, and each one of them was given five scales, the higher the score, the frequency of occurrence and the degree of severity increases.

Statistical data were processed using the following statistical methods:

- Descriptive Statistic Measures: To define the sample of the research, to answer the research questions, and it represents in number of repeats, percentages, and arithmetic.
- Frequency Index : is to arrange the causes of delays in terms of the frequency of occurrence for Each cause, using the next equation:

$$\text{Frequency Index (F.I) (\%)} = \Sigma a (n / N) * 100/5 \quad (3.1)$$

Whereas:

(F.I): Frequency Index.

a: The scales given for each option.

n: Repeated responses by respondents.

N: The total number of respondents.

- Severity Index: is to determine the causes of the delay depending on the degree of severity of the cause, using the following equation:

$$\text{Severity index: (S.I) (\%)} = \Sigma a (n / N) * 100/5 \quad (3.2)$$

Whereas:

(S.I): the severity index (Severity Index:

a: The scales given for each cause.

n: Repeated responses by respondents.

N: The total number of respondents.

- Importance Index: To determine the importance index for each cause, using the following formula:

$$\text{Importance Index (IMP.I)(\%)} = [F.I (\%) * S.I (\%)]/100 \quad (3.3)$$

Whereas:

(IMP.I): Importance Index

(F.I): Frequency Index.

(S.I): Severity Index.

- Cronbach's alpha: To measure the stability of the instrument. The previous equations (3.1), (3.2) and (3.3) adopted by the researcher based on the adaptation of the previous studies by (Assaf and Al-Hejji 2006) and (Albogamy et al. 2012).

The following table shows the measurements and equations used to address the causes of delays in the construction projects as adopted by earlier studies.

The researcher believes that by using of two scales to measure each cause of delay gives more precise and better information.

Table 3. 9: The statistical processing used in previous studies.

NO.	The Previous Study	Used Measurements	Formulas
1	(Falqi, 2004)	Frequency Index	$FI = \frac{\sum_{i=1}^4 Fi \times Pi}{\sum^4 Pi} (1 \leq AF \leq 4)$
		Severity Index	$SI = \frac{\sum_{j=1}^4 Sj \times Pj}{\sum_{j=1}^4 Pj} (1 \leq AS \leq 4)$
		Importance Index	$II = \frac{\sum_{k=1}^9 (F \times S)_k \times P_k}{\sum_{k=1}^9 P_k}$
		Frequency Index	$(F.I)(\%) = \sum a (n/N) * 100/4$
2	(Assaf & Al-Hejji 2006)	Severity Index	$(S.I) (\%) = \sum a (n/N) * 100/4$
		Importance Index	$(IMP.I)(\%) = [F.I (\%) * S.I (\%)]/100$
		Frequency Index	$(F.I) (\%) = \sum a (n/N) * 100/5$
3	(Albogamy et al. 2012)	Severity Index	$(S.I) (\%) = \sum a (n/N) * 100/5$
		Importance Index	$(IMP.I)(\%) = [F.I (\%) * S.I (\%)]/100$
4	(Mahamid et al. 2012)	Severity Index	$Severity\ index\ (S.I) (\%) = \sum a (n/N) * 100/5$
5	(Kazaz A 2012)	Importance Relative Index	$I = \frac{\sum_{i=1}^5 a_i - x_i}{\sum^5 x_i}$

Table 3. 9: The statistical processing used in previous studies (Cont.).

NO.	The Previous Study	Used Measurements	Formulas
6	(Marzouk & El-Rasas 2014)	Frequency Index	$(F.I)(\%) = \sum_{i=1}^4 \frac{a_{if} \times n_{if}}{4 \times N} \times 100$
		Severity Index	$(S.I)(\%) = \sum_{i=1}^4 \frac{a_{is} \times n_{is}}{4 \times N} \times 100$
		Importance Index	$(IMP.I)(\%) = \frac{F.I \times S.I}{100}$

4. DATA PRESENTATION AND RESULTS

4.1 Introduction

This section clarify how the questionnaires distributed, and analyzing the retrieved responses and the data collected through the questionnaire survey from the consultants and contractors who participated in the delayed construction project in Benghazi Municipality. The main purpose of the survey is to rank the already identified causes of delays, in addition to find out the critical factors that are required to give attention in order to significantly minimize delay problems in construction projects within the study area.

The analysis of the data were made by using the statistical methods which mentioned in chapter 3. The analysis illustrates the findings and results of the survey for the frequency, severity and importance index of all the causes of delay.

4.2 Performance of Construction Projects

The first section of the questionnaire consist of questions linked to the implementation of the delayed construction projects. The questionnaire was submitted to the Municipality of Benghazi, in which the respondents (contractor and consultant) participated during the period from 2013 to 2017, in the delayed construction projects.

This section analyze and discusses questions related to the rate of delay period of the project to the duration of the project contract, and the rate of delayed time that the Municipality of Benghazi overlooked for the contractors.

Finally, knowing who is the most responsible party for delays in construction projects from the perspective of the consultant or contractor.

The researcher analyzed this section by using the required statistical processing to extract the numbers and the percentages.

4.2.1 The average time for delays relating to the original project time

The researcher asked the following question: What is the average time for delays in construction projects in Benghazi municipality relating to the project time specified in the contract? For the respondents, contractor and consultant who participated in the execution of the construction projects in the period between 2013 and 2017, in order to detect the rate of delay for these construction projects to the planned date specified in the contract.

To answer this question the researcher identified five options for the respondents, where they were asked to choose one of the options, the frequencies and percentages of each of the five options were extracted from the viewpoint of the project parties, as shown in the following table:

Table 4. 1: The rate of delay according to each party.

The average time for delays relating to the original project time			Contractor	Consultant	Total
1	Less than 10% from the original time	Frequencies	3	1	4
		percentages of frequencies	75%	25%	100%
		Rate of frequencies to the total of one party	18.8%	12.5%	16.7%
		Rate of frequencies to the total parties	12.5%	4.2%	16.7%
2	10% to 30% from the original time	Frequencies	10	6	16
		percentages of frequencies	62.5%	37.5%	100%
		Rate of frequencies to the total of one party	62.4%	75%	66.7%
		Rate of frequencies to the total parties	41.7%	25%	66.7%
3	31% to 50% from the original time	Frequencies	1	0	1
		percentages of frequencies	100%	0%	100%
		Rate of frequencies to the total of one party	6.3%	0%	4.2%
		Rate of frequencies to the total parties	4.2%	0%	4.2%

Table 4. 1: The rate of delay according to each party (Cont.).

The average time for delays relating to the original project time			Contractor	Consultant	Total
4	51% to 100% from the original time	Frequencies	0%	0%	0%
		percentages of frequencies	0%	0%	0%
		Rate of frequencies to the total of one party	0%	0%	0%
		Rate of frequencies to the total parties	0%	0%	0%
5	More than 100%	Frequencies	2	1	3
		percentages of frequencies	66.7%	33.3%	100%
		Rate of frequencies to the total of one party	12.5%	12.5%	12.5%
		Rate of frequencies to the total parties	8.3%	4.2%	12.5%
	Total	Frequencies	16	8	24
		percentages of frequencies	66.7%	33.3%	100%
		Rate of frequencies to the total of one party	100%	100%	100%
		Rate of frequencies to the total parties	66.7%	33.3%	100%

Based on the previous results, there is a similarity and consensus between the contractor and the consultant regarding the rate of delay of the construction projects in Benghazi Municipality, where the results showed that (66.7%) of the responses indicated that the average time for delays is 10% to 30% from the original time.

The researcher believes that this period is not a large period, but its impact is significant and reflected on all the aspects of the project, where this delay is reflected on the contractor in terms of cost overruns and increased expenses, as reflected in the owner not to invest the project and benefit from its revenues and reflect the citizens not to benefit from the services of this project.

The researcher referred the period of previous overrun due to many reasons from the contractor, the owner, the consultant and the citizens who are neighboring the project

site. The most essential of these is the nonexistence of a accurate duration in the contract matching with the contractor's skills and abilities,

In addition, the financial troubles challenged by both the landlord and the consultant throughout the execution of the project, and the objection of the neighbors on the project.

4.2.2 Rate of delayed time which overlooked by the owner

The researcher asked the two project parties the following question: How much delayed time did the owner (Municipality) overlooked?, in order to identify the rate of delay that was overlooked by the owner, which was caused by the actions that fall under the control and responsibility of the contractor (Non-Excusable delay) And the decision to fine or ignore the fine is under the control of the owner.

To answer this question the researcher identified five options for the respondents, where they were asked to choose one of the options, the frequencies and percentages of each of the five options were extracted from the standpoint of the project parties, as shown in the following table:

Table 4. 2: The Rate of delayed time which overlooked by the owner.

Rate of delayed time which overlooked by the owner			Contractor	Consultant	Total
1	Entire delayed time	Frequencies	12	3	15
		percentages of frequencies	80%	20%	100%
		Rate of frequencies to the total of one party	75%	37.5%	62.5%
		Rate of frequencies to the total parties	50%	12.5%	62.5%
2	75% of the delayed time	Frequencies	4	4	8
		percentages of frequencies	50%	50%	100%
		Rate of frequencies to the total of one party	25%	50%	33.3%
		Rate of frequencies to the total parties	16.7%	16.7%	33.3%
3	50% of the delayed time	Frequencies	0	0	0
		percentages of frequencies	0%	0%	0%
		Rate of frequencies to the total of one party	0%	0%	0%
		Rate of frequencies to the total parties	0%	0%	0%

Table 4. 2: The Rate of delayed time which overlooked by the owner (Cont.).

Rate of delayed time which overlooked by the owner			Contractor	Consultant	Total
4	25% of the delayed time	Frequencies	0	1	1
		percentages of frequencies	0%	100%	100%
		Rate of frequencies to the total of one party	0%	12.5%	4.2%
		Rate of frequencies to the total parties	0%	4.2%	4.2%
5	Did not overlooked	Frequencies	0	0	0
		percentages of frequencies	0%	0%	0%
		Rate of frequencies to the total of one party	0%	0%	0%
		Rate of frequencies to the total parties	0%	0%	0%
Total		Frequencies	16	8	24
		percentages of frequencies	66.7%	33.3%	100%
		Rate of frequencies to the total of one party	100%	100%	100%
		Rate of frequencies to the total parties	66.7%	33.3%	100%

The previous results indicate that there is an agreement between the contractor and the consultant on the municipality's overlooking for the entire delayed time in the construction projects, which caused by the contractor's control and responsibility with a percentage of 62.5% of the respondents, also not to count any fine on the contractor.

The researcher considers that the municipality's failure to penalize the contractor for the delay which caused by him, is one of the strongest reasons that drive to the delay of the construction projects, and leads to continued and repeated delays by the contractor.

4.2.3 Greatest party responsible on the delay of the construction projects

The researcher asked the following question: Who is the greatest party responsible for the delays in construction projects in Benghazi Municipality? In order to find the greatest party blamable for the delay in the construction project.

To answer this question the researcher identified four options for the respondents, where they were asked to choose one of the options, the frequencies and percentages

of each of the four options were extracted from the opinion of the project parties, as shown in the following table:

The results shown in Table 4.3 indicates that the contractor is the greatest party responsible on the delay of the construction projects with a percentage of 41.7%.

The results showed that the fourth option "others" was answered by some respondents as a party that has no relationship with the contractor, owner or consultant, such as the neighbors of construction site, weather conditions or security situation.

Table 4. 3: Greatest party responsible for the delay of construction projects.

Greatest responsible party			Contractor	Consultant	Total
1	Contractor	Frequencies	5	5	10
		Rank	2	1	1
		Rate of frequencies to the total of one party	31.3%	62.5%	41.7%
		Rate of frequencies to the total parties	20.8%	20.8%	41.7%
2	Consultant	Frequencies	6	1	7
		Rank	1	2	2
		Rate of frequencies to the total of one party	37.5%	12.5%	29.2%
		Rate of frequencies to the total parties	25%	4.2%	29.2%
3	Owner (Benghazi Municipality)	Frequencies	4	1	5
		Rank	3	2	3
		Rate of frequencies to the total of one party	25%	12.5%	20.8%
		Rate of frequencies to the total parties	16.7%	4.2%	20.8%
4	Others	Frequencies	1	1	2
		Rank	4	2	4
		Rate of frequencies to the total of one party	6.3%	12.5%	8.3%
		Rate of frequencies to the total parties	4.2%	4.2%	8.3%
	Total	Frequencies	16	8	24
		percentages of frequencies	66.7%	33.3%	100%
		Rate of frequencies to the total of one party	100%	100%	100%
		Rate of frequencies to the total parties	66.7%	33.3%	100%

The researcher directs the previous finding that the contractor is the greatest party blamable for the delay to the amount of jobs and duties of the contractor in the implementation of the project and completion on time.

4.3 Causes of Delay

This part represents the second section of the questionnaire, which contains the possible causes of delay of the construction projects in Benghazi Municipality during the period between 2013 and 2017.

This part consists of two sections. The first section consists of (69) possible cause of delay in construction projects where the researcher dignified both Frequency of Occurrence and the Degree of Severity for each of the causes of delay to detect the Frequency Index, Severity Index and Importance Index for each causes of the delay from the perspective of each party and the total respondents.

In addition to arrange the causes of delay in each major group, determining the importance of the major and sub-groups and their order from the perspective of each project party.

The second part consists of a question that was asked to the respondents to write other causes, if any, lead to delay in implementing the construction projects in the municipality of Benghazi during the mentioned period above, determining the frequency of occurrence and the degree of severity for each reason.

4.3.1 Frequency, severity and importance of delays

The researcher provided the respondents with a list of (69) potential causes of delay, these reasons were gathered in four main groups and nine sub-groups as explained in the previous chapter Table 3.5 using two measures to measure each cause of delay which are the frequency of occurrence and the degree of severity as described Table 3.7 to identify the Frequency Index, Severity Index and Importance Index.

In this section, the researcher will present and discuss the results of the top five causes leading to delays in construction projects in Benghazi Municipality. Where the FI, SI, and II are arranged from the perspective of the Contractor, Consultant and respondents as a whole, based on the equations in (3.10).

The next paragraphs analyze and identify the highest cause of delay in each main group depending on the importance index, according to the contractor, consultant

and respondents as a whole, and to analyze this section the researcher have used the Statistical Package for Social Sciences (SPSS 25) for the Statistical processing.

4.3.1.1 Frequency of occurrence

The Frequency was measured by the Frequency Index which shown in Equation 3.1. In this paragraph, the researcher will present the top five causes in terms of the frequency which lead to the delay of construction projects in Benghazi Municipality from the perception of both project parties and the overall.

Table 4.4 shows the top five causes of delay in the construction projects in Benghazi Municipality from the perspective of the contractor and the consultant according to the frequency of occurrence.

Appendix C and Appendix D contains all causes of delay and the frequency of occurrence of each cause according to the contractor and the consultant respectively.

Table 4. 4: FI and ranking of delay causes (Contractor and Consultant).

Contractor				Consultant			
R.	NO.	Cause of delay	FI %	R.	NO.	Cause of delay	FI %
1	46	Delay in progress payments and settlements by the owner	85%	1	53	Choosing the contractor with the lowest bid and lowest price	82.5%
2	53	Choosing the contractor with the lowest bid and lowest price	77.5%	2	20	Ineffective scheduling and planning of project by contractor	80%
3	39	Late response of consultant to contractor entitlements	75%	3	32	Delays in payments to suppliers.	72.5%
4	32	Delays in payments to suppliers.	71.2%	4	68	Problems with neighbors	70%
5	34	Consultant's late approval of contractor's requests	68.7%	5	30	Financial difficulties in financing the project by the Contractor.	70%

The table shows that the contractor chose two of the top five causes that falls within the group of reasons linked to the client, two reasons associated to the consultant and

one linked to the contractor, where this means that the contractor bears the greatest responsibility for the owner and the consultant.

The consultant has selected three of the top five reasons linked to the contractor, one related to the owner, and one reason falls within the "others" group, which means that the consultant carries the greatest responsibility to the contractor.

The following table shows the top five causes of delay in construction projects in Benghazi Municipality from all the respondents according to the frequency of occurrence. Appendix E contains a table of all the causes of delay and the frequency of occurrence of each cause and their rank from the perspective of all the respondents.

Table 4. 5: FI and ranking of delay causes (Overall).

Rank	No.	Cause of delay	Main group	Sub-group	FI %
1	53	Choosing the contractor with the lowest bid and lowest price	Owner	Owner	79.71%
2	46	Delay in progress payments and settlements by the owner	Owner	Owner	77.5%
3	32	Delays in payments to suppliers.	Contractor	Project financing	71.67%
4	68	Problems with neighbors	Others	External causes	69.17%
5	30	Financial difficulties in financing the project by the Contractor.	Contractor	Project financing	67.5%

The previous table shows that the cause (Choosing the contractor with the lowest bid and lowest price) which is related to the owner is the most frequent and occurring from the perspective of the whole respondents.

4.3.1.2 Degree of severity

The Severity was measured by the Severity Index which shown in Equation (3.2). The researcher will present the top five causes according to their Degree of Severity

that drive to the postponement in construction projects in Benghazi Municipality from the perspective of both project parties and the overall.

Appendix C and Appendix D contains all causes of delay arranged by the Degree of Severity of each cause according to the contractor and the consultant respectively.

The table shows that the highest reason from the viewpoint of the contractor according to its severity is (Delay in progress payments and settlements by the owner) which is linked to the Owner set, Two causes related to the Others set and one cause for each contractor and consultant group.

Table 4. 6: SI and ranking of delay causes (Contractor and Consultant).

Contractor				Consultant			
R.	NO.	Cause of delay	SI %	R.	NO.	Cause of delay	SI %
1	46	Delay in progress payments and settlements by the owner	88.7%	1	30	Financial difficulties in financing the project by the Contractor.	82.5%
2	39	Late response of consultant to contractor entitlements	80%	2	20	Ineffective scheduling and planning of project by contractor	80%
3	55	Design errors	76.2%	3	29	Lack of experience of the contractor	72 %
4	32	Delays in payments to suppliers.	75%	4	46	Delay in progress payments and settlements by the owner	75%
5	59	Extreme weather conditions on the work sit	75%	5	53	Choosing the contractor with the lowest bid and lowest price	72.5%

The results in Table 4.6 are almost close to the results of Mahamid et al. (2012) which showed that the delay in selecting the lowest offer and lowest price and the delay in payments by the owner were among the highest in terms of the severity in the delay in construction projects.

According to the consultant the outcomes shows that the consultant has selected three causes related to the contractor's group, and two causes fall into the owner's

group, which it means that the consultant puts the greatest responsibility to the causes that related to the contractor.

The following table shows the top five causes of delay in construction projects in Benghazi Municipality from the angle of all the respondents according to the degree of severity. Appendix E contains a table of all the causes of delay and the Severity Index of each cause and their rank from the perspective of all the respondents.

Table 4. 7: SI and ranking of delay causes (Overall).

Rank	No.	Cause of delay	Main group	Sub-group	SI %
1	46	Delay in progress payments and settlements by the owner	Owner	Owner	84.17%
2	30	Financial difficulties in financing the project by the Contractor.	Contractor	Project financing	75.83%
3	53	Choosing the contractor with the lowest bid and lowest price	Owner	Owner	72.50%
4	32	Delays in payments to suppliers.	Contractor	Project financing	72.50%
5	59	Extreme weather conditions on the work sit	Others	External causes	72.50%

It is clear that respondents as a whole identified two of the top five causes that are linked to the Owner set, two causes in Contractor set, and one cause falls within the Other Causes set.

4.3.1.3 Importance index

The importance was measured by the Importance Index which shown in Equation (3.3). The researcher will present the top five causes according to their importance that effect and cause delay in construction projects in Benghazi Municipality from the perspective of both project parties.

Appendix C and Appendix D contains all causes of delay arranged by the importance Index of each reason according to the contractor and the consultant respectively.

Some of the results in Table 4.8 have converged with the outcome of the study Assaf et al. (1995) which showed that the most important reasons for deferral in construction projects from the standpoint of the contractor is the delay in payment of the contractor's dues by the client, also the outcomes were close to the outcomes of the reserach (Al-Khalil and Al-Ghafly (1999), which showed that the main causes of delay are the problems of financing and cash flows by the Contractor.

Table 4. 8: II and ranking of delay causes (Contractor and Consultant).

Contractor			Consultant		
Rank	Cause of delay	II %	Rank	Cause of delay	II %
1	Delay in progress payments and settlements by the owner	75.44%	1	Ineffective scheduling and planning of project by contractor	64.00%
2	Late response of consultant to contractor entitlements	60.00%	2	Choosing the contractor with the lowest bid and lowest price	59.81%
3	Choosing the contractor with the lowest bid and lowest price	56.19%	3	Financial difficulties in financing the project by the Contractor.	57.75 %
4	Delays in payments to suppliers.	53.44%	4	Delays in payments to suppliers.	48.94%
5	Problems with neighbors	49.84%	5	Lack of experience of the contractor	48.75%

The results in Table 4.8 are almost close to the study of Assaf et al. (1995) which presented that the most significant reasons for delaying projects from the perspective of the consultant are financial and monetary problems. The results also close to the findings of Al-Khalil and Al-Ghafly (1999), which showed that the most important causes of delay from the perspective of the consultant are Contractor financing difficulties, and inefficient planning and scheduling of the project, in addition to Choosing the lowest offer and lowest price without prior notice to the Contractors qualification.

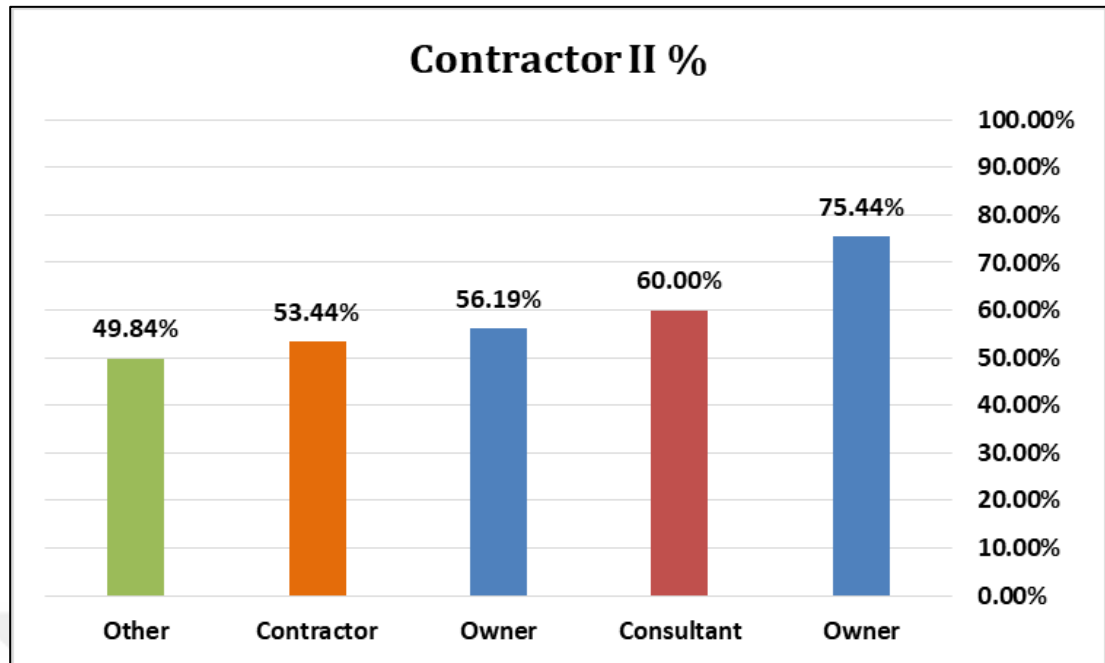


Figure 4. 1: Important Index of Delay Causes (Contractor)

Figure 4.1 demonstrates that the contractor select two of the top five causes that falls within the owner group of causes, one causes linked to the consultant, one linked to the contractor, an one linked to the Other Causes group where this means that the contractor bears the greatest responsibility to the owner.

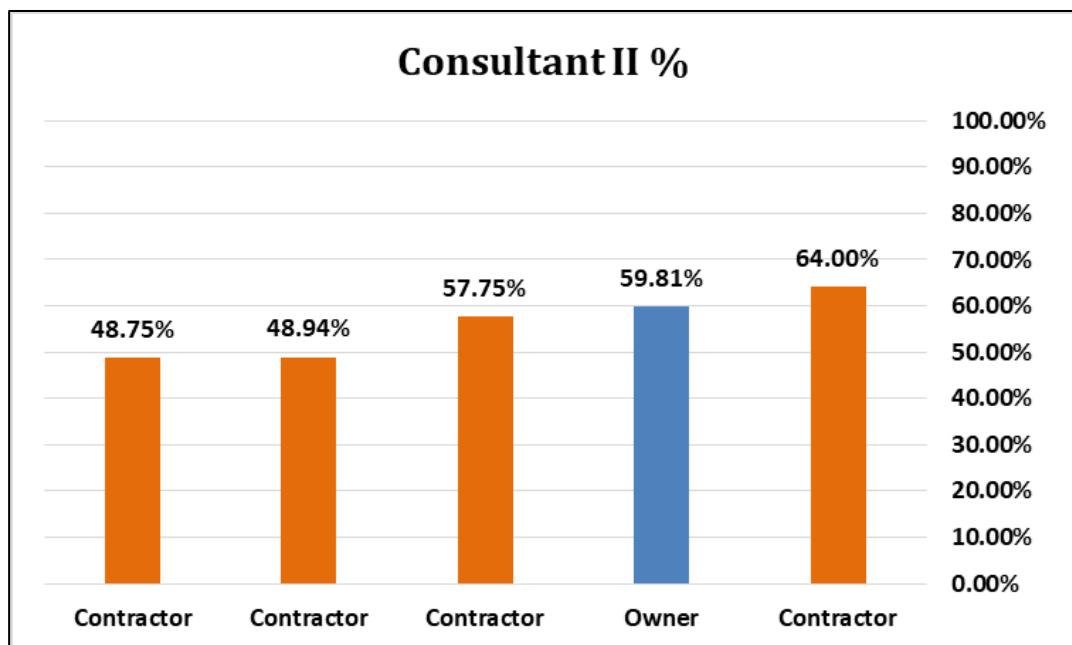


Figure 4. 2: Important Index of Delay Causes (Consultant)

Some of the findings in Table 4.8 have converged with some of the findings of the study Assaf and Al-Hejji (2006), which showed that the most important causes of delay from the perspective of the consultant is Selecting the lowest offer and lowest price.

According to the consultant Figure 4.2 shows that the consultant has selected four causes related to the contractor, and one cause fall into the owner's group, which it means that the consultant puts the greatest responsibility to the causes that relates to the contractor.

The following table shows the top five reasons of delay in construction projects in Benghazi Municipality according to all the respondents in terms of the Importance Index. Appendix E contains a table of all the causes of delay and the Importance Index of each cause and their rank from the perspective of all the respondents.

Table 4. 9: II and ranking of delay causes (Overall).

Rank	No.	Cause of delay	Main group	Sub-group	II %
1	46	Delay in progress payments and settlements by the owner	Owner	Owner	65.23%
2	53	Choosing the contractor with the lowest bid and lowest price	Owner	Owner	57.40%
3	32	Delays in payments to suppliers.	Contractor	Project financing	51.96%
4	30	Financial difficulties in financing the project by the Contractor.	Contractor	Project financing	51.19%
5	68	Problems with neighbors	Others	External causes	48.42%

The table above illustrates that the top five reasons of delay in construction projects in Benghazi Municipality according to its degree of importance are as follows:

- Delay in Progress Payments and Settlements by the Owner

The researcher directs this cause to the failure of the Municipality of Benghazi to estimate its budget accurately before starting to implement the project to the lack of sufficient reserve amounts for each project, as well as the lack of commitment by donors to the financial payments covering project costs.

The researcher indicates that the occurrence of this cause by the owner reflects negatively on the financial balance of the contractor and economic problems towards providers or other parties in sponsoring the project, which declines the contractor's capability to execute the project on time and causes the contractor problems with other parties (internal contractor, workers, supplier, etc.)

- Choosing the Contractor with the Lowest Bid and Lowest Price

The researcher directs this reason to the tenders system in Benghazi Municipality, which relay on the selection of the contractor at the cheapest costs for the execution of projects, where the researcher finds that the selection of the contractor at the cheapest costs without taking into consideration his experience, efficiency and the former performance, causes delays in the construction projects from the side of weak performance and knowledge of the contractor leads to problems and conflicts between the project parties, especially with the owner. In terms of following the specifications and materials according to what is mentioned in the contract.

The researcher believes that the adoption of the municipality at the lowest prices in the selection of the contractor creates a strong race among contractors and causes a decrease in the price of the auction which causing the loss of margin of profit or loss to the contractor, which badly impacts the performance of the contractor in the implementation of the project.

- Delays in Payments to Suppliers

The researcher points this cause to the financial troubles confronted by the contractor, which the owner may be its source.

The researcher finds that the delays in payments to suppliers by the contractor reflects adversely on the provider, in terms of distrust between the contractor and the provider in the schedule of the financial payments that the supplier may needs it, which leads to the delay of the supplier in providing the contractor with the basic materials used in the construction of the project which causes the work to be stopped or delayed, and the contractor may seek another supplier to supply the required materials and this requires a long time.

- Financial difficulties in financing the project by the Contractor

The researcher directs this reason to the depending of the contractor in financing the project on the financial payments which made by the owner

The researcher believes that the payments often delays on its time, also directs this cause to the nonexistence of a financial strategy by the contractor for each project before the start of implementation, a strategy to be capable to expect all the unusual circumstances that occurs through the execution of the project like the lack of liquidity from the contractor or the rise of worker wages or the materials prices or equipment breakdown.

The researcher finds that the access of some contractors in the operation of more than one project in the similar time cause them financial glitches and failure to Commitment to what is contracted upon in the contract and with other parties to finance the project.

- Problems with Neighbors

The researcher finds that the problems with neighbors are varied and many, and it depends on the nature of the project.

Where there are repeated objections from the neighbors, especially if the project is planned to be implemented on parts of citizens land or near to it or because a citizen claiming about owning a part of the project land, whether it's a road project or building or sewage, causing disputes between neighbors and project parties, and these hitches have a powerful influence on the delay of construction projects, due to the failure of the contractor or the municipality to resort to the police or the courts, especially in the case of failure of the friendly methods with the neighbors to resolve the outstanding problems.

Some of the results in Table 4.9 have converged with some of the results of Al-Najjar (2008) the results showed that the highest cause of delay in terms of importance from the point of view of the respondents as a whole is the Delay in Financial Flows during the Contractor's Construction Process, and differed in some of the results.

Which was considered by the study as one of the most important causes such as the supply of materials for the site and the lack of structural materials in the site, where the researcher did not see that these causes are one of the top five causes leading to the delay of construction projects.

The results in Table 4.9 also came close to some of the results of Odeh and Battaineh, (2002), where the results showed that the highest causes of delay in terms

of importance from the perspective of all the Respondents are Project Funding, Delays in Payments and Improper Planning, and It differed in some of the findings that were considered by Odeh and Battaineh (2002) to be among the highest causes according to its Importance such as Insufficient Contractor Experience, Labor Productivity, Subcontractor, While the researcher did not see that these causes are one of the five causes leading to the delay of construction projects.

The study of Sweis et al. (2008), came close to the results in the previous table which showed that one of the most important reasons for the delay in the completion of construction projects in Jordan is the contractor's financial difficulties.

4.3.1.4 Importance of delay groups

In the first part of the second Section of the questionnaire, the respondents were provided with a list of 69 potential reasons of delay. These effects were gathered into four main groups and nine Sub-groups, as shown in Table 3.5.

In this paragraph, the researcher will discuss the importance of the major and minor groups from the perspective of the contractor and the consultant, also the overall and its order according to the Average Important Index for each group which is calculated by the Equation (4.1).

$$\text{Importance Index Average for the group} = \frac{\text{Total of II for causes in the group}}{\text{Number of Causes in the group}} \quad (4.1)$$

Table 4. 10: Importance Index Average for the main groups.

NO.	Main Group	Number of Causes	Contractor		Consultant		Overall	
			II Average	R.	II Average	R.	II Average	R.
1	Contractor Related	32	27.15%	4	34.86%	1	31.00%	4
2	Consultant Related	9	40.81%	2	26.23%	4	33.52%	2
3	Owner Related	13	41.79%	1	33.28%	2	37.54%	1
4	Other Causes	15	33.51%	3	32.55%	3	33.03%	3
	Total	69						

- Main groups

The following table shows the average importance index for the main groups and their ranking according to the parties of the project (contractor and consultant) and the overall average of the importance index.

It is clear from Table 4.10 that the average of Importance Index for each major group from the perspective of the two parties to the project (contractor and consultant) was as follows:

- The Contractor consider the owner related group to be one of the highest group that has the highest Importance Index Average among all the major groups, which lead to delay in construction projects in Benghazi Municipality, followed by the consultant related group and Other Causes group, and in the last place the contractor related group. This shows that the contractor throws the greatest duty to the owner.
- The Consultant consider the contractor related group is the highest group that has the highest Importance Index Average in all the major groups, which lead to delay in construction projects in Benghazi Municipality, followed by the Owner related group and Other Causes group, while the contractor related group takes the last rank. This shows that the consultant carries the greatest responsibility to the contractor.
- The overall shows that the owner related group is the highest group that has the highest Importance Index Average among all the major groups, followed by the consultant related group and Other Causes group, while contractor related group sets in the last place.

- Subgroups

The following table shows the average importance index for the main groups and their ranking according to the parties of the project (contractor and consultant) and the overall average of the importance index.

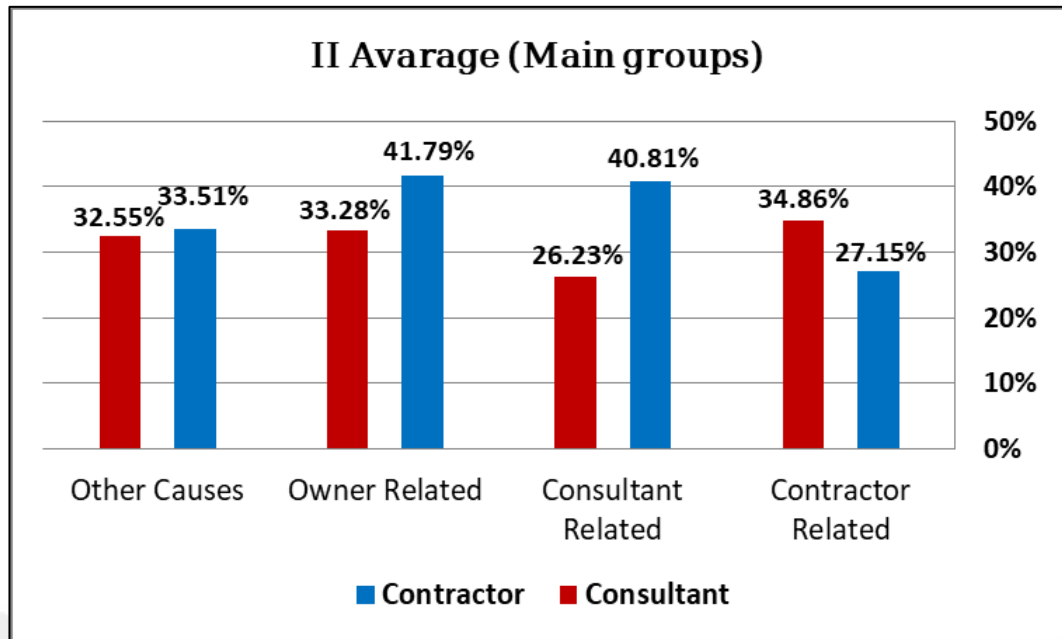


Figure 4. 3: Important Index Average (Main groups).

Table 4. 11: Importance Index Average for the Subgroups.

NO.	Subgroup	Number of Causes	Contractor		Consultant		Overall	
			II Average	Rank	II Average	Rank	II Average	Rank
1	Materials	3	18.44%	8	26.94%	7	22.69%	8
2	Tools	6	16.51%	9	24.6%	9	20.56%	9
3	Man power	5	29.67%	6	36.55%	3	33.11%	5
4	Project management	15	27.93%	7	37.57%	2	32.75%	6
5	Project financing	3	49.01%	1	46.94%	1	47.97%	1
6	Consultant related	9	40.81%	3	26.23%	8	33.52%	4
7	Owner related	13	41.79%	2	33.28%	5	37.54%	2
8	Early planning and designing	4	33.04%	5	29.58%	6	31.31%	7
9	External causes	11	33.68%	4	33.63%	4	33.65%	3
	Total	69						

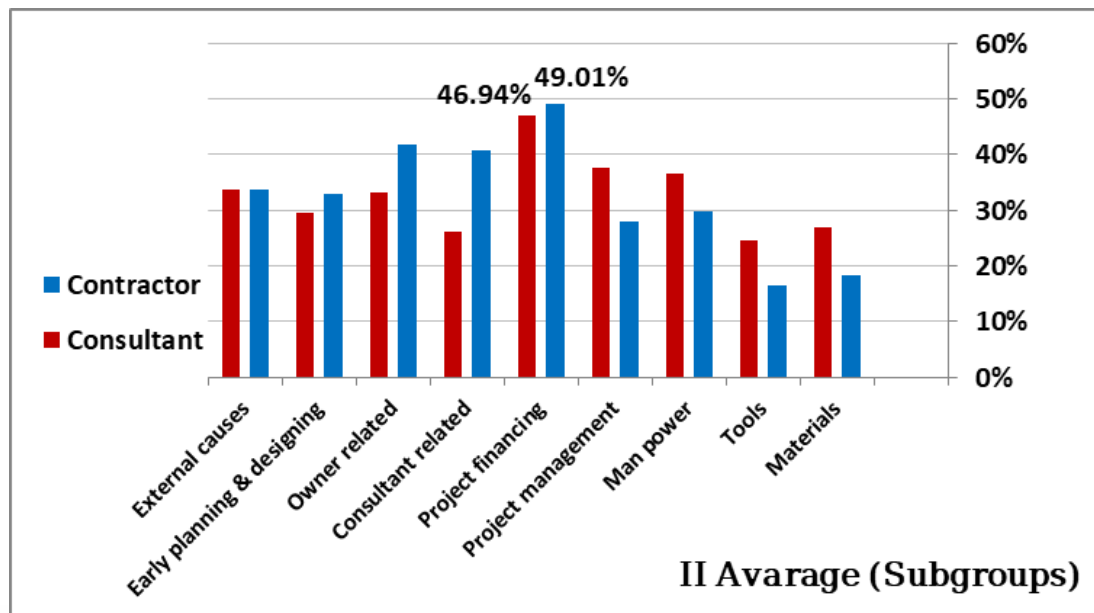


Figure 4. 4: Important Index Average (Subgroups)

The table 4.11 shows that the contractor and the consultant considers the Project Financing group is the highest subgroup that lead to delays in construction projects, where the average Importance Index for this group is 49.01% and 46.94% respectively, while the Tools group ranked ninth from the perspective of the contractor and the consultant which is in the last place with an average of 16.51% and 24.6% respectively, this indicates that the contractor and the consultant carries the greatest responsibility for delaying the projects to the contractor.

Figure 4.4 shows that there is a consensus between the project parties (contractor and consultant) in the order of the highest and lowest sub-group leading to delays in construction projects, also there is an agreement on the order of the external causes group, while there is a difference in the opinions of the project parties in the order of Average importance index for other subgroups.

There is an agreement with the results of Assaf et al. (1995) study, which considered that the project financing group is one of the most significant sub-groups that lead to suspensions in construction projects, which it took the highest rank among all the groups and was the most compatible between the parties of the project.

4.3.2 Other causes

The researcher asked a question to the respondents at the end of the questionnaire, is to write other cause, if any which was not mentioned in the list of (69) reasons that causes the delay in implementing construction projects in the Municipality of Benghazi During the period between 2013 and 2017, and the results were as follows:

- The Contractor

The following table shows the other causes that were not mentioned by the researcher in the Table 3.6, which it leads to delays in the construction projects in Benghazi Municipality in the duration between 2013 and 2017 from the viewpoint of the contractor.

Table 4. 12: SI, FI and II for the other causes (Contractor).

Rank	Other Causes	FI	SI	II
1	Lack of adequate training and qualification for the contracting sector.	80%	100%	80%
2	The competition between contractors in obtaining the tender which leads to low bid price.	100%	60%	60%
3	Delay in resolving the problems and objections of land owners, shops and neighbors nearby the work site.	60%	100%	60%
4	The contractor has more than one project at the same time.	80%	60%	48%

The causes arranged according to the Importance Index from top to bottom as follows: Lack of training and adequate qualification for the contracting sector, The struggle among contractors in earning the tender which cause low offer price, Delay in resolving the problems and objections of land owners, shops and neighbors nearby the work site and The contractor has more than one project at the same time.

- The Consultant

The following table shows the other causes that were not mentioned by the researcher in the Table 3.6, which it leads to delays in the construction projects in

Benghazi Municipality in the duration throughout 2013 to 2017 from the standpoint of the consultant.

Table 4. 13: SI, FI and II for the other causes (Consultant).

Rank	Other Causes	FI	SI	II
1	Overlap in the work site of more than one construction project at the same time e.g. road project with sewage project.	80%	100%	80%
2	Contractor qualification is inadequate	80%	80%	64%
3	The absence of Libyan specifications so that the contractor committed to it.	80%	60%	48%
4	Weak internal coordination between the sections of the municipality.	60%	40%	24%

The causes arranged according to the Importance Index from top to bottom as follows: Overlap in the work site of more than one construction project at the same time e.g. road project with sewage project, Contractor qualification is inadequate, The absence of Libyan specifications so that the contractor committed to it, Weak internal coordination between the sections of the municipality.

4.4 The Interviews

The researcher used the interview tool, where he conducted three interviews with the heads of the three construction departments in the Municipality of Benghazi, Department of Architecture and Projects, Department of Roads and Bridges and Department of Sewage, in order to collect qualitative data.

The interview consisted of six questions that were presented to the departments heads to identify the population of the study and describe the construction projects in Benghazi Municipality during the period between 2013 and 2014, in which a delay occurred as indicated and explained in the four questions in (3.4.1), where these questions were answered by the department heads and analyzed by the researcher.

The fifth and sixth questions was asked about the most essential reasons of delay in the construction projects and the recommendations about them as follows:

- What are the most important causes of delay in construction projects executed in the period between 2013 to 2017 according to the head of the department?
- What are the recommendations that the head of department recommend to avoid the most important causes of delay?

The answers of each head of department were as follows was as follows:

- The head of the Department of Architecture and Projects answered this question by dividing the causes of delay as excusable delays and its source the municipality or funding agencies and these are: the additional works by the municipality, requests for adjustments from time to time by the municipality, lack of clarity in the drawings and plans for the owner, delays in financial payment by the owner or the financier, neighbors problems, incomplete drawings, The security situation and the unusual weather conditions.

And non-excusable delays that the contractor its source such as the lack of experience of contractors in time management, contractors are not qualified, lack of qualified technical staff with the contractor, and some contractors provide inaccurate financial details about their financial status despite their true status that is not good and unstable, also the lack of materials causes interruptions in construction projects. One of the most significant reasons mentioned by the head of the Department of Architecture is that the municipality overlooks most of the delayed time caused by the contractor. He mentioned that this overlooking occurs because of the existence of a deal between the owner and the contractor so that the municipality exceeds some matters and the contractor exceeds some other matters, in addition to the municipality's unwillingness to cause a loss for the contractor.

The head of the Department of Architecture and Projects recommends that the owner should not overlook the time delayed by the contractor , where fines would be the best solution for this case as the contractor will give more attention to the delayed time which cause by him.

- The head of the sewage department indicated that the main causes of delay are extreme weather conditions, equipment breakdowns, neighbor's

problems, the contractor has a several projects to operate in one time, the economical complications in funding the project by the contractor, delaying in payments by the owner to the contractor and an unrealistic period of time in the contract.

The head of the sewage department recommends that the Contractors should carefully study all the technical and financial aspects and review the documents of the contract in a scientific and accurate before signing the contract and the owner should pay the duties to the contractor on time because it effects the contractor work which it causes delay.

- The head of the roads department answered that the main causes of delay are the competition is limited in some financially weak companies due to lack of competition or alternative, problems with the neighbors, extreme weather conditions, the effects of underground conditions (soil type, water level), traffic restrictions on the work site, unfinished infrastructure work and equipment breakdowns.

The head of the roads department recommends that both the contractor and the municipality immediately resolve the issues, disputes and problems with site neighbours without postponement or waiting, through the police or the courts, especially if the friendly methods did not succeed with the neighbors.

The researcher finds that there is an agreement in the results of interviews with the results of the questionnaire in terms of the most important causes of delay such as financial difficulties of the owner and the contractor, and the problems of neighbors.

4.5 Case Study (Tariq Bin Ziyad Community Center)

4.5.1 Project background

This case is one of the construction projects that have passed into a time and cost overruns in the Department of Architecture and Projects in the Municipality of Benghazi.

The project is a cultural and sports center consisting of swimming pool, sauna, Jacuzzi, and a multi-purpose hall and its annexes. The area of the center is 1000 m^2 square meters located in the city of Benghazi in the northern region, it was targeting 50,000 people, and the supervisors and designers of this project were the

municipality consultants, where the project began on 25-7-2015 and actually ended on 1-3-2017.

Table 4. 14: Characteristics of the Case Study Project.

Project name	Tariq Bin Ziyad Community Center
Owner	Municipality of Benghazi
Sponsor	Municipality of Benghazi
Contractor	Al - Fardous Contracting Company.
Project Designer	Benghazi Municipality Consultant
Project Supervisor	Benghazi Municipality Consultant
Project Description	Cultural and sports center consist of swimming pool, sauna, Jacuzzi, and a multi-purpose hall and its annexes and the area of the center is 1000 m^2
Location	Benghazi City, Northern region
Target Population	50,000
Contract Start Date	25-7-2015
Contract End Date	25-1-2016
Contract Duration	185 Days
Actual End Date	1-3-2017
Actual Duration	585 Days
Exceeded duration (Delay Time)	401 Days
Contract Project Amount (\$)	493,702.9 \$
Actual Project Amount (\$)	612,676.3 \$
Cost Overruns (\$)	118,973.4 \$

4.5.2 Project history

The number of contractors who submitted for this project was 6 contractors the municipality has examined the documents by selecting a committee of experts, technicians, consultants, engineers and accountants in the municipality to check the complete documents including the general and technical specifications and the invoices of quantities and drawings. The tender continued for 11 days.

The methods used by the Municipality of Benghazi in selecting and awarding the tender to the contractor are the technical and financial evaluation by the relevant committees. Thus, according to the evaluation report submitted by the Municipality of Benghazi, and audited by the municipal consultant, the contract was awarded to the contractor who has the lowest bid value "lowest price" and meets the requirements.

4.5.3 Project assessment

To evaluate the project, the researcher took the opinions of the project parties, the contractor and consultant. The owner excluded because the consultant works for Benghazi Municipality, where the consultant's report on the project and its delay represent the owner at the same time, therefore the researcher asked both parties to present the most essential reasons of delay in the project and they were as following:

From the perspective of the contractor

- Late payment and disbursement of dues and payments to the contractor by the municipality of Benghazi.
- Opposition of the land neighbors and preventing the contractor from carrying out his work.
- Failure to inform the police or courts to resolve disputes with the site's neighbors.
- Incomplete drawings where the building was expanded and new jobs added to the contractor.
- Financial complications in funding the project by the contractor.
- Rising of resources prices.
- High Exchange rate "Currency".
- Presence of several project for the contractor in one time.

From the perspective of the consultant

- Choose the contractor with the lowest bid and price.
- Problems with Neighbors.
- Assigning the contractor additional work.
- Unsuccessful preparation and arranging of project by the contractor.
- Financial complications in funding the project by the contractor.

The researcher finds that the information obtained from the records of the Municipality of Benghazi and from the perspective of the consultant are matching the findings of the researcher and the results of the questionnaire which stating that the contractor was selected in terms of the lowest bid and price, Also the problems of neighbors are one of the major reasons of the delay in construction projects.

In the opinion of the researcher the time overrun led to cost overrun as the delayed period was 401 calendar day, and led to an exceeding and increasing in cost

amounted 118973.4 US dollars, this is a large amount and the cost overruns are much greater, as there is a missed opportunity by the beneficiaries of this project to invest during the delayed time, also time overrun affects the financial position of the contractor in terms of increasing administrative expenses and guarantees which causes loss to the contractor.

The researcher finds that the main source of delay was caused by the owner in terms of expansion of the building and assigning an additional work to the contractor, in addition delays in paying the dues to the contractor, and the second source is the problems with neighbors and lack of speed in deciding to solve these problems either by the owner or the contractor.

4.6 Kendall Coefficient of Concordance

To determine the agreement of ranks between the two parties the consultants and contractors. The Kendall coefficient of concordance (W) is used to measure the communality of ranks for (m) observers. It is computed with the following formula (Kendall, 1970) :

$$W = \frac{12S}{m^2(n^3 - n)} \quad (4.2)$$

Where S is the sum of squares of deviations of the rankings, that is:

$$S = \sum_{i=1}^N (R_i - \bar{R})^2 \quad (4.3)$$

m is the number of sets of rankings, n is the number of variables being ranked, R_i is the sum of ranks for i^{th} variable and $\bar{R}$ is mean of sum of the ranks.

W ranges between 0 and 1, $W = 1$ indicate a perfect agreement; but if the rankings by various groups differ very much, the sum of rankings (R_i) is more or less equal for each of the factors and hence the value of S becomes small and so does W .

The data collection and analysis methods explored in chapter 3 are used to provide appropriate formulae upon which to test the research findings in delayed construction projects in Benghazi Municipality. The four formulae: (3.1) the Severity Index, (3.2) the Frequency Index, (3.3) Importance Index, (4.2) the Kendall's Coefficient play a significant role in producing ordered ranking lists,

Accordingly, the values of W for rankings of delay causes are found to be 0.763. In order to know whether there is agreement or disagreement between the two groups on ranking the factors, a test of hypothesis is needed.

- Null hypothesis: H_0 : Disagreement in rankings between the two groups.
- Alternative hypothesis: H_1 : Agreement in rankings among the two groups.

Siegel and Castellan (1988) assert that the null hypothesis is usually formulated to express the purpose of being rejected; it is the opposite of an alternative hypothesis that one is attempting to prove. The null hypothesis is rejected, in favor of the alternative hypothesis, if its associated probability of occurrence is equal to or less than some small probability (p). That probability is called level of significance, and its common values are 0.05 and 0.01. The level of significance of 0.05 is selected for this research.

The probability related with the occurrence when the null hypothesis is true of any value may be calculated after finding χ_r^2 using equation (4.4) and determining the probability linked with as large a value of χ_r^2 by referring to chi-square χ^2 distribution table [Siegel and Castellan, 1988], The respective results are shown in Table 4.15.

$$\chi_r^2 = m(n - 1)W \quad (4.4)$$

Table 4. 15: Analysis of coefficient of concordance and significance level.

Description	m	n	W	χ_r^2	P
Ranking for Delay variables	3	85	0.763	192.05	0.00000000019

The values of level (P) are less than 0.05, and hence verify that the null hypothesis “there is no agreement among the sets of rankings by the parties (consultant and contractor)” has to be rejected. Subsequently, the alternative hypothesis; i.e., “there is agreement among the sets of rankings by the parties” is supported with confidence level of more than 95%. Computation of Kendall coefficient of concordance and level of significance (p) is indicated in Appendix G.

5. FINDINGS AND RECOMMENDATIONS

5.1 Introduction

In this chapter, the researcher presents a summary of the research outcomes from the characteristics of the respondents and the research questions, in addition to the important recommendations.

5.2 Findings

5.2.1 Characteristics of respondents

- The results showed that the total amount of construction projects implemented in Benghazi municipality between 2013 and 2017 are (104) construction project. The amount of delayed construction projects reached (54) projects which is 51.9% of the total implemented projects, and the amount of Non-delayed construction projects according to the contract are (50) which is (48%) of the construction projects which implemented in the municipality of Benghazi. The researcher believes that these results give a strong indication that the delay is a common phenomenon in construction projects In Benghazi Municipality.
- The results cleared that the number of respondents whose data subjected to statistical analysis was (54) respondents. The total number of contractors and consultants participated in the construction projects in which were delayed occurred reached (36) contractors and (18) consultants who participated in the implementation of (104) construction projects.

The researcher believes that this conclusion indicates that some of the contractors which had a delayed projects implemented more than one construction project in Benghazi Municipality.

5.2.2 Projects performance

This section summarizes the results of the delayed projects performance which implemented by the Municipality of Benghazi from 2013 to 2017.

The results showed that (62.4%) of the responses were from the perspective of the contractors and (75%) of the responses from the perspective of the consultants and (66.7%) of the responses from the respondents as a whole, indicated that the period of postponement in the construction projects in Benghazi Municipality ranges from 10% to 30% of the original project time that specified in the contract, where it appears that there is an agreement and convergence between the contractor and the consultant about the rate of the delay period.

The results showed that (62.5%) of the responses from the viewpoint of the respondents as a whole indicated that Benghazi Municipality has ignored the full delay in the construction projects despite that the delay due to events that falls under the responsibility and the control of the contractor, and from the results it is found that there is an agreement between the contractor and the consultant regarding the municipality's ignoring for the suspension in the construction projects. This indicates that the non-fining of the municipality to the contractor is one of the strongest reasons that lead to delay in construction projects at Benghazi Municipality.

The results showed that (41.7%) of responses from the point of view of the respondents as a whole show that the greatest responsible party for the delay is the contractor, however all the parties have took a part of the responsibility, where each of the parties of the project (contractor and consultant) holding the responsibility of the delay to each other.

5.2.3 Causes of Delay

The results showed the highest five causes in terms of the Frequency of Occurrence out of (69) causes leading to the delay of construction projects in Benghazi Municipality in period from 2013 to 2017 are sorted from the highest to lowest as follows:

- Contractor perspective: Delay in progress payments and settlements by the owner, Choosing the contractor with the lowest bid and lowest price, Late response of consultant to contractor entitlements, Delays in payments to suppliers by the contractor and Consultant's late approval of contractor's requests.

- Consultant perspective: Choosing the contractor with the lowest bid and lowest price, Ineffective scheduling and planning of project by contractor, Delays in payments to suppliers by the contractor, Problems with neighbors and Financial difficulties in financing the project by the Contractor.
- All Respondents perspective: Choosing the contractor with the lowest bid and lowest price, Delay in progress payments and settlements by the owner, Delays in payments to suppliers by the contractor, Problems with neighbors and Financial difficulties in financing the project by the Contractor.

The results showed the highest five causes in terms of the Degree of Severity leads to the delay of construction projects in Benghazi Municipality in period from 2013 to 2017 are sorted from the highest to lowest as follows:

- Contractor perspective: Late response of consultant to contractor entitlements, Design errors, Delays in payments to suppliers by the contractor, and Extreme weather conditions on the work sit.
- Consultant perspective: Financial difficulties in financing the project by the Contractor, Ineffective scheduling and planning of project by contractor, Lack of experience of the contractor, Delay in progress payments and settlements by the owner and Choosing the contractor with the lowest bid and lowest price.
- All Respondents perspective: Delay in progress payments and settlements by the owner, Financial difficulties in financing the project by the Contractor, Choosing the contractor with the lowest bid and lowest price, Delays in payments to suppliers by the contractor and Extreme weather conditions on the work sit.

The results showed the highest five causes according to the Importance Index leads to the delay of construction projects in Benghazi Municipality in period from 2013 to 2017 are sorted from the highest to lowest as follows:

- Contractor perspective: Delay in progress payments and settlements by the owner, Late response of consultant to contractor entitlements, , Choosing the contractor with the lowest bid and lowest price, Delays in payments to

suppliers by the contractor and Problems with neighbors, where this results indicates that the contractor holds the greatest responsibility for delaying the projects to the Owner.

- Consultant perspective: Ineffective scheduling and planning of project by contractor, Choosing the contractor with the lowest bid and lowest price, Financial difficulties in financing the project by the Contractor, Delays in payments to suppliers by the contractor and Lack of experience of the contractor, where this result indicates that the contractor holds the greatest responsibility for delaying the projects to the Contractor.
- All Respondents perspective: Delay in progress payments and settlements by the owner, Choosing the contractor with the lowest bid and lowest price, Delays in payments to suppliers by the contractor, Financial difficulties in financing the project by the Contractor and Problems with neighbors.

The outcomes revealed that the most significant reasons not mentioned by the researcher in the list (69), which leads to delays in the construction projects in the municipality of Benghazi are the intense competition between contractors in the selection of tender "and overlap in the site work due to the implementation of more than one construction project in the same time.

5.2.4 Importance of delay groups

- The results showed the ranking of the four main groups from top to bottom according to the average importance index from the opinion of the two parties of the project as follows: First came the owner related group, followed by the consultant related group, the other causes group, and finally the contractor related group.
- The results showed the highest and the lowest rank of the nine Subgroups according to the average importance index from the viewpoint of the two parties of the project as follows: The project financing group was first among the causes and the lower rank was the Tools group.

5.3 Recommendations

From the findings of the current research, the researcher recommends the following:

5.3.1 Recommendations related to the municipality

The study endorses that the Municipality of Benghazi should assess and calculate its budget accurately before starting Implementation of the project, as well as covering high prices and payment of contractors' financial dues on time.

The need to develop pure rules to the system of tenders and selection of the contractor, and not only count on the selection of the contractor at the cheapest costs for the execution of the project, but to make attention to the technical and financial productivity of the contractor and his experience, qualifications and previous performance in the construction projects, in addition to the need to take punishing procedures and fine the late contractor to lead to his commitment to the specified time, also the establishment of a accurate duration in the contract to stay far from time overrun by the contractor, also additional works required by the Municipality from the Contractor during the implementation of the Project and focusing on the stage of planning and design to not fall in any errors or struggles or additions to adjustments.

5.3.2 Recommendations related to the contractor

The study recommends that the contractors identify the bases of subsidy and develop a economical plan for each project before the implementation and to be capable of predicting all the unusual situations that arise throughout the implementation of the project due to the shortage of liquidity of the contractor or the high salaries of workers or material prices.

The contractor must refrain from entering into an intense competition that is not calculated or computed between him and the other contractors whose submitting the tender, which has undesirable consequences and become an Adventure for the contractor because of the low price of the auction, which causes the loss of profit margin or loss due to intense competition, which negatively affects the project.

Contractors should carefully study all the technical and financial aspects, and review the documents of the contract in a scientific and accurate before signing the contract and They should take advice, support and assistance from experts to understand any ambiguous item or unclear requirements, because it is difficult to modify the contract after signing it.

5.3.3 General recommendations

The study recommends that both the contractor and the municipality immediately resolve the issues, disputes and problems with site neighbours without postponement or waiting, through the police or the courts, especially if the friendly methods did not succeed with the neighbors.

The study recommends the necessity of increasing communication and interaction between contractors. Municipality and consulting offices to study and discuss the problems which faced by the main project parties (contractor, consultant and owner), which cause delays in the construction project, in order to solve these problems and avoid them in the future.

5.3.4 Future recommendations

The researcher recommends to conduct more investigation and field studies in this zone, especially for truthful cases of implemented and delayed projects, by taking the available archives for those projects, also to make studies on delays in other municipalities and on each the government and private subdivision and compare it with this study.

There is a need to conduct research and studies on several important topics in the Municipality of Benghazi such as:

- The causes for growing prices in the construction projects in Benghazi Municipality.
- Influence of the delayed payments on construction projects.
- Elements influencing the funding of construction projects in Benghazi Municipality.
- The application of risk management in the construction projects in Benghazi Municipality.
- Causes of failure in construction projects in Benghazi Municipality.
- Causes of the poor quality of construction projects in the Municipality of Benghazi.
- Researching problems in tenders official papers and its solutions.
- The truthful negotiations in resolving clashes among the parties of the project.

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APPENDICES

APPENDIX A: Questionnaire

Dear participant,

The researcher is preparing a field study on the causes of delays in construction projects in Benghazi Municipality during the period from 2013 to 2017, in order to complete the requirements to obtain a Master's Degree in Business Administration from Istanbul Aydin University.

The key element in the completion and success of this research is to proceed of this questionnaire

Please kindly respond to all the attached paragraphs and questions carefully and objectively. All answers and information will be strictly confidential and will be only used for scientific research purposes.

Note: The answers must be based on the experience in this area rather than on specific project information.

Thank you for your cooperation.

Zuhir Fathi Busneina
Istanbul Aydin University
Institute of Social Sciences

Type of Organization: ☐ Contractor. ☐ Consultant.

Section 1: Performance of the Delayed Construction Projects.

Please indicate your response by marking (X or √) in the appropriate boxes.

1. What is the average time for delays in construction projects in Benghazi municipality relating to the project time specified in the contract?

☐ Less than 10% from the original time. ☐ 10% to 30% from the original time.

☐ 31% to 50% from the original time. ☐ 51% to 100% from the original time.

☐ More than 100%.

2. How much delayed time did the owner (Municipality) overlooked?

☐ Entire delayed time. ☐ 75% of the delayed time. ☐ 50% of the delayed time.

☐ 25% of the delayed time. ☐ Did not overlooked.

3. Based on your previous experience, who is the greatest party responsible for the delays of construction projects in Benghazi Municipality?

☐ Contractor. ☐ Consultant. ☐ Owner (Benghazi Municipality).

☐ Others, Please specify

Section 2: Causes of delay in Construction Projects

Explanatory notes to answer this section:

Frequency of Occurrence: means to which range these causes occur during the construction of projects.

Degree of Severity: means in which range this cause affects the delay of completion of the construction projects according to the original date specified in the contract.

Frequency of Occurrence		Degree of Severity	
Scale	Description	Scale	Description
1	Never	1	None
2	Rare	2	Neutral
3	Sometimes	3	Moderate
4	Often	4	High
5	Always	5	Very high

1. The list below includes the Causes of the delay: Please read the following statements and answer them in the scale by marking (√) for the appropriate answer for each cause:

No	Factors Causing Delay	Frequency of Occurrence					Degree of Severity				
		Never	Rare	Sometimes	Often	Always	None	Neutral	Moderate	High	Very high
1. Contractor Related											
Materials											
1	Shortage of required materials										
2	Delays in the supply of materials to the work site										
3	Change in material specifications										
Tools											
4	Shortage of required equipment										

No	Factors Causing Delay	Frequency of Occurrence					Degree of Severity				
		Never	Rare	Sometimes	Often	Always	None	Neutral	Moderate	High	Very high
5	equipment breakdowns										
6	Shortage of equipment spare parts										
7	Low equipment productivity										
8	Improper selection of equipment (not appropriate)										
9	Incorrect distribution of project equipment										
Manpower											
10	Shortage of skilled labor in the market										
11	Insufficient skill of labour										
12	shortage in number of site workers										
13	The personal arguments between the workers and the management team										
14	Poor distribution of workers at the workplace										
Project Management											
15	Lack of administrative staff at the contractor										
16	Lack of experienced staff in the contractor company										
17	Poor communication of contractor's within the parties involved in the project										
18	Poor coordination of contractor with other parties in the project										
19	Poor control of the contractor on the subcontractor										
20	Ineffective scheduling and planning of project by contractor										
21	Ineffective control over the progress of the project by the Contractor										
22	Inefficient quality control by the Contractor										
23	Interruption between Contractor and other parties										
24	Use of bureaucracy in organizing work within Location										
25	Spend a lot of time finding subcontractors at the lowest price to implement project										

No	Factors Causing Delay	Frequency of Occurrence					Degree of Severity				
		Never	Rare	Sometimes	Often	Always	None	Neutral	Moderate	High	Very high
	activities										
26	Lack of understanding by the technical staff of the contractor for the consultant's position										
27	Contractor's failure to comply with Consultant's instructions										
28	Contractor depends on a newly graduated engineer for all responsibilities in the site										
29	Lack of experience of the contractor										
Project Financing											
30	Financial difficulties in financing the project by the Contractor.										
31	Delays in payments to subcontractors.										
32	Delays in payments to suppliers.										
2. Consultant Related											
33	Poor qualification of consultant/ engineer's staff assigned to the project										
34	Consultant's late approval of contractor's requests										
35	Poor communication between the consultant and the other parties in the project.										
36	Poor coordination between the consultant and the other parties of the project.										
37	Delay in inspection, performing and testing by the engineer/ consultant										
38	Non-compliance of the consultant's staff with the official attendance.										
39	Late response of consultant to contractor entitlements										
40	Consultant's late approval of contractor materials										
41	The existence of previous conflicts between the consultant and the contractor										
3. Owner Related											
42	The duration of the contract is insufficient "short"										

No	Factors Causing Delay	Frequency of Occurrence					Degree of Severity				
		Never	Rare	Sometimes	Often	Always	None	Neutral	Moderate	High	Very high
43	Owner's late approval of contractor's requests										
44	Suspension of work by owner										
45	Delay in change orders by the owner										
46	Delay in progress payments and settlements by the owner										
47	Poor communication with other project parties										
48	Poor coordination by the owner with other project parties										
49	The bureaucracy in the owner's administration										
50	Changes in the project contract by the owner (change in Specifications or works ... etc).										
51	Assigning the contractor additional work from time to time										
52	the owner gives oral instructions										
53	Choosing the contractor with the lowest bid and lowest price										
54	Shortage of owner's consultants										
4. Other Causes											
Early Planning and Designing											
55	Design errors										
56	Changes in project scope										
57	Unclear specifications										
58	Graphics are incomplete										
External Causes											
59	Extreme weather conditions on the work sit										
60	Ground conditions (soil type, water levels)										
61	Traffic restrictions on the work site										
62	Effects of social and cultural conditions on the workplace										
63	Inappropriate infrastructure in the workplace (water supply, electricity / telephone, etc.)										
64	The security situation of the work site										
65	Exchange rate fluctuations "Currency"										

No	Factors Causing Delay	Frequency of Occurrence					Degree of Severity				
		Never	Rare	Sometimes	Often	Always	None	Neutral	Moderate	High	Very high
66	Changes in the banking policy for loans										
67	Changes in material prices										
68	Problems with neighbors										
69	Financiers controls project orientation										

2. Based on your experience. Kindly write three other Causes, if any, lead to delays in construction projects indicating their scale of frequency and severity.

No	Factors Causing Delay	Frequency of Occurrence					Degree of Severity				
		Never	Rare	Sometimes	Often	Always	None	Neutral	Moderate	High	Very high
1											
2											
3											

Note:

If you wish to receive the research and its results, please write your name and e-mail.

Name /

Email /

Kind Regards for your effort in answering this questionnaire.

APPENDIX B: Interview Questions

- How many construction projects implemented in the department during the period between 2013 and 2017?
- How many construction projects implemented in the department in which a delay accrued during the period between 2013 and 2017?
- How many contracting companies participated in the delayed construction projects implemented during the period between 2013 and 2017 in Benghazi municipality?
- The number of consultants involved in the implementation of the delayed construction projects which implemented by the Municipality of Benghazi during the period between 2013 and 2017?
- What are the most important causes of delay in construction projects executed in the period between 2013 to 2017, according to the head of the department?
- What are the recommendations that the head of department recommend to avoid the most important causes of delay?

APPENDIX C:

Table C.1: FI, SI and II according to the contractor.

R.	No.	Main Group	Subgroup	FI %	SI %	II %
1	46	Owner	Owner	85.00	88.75	75.44
2	39	Consultant	Consultant	75.00	80.00	60.00
3	53	Owner	Owner	77.50	72.50	56.19
4	32	Contractor	Project Financing	71.25	75.00	53.44
5	68	Other	External Causes	68.75	72.50	49.84
6	59	Other	External Causes	65.00	75.00	48.75
7	30	Contractor	Project Financing	66.25	72.50	48.03
8	51	Owner	Owner	66.25	72.50	48.03
9	55	Other	Early Planning and Designing	62.50	76.25	47.66
10	34	Consultant	Consultant	68.75	68.75	47.27
11	40	Consultant	Consultant	66.25	70.00	46.38
12	62	Other	External Causes	66.25	70.00	46.38
13	31	Contractor	Project Financing	67.50	67.50	45.56
14	42	Owner	Owner	62.50	70.00	43.75
15	10	Contractor	Manpower	65.00	66.25	43.06
16	33	Consultant	Consultant	66.25	65.00	43.06
17	50	Owner	Owner	60.00	71.25	42.75
18	64	Other	External Causes	65.00	65.00	42.25
19	19	Contractor	Project Management	63.75	66.25	42.23
20	35	Consultant	Consultant	65.00	63.75	41.44
21	43	Owner	Owner	62.50	65.00	40.63
22	47	Owner	Owner	62.50	65.00	40.63
23	36	Consultant	Consultant	65.00	62.50	40.63
24	61	Other	External Causes	60.00	65.00	39.00
25	37	Consultant	Consultant	62.50	61.25	38.28
26	48	Owner	Owner	57.50	66.25	38.09
27	45	Owner	Owner	60.00	61.25	36.75
28	49	Owner	Owner	57.50	63.75	36.66
29	11	Contractor	Owner	60.00	60.00	36.00
30	21	Contractor	Project Management	58.75	60.00	35.25
31	23	Contractor	Project Management	58.75	60.00	35.25
32	20	Contractor	Project Management	52.5	65.00	34.13
33	67	Other	External Causes	60.00	56.25	33.75
34	28	Contractor	Project Management	56.25	57.50	32.34
35	52	Owner	Owner	57.50	56.25	32.34
36	12	Contractor	Owner	55.00	56.25	30.94
37	25	Contractor	Project Management	55.00	56.25	30.94
38	22	Contractor	Project Management	53.75	56.25	30.23

Table C.1: FI, SI and II according to the contractor (cont.).

R.	No.	Main Group	Subgroup	FI %	SI %	II %
39	54	Owner	Owner	53.75	56.25	30.23
40	58	Other	Early Planning and Designing	52.50	57.50	30.19
41	38	Consultant	Consultant	53.75	55.00	29.56
42	65	Other	External Causes	56.25	52.50	29.53
43	57	Other	Early Planning and Designing	50.00	56.25	28.13
44	56	Other	Early Planning and Designing	48.75	53.75	26.20
45	29	Contractor	Project Management	48.75	51.25	24.98
46	17	Contractor	Project Management	46.25	50.00	24.38
47	27	Contractor	Project Management	47.50	51.25	23.70
48	18	Contractor	Project Management	46.25	48.75	23.16
49	15	Contractor	Project Management	46.25	50.00	23.13
50	16	Contractor	Project Management	43.75	50.00	23.13
51	8	Contractor	Tools	43.75	51.25	22.42
52	3	Contractor	Materials	47.50	46.25	21.97
53	60	Other	External Causes	45.00	48.75	21.94
54	44	Owner	Owner	42.50	51.25	21.78
55	69	Other	External Causes	45.00	46.25	20.81
56	14	Contractor	Manpower	46.25	45.00	20.81
57	41	Consultant	Consultant	42.50	48.75	20.72
58	66	Other	External Causes	43.75	43.75	19.14
59	5	Contractor	Tools	45.00	42.50	19.13
60	63	Other	External Causes	45.00	42.50	19.13
61	4	Contractor	Tools	46.25	41.25	19.08
62	24	Contractor	Project Management	42.50	43.75	18.59
63	26	Contractor	Project Management	41.25	42.50	17.53
64	13	Contractor	Manpower	42.50	41.25	17.53
65	1	Contractor	Materials	37.50	46.25	17.34
66	2	Contractor	Materials	40.00	40.00	16.00
67	9	Contractor	Tools	38.75	41.25	15.98
68	7	Contractor	Tools	37.50	38.75	14.53
69	6	Contractor	Tools	27.50	28.75	7.91

Table C.2: FI, SI and II according to the consultant.

R.	No	Main Group	Subgroup	FI %	SI %	II %
1	20	Contractor	Project Management	80.00	80.00	64.00
2	53	Owner	Owner	82.50	72.50	59.81
3	30	Contractor	Project Financing	70.00	82.50	57.75
4	32	Contractor	Project Financing	72.50	67.50	48.94
5	29	Contractor	Project Management	65.00	75.00	48.75
6	46	Owner	Owner	62.50	75.00	46.88
7	10	Contractor	Manpower	67.50	67.50	45.56
8	21	Contractor	Project Management	65.00	70.00	45.50
9	68	Other	External Causes	70.00	65.00	45.50
10	16	Contractor	Project Management	70.00	65.00	45.50
11	60	Other	External Causes	65.00	67.50	43.88
12	12	Contractor	Manpower	65.00	65.00	42.25
13	22	Contractor	Project Management	65.00	65.00	42.25
14	59	Other	External Causes	62.50	67.50	42.19
15	15	Contractor	Project Management	70.00	60.00	42.00
16	50	Owner	Owner	62.50	65.00	40.63
17	14	Contractor	Manpower	62.50	62.50	39.06
18	28	Contractor	Project Management	60.00	65.00	39.00
19	51	Owner	Owner	62.50	60.00	37.50
20	42	Owner	Owner	50.00	67.50	37.13
21	27	Contractor	Project Management	62.50	57.50	35.94
22	69	Other	External Causes	62.50	57.50	35.94
23	64	Other	External Causes	57.50	60.00	34.50
24	2	Contractor	Materials	60.00	57.50	34.50
25	31	Contractor	Project Financing	52.50	65.00	34.13
26	65	Other	External Causes	57.50	57.50	33.06
27	67	Other	External Causes	60.00	55.00	33.00
28	55	Other	Early Planning and Designing	55.00	57.50	31.63
29	61	Other	External Causes	55.00	57.50	31.63
30	33	Consultant	Consultant	57.50	55.00	31.63
31	19	Contractor	Project Management	57.50	55.00	31.63
32	9	Contractor	Tools	57.50	55.00	31.63
33	57	Other	Early Planning and Designing	55.00	55.00	30.25
34	24	Contractor	Project Management	55.00	55.00	30.25
35	18	Contractor	Project Management	60.00	50.00	30.00
36	40	Consultant	Consultant	45.00	65.00	29.25
37	49	Owner	Owner	52.50	55.00	28.88
38	43	Owner	Owner	55.00	52.50	28.88
39	11	Contractor	Manpower	55.00	52.50	28.88
40	58	Other	Early Planning and Designing	55.00	52.50	28.88
41	17	Contractor	Project Management	55.00	52.50	28.88

Table C.2: FI, SI and II according to the consultant (cont.).

R.	No.	Main Group	Subgroup	FI %	SI %	II %
42	35	Consultant	Consultant	50.00	57.50	28.75
43	48	Owner	Owner	50.00	57.50	28.75
44	8	Contractor	Tools	50.00	57.50	28.75
45	62	Other	External Causes	60.00	47.50	28.50
46	56	Other	Early Planning and Designing	52.50	52.50	27.56
47	3	Contractor	Materials	52.50	52.50	27.56
48	36	Consultant	Consultant	50.00	55.00	27.50
49	25	Contractor	Project Management	55.00	50.00	27.50
50	4	Contractor	Tools	55.00	50.00	27.50
51	34	Consultant	Consultant	47.50	57.50	27.31
52	13	Contractor	Manpower	45.00	60.00	27.00
53	52	Owner	Owner	60.00	45.00	27.00
54	23	Contractor	Project Management	52.50	50.00	26.25
55	44	Owner	Owner	52.50	50.00	26.25
56	41	Consultant	Consultant	47.50	55.00	26.13
57	26	Contractor	Project Management	55.00	47.50	26.13
58	37	Consultant	Consultant	47.50	52.50	24.94
59	47	Owner	Owner	45.00	55.00	24.75
60	5	Contractor	Tools	47.50	50.00	23.75
61	45	Owner	Owner	50.00	47.50	23.75
62	63	Other	External Causes	47.50	47.50	22.56
63	39	Consultant	Consultant	45.00	50.00	22.50
64	54	Owner	Owner	50.00	45.00	22.50
65	66	Other	External Causes	42.50	45.00	19.13
66	6	Contractor	Tools	45.00	42.50	19.13
67	1	Contractor	Materials	50.00	37.50	18.75
68	38	Consultant	Consultant	42.50	42.50	18.06
69	7	Contractor	Tools	45.00	37.50	16.88

Table C.3: FI, SI and II arranged according to the overall.

R.	No.	Main Group	Subgroup	FI %	SI %	II %
1	46	Owner	Owner	77.50	84.17	65.23
2	53	Owner	Owner	79.17	72.50	57.40
3	32	Contractor	Project Financing	71.67	72.50	51.96
4	30	Contractor	Project Financing	67.50	75.83	51.19
5	68	Other	External Causes	69.17	70.00	48.42
6	59	Other	External Causes	64.17	72.50	46.52
7	39	Consultant	Consultant	65.00	70.00	45.50
8	51	Owner	Owner	65.00	68.33	44.42
9	10	Contractor	Manpower	65.83	66.67	43.89
10	20	Contractor	Project Management	61.67	70.00	43.17
11	50	Owner	Owner	60.83	69.17	42.08
12	55	Other	Early Planning and Designing	60.00	70.00	42.00
13	31	Contractor	Project Financing	62.50	66.67	41.67
14	42	Owner	Owner	60.00	69.17	41.50
15	40	Consultant	Consultant	59.17	68.33	40.43
16	62	Other	External Causes	64.17	62.50	40.10
17	34	Consultant	Consultant	61.67	65.00	40.08
18	64	Other	External Causes	62.50	63.33	39.58
19	33	Consultant	Consultant	63.33	61.67	39.06
20	19	Contractor	Project Management	61.67	62.50	38.54
21	21	Contractor	Project Management	60.83	63.33	38.53
22	35	Consultant	Consultant	60.00	61.67	37.00
23	43	Owner	Owner	60.00	60.83	36.50
24	61	Other	External Causes	58.33	62.50	36.46
25	36	Consultant	Consultant	60.00	60.00	36.00
26	47	Owner	Owner	56.67	61.67	34.94
27	48	Owner	Owner	55.00	63.33	34.83
28	12	Contractor	Manpower	58.33	59.17	34.51
29	28	Contractor	Project Management	57.50	60.00	34.50
30	22	Contractor	Project Management	57.50	59.17	34.02
31	49	Owner	Owner	55.83	60.83	33.97
32	37	Consultant	Consultant	57.50	58.33	33.54
33	11	Contractor	Manpower	58.33	57.50	33.54
34	67	Other	External Causes	60.00	55.83	33.50
35	23	Contractor	Project Management	56.67	56.67	32.11
36	45	Owner	Owner	56.67	56.67	32.11
37	29	Contractor	Project Management	54.17	59.17	32.05
38	65	Other	External Causes	56.67	54.17	30.69
39	52	Owner	Owner	58.33	52.50	30.63
40	16	Contractor	Project Management	54.17	55.00	29.79
41	25	Contractor	Project Management	55.00	54.17	29.79

Table C.3: FI, SI and II arranged according to the overall (cont.).

R.	No.	Main Group	Subgroup	FI %	SI %	II %
42	58	Other	Early Planning and Designing	53.33	55.83	29.78
43	15	Contractor	Project Management	54.17	53.33	28.89
44	57	Other	Early Planning and Designing	51.67	55.83	28.85
45	60	Other	External Causes	51.67	55.00	28.42
46	54	Owner	Owner	52.50	52.50	27.56
47	27	Contractor	Project Management	51.67	53.33	27.56
48	56	Other	Early Planning and Designing	50.00	53.33	26.67
49	14	Contractor	Manpower	51.67	50.83	26.26
50	17	Contractor	Project Management	50.83	50.83	25.84
51	38	Consultant	Consultant	50.00	50.83	25.42
52	69	Other	External Causes	50.83	50.00	25.42
53	18	Contractor	Project Management	51.67	49.17	25.40
54	8	Contractor	Tools	45.83	53.33	24.44
55	3	Contractor	Materials	49.17	48.33	23.76
56	44	Owner	Owner	45.83	50.83	23.30
57	41	Consultant	Consultant	44.17	50.83	22.45
58	24	Contractor	Project Management	46.67	47.50	22.17
59	4	Contractor	Tools	49.17	44.17	21.72
60	2	Contractor	Materials	46.67	45.83	21.39
61	9	Contractor	Tools	45.00	45.83	20.63
62	5	Contractor	Tools	45.83	45.00	20.63
63	13	Contractor	Manpower	43.33	47.50	20.58
64	63	Other	External Causes	45.83	44.17	20.24
65	26	Contractor	Project Management	45.83	44.17	20.24
66	66	Other	External Causes	43.33	44.17	19.14
67	1	Contractor	Materials	41.67	43.33	18.06
68	7	Contractor	Tools	40.00	38.33	15.33
69	6	Contractor	Tools	33.33	33.33	11.11

Table C.4: FI, SI and II arranged in order by overall.

R.	No.	Main Group	Subgroup	FI %	SI %	II %
67	1	Contractor	Materials	41.67	43.33	18.06
60	2	Contractor	Materials	46.67	45.83	21.39
55	3	Contractor	Materials	49.17	48.33	23.76
59	4	Contractor	Tools	49.17	44.17	21.72
62	5	Contractor	Tools	45.83	45.00	20.63
69	6	Contractor	Tools	33.33	33.33	11.11
68	7	Contractor	Tools	40.00	38.33	15.33
54	8	Contractor	Tools	45.83	53.33	24.44
61	9	Contractor	Tools	45.00	45.83	20.63
9	10	Contractor	Manpower	65.83	66.67	43.89
33	11	Contractor	Manpower	58.33	57.50	33.54
28	12	Contractor	Manpower	58.33	59.17	34.51
63	13	Contractor	Manpower	43.33	47.50	20.58
49	14	Contractor	Manpower	51.67	50.83	26.26
43	15	Contractor	Project Management	54.17	53.33	28.89
40	16	Contractor	Project Management	54.17	55.00	29.79
50	17	Contractor	Project Management	50.83	50.83	25.84
53	18	Contractor	Project Management	51.67	49.17	25.40
20	19	Contractor	Project Management	61.67	62.50	38.54
10	20	Contractor	Project Management	61.67	70.00	43.17
21	21	Contractor	Project Management	60.83	63.33	38.53
30	22	Contractor	Project Management	57.50	59.17	34.02
35	23	Contractor	Project Management	56.67	56.67	32.11
58	24	Contractor	Project Management	46.67	47.50	22.17
41	25	Contractor	Project Management	55.00	54.17	29.79
65	26	Contractor	Project Management	45.83	44.17	20.24
47	27	Contractor	Project Management	51.67	53.33	27.56
29	28	Contractor	Project Management	57.50	60.00	34.50
37	29	Contractor	Project Management	54.17	59.17	32.05
4	30	Contractor	Project Financing	67.50	75.83	51.19
13	31	Contractor	Project Financing	62.50	66.67	41.67
3	32	Contractor	Project Financing	71.67	72.50	51.96
19	33	Consultant	Consultant	63.33	61.67	39.06
17	34	Consultant	Consultant	61.67	65.00	40.08
22	35	Consultant	Consultant	60.00	61.67	37.00
25	36	Consultant	Consultant	60.00	60.00	36.00
32	37	Consultant	Consultant	57.50	58.33	33.54
51	38	Consultant	Consultant	50.00	50.83	25.42
7	39	Consultant	Consultant	65.00	70.00	45.50
15	40	Consultant	Consultant	59.17	68.33	40.43
57	41	Consultant	Consultant	44.17	50.83	22.45

Table C.4: FI, SI and II arranged in order by overall (cont.).

R.	No.	Main Group	Subgroup	FI %	SI %	II %
14	42	Owner	Owner	60.00	69.17	41.50
23	43	Owner	Owner	60.00	60.83	36.50
56	44	Owner	Owner	45.83	50.83	23.30
36	45	Owner	Owner	56.67	56.67	32.11
1	46	Owner	Owner	77.50	84.17	65.23
26	47	Owner	Owner	56.67	61.67	34.94
27	48	Owner	Owner	55.00	63.33	34.83
31	49	Owner	Owner	55.83	60.83	33.97
11	50	Owner	Owner	60.83	69.17	42.08
8	51	Owner	Owner	65.00	68.33	44.42
39	52	Owner	Owner	58.33	52.50	30.63
2	53	Owner	Owner	79.17	72.50	57.40
46	54	Owner	Owner	52.50	52.50	27.56
12	55	Other	Early Planning and Designing	60.00	70.00	42.00
48	56	Other	Early Planning and Designing	50.00	53.33	26.67
44	57	Other	Early Planning and Designing	51.67	55.83	28.85
42	58	Other	Early Planning and Designing	53.33	55.83	29.78
6	59	Other	External Causes	64.17	72.50	46.52
45	60	Other	External Causes	51.67	55.00	28.42
24	61	Other	External Causes	58.33	62.50	36.46
16	62	Other	External Causes	64.17	62.50	40.10
64	63	Other	External Causes	45.83	44.17	20.24
18	64	Other	External Causes	62.50	63.33	39.58
38	65	Other	External Causes	56.67	54.17	30.69
66	66	Other	External Causes	43.33	44.17	19.14
34	67	Other	External Causes	60.00	55.83	33.50
5	68	Other	External Causes	69.17	70.00	48.42
52	69	Other	External Causes	50.83	50.00	25.42

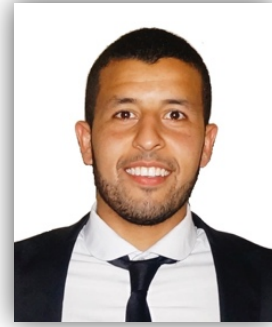
Table C.5: Kendall Coefficient (W) for causes of delay.

No.	Main Group	R_1	R_1 - Mean	$S = (R_1 - \text{Mean})^2$
1	Contractor	118	-23.26	540.97
2	Contractor	155	13.74	188.82
3	Contractor	213	71.74	5146.80
4	Contractor	186	44.74	2001.77
5	Contractor	194	52.74	2781.63
6	Contractor	133	-8.26	68.21
7	Contractor	203	61.74	3811.97
8	Contractor	221	79.74	6358.66
9	Contractor	220	78.74	6200.17
10	Contractor	245	138.74	19249.11
11	Contractor	219	77.74	6043.69
12	Contractor	21	-120.26	14462.18
13	Contractor	135	-6.26	39.17
14	Contractor	74	-67.26	4523.75
15	Contractor	36	-105.26	11079.42
16	Contractor	104	-37.26	1388.22
17	Contractor	105	-36.26	1314.70
18	Contractor	51	-90.26	8146.66
19	Contractor	198	56.74	3219.56
20	Contractor	153	11.74	137.86
21	Contractor	197	55.74	3107.08
22	Contractor	142	0.74	0.55
23	Contractor	74	-67.26	4523.75
24	Contractor	57	-84.26	7099.55
25	Contractor	65	-76.26	5815.41
26	Contractor	54	-87.26	7614.10
27	Contractor	76	-65.26	4258.71
28	Contractor	132	-9.26	85.73
29	Contractor	84	-57.26	3278.57
30	Contractor	71	-70.26	4936.30
31	Contractor	61	-80.26	6441.48
32	Contractor	80	-61.26	3752.64
33	Consultant	94	-47.26	2233.40
34	Consultant	123	-18.26	333.38
35	Consultant	129	-12.26	150.28
36	Consultant	142	0.74	0.55
37	Consultant	54	-87.26	7614.10
38	Consultant	63	-78.26	6124.44
39	Consultant	90	-51.26	2627.47
40	Consultant	50	-91.26	8328.17
41	Consultant	180	38.74	1500.88

Table C.5: Kendall Coefficient (W) for causes of delay (cont.).

No.	Main Group	R_1	R_1 - Mean	$S = (R_1\text{-Mean})^2$
42	Owner	115	-26.26	689.53
43	Owner	180	38.74	1500.88
44	Owner	175	33.74	1138.47
45	Owner	158	16.74	280.27
46	Owner	134	-7.26	52.69
47	Owner	168	26.74	715.09
48	Owner	144	2.74	7.51
49	Owner	190	48.74	2375.70
50	Owner	180	38.74	1500.88
51	Owner	119	-22.26	495.46
52	Owner	124	-17.26	297.87
53	Owner	81	-60.26	3631.13
54	Owner	52	-89.26	7967.14
55	Other	37	-104.26	10869.90
56	Other	50	-91.26	8328.17
57	Other	132	-9.26	85.73
58	Other	167	25.74	662.61
59	Other	54	-87.26	7614.10
60	Other	146	4.74	22.48
61	Other	112	-29.26	856.08
62	Other	135	-6.26	39.17
63	Other	148	6.74	45.44
64	Other	158	16.74	280.27
65	Other	183	41.74	1742.33
66	Other	151	9.74	94.89
67	Other	202	60.74	3689.49
68	Other	199	57.74	3334.04
69	Other	197	55.74	3107.08

RESUME



Name Surname: Zuhir Busneina

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Education:

- **Bachelor** : 2013, University of Benghazi, Faculty of Engineering, Civil Engineering Department

Languages:

- **Languages spoken** : Fluent English , Arabic, Basic Turkish, Basic French.
- **Languages written** : English / Arabic / Basic Turkish, Basic French.

Special skills:

- Able to operate Microsoft Office tools.
- Good with Apple Mackintosh and Visual C++.
- Very good with AutoCAD.
- Good with Robot Structural Analysis 3D.
- Very good with Photoshop programs and other Video editing programs.
- Good experience with designing logos and Icons.
- Photographer specialized in editing and designing, photos and signatures.

Qualifications & training courses:

- December, 2012, Course in Autodesk Robot 3D Structural Analysis Professional 2011, by Bayenah training and consulting Center.

- May, 2012 Common Purpose's Young Leaders course (Be a leader) – Tripoli – Libya
- February, 2010 Course in Autodesk AutoCAD, Al Salam training and consulting, Benghazi - Libya
- December, 2008, Standard General English Course at Advanced level, Capital School of English, Bournemouth – England – UK.
- IELTS certificate with overall score 6.
- December, 2015 "Project Management: The Basics for Success by University of California, Irvine on Coursera, California – USA.

Working experience:

- April, 2014 – Current, Owner, Tubar Co. For Engineering Contracting and Real estate Investment.
- February, 2016 – Current, Head of Studies and Examination Department, Mediterranean International University.
- September, 2014 – August 2015, Junior project manager (Full Time), ALTadamun Social Fund /Department of Engineering projects management, Benghazi-Libya. (working with team of project managers under the directions of the senior projects manager, where i supervise on the completion of project tasks. Also to support project management office and document all project related assignments, issues and risks. Responsible on a team of supervisors engineers by planning tasks and assisting with creating reports and presentations using a variety of office productivity tools.
- June, 2013 – August, 2014, Supervisor civil engineer/Site engineer (Full time), Al-Bonyan Al-Almarsous for Engineering Services, Benghazi-Libya. (supervising on above and underground infrastructure of 5 towers contains 20 floors for each one and CFA piles drillings).
- June, 2012 – August, 2012, Supervisor civil engineer/Site engineer (Internship), Al Rayan Co. For Constructions and Investment, Benghazi-Libya. (Supervising over construction operations of Houses and Blocks, and testing the used concrete in construction)
- May, 2011 –July, 2011, Volunteer/Leader of Mines Risk Awareness Team (Voluntary work) Handicap International Organization, Benghazi-Libya. (educating about mine risks and making social experiments)

- June, 2010 – November, 2010, Sales man/member of sales team (Full time), Al-Nokhba Company For Foodstuff Importing and Exporting, Benghazi-Libya. (Work on advertising and promoting Products with team members also to deliver products for usual costumers).

Memberships:

- Member at Hostelling International – Libya.
- Member at AL-Tawasil Organization for Charity works – Libya.

About:

- Active social person who likes to involve with others.
- Practical person who wants everything done correctly without postponing.
- Hungry for knowledge and gaining experience.
- Good in running tasks and in love with Designing.

Reference:

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