إقـــــرار

أنا الموقع أدناه مقدم الرسالة التي تحمل العنوان:

Factors Affecting Delay of Design in Construction Projects in Gaza Strip

دراسة العوامل التي تؤثر على تأخير التصميم في مشاريع التشييد في قطاع غزه

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DECLARATION

The work provided in this thesis, unless otherwise referenced, is the researcher's own work, and has not been submitted elsewhere for any other degree or qualification

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دراسة العوامل التي تؤثر على تأخير التصميم في مشاريع التشييد في قطاع غزه

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DEDICATION

I would like to dedicate this work to

my father,

who was the light of my life,

my mother,

who was paradise under her feet,

my wife, my lovely kids, and my brothers,

for their endless and generous support

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First and foremost, all praise is due to Allah, the Almighty, who gave me the strength, opportunity and patience to carry out this work. I would like to express my sincere gratitude and heartfelt thanks to Dr. Nabil El Sawalhi; the supervisor of my thesis, for his strong support and guidance throughout the duration of this research.

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ملخص الدراسة

التأخير في مرحلة التصميم يعد واحد من اهم المواضيع التي تواجه صناعة الانشاءات و تؤثر على امكانية انهاء المشروع في الوقت المطلوب و الميزانية التي تم اعدادها و ضمن المواصفات و الجودة المطلوبة, يوجد عدة عوامل تؤثر على التأخير في وقت التصميم ولكن تختلف في مدى تأثيرها من مشروع لآخر بحيث تتراوح ما بين يوم واحد الى سنوات, وكما لها تأثيرات ماليه و بيئية و اجتماعيه هامه, تم دراسة و تحليل اسباب التأخير في المشاريع الإنشائية في مرحلة التصميم.

الهدف من هذه الدراسة هوه تقييم و معالجة العوامل التي تعمل على تأخير المشاريع الهندسية في مرحلة التصميم في قطاع غزه.

تمت مراجعة الدراسات السابقة لتحديد العوامل المؤثرة على التأخير في وقت التصميم في المشاريع الهندسية في قطاع غزه. كما تمت اضافة عوامل اخرى لها علاقة بالوضع المحلي في قطاع غزه و ذلك بناء على اراء خبراء محليين. وتم استخدام الطريقة الكمية و عمل استبيان لتحقيق اهداف الدراسة. تم اعداد استبيان منظم وواضح و ارساله الى المهندسين في طواقم الاستشاري و المالك في قطاع غزه, حيث تم توزيع 100 استبيان على العينة المختارة و بناء على 85% من الردود تم تحديد اكثر العوامل التي تؤثر على التأخير في وقت التصميم. وكشفت النتائج التحليلية أن جميع أفراد العينة وافقت على جميع العوامل المدروسة، ولكل واحد منهم يكون لها تأثير على تأخير التصميم، ولكن مع نسبة مختلفة، وجميع الأطراف (مالك، استشاري) لها دور في تأخير التصميم.

و قد اظهرت الدراسة اهم النتائج التي تؤثر على التأخير في مرحلة التصميم حيث أن العوامل المالية هي اهم العوامل و اكثرها فاعليه. كما اوضحت الدراسة ان التغييرات في العقد تؤثر بشكل واضح على التأخير في مرحلة التصميم و من الجيد ان يكون لدى المالك وممثله رؤية واضحة للمشروع و الاسراع في انجاز التغيرات المطلوبة منهم حتى لا يحدث اعاقه لعملية التصميم.

واتفقت غالبية العينة أن جميع المقترحات المقدمة للتقليل من حدوث التأخير في مرحلة التصميم يمكن أن تساعد في الحد من التأخير اثناء تلك المرحلة ولكن بنسب مختلفة.

فمن المستحسن عمل نموذج لقياس التأخير في التصميم في مشاريع البناء في قطاع غزة، ومن المستحسن من الجهات المعنية و المسؤولة وضع نظام وحد ادنى للأجور ومراقبة تنفيذ هذا النظام.

ABSTRACT

Design delays are one of the biggest issues facing the construction industry and affecting delivery in terms of time, budget and the required quality. The characteristics of delay factors and their level of impact vary from project to project, ranging from a few days to years. They have significant financial, environmental and social impacts in construction projects; so, it is vital to investigate the causes of delay.

Therefore the aim of this research is to assess and reduce design delay occurs in the planning and design phases in construction projects in Gaza Strip.

Literature review about design delay was reviewed to identify the factors affecting the design delay of construction projects. In addition, other local factors have been added as recommended by local experts. A quantitative methodology was adopted to achieve research objects. The questionnaire method was selected and pilot study of the questionnaire was achieved by a scouting sample. A structured questionnaire was sent to engineers at consultants companies and owners in Gaza-strip. One hundred questionnaires were distributed on the selected sample. Based on 85 valid responses, the most effective factors that can affect design delay was determined. Analytical results revealed that all the respondents agreed to all the studied factors, and each of them have an effect on design delay, but with different ratio, and all parties(owner, consultant) have a role in design delay.

It is clear also that financial factors are common effective factor on design delay for each part. Contract changes and variations affect design delay as owners hadn't a clear vision for project and its output, which may return to the unstable economic , political, and social environment in Gaza Strip.

Majority of respondent agreed that all proposed minimizing design delay method can help in minimizing design delay, but with different percentages.

It is recommended to develop models in order to measure design delay in construction projects in Gaza Strip, also it is recommended that the concerned bodies and parts to establish a minimum wage system and to monitor implementing this system.

LIST OF CONTENTS

LIST OF ABBREVIATIONS

GNP	Gross National Product
NEDO	National Economic Development Office
QFD	Quality Function Deployment
SPSS	Statistical Package for Social Sciences
DMM	Delay Ninimizing Nethod

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CHAPTER 1: INTRODUCTION

1.1 Background

Construction industry plays a major role in development and achievement the goals of society. Construction is one of the largest industries and contributes to about 10% of the gross national product (GNP) in industrialized countries (Navon, 2005).

The main phases of a project can be described as: conceptual planning, feasibility study, design, procurement, construction, acceptance, operation and maintenance.

Delay may be a scenario during which a project as a result of some causes associated with the contractor (consultant), client, client’s authority or alternative causes has not been finished in written agreement or in agreement amount. Delays are insidious typically leading to time overrun, cost, disputes, litigation, and complete abandonment of comes (Sambasivan, 2007).

Delay is one of the biggest problems often experienced on construction project sites. Delays can instigates negative effects such as increased costs, loss of productivity and revenue many lawsuits between owners and contractors (consultants) and contract termination (Owolabi, 2014). This study proposes a methodology to support and identify factors affecting delay in design phase. In addition, ability of constructing faster and completing projects on time objectively reflects the capacity to organize and control project operations, to optimally allocate resources and to manage the information flow between owner team and among consultants.

Design time is usually deduced from the client’s brief or derived by the construction planner from available project information such as design drawings, bill of quantities, method statements, specifications, bar chart programs, etc. Delays are costly and often result in disputes and claims. Furthermore, delays effects the feasibility for project owner and retard the development in construction industry (Lim, 2004).

They emphasized that timely delivery of projects within budget and to the level of quality standard specified by the client is an index of successful project delivery. Failure to achieve targeted time, budgeted cost and specified quality result in various unexpected negative effects on the projects normally, when the projects are delayed, they are either extended or accelerated and therefore, incur additional cost (Owolabi, 2014).

In a NEDO (National Economic Development Office), London survey aimed at improving methods of quality control for building works, it was found that "design" and "poor workmanship in the construction process" combined to form more than 90% of the total failure events.

Tilley (2005) in his study revealed that, inadequate design fees, inadequate design time allowances and inadequate/changing design briefs, were considered to be the most important due to the direct impact they have on all aspects of the design process from the consultant's point of view.

1.2 Problem Statement

Design delay can adversely affect the total completion time of a construction project. Factors affecting the delays of design duration are complicated and interrelated.

Delay can lead to many negative effects such as lawsuits between owners and contractors, increased costs, loss of productivity and revenue, and contract termination. Design delay can be minimized only when their cause are identified. This study proposes a methodology to identify factors affecting design delay.

Based on previous studies and interviews, this research will develop a list of factors affecting design delay. The research will focus on public and private projects in Gaza Strip to investigate the factors that affect design delay, and the best methods to minimize this delay.

In Gaza strip, there are many construction projects fail in delay. Delay in Construction projects problem appears in many aspects in the Gaza strip. It is well known that most construction projects in Gaza Strip exposed to time and cost overrun or both. Construction industry in Gaza Strip is suffering from many problems which affect time, these factors related to political situation and techniques used in Gaza Strip.

1.3 Research Aim and Objectives

The aim of this research is to assess and reduce the design delay during design phase in Gaza-Strip

To achieve this aim, the following specific objectives were pursued:

1. To identify the factors influencing design delay.
2. To rank the severity of these factors on design delay in Gaza Strip.

3. To determine the most effective methods that can be used to minimize the design delay.

1.4 Research Scope and Limitations

As mentioned previously, the general purpose of this study is to explore and understand the delay factors in design phase. This also includes identifying the major delay factors and analyze their impact.

The study was narrowed within the following scopes:

1. The study is focused on identifying the causes and effects of delay factors that influence the design phase in Gaza Strip.

2. The respondents were selected only from owners and consultants from different locations within Gaza Strip.

3. Experts from each group (consultant and owner); with more than 10 years' experience construction projects were interviewed.

1.5 Structure of Methodology

The methodology of this study consist of four stages as follow:

Stage 1: Literature Review

This research has reviewed the relevant literature of the subject of design delay, review the associated problems in the construction.

Stage 2: Pilot Study

The literature review was followed by a pilot research which took the form of closed questionnaire to find out the most critical and serious problems .

Stage 3: Research Strategy

The pilot study was used for designing the main research questionnaire which was used to identify the most critical and serious bottlenecks problems in the design delay.

Stage 4: Writing Up

This stage involves writing up the content of the dissertation and should cover the chapters proposed in the following section.

1.6 Research Structure

This thesis is organized into five chapters:

Chapter 1- Introduction: this chapter gives background information of design delay. It also presents a statement of the problem, the aim, objectives of the study, its scope and its limitations and significance of the study.

Chapter 2- Literature review: this chapter presents the related definitions and summarizes the basic findings of the conducted literature review regarding design delay performance, review the associated problems in the design phase.

Chapter 3- Research design and methodology: this chapter explains how the problem was investigated and describes the tools used to undertake the investigation. The chapter also presents the method of data collection which is questionnaire survey. It also describes the characteristics of the research sample and the method of analysis.

Chapter 4- Questionnaire results and Analysis: this chapter describes the results and discussion of questionnaire survey concerning design delay from consultants and owner viewpoints in Gaza Strip.

Chapter 5- Conclusion and Recommendations : this chapter includes the conclusions and recommendations that would help in solving the problem of delay at construction projects in Gaza Strip.

1.7 Research Hypothesis

A test is a statistical procedure to obtain a statement on the truth of falsity of a proposition, on the basis of empirical evidence. This is done within the context of a model, in which the fallibility or variability of this empirical evidence is represented by probability.

Hypothesis which was studied in this research as :

Hypothesis (1) : If the firm type has effect design delay or not.

Hypothesis (2) : If the respondents' firm has effect design delay or not.

Hypothesis (3) : If the respondents' experience has effect design delay or not.

Hypothesis (4) : If the current project value has effect design delay or not.

Hypothesis (5) : If the respondents' years of experience has effect design delay or not.

Hypothesis (6) : If the type of work has effect design delay or not.

Hypothesis (7) : If the numbers of project has effect design delay or not.

CHAPTER 2: LITERATURE REVIEW

This chapter presents the related definitions and summarizes the basic findings of the conducted literature review regarding design delay performance, review the associated problems in the design phase.

2.1 Background

This thesis deals with design delays in the Gaza-strip construction project. Delay may be a scenario during which a project as a result of some causes associated with the contractor, client, client's authority or alternative causes has not been finished in written agreement or in agreement amount (Taher, 2013). One of the most important problems in the construction industry is delays. Delays occur in every construction project and the magnitude of these delays varies considerably from project to project. Some projects are only a few days behind schedule; some are delayed by over a year (Alaghbari, 2007). So it is essential to define the actual causes of delay in order to minimize and avoid delays in any construction project. It is generally understood that design delay is the most critical factor affecting the delivery of construction projects in terms of time, budget and the required quality (Aswathi, 2013). Design also plays an integral part in any organization with innovation as a core consideration. Thus, it comes as no surprise that in recent years, increased emphasis has been placed on design in engineering curricula. Even so, design may still be one of the least understood areas in engineering education. Delays are insidious typically leading to time overrun, cost, disputes, litigation, and complete abandonment of comes (Sambasivan, 2007). Few comes are often found that the worry of not finishing the project on time isn't the most important concern of the relevant project manager (Taher, 2013). However, it is very important to identify the exact causes and their significance in order to minimize and avoid the impact of delays in construction projects. Construction projects completed on time were a signal of project efficiency (Aswathi, 2013). Time overrun is a very frequent phenomenon and is almost associated with nearly all projects in the construction industry. This trend is more severe in developing countries where time and cost overruns sometimes exceed 100% of the anticipated cost of the project (Kaming et al., 1997; Abd El–Razek et al., 2008; Le Hoai et al., 2008). A construction project comprises two distinct phases: the preconstruction phase, the period between the initial conception of the project and the signing of the contract; and the construction phase, during which the contractor must complete construction subject to the conditions of the contract. Several studies have addressed many different factors that cause overruns in different types of construction projects.

2.2 Construction Life Cycle

According to (Kartam, 1996) , the common phases in project life cycle consists four phases which are conceptual planning and feasibility studies, design and engineering, construction, and operation and maintenance.

Besides that, Alshubbak classified the project life cycle into five phases which are feasibility phase, design phase, construction phase, exploitation phase and dismantling phase. The first phase is feasibility phase which consist the issues of economical, safety of workers along the construction process, technical aspects, and basic information for the all phase in construction. The second phase is design phase which not only focused on the design but also includes the details of project, proposing initial tests, the calculation of each element of the structure, drawings, specifications and also estimated costs. The third is construction phase which involves two sub-phases of the execution and inspection. In the execution phase, it includes the activities of the construction works until the project is completed. While inspection phase involves the inspection work performed in continuously to ensure that the construction works are carried out properly, and also assuring of safety and environmental quality. The next phase is exploitation phase which consist activities of use and maintenance after completion of evaluation stage. Dismantling phase is the last phase in project life cycle which involves activities of demolishing and removing the facilities from the service depends on their use and life expectancy listed in (Ismail et al., 2013).

Saad (2011), project life cycle divided into five phases consists of conceptual planning and economics phase, engineering and functional design phase, construction and completion of the project phase, and operation and utilization phase. Conceptual Planning and Feasibility Study involves a few components such as analyzing the concept of the project, studies of related issues of technical and economic and identify the impact on the environment. The second phase is engineering and design and it was divided into two main stage which are preliminary engineering and design, and detailed engineering and design. However, both of these stages more emphasize related to architectural concepts and structure analysis to ensure each structure follow the actual specification. For the phase III, it involves the preparation of all contract documents by the designer for submitted to the contractor. Next, in construction phase, the execution of project started until the project completed within the stipulated time, cost and quality. For the final phase, the operating life is determined during the beginning of project since the developing of project's conception. Sometimes owner will be conducting the regular maintenance for their project. However, this study only focus on planning phase and design phase. Figure 2.1 shows project life cycle.

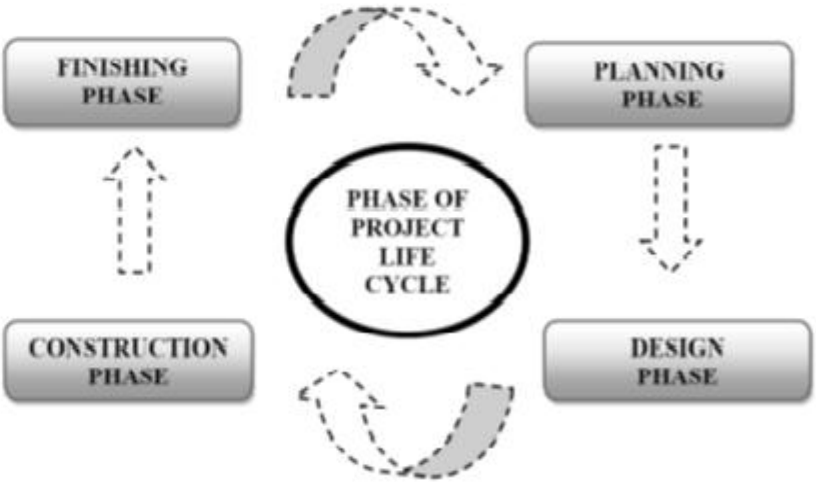

Figure2.1: Project life cycle

• Design phase: This phase involves preparation of detailed plan and drawings for entire project. Designers are responsible for providing drawings according to owner requirements and any changes can be made before it is approved.

2.3 Design Process

Design is one of the oldest skills that humanity adopted to serve their needs. The concept of designing had the same meaning of making till the modern industrial societies were the two concepts are separated.

In the modern industry design Process may be described from two perspectives. The first perspective believes that design process characteristic is similar between all disciplines, the second argues that it varies between different sectors such as construction and industry (Durward, and Vikas, 2005).

Many researchers agree that construction can learn from industry, and Howell (1999) suggests that construction can learn from manufacturing's solutions development, and manufacturing can learn from the project-based construction management (Durward, and Vikas, 2005).

Recent researches according to Cooper et al. (2005) have led to the development of the 'Construction as a Manufacturing Process'. The similarity in design between construction and manufacturing is that both of them begin with a need (dulaimi, 2011).The design process in both consists of solving series of problems and sub-problems. The design process itself is an iterative process. Bruce and Biemans (1995) go further and explain that product development is fundamental in stimulating and supporting economic growth for companies and for wealth generation. In many industrialized nations product development and design activities are very powerful corporate tools.

2.4 Flow of Design

Its duration, cost and value can characterize the flow processes. The value is referred to the satisfaction of the requirements of the client. Only the activities that can be converted to form valuables for the client are the ones that add value to the product. Huovila et al. (1997) suggested the model shown in Figure 2.3 for the design process.

The design activities that do not contribute to the conversion are: inspection, moving, transformation and waiting of the information.

2. The only conversion activity is the design itself. Redesign due to errors, omissions, uncertainty, etc. is also waste.

If we examine the design process with this perspective we realize that only a small fraction of the total design cycle time is used in conversion activities. Thus, the reduction of these losses provides a large improvement potential. The value generating process is carried out through the fulfillment of the client requirements and needs. However, during this process there are several instances for value loss:

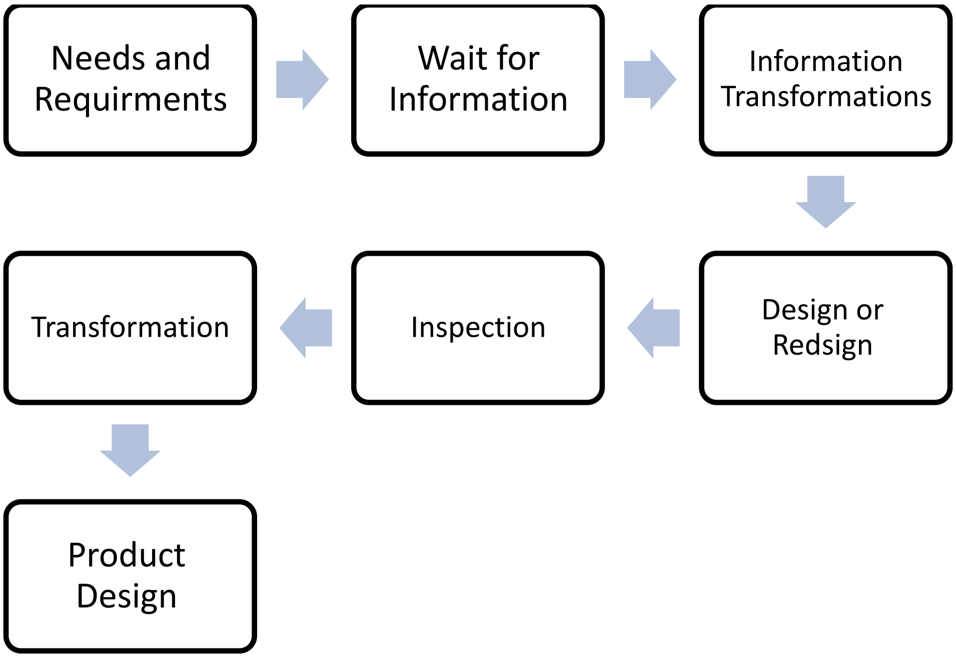

Figure 2.2: Design flow (Huovila et al. 1997)

1. Part of the requirements are lost at the beginning.

2. Part of the requirements are lost during the design process (for example, the design intention of a designer is not communicated to the following phases, and it can be spoiled by decisions in them).

3.There is very little improvement and optimization of the design solutions (for example, the actions or the opportunities of the following phases are not taken into account).

4. Quality errors of the design remain in the final product. The corresponding actions to avoid these value losses are:

- The rigorous analysis of the requirements and needs at the beginning, with a close cooperation of the client;
- The systematical administration of the requirements with the application of Quality Function Deployment (Q.F.D).
- Improvement and the optimization of the design process through rapid iterations among all the agents that issue design and construction information; thus, all the phases of the life cycle of the project should be considered simultaneously from the conceptual phase. All these actions are necessary to eliminate those activities that do not add value and then return from the construction stage to the design stage.

2.5 Design Delay

In the study of Assaf & Al-Hejji (2006), delay could be defined as the time over run either beyond completion date specified in a contract or beyond the date that the parties agrees upon for delivery of a project. It is a project slipping over its planned schedule and is considered as common problem in construction projects. Bassioni & El-Razek (2008) identified that delay in construction project is considered one of the most common problems causing a multitude a negative effect on the project and its participating parties. Therefore, it is essential to identify the actual causes of delay in order to minimize and avoid the delays and their corresponding expenses. Arditi & Pattanakitchamrron (2006) stated that delays in construction can cause a number of changes in a project such as late completion, lost productivity, acceleration, increased costs, and contract termination. The party experiencing damages and the parties responsible for them in order to recover time and cost. However, in general delay situations are complex in nature. A delay in an activity may not result in the same amount of project delay. A delay caused by a party may or may not affect the project completion date and may or may not cause damage to another party. A delay may occur concurrently with other delays and all of them may impact the project completion date. Delays caused by the client such as late submission of drawings and specifications, frequent change orders, and inadequate site information generate claims from both the main contractors and subcontractors which many times entail lengthy court bettles with huge financial repercussions. Delays caused by contractors can generally be attributes to poor managerial skills. Lack of planning and a poor understanding of accounting and financial principles have led to many a contractor's downfall.

Time overrun is a very frequent phenomenon and is almost associated with nearly all projects in the construction industry. A construction project comprises two distinct phases: the preconstruction phase, the period between the initial conception of the project and the signing of the contract; and the construction phase, during which the contractor must complete construction subject to the conditions of the contract (Sweis, 2013). Several studies have addressed many different factors that cause overruns in different types of construction projects.

For the client, design delay refers to the loss of revenue, lack of productivity, dependency on existing facilities, lack of rentable facilities etc. For the consultant, design delay refers to the higher costs, longer work duration, increased technical staff cost etc. Completion of construction projects on specified time or time agreed within parties indicates the work and construction efficiency. The delays in construction projects happen because of various factors or causes. These causes lead to the delay in project completion, and this delay leads to some negative effects on the project (Haseeb, 2011).

All projects have phases that start with a concept and end with utilization. These phases are known as the life cycle. The length and timing of the life cycle varies with each project and is dependent on the degree of complexity and the resources available. Phases may occur in sequence or overlap. Each phase can be treated as a mini project. Understanding the design process and management techniques in detail will reduce the level of risk in delay.

2.6 Design Deficiency and Design Delay

Designers provide the graphic and written representations which allow contractors and subcontractors to transform concepts and ideas into physical reality. How effectively and efficiently this transformation occurs, depends largely on the quality of the design and documentation provided (Tilley and Barton 1997).

Unfortunately, contractors are quite often supplied with project documentation that is incomplete, conflicting or erroneous, thereby requiring clarifications to be provided by the designers.

A national survey of Australian contractors by Tilley & McFallan (2000a, b&c) found that design documents deficiencies were directly responsible for approximately 50% of all variations, contract disputes and cost overruns (Cited in Tilley, 2005b).

According to Love et al. (2006) a large proportion of rework and non-conformance costs are also directly due to deficiencies in design and contractual documents and in the transfer of information during the design process.

In addition, a study by Queensland (2005) summarized that the root causes of design and contractual documents deficiency were identified as:

1. Poor project briefs based on unrealistic expectations.
2. Lack of integration along supply chain linking service providers and between project phases.
3. Devaluing of professional ethics and standards in business practices.
4. Service providers chosen on a lowest bid basis, rather than "Value for Money".
5. Poor understanding of risk assessment and management processes and lack of risk management knowledge and skills.

6. Absence of client appointed overall design manager.

7. Poor understanding of what is required to optimize designs and provide quality documentation.

8. Inadequate numbers of skilled and experienced people.

9. Inadequate/ineffective use of technology (e.g. poor application of CAD techniques; technical specifications drawn from an firm's data base but not tailored to the project).

10. Poor communication practices.

Ballard (2000) in his case study identified "waiting for prerequisite work", "insufficient time" and "conflicting work demands" as being the most common causes identified by designers for the non-completion of planned project design tasks.

2.7 Causes of delay

Delay in construction projects is considered one of the most common problems causing a multitude of negative effects on the project and its participating parties. Therefore, it is essential to identify the actual causes of delay in order to minimize and avoid the delays and their corresponding expenses. There are two kinds of cause for delay in construction projects:

(1) external causes; and

(2) internal causes.

Internal causes of delay include the causes arising from four parties involved in the project. These parties include the owner, designers, contractors, and consultants. Other delays, which do not arise from these four parties, are based on external causes for example from the government, materials suppliers, or the weather (Ahmed et al., 2003).

Ahmed et al. (2003) and Alaghbari (2005) mentioned the possible following factors causing delays in construction projects in Malaysia:

Consultant's responsibility:

- absence of consultant's site staff;
- lack of experience on the part of the consultant;
- lack of experience on the part of the consultant's site staff; (managerial and supervisory personnel);
- delayed and slow supervision in making decisions;
- incomplete documents; and
- slowness in giving instructions.

Owner’s responsibility:

- lack of working knowledge;
- slowness in making decisions;
- lack of coordination with contractors;
- contract modifications (replacement and addition of new work to the project and change in specifications); and
- financial problems (delayed payments, financial difficulties, and economic problems).

External factors:

- lack of materials on the market;
- lack of equipment and tools on the market;
- poor weather conditions;
- poor site conditions (location, ground, etc.);
- poor economic conditions (currency, inflation rate, etc.);
- changes in laws and regulations;
- transportation delays; and
- external work due to public agencies (roads, utilities and public services).

2.8 Type of delay

According to Pickavance (2005), the technical meaning of the term “delay” in construction projects has not been defined correctly since it has a different sense to different conditions during the project execution. However, the term is normally used as an extended the duration or delay in the start or finish date of any a project activities. Delays therefore cause the time extension and variation in cost allocation the impact in time and cost will only occur when the delay lies on the critical path of the program.

Braimah (2008) stated that delayed completion of any projects is generally caused by the actions or inactions of the project parties including the contractors, consultants, owners, or others (e.g. acts of God). Based on these sources and the contractual risk allocation for delay-causing events, Braimah has classified delays in to four categories as follows:

- Critical and non-critical;
- Excusable and non-excusable.

In the process of determining the effect of a delay on construction project, it is necessary to determine whether the delay is critical or noncritical. It is also required to fine the delays are concurrent or non-excusable. However, delays can also be further classify into compensable or non-compensable delays (Trauner and Theodore, 2009).

2.8.1 Critical and non-critical delays

Delays that result in extended project completion times are known as critical delays, (Callahan et al, 1992). In the case of excusable critical delays, the contractor will generally be entitled to a time extension. Changing the type of structural steel members while the contractor is erecting structural steel is a clear example of a critical delay that is likely to delay the contractor's overall completion of the project. However, many delays occur that do not delay the project completion date or milestone date. The concept of critical delays emanates from critical path method scheduling, and all projects, regardless of the type of schedule, have critical activities. If these activities are delayed, the project completion date or a milestone date will be delayed. In some contracts, the term controlling item of work will be used. Normally, this refers to critical activities or critical paths that if delayed will delay the completion date (Trauner and Theodore, 2009). Determining which activities truly control the project completion date depends on the following:

- The project itself;
- The consultant's plan and schedule;
- The requirement of the contract for sequence and phasing;
- The physical constraints of the project.

Non-critical delays are delays incurred off the critical path which do not delay ultimate project performance

2.8.2 Excusable and non-excusable delay

Excusable All delays are either excusable or non-excusable. An excusable delay, in general, is a delay that is due to an unforeseeable event beyond the consultants control. Normally, based on common general provisions in public agency specifications, delays resulting from the following events would be considered excusable:

- Owner-direct changes;
- Errors and omissions in the plans and specifications;
- Differing site conditions or concealed conditions;
- Unusually severe weather;

- Intervention by outside agencies;
- Lack of action by government bodies, such as building inspection.

The contract should clearly define the factors that are considered valid delays to the project and that justify time extensions to the contract completion date **(**Trauner and Theodore, 2009). For example, some contracts may not allow for any time extensions caused by weather conditions, regardless of how unusual, unexpected, or severe.

Non-excusable delay Non-excusable delays are events that are within the consultants control or that are foreseeable. Again, the contract is the controlling document that determines if a delay would be considered non-excusable. The owner and the designer or drafter of the contract specifications must be sure that the contract documents are clear and unambiguous. Similarly, before signing the contract, the contractor (consultants) should fully understand what the contract defines as excusable and non-excusable delays (Trauner and Theodore, 2009).

2.9 Management of the Design Process

Gray and Hughes (2000) indicated that two issues should always be addressed in design; the provision of accurate, fully coordinated, complete information and the timely provision of that information. The first is the responsibility of the lead designer and the second is management. Findings from research indicate that, for design, planning and control are substituted by chaos and improvising in design (Koskela et al, 1997). Poor communication, lack of adequate documentation, deficient or missing input information, unbalanced resource allocation, lack of co-ordination between disciplines and erratic decision making have been pointed out as the main problems in design management (Ballard and Koskela, 1998). Coles (1990) found that the most significant causes of design problems were poor briefing and communication, inadequacies in the technical knowledge of designers and lack of preplanning for design work. Common consequences included slow approvals from clients, late appointments of consultants and inadequate time to complete design documents carefully. Koskela et al. (1997) explains that, to some extent the situation is understand able. The design effort is complex, with numerous interdependencies, singularly uncertain, with erratic decision-making by lay clients and authorities, and often carried out under time pressure.

Design management concerns itself with the design content of project outcomes and the effective management of the design process. Like design itself, design management is a multi-faceted subject. There are different and equally valid ways of approaching it, all of which are concerned with realizing potential and avoiding risks (Allinson, 1997). Dumas and Mintzbergin (Johansen, and Carson, 2003) proposed four management models for design management. The 'cooperative design: Interactive functions' is the model most effective with the growing level of complexity that exists in the process today. This model encourages interaction between the different contributors. Co-operative design is based on teamwork and reflects the ad hoc structure of most creative firms . Gray and Hughes (2001) suggest we view the task of managing the design as the responsibility of everyone on the project. Various professional institutions have published a formalized view of the main stages of design work, in an attempt to make it more controllable. Poor communication, lack of adequate documentation, deficient or missing input information, unbalanced resource allocation, lack of co-ordination between disciplines and erratic decision making have been pointed out as the main problems in design management (Johansen, and Carson, 2003). Coles as cited in (Johansen, and Carson, 2003) found that the most significant causes of design problems were poor briefing and communication in adequacies in the technical knowledge of designers and lack of preplanning for design work. Common consequences included slow approvals from clients, late appointments of consultants and inadequate time to complete design documents carefully. Koskela et al. (1997) explains that, to some extent the situation is understandable. The design effort is complex, with numerous interdependencies singularly uncertain, with erratic decision-making by lay clients and authorities, and often carried out under time pressure. The principles of lean construction are proposed in Koskela et al. (1997) where the following hypotheses are presented and justified through results from case studies:

1. There is an optimal sequence of design tasks.

2. Internal and external uncertainties tend to push the design process away from the optimal sequence.

3.Out of sequence design leads to low productivity, prolonged duration and decreased value of the design solution.

4. It is possible and worthwhile to enforce the realization of the optimal or near optimal sequence.

They also observed the following as problems :

•The iteration needed from incomplete information,

•Lacking or delayed input from the client,

•Changes in design objectives,

•Unbalanced design resources,

•Late engagement of a design party,

•Earlier intentions not being taken into account in a later task .

These deteriorate the design and construction performance and eventually decrease the value provided for the customer.

2.10 Improving Design delay

Alarcón, and Mardones, (1998) proposed a methodology to eliminate the causes of the defects detected in the identification phase of the research. These problems that can be solved acting through four different actions:

1. Supervision: of the design process. A construction company must participate in that design process, in order to avoid the problems related with lack of construction knowledge of the designers, providing its experience in design solutions.
2. Coordination: of the different specialties through a logic sequence of information transfer, avoiding incorrect assumptions, and giving a priority level for changes in order to avoid lack of coordination and to improve the design compatibility.
3. Standardization: of design information, to avoid the omissions, errors and continuous changes, that affects the normal development of the projects.
4. Control: of the flow of information, verifying that the requirements of previous processes are fulfilled, in order to avoid that design defects arrive to the construction site.

Regulatory constraints on design have increased steadily. Beginning with simple safety requirements and minimal land-use and light-and-air zoning, building codes and regulations have grown into a major force in design that regulates every aspect of design and construction.

Contextual factors include the nature of the surrounding fabric of natural and built elements. Existing patterns and characteristics of this fabric can provide clues or starting points for approaching site development as well as the building design, influencing its configuration and use of materials, colors, and textures. Climatic factors include the nature of regional microclimates defined by solar radiation, temperatures, humidity, wind, and precipitation (Demkin, 2007).

In its broadest scope, sustainability refers to the ability of a society, ecosystem, or any such ongoing system to continue functioning into the future without being forced into decline through exhaustion or overloading of the key resources on which that system depends. For architecture, this means design that delivers buildings and communities with lower environmental impacts while enhancing health, productivity, community, and quality of life.

2.11 Influence of Fees on Design Delay

A study of the relationship between fee structure and design deficiency, showed that design deficiency had a non-linear inverse relationship with project design fees. Project and the project's costs increase when design fees are reduced ; also project costs due to design deficiency increase sharply when design fees are reduced below their optimal level (Abolnour, 1994).

The fee that the design offices charge takes several forms depending on the size of the project to be designed and the type of services delivered, other than the basic design services. Generally, the fee may be broken into several constituents.

First is the direct cost that covers the cost of engineering services, securing legal permits. Second is the overhead cost that includes the cost of all indirect charges for the design of the project and that is necessary for the operation of the design offices.

Most design deficincy can be categorized as one of the following three types:

- Contract document conflict;
- Interdisciplinary coordination errors – conflicts or interface problems of a structural, mechanical and electrical nature;
- Technical compliance discrepancies – no adherence to the appropriate design guidelines, technical specification, and building codes (Lutz et al. 1990).

In most cases, there is a limit to the funds available for construction. Once defined, this limit has a major influence on subsequent design decisions, from building size and configuration to material selection and detailing. Although most budgets are fixed (often by the amount of financing available), others may be flexible. For example, some owners are willing to increase initial budgets to achieve overall life-cycle cost savings.

The demands and constraints set by the project schedule may influence how specific issues are explored and considered. For example, an alternative requiring a time consuming zoning variance may be discarded in favor of one that can keep the project on schedule.

Another example may include committing to a final site plan early in the process before the building footprint on the site plan is fully designed (Demkin, 2007).

2.12 Consultant Related Delay Factors

The client may consult with other professionals who can assist him in organizing the entire construction project. These professionals are called consultants. The main duties and responsibilities of a consultant may be to design the infrastructure of the project, which includes architectural, mechanical, structural, and electrical designs. Some other responsibilities may include the preparation of project related documents such as bills, drawings, specifications, and tender documents (Long et al, 2004). Furthermore, in some cases, consultants also conduct project planning, cost control and estimation, and quality control. In normal circumstances, consultant-related delays occur during preparation of drawings, during the adoption of design drawings, while taking design approvals from contractors and client, and when performing inspection procedures. There are many possible reasons behind these types of delays; prominent factors include inexperienced consultancy staff, poor qualifications, inadequate communication and coordination skills, and improper planning (Gunlana and Krit, 1996). Building configuration, materials, and systems are rarely arbitrarily chosen and are only partially based on aesthetic criteria. For example, floor-to-floor height required to accommodate structural, mechanical, lighting, and ceiling systems in a cost-effective manner varies significantly from an apartment house to an office building to a research facility. Similarly, office fenestration may be based on one module and housing on another module. In still other cases, these dimensions may be dictated largely by mechanical systems or even by the knowledge and preferences of the local construction industry. Odeh and Battaineh (2002) believe that during the construction project, the enquiries and inspections of the consultant may slow down the progress of the work. In response, the contractor may come up with solutions to the problems; however, these solutions may not satisfy the consultant, and could result in the work having to be redone. Effective control and command over production on the construction site is a major element that contributes to the success of implementing the project; conversely, hindrances in performing these activities can have severe impacts on a construction project.

2.13 Owner-Related Delay Factors

The owner or client is the key participant during the entire construction project. Some clients have a clear idea of a program, budget, and other project objectives, including the final appearance of the building. Others look to their architect to help them define the project objectives and to design a building that meets those objectives. In both cases the effectiveness of the relationship between client and architect is a major factor in making and implementing design decisions throughout the project.

In a few cases, owners have in-house project management teams that participate in the construction project, but most of the time, owners hire a project manager and external parties to handle the project (Odeh and Battaineh, 2002). One of the most crucial decisions that owners need to take at the beginning of the project is to determine the duration of the contract. Many owners prefer fast completion of work but thorough investigations should be conducted to decide the contract duration. Therefore, the personal involvement and quick decision-making on various matters by the owner in the initial phases of the project may accelerate the project's progress. The owner must participate in the construction project horizontally and vertically, but without interrupting the consultants project plan. In addition, financial matters should also be taken into account, and the owner must ensure the on-time availability of funds; lack of financial stability may cause many problems.
Clients and their architects must adjust their designs to satisfy community groups, neighbors, and public officials. These design adjustments are often ad hoc efforts to meet objections or to gain support rather than direct responses to codified requirements.

All clients have a series of aspirations, requirements, and limitations to be met in design. The program provides a place for identifying and delineating these factors and any number of related considerations. The program may be short or long, general or specific, descriptive of needs, or suggestive of solutions (Demkin, 2007).

2.14 Summary

To identify the causes of design delays, a detailed literature review was carried out using international journals, conferences, and books. Previous literature has shown that causes and effects of delays in the construction industry can vary from country to country, due to different environments and the techniques applied that can affect the design processes.

Several delay factors were listed from the literature review. These delay factors were considered during the design of a questionnaire that aimed to rank the delay factors using the responses collected from construction industry representatives, including consultants and owners.

CHAPTER 3: RESEARCH METHODOLOGY

This chapter explains how the problem was investigated and describes the tools used to undertake the investigation. The chapter also presents the method of data collection which is questionnaire survey. It also describes the characteristics of the research sample and the method of analysis.

3.1 Research Strategy

3.1.1 Overview

Naoum (2007) defined the research strategy as the way in which the research objectives can be questioned. From the literature review, it was found that there are two basic research approaches: quantitative and qualitative.

Furthermore, Addis and Talbot (2001) defined research methods as "a systematic and orderly approach taken towards the collection of data so that information can be obtained from those data". Considerable thought was given to the selection of research methodology prior to commencement so that the research could be conducted in as systematic a way as possible. The main focus was kept particularly on the essential aspects of research, which can be regarded as being "searching by means of careful, critical investigation in order to discover something specific" (Barton et al., 2000).

3.1.2 Quantitative Method

In this thesis, a quantitative approach is used as a quantitative research methodology is appropriate where quantify able measures of variables of interest are possible. A quantitative research methodology is appropriate where quantify able measures of variables of interest are possible, and where hypotheses can be formulated, tested and inferences drawn from samples to populations (Parkin, 2000). Recently, the strict scientific methods employed by quantitative analysis have been considered the best way to conduct any meaningful research.

3.1.3 Secondary Data

Secondary data to inform the current research was also obtained from different sources, including e-resources (the Internet), past research projects, journals and books.

The Internet provides access to a wide variety of different types of secondary data that can be used to support the research (Barnett, 2002).

3.1.4 Questionnaire

In this thesis, a questionnaire is used. The questionnaire is a technique to collect data/information from a potentially large number of respondents in economic time and money. It is important to keep in mind that a questionnaire should be viewed as a multi-stage process beginning with definition of the different aspects to be examined and ending with interpretation of the results. Every was designed carefully because the final results are only as good as the weakest link in the questionnaire process. Although questionnaires was used because of its may be economical to administer compared to other data collection methods, they are every bit as expensive in terms of design time and interpretation (Houtkoop, 2000).

3.2 Research Process and Design

The purpose of this research methodology chapter, as explained by Naoum (2006) is, an action plan for getting from here to there, where here is defined as the initial questions to be answered, and there is the conclusion about these questions. It contains the nuts and bolts of the research project, as it describes what is to be achieved, how it is performed, and the results to be obtained (Holt, 1997).

Figure 3.1 summarizes the methodology flowchart and how it leads to achieve the research objectives.

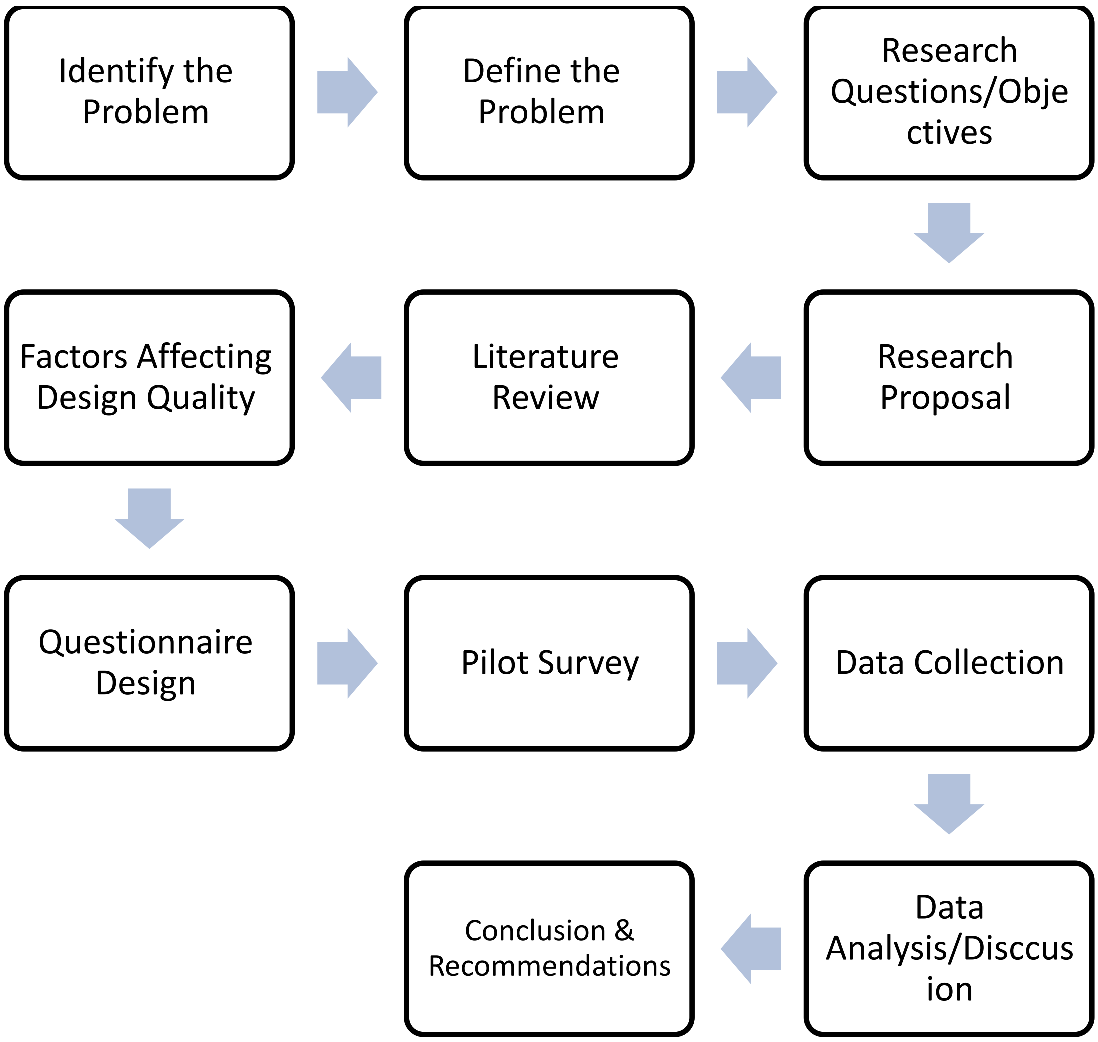

Figure3.1: Methodology flow chart

This research consists of sixth phases:

The first one is the proposal for identifying and defining the problems and establishment of the objectives of the study and development of research plan.

The second phase of the research includes literature review.

The third phase of the research includes the questionnaire design through distributing the questionnaire to a local sample of consultants and owners' firms. The purpose of the pilot study was to test and prove that the questionnaire questions are clear to be answered in a way that help to achieve the target of the study. The questionnaire was modified based on the results of the pilot study.

The fourth phase of the research was questionnaire distribution. The questionnaire wasused to collect the required data in order to achieve the research objective.

The fifth phase of the research focused data analysis and discussion. Statistical Package for the Social Sciences, (SPSS) was used to perform the required analysis.

The last phase of the research includes the conclusions and recommendations.

3.3 Questionnaire Design

Questionnaire was designed for this research work taken into consideration the aim and objectives of the study. The questionnaire survey is aiming to collect representative data from the industry to verify the findings of the previous work on the subject, to update the existing knowledge and to re-evaluate the extent of the problem as it stands to date. Hence, the questionnaire was set up to obtain professional opinions on the following aspects:

- Factors affecting the design delay; and
- The possible remedial methods to minimize the design delay.

The questionnaire survey was designed to verify the significant level of the potential factors that affecting the design delay. While designing the questionnaire, considerations have been taken for the aim and the objectives of the study with an intention to provide sufficient background and to obtain professional opinions from the industry to cover the issues that are within the limitation of this research work.

According to the review of literature related to the concern subject and after interviewing experts who were dealing or having contact with the subject at different levels, a questionnaire was developed with closed ended statements. The questionnaire was designed in the Arabic Language, as most of the target population were unfamiliar with the English Language. Unnecessary personal data, complex and duplicated questions were avoided. In each questionnaire, an explanatory letter was attached to cover some ethical considerations and to facilitate questionnaire filling.

In order to present the questionnaire in a systematic way, it was decided to divide the questions into four sections to cover the main issues under investigation:

1. Questions related to the background of the respondent firm and it included several areas of questions such as type of firm, delay occurred, sector, period of experience, type

of work, value of the projects which implemented in 5 years ago. This section consisted of (6) questions.

2. Questions related to the background of the respondent and it included several areas of questions such as period of experience, number of projects, and position. This section consisted of (3) questions.

3. The third section includes the list of factors influencing design delay, The factors were divided into six main groups, which are:

a. Technical staff related factors;

b. owner representative related factors;

c. owner related factors;

d. consultant related factors;

e. external factors.

4. The fourth section includes a list of possible methods that can help in minimizing design delay. At the end of this section, the respondents were requested to add any other comments that in their opinions are appropriate to minimize design delay.

The respondents' were asked to indicate the degree of severity and occurrence of the factors in section three, based on Likert scale from 1 – 5, then to indicate the importance and relative use of remedial methods in section four.

Questions were arranged in logical sequence to facilitate filling the questionnaire. A draft questionnaire was designed with the help of supervisor. This draft was discussed with a group of specialists. After data was received, it was tested and analyzed using the statistical package for social sciences (SPSS).

3.4 Pilot Study

The structured questionnaires should be based on a carefully prepared set of questions piloted and refined until the researcher is convinced of their validity. Therefore the pretesting is an important stage in the questionnaire design process, prior to finalizing the questionnaire. It involves administrating the questionnaire to alimited number of potential respondents and other knowledgeable individuals in orderto identify and correct design flaws. The pilot survey was also used as an opportunity to identify any other information, suggestions, comments or factors appropriate to the study that could be included in the second stage main survey. The Arabic version of questionnaire was tested in order to make sure that the questions were easily understood. The test was made by distributing six drafts of the questionnaire, these questionnaires were distributed to expert engineers such as project manager, site engineer, office engineer and firm manager.

The responses in pilot study illustrated the lack of clarity on some of the questions and factors. As a result, many amendments were made to the questions for the main survey questionnaire that have unsatisfactory responses. Many respondents have added more factors to the ones that have been identified for the pilot study which in turn have been incorporated into the main survey. The questionnaire's format was also improved from that of the pilot study.

3.5 Main Survey Questionnaire

A copy of the main survey questionnaire in English version is presented in (Annex A). Because the mother tongue of most members of the target population is Arabic, it was necessary to provide an Arabic questionnaire (see Annex B).

Three points were considered in order to obtain a high level of response:

1. Providing a covering letter (see Annex A) to do the following:

- Identify the type of research, sponsoring firm and the researcher's name;
- Explain the objectives and the benefits of the study;
- Inform the participants that their name, department, or company name will not appear in the research.

2. Structuring the questionnaire in a smart and attractive design
3. Keeping the questionnaire as short as possible, but comprehensive enough

3.6 Target Group

The overall sample are consultants, and owners.

The target groups in this study included the all sample (owners, and consultants). The owners are governmental ministries, nongovernmental firms and main municipalities.

In Gaza-Strip and from background information it was found that we have 35 owner and 30 consultants offices.

The main population of the questionnaire survey was limited to the following:

1. Consulting office/firms holding an excellent grade. Only (6) consulting firms were approached and responded, that is, those (6) offices were approached by public clients for consultancy services.

2. Owners implementing and managing public projects were approached which are familiar with design process. The owner's institutions were: Municipality of Jabalia ,Municipality of Gaza, Rafah Governorate, Islamic Relief, Rafah Municipality, Khanyounis Municipality, Islamic University of Gaza, Ministry of Local Government, Ministry of Education and Higher Education, PECDAR, UNRWA, Ministry of Housing and Public Works, Ministry of Health, Ministry of Awqaf and Religious Affairs, Middle Area Municipalities, United Nations Development Programme – UNDP and Palestinian Council of Housing.

The rationale behind limiting the population of the questionnaire survey to the above is that: they usually take on large scale projects in which design delay is normally encountered in such projects and hence they are more familiar with the issues of the design delay. While smaller consultants and smaller owners familiarity of the issues related to design delay is very limited, if there is.

3.6.1 Sample Size Determination

The sampling is the process of selecting representative units of a population for the study in research investigation. A sample is a small proportion of a population selected for observation and analysis. The samples were selected randomly from consultant offices & public owners sectors.

Statistical equations were used in order to calculate the sample size for the contractors. Equation 3.1 was used to determine the sample size of the unlimited population

$$SS = \frac{Z^2 * P * (1-P)}{C^2}$$

Where SS = Sample size

Z = Z value (e.g. 1.96 for 95% confidence level)

P = percentage picking a choice, expressed as a decimal (0.50 used for sample size needed).

C = margin of error (10%)

SS= 96 sample.

A number of 100 questionnaires were distributed to the target group, 85 questionnaires were received. The respondent percentage rate was 85 %.

The questionnaires were distributed across Gaza Strip governates as follow:

1. North governate - 30 questionnaires.

2. Gaza governate- 30 questionnaires.

3. Middle area governate- 10 questionnaires.

4. Khanyonis governate- 20 questionnaires.

5.Rafah governate- 10 questionnaires.

3.7 Instrument Validity

The validity of an instrument is defined as: "an integrated evaluative judgment of the degree to which empirical evidence and theoretical rational support the adequacy and appropriateness of inferences and actions based on test scores or other models of measurement".

To accumulate evidence of validity, two types of validity was utilized in this study; face validity and content related validity. Face validity relates to the suitability, layout, appearance and arrangement of the questionnaire and assessed by independent evaluators who suggested useful remarks. By the end, the questionnaire was produced by a professional attractive manner. The content related validity was done by experts in statistics who was asked to identify that the instrument used was valid statistically and that the questionnaire was designed well enough to provide relations and tests among variables.

All additions, omissions and the new factors was discussed and approved by the supervisor.

3.8 Instrument Reliability

This section presents test of reliability of questionnaire according to the pilot study. The reliability of an instrument is the degree of consistency which measures the attribute; it is supposed to be measuring. The less variation an instrument produces in repeated measurements of an attribute, the higher its reliability. Reliability can be equated with the stability, consistency, or dependability of a measuring tool. The test is repeated to the same sample of people on two occasions and then compares the scores obtained by computing a reliability coefficient.

Chronbach's coefficient alpha is designed as a measure of internal consistency, that is, do all items within the instrument measure the same thing? Chronbach.s alpha is used here to measure the reliability of the questionnaire between each field. The normal range of Chronbach.s coefficient alpha value between 0.0 and + 1.0. The closer the Alpha is to 1, the greater the internal consistency of items in the instrument being assumed. The formula that determines alpha is fairly simple and makes use of the items (variables), k, in the scale and the average of the inter-item correlations, r:

$$\alpha = \frac{k\,r}{1+(k-1)r}$$

As the number of items (variables) in the scale (k) increases the value α becomes large. Also, if the intercorrelation between items is large, the corresponding α will also be large.

3.9 Test of Normality

Table 3.2 shows the results for Kolmogorov-Smirnov test of normality. From Table 3.2, the p-value for each field is greater than 0.05 level of significance, then the distribution for each field is normally distributed. Consequently, Parametric tests will be used to perform the statistical data analysis.Person-Firm Fit

Table 3.1: Kolmogorov-Smirnov test

Field	Kolmogorov-Smirnov	
	Statistic	**P-value**
Technical staff related factors	1.316	0.063
Owner representative related factors	1.029	0.092
Owner related factors	1.246	0.079
Consultant related factors	1.283	0.074
External factors	0.931	0.351
Delay Minimizing Methods	1.324	0.064
All paragraphs of the questionnaire	0.993	0.362

3.10 Statistical Analysis Tools

The researcher would use data analysis both qualitative and quantitative data analysis methods. The Data analysis will be made utilizing (SPSS 22). The researcher would utilize the following statistical tools:

1) Kolmogorov-Smirnov test of normality.
2) Pearson correlation coefficient for Validity.
3) Cronbach's Alpha for Reliability Statistics.
4) Frequency and Descriptive analysis.

5) Parametric Tests (One-sample T test).

T-testis used to determine if the mean of a paragraph is significantly different from a hypothesized value 3 (Middle value of Likert scale). If the P-value (Sig.) is smaller than or equal to the level of significance, $\alpha = 0.05$, then the mean of a paragraph is significantly different from a hypothesized value 3. The sign of the Test value indicates whether the mean is significantly greater or smaller than hypothesized value 3. On the other hand, if the P-value (Sig.) is greater than the level of significance $\alpha = 0.05$, then the mean a paragraph is insignificantly different from a hypothesized value 3.

3.11 Validity of Questionnaire

Validity refers to the degree to which an instrument measures what it is supposed to be measuring. Validity has a number of different aspects and assessment approaches. Statistical validity is used to evaluate instrument validity, which include internal validity and structure validity.

3.11.1 Internal Validity

Internal validity of the questionnaire is the first statistical test that used to test the validity of the questionnaire. It is measured by the correlation coefficients between each paragraph in one field and the whole field.

Table 3.3 clarifies the correlation coefficient for each paragraph of the " Technical staff related factors " and the total of the field. The p-values (Sig.) are less than 0.05, so the correlation coefficients of this field are significant at α = 0.05, so it can be said that the paragraphs of this field are consistent and valid to be measure what it was set for.

Table 3.2: Correlation coefficient of each paragraph of " Technical staff related factors " and the total of this field

No.	Paragraph	Pearson Correlation Coefficient	P-Value (Sig.)
1.	Shortage of professional staff (engineers, painters, surveyors ...)	.668	0.000*
2.	The weakness of the skills and qualifications of design engineers	.658	0.000*
3.	The low salaries of technical staff	.620	0.000*
4.	Lack of access to development courses in the field of design	.729	0.000*
5.	Lack of incentives	.629	0.000*

* Correlation is significant at the 0.05 level

Table 3.4 clarifies the correlation coefficient for each paragraph of the " Owner representative related factors " and the total of the field. The p-values (Sig.) are less than 0.05, so the correlation coefficients of this field are significant at α = 0.05, so it can be said that the paragraphs of this field are consistent and valid to be measure what it was set for.

Table 3.3: Correlation coefficient of each paragraph of " Owner representative related factors " and the total of this field

No.	Paragraph	Pearson Correlation Coefficient	P-Value (Sig.)
1.	Lack of incentives factors in crews of owner representative	.338	0.001*
2.	Poor communication between the project's parties and owner representative	.477	0.000*
3.	Ineffective influence and poor follow-up of owner representative	.627	0.000*
4.	Ineffective planning and scheduling for the project by owner representative	.555	0.000*
5.	Delays in the study and on-site survey by owner representative	.580	0.000*
6.	Weak follow-up for project design phases by the owner representative	.728	0.000*
7.	Weak follow-up and quality control by owner representative	.686	0.000*
8.	Poor qualifications of owner representative staff	.625	0.000*
9.	Weakness of preparing feasibility study for the project	.655	0.000*
10.	Slow processing of the changes required by the owner representative	.615	0.000*
11.	The weakness of the upper supervision by owner representative	.720	0.000*

* Correlation is significant at the 0.05 level

Table 3.5 clarifies the correlation coefficient for each paragraph of the "Owner related factors " and the total of the field. The p-values (Sig.) are less than 0.05, so the correlation coefficients of this field are significant at α = 0.05, so it can be said that the paragraphs of this field are consistent and valid to be measure what it was set for.

Table 3.4: Correlation coefficient of each paragraph of " Owner related factors " and the total of this field

No.	Paragraph	Pearson Correlation Coefficient	P-Value (Sig.)
1.	Owner lack of experience in the field of construction	.758	0.000*
2.	Lack of coordination among the parties of the project owner	.767	0.000*
3.	Contract changes (in addition to the contract work, and a change in the specifications)	.459	0.000*
4.	Financial problems (delay payments, financial difficulties)	.454	0.000*
5.	Un realistic idea of the project	.707	0.000*
6.	Slow decision-making by the owner	.677	0.000*
7.	Owner intervention in the design process and give oral instructions	.728	0.000*
8.	Change in the goal and scope of the project	.636	0.000*

* Correlation is significant at the 0.05 level

Table 3.6 clarifies the correlation coefficient for each paragraph of the "consultant related factors " and the total of the field. The p-values (Sig.) are less than 0.05, so the correlation coefficients of this field are significant at α = 0.05, so it can be said that the paragraphs of this field are consistent and valid to be measure what it was set for.

Table 3.5: Correlation coefficient of each paragraph of " Consultant related factors " and the total of this field

No.	Paragraph	Pearson Correlation Coefficient	P-Value (Sig.)
1.	Poor qualifications of consultant engineer's staff assigned to the project	.685	0.000*
2.	Delay in the planning process	.682	0.000*
3.	Lack of experience by the project consultant	.721	0.000*
4.	Delayed and slow supervision in making decisions	.702	0.000*
5.	Delay in the preparation of drawings and documents	.576	0.000*
6.	Poor communication and contact between consultant management and design engineers	.733	0.000*
7.	Improper design methods implemented by the consultant's	.823	0.000*
8.	The financial problems that face the consultant	.222	0.020*
9.	Rework due to errors activities during design stage	.682	0.000*
10.	Imprecise prediction of productivity rate of technical staff	.737	0.000*
11.	The use of inappropriate action plan by the Consultant	.783	0.000*
12.	The use of the bureaucracy in work organizing in the office	.678	0.000*
13.	Un commitment of official work hours by consultant team	.747	0.000*
14.	Slowness in giving instruction	.718	0.000*
15.	Lack of consultant crew's job security	.486	0.000*

* Correlation is significant at the 0.05 level

Table 3.7 clarifies the correlation coefficient for each paragraph of the " External factors " and the total of the field. The p-values (Sig.) are less than 0.05, so the correlation coefficients of this field are significant at α = 0.05, so it can be said that the paragraphs of this field are consistent and valid to be measure what it was set for.

Table 3.6: Correlation coefficient of each paragraph of " External factors " and the total of this field

No.	Paragraph	Pearson Correlation Coefficient	P-Value (Sig.)
1.	Severe weather conditions	.738	0.000*
2.	Rise in the prices of materials	.732	0.000*
3.	Poor economic conditions (currency, inflation rate,,, etc)	.719	0.000*
4.	Problems with neighbors of the site	.734	0.000*
5.	Unexpected geological condition	.681	0.000*
6.	Slow Site Clearance	.737	0.000*
7.	Unstable laws and regulation	.698	0.000*
8.	Bureaucracy and the difficulty of obtaining government permissions	.508	0.000*

* Correlation is significant at the 0.05 level

Table 3.8 clarifies the correlation coefficient for each paragraph of the "Delay Minimizing Methods " and the total of the field. The p-values (Sig.) are less than 0.05, so the correlation coefficients of this field are significant at α = 0.05, so it can be said that the paragraphs of this field are consistent and valid to be measure what it was set for.

Table 3.7: Correlation coefficient of each paragraph of " Delay minimizing methods " and the total of this field

No.	Paragraph	Pearson Correlation Coefficient	P-Value (Sig.)
1.	Effective cooperation among the parties of the project	.611	0.000*
2.	Improve salaries and incentives for staff	.726	0.000*
3.	Consultant selection on .the basis of professional and not financial	.483	0.000*
4.	Consultant engage in pre-design (initial idea)	.719	0.000*
5.	Providing enough time & money for design	.705	0.000*
6.	Provide appropriate courses to improve the performance of the technical staff	.751	0.000*
7.	Using advanced design methods and programs	.561	0.000*

* Correlation is significant at the 0.05 level

3.11.2 Structure validity of the questionnaire

Structure validity is the second statistical test that used to test the validity of the questionnaire structure by testing the validity of each field and the validity of the whole questionnaire. It measures the correlation coefficient between one field and all the fields of the questionnaire that have the same level of liker scale.

Table 3.9 clarifies the correlation coefficient for each field and the whole questionnaire. The p-values (Sig.) are less than 0.05, so the correlation coefficients of all the fields are significant at $\alpha = 0.05$, so it can be said that the fields are valid to be measured what it was set for to achieve the main aim of the study.

Table 3.8: Correlation coefficient of each field and the whole of questionnaire

No.	Field	Pearson Correlation Coefficient	P-Value (Sig.)
1.	Technical staff related factors	.623	0.000*
2.	Owner representative related factors	.748	0.000*
3.	Owner related factors	.809	0.000*
4.	Consultant related factors	.848	0.000*
5.	External factors	.480	0.000*
6.	Delay Minimizing Methods	.476	0.000*

* Correlation is significant at the 0.05 level

3.12 Reliability of the Research

The reliability of an instrument is the degree of consistency which measures the attribute; it is supposed to be measuring. The less variation an instrument produces in repeated measurements of an attribute, the higher its reliability. Reliability can be equated with the stability, consistency, or dependability of a measuring tool. The test is repeated to the same sample of people on two occasions and then compares the scores obtained by computing a reliability coefficient.

3.13 Cronbach's Coefficient Alpha

This method is used to measure the reliability of the questionnaire between each field and the mean of the whole fields of the questionnaire. The normal range of Cronbach's coefficient alpha value between 0.0 and + 1.0, and the higher values reflects a higher degree of internal consistency. The Cronbach's coefficient alpha was calculated for each field of the questionnaire.

Table 3.10 shows the values of Cronbach's Alpha for each field of the questionnaire and the entire questionnaire. For the fields, values of Cronbach's Alpha were in the range from 0.671 and 0.913. This range is considered high; the result ensures the reliability of each field of the questionnaire. Cronbach's Alpha equals 0.922 for the entire questionnaire which indicates an excellent reliability of the entire questionnaire.

Table 3.9: Cronbach's Alpha for each field of the questionnaire

No.	Field	Cronbach's Alpha
1.	Technical staff related factors	0.671
2.	Owner representative related factors	0.824
3.	Owner related factors	0.807
4.	Consultant related factors	0.913
5.	External factors	0.849
6.	Delay Minimizing Methods	0.775
	All paragraphs of the questionnaire	0.922

The Thereby, it can be said that the researcher proved that the questionnaire was valid, reliable, and ready for distribution for the population sample.

CHAPTER 4: DATA ANALYSIS AND DISCUSSION

This chapter consists of two major parts. The first part describes and analyzes the data related to the respondents' experience, and the performances of the projects they have participated in. The second focus on the main objective of this survey, which presents and ranks the factors affecting design delay based on the opinions of clients and consultants. Each rank table is ordered according to the importance of the factors affecting design delay. The importance of these factors is based on the integration of their occurrences and severities.

4.1 Firm and Experience

This section presents general information about the firm of respondents in this survey. The results of this section reflect the strength of respondents' experience, and therefore indicate the degree of reliability of the data provided. It was distributed to 100 questionnaires, 85 questionnaires were received later, the respondent percentage was 85 %.

4.1.1 Firm Type

Table4.1 shows that 48.2% of the sample type are " Owner " and 51.8% of the sample type are " Consultant"

Table 4.1: Firm type

Firm Type	Frequency	Percent %
Owner	41	48.2
Consultant	44	51.8
Total	85	100.0

4.1.2 Delay in Past Projects

Table 4.2 shows that95.3% of the sample had delay in the past projects and 4.7% didn't had delay in the past project**s.** .

It is obviously that most of past projects was delayed, which give more reliability to the factors affecting delay.

Table 4.2: Delay in past projects

Did delay occur in past projects	Frequency	Percent %
Yes	81	95.3
No	4	4.7
Total	85	100.0

4.1.3 Type of Firm

Table 4.3 shows that 62.4% of the sample are "Public firm ", 34.1% of them are "Private firm " and 3.5% of them are other.

Table 4.3: Type of firm

What are the firm being involved	Frequency	Percent %
Public	53	62.4
Private	29	34.1
Other	3	3.5
Total	85	100.0

4.1.4 Firm Experience in Construction

Table 4.4 shows that5.9% of firms have been involved "less than 5 years" in the construction projects , 7.1% of them have been involved "5-<10 years" in the construction projects, 20.0% of firms have been involved "10-<15 years" in the construction projects and 67.1% of firms have been involved more than 15yearsin the construction projects. It is clear that most of respondent firms have a long experience in construction projects, which enchase the research results.

Table 4.4: Firm experience in projects

Experience	Frequency	Percent %
Less than 5 years	5	5.9
5 – less than10 years	6	7.1
10 – less than 15 years	17	20.0
>= 15 years	57	67.1
Total	85	100.0

4.1.5 Firm Specialization

Figure4.1 shows that88.2% of the firm's specialization is " Roads", 81.2% of firm's specialization is " Constructions ", 78.8% of firm's specialization is " Underground "and 27.1% of firm's have other specializations. Noting that respondents have the choice to select more than one specialization.

It is clear that most respondents have a wide experience in different fields of construction projects.

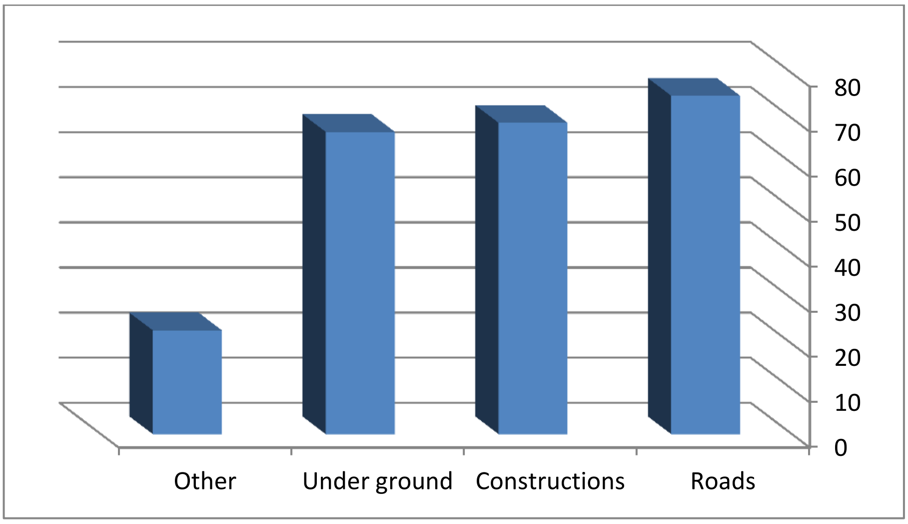

Figure4.1: Firm experience in construction

4.1.6 Value of The Current Projects

Table 4.5 shows that10.6% of the firm**s** have a value of the current projects "1million" during 5 years, 21.2% of the sample have a value of the current projects "1 – 3 millions ", 4.7% of firms have a value of the current projects "4-5millions", 63.5 % of firms have a value of the current projects more than 5 millions.

Noting that Gaza strip in the past five years had implemented a lot of projects to reconstruct , rehabilitate and improve Gaza strip buildings and infrastructure .

Most of respondents have a high project values which often have long duration with different items and activities.

Table 4.5: Value of the current projects

Value of Current Projects	Frequency	Percent %
1million	9	10.6
1 – 3 millions	18	21.2
4 – 5 millions	4	4.7
> 5 millions	54	63.5
Total	85	100.0

4.2 Question Related to The Respondent

4.2.1 Type of Work

Figure 4.2 shows that12.9% of the sampleare project managers, 36.5%of the sampleare supervisor engineers, 8.2% ofthe sampleare officeengineers ", 37.6%of the sampleare design engineers ", 4.7%ofthe sampleare design managers.

This ensures that the respondent's position provides a confident responses for the survey questions because of their deep experience and broad knowledge especially in design sector.

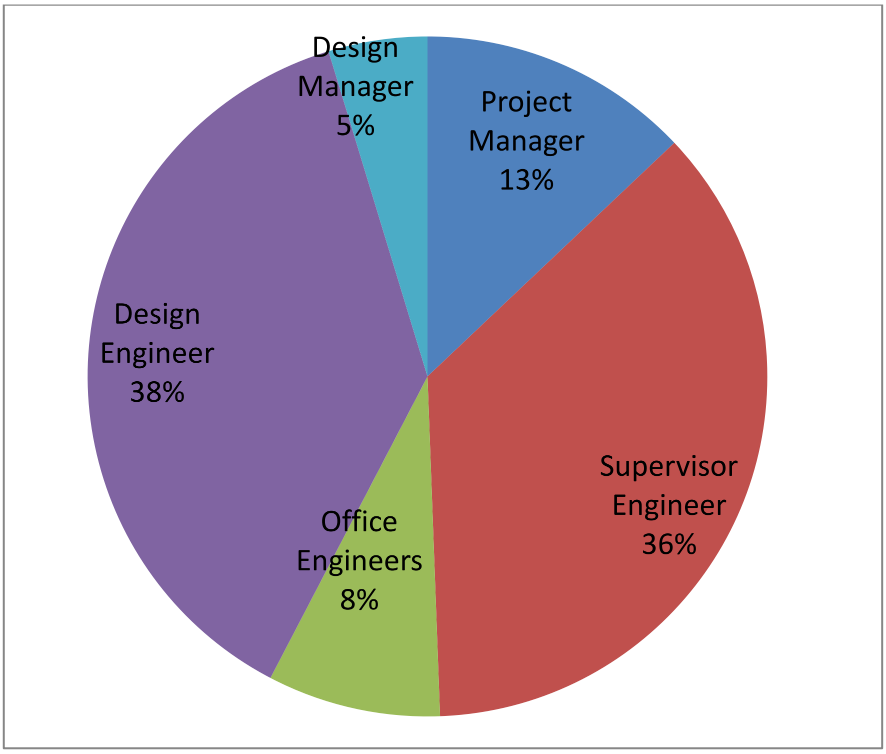

Figure4.2: Type of work

4.2.2 Numbers of Projects

Table 4.6 shows that 12.9% of the sample are involved in less than 5 projects, 22.4% of the sample are involved in "5-10"projects, 64.7% of the sample are involved in more than 10 projects. These results ensure the high experience of respondents

Table 4.6: Number of projects

Number of projects that you are involved in	Frequency	Percent %
< 5	11	12.9
5 – 10	19	22.4
> 10	55	64.7
Total	85	100.0

4.2.3 Experience of Respondents

Table 4.7 shows that15.3% of the sample have less than 5 years of experience, 45.9 % of the sample have "5-10" years of experience**,** 38.8%of the sample have more than 10 years of experience**.** These results also as previous results show that most of respondents have a wide experience..

Table 4.7: Experience of respondents

Years of respondent's experience	Frequency	Percent%
< 5	13	15.3
5 – 10	39	45.9
> 10	33	38.8
Total	85	100.0

4.3 Factors Affecting Design Delay

Respondents were asked to rank the factors that affect design delay according to their negative impact. The severity weights were scaled to five levels.

4.3.1 Technical Staff Related Factors

Table 4.8 summarize that the mean of "Lack of incentives" equals 4.13 (82.59%), Test-value = 12.36, and P-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive. The mean of this factor is significantly greater than the hypothesized value 3 . It is concluded that the respondents agree that lack of incentives have significant value.

The mean of "The weakness of the skills and qualifications of design engineers'" equals 3.66 (73.18%), Test-value = 5.77, and P-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, therefore the mean of this factor is significantly greater than the hypothesized value 3 . It is concluded that the respondents have a positive attitude towards considering the weakness of skills and qualifications as an important factor affect design delay.

The mean of the "Technical staff related factors" equals 3.93 (78.68%), Test-value = 14.03, and P-value=0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive. The mean of these factors is significantly greater than the hypothesized value 3.It is concluded that respondents agreed that all technical staff factors have an effect on design delay but with different ratios.

As shown in the table the financial factors have the most effectiveness, as lack on of incentives came in the first level, follows with the low salaries, while lack of professional staff had the least effectiveness on design delay.

This indicates that most of consultants and owner had a low range of salaries and don't give enough incentives, in spite of having a qualified staff with high experience.

Table 4.8: Technical staff related factors

#	Item	Mean	Proportional mean	Test value	P-value (Sig.)	Rank
1.	Shortage of professional staff (engineers, painters, surveyors ...)	3.89	77.88	7.79	0.000*	3
2.	The weakness of the skills and qualifications of design engineers	3.66	73.18	5.77	0.000*	5
3.	The low salaries of technical staff	4.09	81.88	12.44	0.000*	2
4.	Lack of access to development courses in the field of design	3.89	77.88	9.44	0.000*	3
5.	Lack of incentives	4.13	82.59	12.36	0.000*	1
	All factors	3.93	78.68	14.03	0.000*	

* The mean is significantly different from 3

4.3.2 Owner Representative Related Factors

Table 4.9 shows that the mean of "Slow processing of the changes required by the representative of the owner" equals 3.82 (76.47%), Test-value = 8.54 and P-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive. The mean of this factor is significantly greater than the hypothesized value 3 . It is concluded that the respondents agree to this factor.

The mean of "Weak follow-up and quality control by the representative of the owner" equals 3.16 (63.29%), Test-value = 1.97, and P-value = 0.026 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive. The mean of this factor is significantly greater than the hypothesized value 3. It is concluded that the respondents agreed to this factor also.

The mean of the factor's group "Owner representative related factors" equals 3.55 (71.08%), Test-value = 9.70, and P-value=0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this factors groupis significantly greater than the hypothesized value 3.It is concluded that the respondents agreed that all Owner representative related factors ".have an effect on design delay, but also with different ratios.

It is obviously shown that slow processing of the changes required by the representative of the owner is the most effective factor on design delay, followed with lack of incentives, followed with planning &scheduling. While the least effective factors were poor qualifications, weakness of follow-up and controlling, and poor communications.

This refer to the high controlling and supervision of owner representative and good qualification they had, but the bureaucracy and the routine of procedures had a great effect on design delay in addition to financial factors also.

Table 4.9: Owner representative related factors

#	Item	Mean	Proportional mean (%)	Test value	P-value (Sig.)	Rank
1.	Lack of incentives factors in crews of owner representative	3.73	74.59	8.48	0.000*	2
2.	Poor communication between the project's parties and owner representative	3.48	69.65	5.30	0.000*	8
3.	Ineffective influence and poor follow-up of owner representative	3.48	69.52	6.73	0.000*	9
4.	Ineffective planning and scheduling for the project by owner representative	3.71	74.29	7.28	0.000*	3
5.	Delays in the study and on-site survey by owner representative	3.55	71.06	5.47	0.000*	6
6.	Weak follow-up for project design phases by the owner representative	3.59	71.76	7.13	0.000*	4
7.	Weak follow-up and quality control by owner representative	3.16	63.29	1.97	0.026*	11
8.	Poor qualifications of owner representative staff	3.45	68.94	3.88	0.000*	10
9.	Weakness of preparing feasibility study for the project	3.58	71.53	6.15	0.000*	5
10.	Slow processing of the changes required by the owner representative	3.82	76.47	8.54	0.000*	1
11.	The weakness of the upper supervision by owner representative	3.55	71.06	4.52	0.000*	6
	All factors	3.55	71.08	9.70	0.000*	

* The mean is significantly different from 3

4.3.3 Owner Related Factors

Table 4.10 shows that the mean of factor "Financial problems (delay payments, financial difficulties)" equals 4.12 (82.35%), Test-value = 12.99, and P-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this factor is significantly greater than the hypothesized value 3 . It is concluded that the respondents agree to this factor.

The mean of factor "Unrealistic idea of the project" equals 3.08 (61.67%), Test-value = 0.72, and P-value = 0.238 which is greater than the level of significance $\alpha = 0.05$. Then the mean of this factor is insignificantly different from the hypothesized value 3. It is concluded that the respondents (Do not know, neutral) to this factor.

The mean of the "Owner related factors" group equals 3.75 (74.97%), Test-value = 11.43, and P-value=0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this field is significantly greater than the hypothesized value 3.It is concluded that the respondents agreed that most owner related factors can delay design with different percentages.

Financial problems had the most effect on design delay, followed by the contract changes and variations, while the unrealistic project idea and lack of owner construction experience had the least effectiveness. As it is clear also that financial factors are common effective factor on design delay for each part. Contract changes and variations affect design delay as owners hadn't a clear vision for project and its output, which may return to the unstable economic , political, and social environment in Gaza Strip.

Table 4.10: Owner related factors

#	Item	Mean	Proportional mean (%)	Test value	P-value (Sig.)	Rank
1.	Owner lack of experience in the field of construction	3.45	68.94	3.62	0.000*	7
2.	Lack of coordination among the parties of the project owner	3.75	75.06	7.51	0.000*	5
3.	Contract changes (in addition to the contract work, and a change in the specifications)	4.05	80.95	11.31	0.000*	2
4.	Financial problems (delay payments, financial difficulties)	4.12	82.35	12.99	0.000*	1
5.	Un realistic idea of the project	3.08	61.67	0.72	0.238	8
6.	Slow decision-making by the owner	3.92	78.35	10.71	0.000*	4
7.	Owner intervention in the design process and give oral instructions	4.01	80.24	10.77	0.000*	3
8.	Change in the goal and scope of the project	3.61	72.24	6.00	0.000*	6
	All factors	3.75	74.97	11.43	0.000*	

* The mean is significantly different from 3

4.3.4 Consultant Related Factors

Table 4.11 shows that the mean of factor "The use of inappropriate action plan by the consultant" equals 3.72 (74.35%), Test-value = 6.49, and P-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this factor is significantly greater than the hypothesized value 3. It is concluded that the respondents agree to this factor.

The mean of factor "Un commitment of official work hours by consultant team" equals 3.25 (64.94%), Test-value = 2.18, and P-value = 0.016 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this factor is significantly greater than the hypothesized value 3. It is concluded that the respondents agree to this factor.

The mean of the group of “Consultant related factors” equals 3.51 (70.22%), Test-value = 7.23, and P-value=0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this groupis significantly greater than the hypothesized value 3.It is concluded that the respondents agreed that “Consultant related factors "can delay design with different percentages.

From results it is clear that all studied factors can delay design with different percentages.

The use of inappropriate plan by the Consultant had the most effect on design delay, followed with poor communication between Consultant management and design team, followed with redesign due to errors in design stage, while the least effective factors are lack of work hour's commitment and financial problems that face the consultant office.This an indicator for the importance of planning and scheduling for the design process and arranging the mechanism of working, inside of the importance of executing an appropriate action plan.

Table 4.11: Consultant related factors

#	Item	Mean	Proportional mean (%)	Test value	P-value (Sig.)	Rank
1.	Poor qualifications of consultant engineer's staff assigned to the project	3.48	69.65	4.70	0.000*	11
2.	Delay in the planning process	3.64	72.71	6.73	0.000*	4
3.	Lack of experience by the project consultant	3.38	67.53	3.60	0.000*	13
4.	Delayed and slow supervision in making decisions	3.49	69.88	4.14	0.000*	10
5.	Delay in the preparation of drawings and documents	3.53	70.59	5.23	0.000*	7
6.	Poor communication and contact between consultant management and design engineers	3.65	72.94	5.92	0.000*	2
7.	Improper design methods implemented by the consultant's	3.40	68.00	3.64	0.000*	12
8.	The financial problems that face the consultant	3.29	65.88	3.22	0.001*	14
9.	Rework due to errors activities during design stage	3.64	72.86	6.45	0.000*	3
10.	Imprecise prediction of productivity rate of technical staff	3.51	70.12	5.75	0.000*	8
11.	The use of inappropriate action plan by the Consultant	3.72	74.35	6.49	0.000*	1
12.	The use of the bureaucracy in work organizing in the office	3.49	69.88	3.99	0.000*	9
13.	Un commitment of official work hours by consultant team	3.25	64.94	2.18	0.016*	15
14.	Slowness in giving instruction	3.58	71.53	5.71	0.000*	6
15.	Lack of consultant crew's job security	3.64	72.71	5.13	0.000*	4
	All factors	3.51	70.22	7.23	0.000*	

* The mean is significantly different from 3

4.3.5 Other External Factors

Table 4.12 shows that the mean of factor “Bureaucracy and the difficulty of obtaining government permissions” equals 3.71 (74.12%), Test-value = 7.05, and P-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this factor is significantly greater than the hypothesized value 3 . It is concluded that the respondents agree to this factor.

The mean of factor “Severe weather conditions on the job site” equals 3.25 (64.94%), Test-value = 2.11, and P-value = 0.019 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this factor is significantly greater than the hypothesized value 3 . It is concluded that the respondents agree to this factor.

The mean of the group of “Other external factors” equals 3.58 (71.66%), Test-value = 7.89, and P-value=0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this groupis significantly greater than the hypothesized value 3.It is concluded that the respondents agreed that all external other factors have an effect on design delay but with different ratios.

From previous results it is obvious that the factor " Bureaucracy and the difficulty of obtaining government permissions" is the most significant effective on design delay, followed by the factor "Rise in the prices of materials" while the least effective factor was "Severe weather conditions on the job site".

These statistics give an indicator that governmental routine and permissions play a major rule in the time of design, also financial and economic condition have a similar effect, while other external factor have different significance on design time.

Table 4.12: Other external factors

#	Item	Mean	Proportional mean (%)	Test value	P-value (Sig.)	Rank
1.	Severe weather conditions	3.25	64.94	2.11	0.019*	8
2.	Rise in the prices of materials	3.69	73.88	5.92	0.000*	2
3.	Poor economic conditions (currency, inflation rate,,, etc)	3.64	72.71	5.87	0.000*	4
4.	Problems with neighbors of the site	3.62	72.47	5.62	0.000*	5
5.	Unexpected geological condition	3.58	71.67	5.72	0.000*	6
6.	Slow Site Clearance	3.66	73.18	6.42	0.000*	3
7.	Unstable laws and regulation	3.52	70.35	5.59	0.000*	7
8.	Bureaucracy and the difficulty of obtaining government permissions	3.71	74.12	7.05	0.000*	1
	All factors	3.58	71.66	7.89	0.000*	

* The mean is significantly different from 3

4.4 Minimizing Delay Methods

Table 4.13 shows that the mean of method "Effective cooperation among the parties of the project" equals 4.65 (92.94%), Test-value = 30.08, and P-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this method is significantly greater than the hypothesized value 3.It is conclude that the respondents agreed to this method.

The mean of method "Consultant engage in pre-design (initial idea)" equals 4.21 (84.24%), Test-value = 15.40, and P-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this method is significantly greater than the hypothesized value 3 . It is concluded that the respondents agree to this method.

The mean of the group of "Minimizing design delay methods" equals 4.43 (88.54%), Test-value = 31.97, and P-value=0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this group is significantly greater than the hypothesized value 3.It is concluded that the respondents agreed that these proposed method can help in minimizing design delay, but with different percentages.

Majority of respondent agreed that these proposed method can help in minimizing design delay, but with different percentages.

Effective cooperation between project parties had the highest rank, followed by providing enough money for design, while engaging consultant in pre-design stage(initial idea) had the lowest rank.

This is another indicator that respondents saw that they have qualified staff with good experience in design, and there is not a real need to improve staff knowledge and experience, but the real problem is in coordination, cooperation and effective communication between project parties.

Table 4.13: Minimizing design delay methods

	Item	Mean	Proportional mean (%)	Test value	P-value (Sig.)	Rank
1.	Effective cooperation among the parties of the project	4.65	92.94	30.08	0.000*	1
2.	Improve salaries and incentives for staff	4.40	88.00	20.17	0.000*	4
3.	Consultant selection on .the basis of professional and not financial	4.52	90.35	24.58	0.000*	3
4.	Consultant engage in pre-design (initial idea)	4.21	84.24	15.40	0.000*	7
5.	Providing enough time & money for design	4.53	90.59	23.93	0.000*	2
6.	Provide appropriate courses to improve the performance of the technical staff	4.28	85.65	16.88	0.000*	6
7.	Using advanced design methods and programs	4.40	88.00	19.61	0.000*	4
	All methods	4.43	88.54	31.97	0.000*	

* The mean is significantly different from 3

4.5 Summary

Table 4.14 shows that the mean of all factors equals 3.72 (74.47%), Test-value =16.03, and P-value=0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of all factors is significantly greater than the hypothesized value 3. It is concluded that all the respondents agreed to all the studied factors, and each of them have an effect on design delay, but with different ratio, and all parties(owner, consultant, owner representative) have a role in design time.

Table 4.14: Factors summary

	Mean	Proportional mean (%)	Test value	P-value (Sig.)
All factors	3.72	74.47	16.03	0.000*

*The mean is significantly different from 3

4.6 Test of Hypothesis

There are significant differences at level 0.05 in the responses of the research sample due to Firm Type.

Table 4.15 shows that the p-value (Sig.) is smaller than the level of significance $\alpha = 0.05$ for the field “Technical staff related factors”, then there is significant difference among the respondents regarding to these field due to Firm Type. We conclude that the respondents’ Firm Type has significant effect on this field.

Table 4.15 shows that the p-value (Sig.) is greater than the level of significance $\alpha = 0.05$ for the other fields, then there is insignificant difference among the respondents regarding to these fields due to Firm Type. We conclude that the respondents’ Firm Type has no effect on this fields.

Table 4.15: Factors independent samples T-test test of the fields and their p-values for firm type

No.	Field	Means		Test Value	Sig.
		Owner	Consultant		
1.	Technical staff related factors	4.11	3.77	2.676	0.009*
2.	Owner representative related factors	3.53	3.57	−0.366	0.716
3.	Owner related factors	3.76	3.74	0.111	0.912
4.	Consultant related factors	3.63	3.40	1.665	0.100
5.	External factors	3.63	3.54	0.584	0.561
6.	Delay Minimizing Methods	4.42	4.44	−0.189	0.851
	All fields together	3.78	3.67	1.122	0.265

* The mean difference is significant a 0.05 level

There are significant differences at level 0.05 in the responses of the research sample due to Experience.

Table 4.16 shows that the p-value (Sig.) is smaller than the level of significance $\alpha = 0.05$ for the field "Other factors", then there is significant difference among the respondents regarding to these field due to Experience. We conclude that the respondents' Experience has significant effect on this field.

Table 4.16shows that the p-value (Sig.) is greater than the level of significance $\alpha = 0.05$ for the other fields, then there is insignificant difference among the respondents regarding to these fields due to Experience. We conclude that the respondents' Experience has no effect on this fields.

Table 4.16: ANOVA test of the fields and their p-values for Experience

No.	Field	Means				Test Value	Sig.
		5 years	6 – 10	11 – 15	> 16 years		
1.	Technical staff related factors	3.72	3.70	3.74	4.04	1.602	0.195
2.	Owner representative related factors	3.64	3.41	3.49	3.58	0.331	0.803
3.	Owner related factors	3.48	3.56	3.84	3.77	0.663	0.577
4.	Consultant related factors	3.17	3.18	3.40	3.61	1.581	0.200
5.	External factors	4.10	3.65	3.15	3.66	3.919	0.011*
6.	Delay Minimizing Methods	4.60	4.40	4.40	4.42	0.315	0.814
	All fields together	3.69	3.56	3.61	3.78	1.119	0.346

* The mean difference is significant a 0.05 level

There are significant differences at level 0.05 in the responses of the research sample due to Current project value.

Table 4.17shows that the p-value (Sig.) is greater than the level of significance α = 0.05 for each field, then there is insignificant difference among the respondents toward each field due to Current project value. We conclude that the personal characteristics’ Current project value has no effect on each field.

Table 4.17: ANOVA test of the fields and their p-values for Current project value

No.	Field	Means				Test Value	Sig.
		1million	1 – 3 millions	4 – 5 millions	> 5 millions		
1.	Technical staff related factors	3.53	3.83	4.05	4.03	1.957	0.127
2.	Owner representative related factors	3.39	3.60	3.55	3.57	0.325	0.807
3.	Owner related factors	3.78	3.78	3.84	3.72	0.087	0.967
4.	Consultant related factors	3.11	3.40	3.63	3.61	1.777	0.158
5.	External factors	3.46	3.30	3.91	3.67	1.827	0.149
6.	Delay Minimizing Methods	4.24	4.48	4.54	4.43	0.810	0.492
	All fields together	3.50	3.66	3.84	3.77	1.352	0.264

There are significant differences at level 0.05 in the responses of the research sample due to (Firm Type, Experience and Current project value)

Table 4.18 shows that the p-value (Sig.) is greater than the level of significance α = 0.05 for (Firm Type, Experience and Current project value), then there is insignificant difference in respondents' answers toward Factors. We conclude that the (Firm Type, Experience and Current project value) have no effect on Factors.

Table 4.18: Analysis of Variance and Independent Samples T-test for (Firm Type, Experience and Current project value)

No		Test Name	Test Value	P-value(Sig.)
1.	Firm Type	Independent Samples T-test	1.259	0.265
2.	Experience	Analysis of Variance	1.119	0.346
3.	Current project value	Analysis of Variance	1.352	0.264

- There are significant differences at level 0.05 in the responses of the research sample due to firm being involved.

Table (4.19) shows that the p-value (Sig.) is smaller than the level of significance α = 0.05 for the fields "Technical staff related factors, consultant related factors and Other factors ", then there is significant difference among the respondents regarding to this field due to firm being involved. We conclude that the respondents' firm being involved has significant effect on this field.

Table (4.19) shows that the p-value (Sig.) is greater than the level of significance α = 0.05 for the other fields, then there is insignificant difference among the respondents regarding to this fields due to firm being involved. We conclude that the respondents' firm being involved has no effect on this fields.

Table (4.19): Independent Samples T-test test of the fields and their p-values for firm being involved

No.	Field	Means		Test Value	Sig.
		Public	Private		
7.	Technical staff related factors	3.82	4.14	−2.298	0.024*
8.	Owner representative related factors	3.55	3.61	−0.490	0.625
9.	Owner related factors	3.74	3.84	−0.775	0.440
10.	consultant related factors	3.41	3.73	−2.222	0.029*
11.	Other factors	3.43	3.88	−3.072	0.003*
12.	Remedial Methods	4.41	4.45	−0.374	0.710
	All fields together	3.66	3.88	−2.396	0.019*

* The mean difference is significant a 0.05 level

- There are significant differences at level 0.05 in the responses of the research sample due to type work.

Table (4.20) shows that the p-value (Sig.) is smaller than the level of significance $\alpha = 0.05$ for the field "Owner related factors", then there is significant difference among the respondents regarding to this field due to type work. We conclude that the respondents' type work has significant effect on this field.

Table (4.20) shows that the p-value (Sig.) is greater than the level of significance $\alpha = 0.05$ for the other fields, then there is insignificant difference among the respondents regarding to this fields due to type work. We conclude that the respondents' type work has no effect on this fields.

Table (4.20):ANOVA test of the fields and their p-values for type work

No.	Field	Means					Test Value	Sig.
		project management	supervisor engineering	Engineering	design engineering	design management engineering		
7.	Technical staff related factors	3.78	4.13	3.60	3.92	3.55	1.952	0.110
8.	Owner representative related factors	3.69	3.52	3.29	3.60	3.52	0.715	0.584
9.	Owner related factors	3.47	3.95	3.07	3.80	3.78	4.274	0.003*
10.	consultant related factors	3.23	3.74	3.14	3.48	3.45	2.135	0.084
11.	Other factors	3.67	3.60	3.23	3.62	3.53	0.530	0.714
12.	Remedial Methods	4.51	4.53	4.20	4.33	4.54	1.619	0.178
	All fields together	3.64	3.84	3.35	3.72	3.68	2.283	0.068

* The mean difference is significant a 0.05 level

- There are significant differences at level 0.05 in the responses of the research sample due to Numbers of project.

Table (4.21) shows that the p-value (Sig.) is smaller than the level of significance α = 0.05 for the field "Technical staff related factors and consultant related factors ", then there is significant difference among the respondents regarding to this field due to Numbers of project. We conclude that the respondents' Numbers of project has significant effect on this field.

Table (4.21) shows that the p-value (Sig.) is greater than the level of significance α = 0.05 for the other fields, then there is insignificant difference among the respondents regarding to this fields due to Numbers of project. We conclude that the respondents' Numbers of project has no effect on this fields.

Table (4.21):ANOVA test of the fields and their p-values forNumbers of project

No.	Field	Means			Test Value	Sig.
		< 5	5 – 10	> 10		
1.	Technical staff related factors	3.35	4.15	3.98	7.303	0.001*
2.	Owner representative related factors	3.25	3.50	3.63	2.663	0.076
3.	Owner related factors	3.50	3.61	3.85	2.275	0.109
4.	consultant related factors	2.91	3.55	3.62	6.189	0.003*
5.	Other factors	3.76	3.65	3.53	0.659	0.520
6.	Remedial Methods	4.35	4.29	4.49	1.840	0.165
	All fields together	3.42	3.71	3.79	3.910	0.024*

* The mean difference is significant a 0.05 level

- There are significant differences at level 0.05 in the responses of the research sample due to Years of respondent's experience.

Table (4.22) shows that the p-value (Sig.) is smaller than the level of significance α = 0.05 for the field "Technical staff related factors, Owner representative related factors and consultant related factors ", then there is significant difference among the respondents regarding to this field due to Years of respondent's experience. We conclude that the respondents' Years of respondent's experience has significant effect on this field.

Table (4.22) shows that the p-value (Sig.) is greater than the level of significance α = 0.05 for the other fields, then there is insignificant difference among the respondents regarding to this fields due to Years of respondent's experience. We conclude that the respondents' Years of respondent's experience has no effect on this fields.

Table (4.22):ANOVA test of the fields and their p-values forYears of respondent's experience

No.	Field	Means			Test Value	Sig.
		< 5	5 – 10	> 10		
1.	Technical staff related factors	3.37	4.15	3.90	9.750	0.000*
2.	Owner representative related factors	3.27	3.71	3.49	4.137	0.019*
3.	Owner related factors	3.55	3.88	3.67	1.981	0.144
4.	consultant related factors	2.89	3.71	3.52	9.380	0.000*
5.	Other factors	3.57	3.62	3.55	0.091	0.913
6.	Remedial Methods	4.29	4.43	4.48	1.005	0.370
	All fields together	3.39	3.86	3.70	7.243	0.001*

* The mean difference is significant a 0.05 level

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This research aims to determine the design delay factors in construction project.

The first objective of this research was to identify factors influencing design delay. To achieve the first objective, related previous studies were collected from books through the university main library, journals, dissertations, conference papers and internet. As a result, a comprehensive background was conducted to explain design process, design delay, type of design delay, determine the sources of design delay, determine the impacts of design delay on cost and the total time of the projects and identify factors/causes affecting design delay.

The second objective was to evaluate the delay factors importance. To achieve the second objective a questionnaire was developed to assess the perceptions of owners, and consultants, on the importance of factors causes and effects design delay in Gaza Strip construction industry. Factors influencing time in projects in Gaza Strip were first examined and identified through a relevant literature review and by conducting a pilot study that sought advice from experienced construction practitioners.

5.2 Conclusion

Four main factors were found to affect delay in design phase which are, technical staff, owner representative, owner and external factors.

The most important factors affecting delay during the design phase which related to technical staff are the financial factors which have the most effectiveness, as lack on of incentives came in the first level, follows with the low salaries. Also the lack of professional staff and Lack of access to development courses in the field of design came at the middle of effectiveness on design delay. There is in Gaza Strip a qualified staff with high experience so Lake of the skills and qualifications of design engineers had the least effectiveness on design delay which mean that the consultants having a qualified staff with high experience.

The most important factors which affecting design delay which are related to owner representative are processing the data to the consultant so Slow processing of the changes required by the representative of the owner is the most effective factor on design delay, also a weak follow-up to provide the design phases of the project by the representative of the owner and weak of preparing feasibility study for the project came at the middle of factors affecting design delay related to owner representative. There is high controlling and supervision of owner representative and good qualification while the least effective factors were poor qualifications, weakness of follow up, controlling and poor communications.

The most important factors affecting design delay which are relative to the owner are unstable economic , political, and social environment in Gaza Strip make the financial problems had the most effect on design delay, followed by the contract changes and variations. Also the owner need more communication with the parties of the design staff in which Lack of coordination among the parties of and Slow decision-making by the owner came at the middle of factors which affect design delay. Furthermore the owner have good experiences and good idea about the project in which unrealistic project idea and lack of owner construction experience had the least effectiveness.

The consultant factors which affecting design delay are consultant need to Reviewing and checking design documents to make appropriate plan and consultants need to make sure that there is proper communication and coordination with design team. Furthermore the lack of commitment by the consultative forum official hours and finally design drawings and schedules need to be approved and check to avoid work suffering from delays or quality issues.

The external factors which affecting design delay are as flow avoiding time extensions due to adverse weather, it is recommended to improve by working overtime hours. Bureaucracy and the difficulty of obtaining government permissions had a great effect on design delay and external factors did not have a great effect on the design delay during design phase

5.3 Recommendations

This section suggest the recommendations for identifying, analyzing and responding to the delay factors associated with building construction projects. Taking into account the findings from the literature review and industry survey, and the results obtained from the questionnaire.

From the literature review and questionnaire analysis, there are some actions that may be decrease the risk of delay which are :

- Allow reasonable time for the design team to produce clear and complete design;
- Contract documents between owner and consultant with no or minimum errors and discrepancies;
- Establish efficient quality control techniques and mechanisms that can be used during the design process to minimize errors, mismatches, and discrepancies in contact documents;
- Use special contracting provisions and practices that have been used successfully on past projects;
- Establish a strategy on how to deal with tighter scheduling requirements;
- Pay progress payments regularly to consultant so that delays can be avoided, and the consultant's ability to deliver the project on time and within quality improved;
- Minimize change orders throughout design phase to avoid delays to the project;
- Review and approve the design documents within the agreed schedule;
- The required amount of technical staff should be in the consultant organization;
- The consultant's should manage financial resources and plan cash flow by utilizing progress payments;
- It is recommended that the concerned bodies and parts to establish a minimum wage system and to monitor implementing this system;
- It is recommended to develop modeling system in order to measure design delay. In addition, it is recommended to study and evaluate the most important factors affecting design delay in the Gaza Strip.

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ANNEX 1: QUESTIONNAIRE

Dear: Projects' owners, Consultants, Greetings

Subject: Survey

The researcher conducted a study on the factors that affect the design delays in construction projects in the Gaza Strip, and that as a quest supplementary Master's degree in construction management.

Design is one of the most important stages of the project life cycle, and affects the quality of construction projects results. At the time of the design is possible that the negative impact on the overall time to complete the project, and there are overlapping and interrelated factors that affect the design time delay, so the aim of this questionnaire is to identify these factors.

Therefore we ask you to fill out this questionnaire to participate in a neutral and objective, with the assurance that the information will be packaged this questionnaire will be used for research purposes only, and will maintain full confidentiality.

Thank you for your cooperation

Researcher

Ahmed Al-Tayeb

SECTION ONE – Questions related to the respondent's organization

1. **Organization Type**

Owner Consultant ☐

2. Did delay occur in the past project

Yes ☐ NO ☐

3. Type of organization

☐ Public ☐ Private ☐ Other ………………..

4. How long have your organization been involved in the construction projects?

☐ < 5 years ☐ 5 – less than 10 ☐ 10 – less than 15

☐ > 15 years

5. what are your organization specialization ?

☐ Roads ☐ Constructions ☐ Under ground

☐ Other …………..

6. What is the value of the current project your organization are involved during 5 years ago:

☐ < 1 million ☐ 1 – less than 3 millions ☐ 4 – less than 5 millions

☐ > 5 millions

SECTION TWO – Questions related to the respondent

1.What is your work type

☐ Engineer ☐ supervisor engineer ☐ project manager ☐ design engineer

☐ design manager

2.Numbers of project that you are involved in:

☐ 5 > ☐ 5 – less than10 ☐ > 10

3. Years of respondent's experience:

☐ < 5 – less than 10 ☐ 5 >10

Section two:

Factors affect delay in construction project (design stage)

No.	Technical staff related factors	Strongly Agree	Agree	Netu.	Dis. Agree	Strongly dis. Agree
1	Lack of professional staff (engineers, painters, surveyors ...)					
2	The weakness of the skills and qualifications of design engineers					
3	The low salaries of technical staff					
4	Lack of access to development courses in the field of design					
5	Lack of incentives					

No.	**Owner representative related factors**	**Strongly Agree**	**Agree**	**Netu.**	**Dis. Agree**	**Strongly dis. Agree**
1	Lack of incentives factors in crews of owner representative					
2	Poor communication between the parties and representative of the owner of the project					
3	Ineffective influence and poor follow-up representative of the owner					
4	Planning and scheduling is effective for the project by the representative of the owner					

5	Delays in the study and on-site survey by the representative of the owner					
6	Weak follow-up to provide the design phases of the project by the representative of the owner					
7	Weak follow-up and quality control by the representative of the owner					
8	Twice the qualifications of staff representative of the owner					
9	Weak of preparing feasibility study for the project					
10	Slow processing of the changes required by the representative of the owner					
11	The weakness of the upper supervision by the representative of the owner					

No	**Owner related factors**	**Strongly Agree**	**Agree**	**Netu.**	**Dis. Agree**	**Strongly dis. Agree**
1	Owner lack of experience in the field of construction					
2	Lack of coordination among the parties of the project owner					
3	Contract changes (in addition to the contract work, and a change in the specifications)					

4	Financial problems (delay payments, financial difficulties)					
5	Not a realistic idea of the project					
6	Slow decision-making by the owner					
7	Owner intervention in the design process and give oral instructions					
8	Change in the goal and scope of the project					

No	**consultant related factors**	**Strongly Agree**	**Agree**	**Netu.**	**Dis. Agree**	**Strongly dis. Agree**
1	The weakness of the qualifications for the project consultant engineers					
2	Delay the planning process					
3	Lack of experience by the project consultant					
4	Delays and slow consultant in decision-making					
5	Not a luxury, and the readiness of the necessary documents					
6	Poor communication and contact between management consultant and design engineers					
7	The use of methods and design is appropriate by the Consultative mechanisms					

8	The financial difficulties faced by the project consultant					
9	Redesign the result of errors during the design phase					
10	Prediction imprecise at a rate of productivity and technical staff at the Advisory					
11	The use of inappropriate action plan by the Advisory					
12	The use of the bureaucracy in the organization of work in the office					
13	Lack of commitment by the Consultative Forum official hours					
14	Slow to give instructions					
15	Lack of job security consultant for the crew of the existence of					

No.	External factors	Strongly Agree	Agree	Netu.	Dis. Agree	Strongly dis. Agree
1	Bad weather					
2	Differing prices					
3	Poor economic conditions (currency, inflation rate,,, etc)					
4	Problems with neighbors of the site					
5	Geological conditions of the unexpected					
6	Slow processing and evacuation site					
7	Laws and norms unstable					
8	Bureaucracy and the difficulty of obtaining government permissions					

No	Minimizing Design Delay Methods	Strongly Agree	Agree	Netu.	Dis. Agree	Strongly dis. Agree
1	Effective cooperation among the parties of the project					
2	Improve wages and stimulation crews artwork					
3	Consultant selection on the basis of a professional and not a corporeal					

4	Advisory engage in pre-design (initial idea)					
5	Save money and time to design					
6	Provide appropriate courses to improve the performance of the technical staff					
7	Speaking to use design methods and advanced programs					

ANNEX 2: ARABIC QUESTIONNAIRE

بسم الله الرحمن الرحيم

الأخوة المهندسين في قطاع الإنشاءات في قطاع غزة

السلام عليكم و رحمة الله و بركاته

يقوم الباحث بعمل دراسة حول العوامل التي تؤثر على التأخير فيوقت التصميم في المشاريع الإنشائية في قطاع غزة، و ما يترتب على ذلك من آثار و تكلفة على المشاريع ، وذلك كبحث تكميلي لنيل درجة الماجستير في إدارة التشييد.

يعتبر التصميم أحد أهم مراحل دورة حياة المشروع، ويؤثر على جودة نتائج تشييد المشاريع،

ووقت التصميم ممكن أن يؤثر سلبا على الوقت الكلي لإنجاز المشاريع، وهناك عوامل متداخلة و مترابطة تؤثر على تأخير وقت التصميم ، لذلك الهدف من هذه الاستبانة هو تحديد هذه العوامل.

ولذلك نطلب منكم المشاركة بتعبئة هذه الاستبانة بكل حيادية و موضوعية، مع التأكيد على أن المعلومات التي سيتم تعبئتها بهذا الاستبيان ستستخدم لأغراض البحث العلمي فقط، و سيتم المحافظة على السرية الكاملة .

شكرا لكم حسن تعاونكم

الباحث

أحمد بشير الطيب

الجزء الأول: معلومات تتعلق بالمؤسسة:

1. نوع المؤسسة:

☐ استشاري مالك ☐ أخرى/ حدد من فضلك ....

2. هل حدث تأخير في المشاريع السابقة

☐ نعم ☐ لا

3. ما هو قطاع المؤسسة

☐ خاصة ☐ عامة ☐ أخرى / حدد من فضلك ....

4. عدد سنوات خبرة المؤسسة في مجال المشاريع الإنشائية

☐ أقل من 5 ☐ 5-اقل من 10 ☐ 10-اقل من 15 سنه ☐ أكثر من 15

5. ما هو تخصص المؤسسة في مجال انشاء الأبنية (يمكن اختيار أكثر من تخصص)

☐ أبنية ☐ بنية تحتية ☐ طرق ☐ أخرى/حدد من فضلك ....

6. ما هي قيمة المشاريع المنفذة خلال الخمس سنوات السابقة (دولار)

☐ أقل من مليون ☐ 1-3 مليون ☐ 4-5 مليون ☐ أكثر من 5 مليون

2 – معلومات تتعلق بالشخص الذي يقوم بتعبئة الاستبيان :

1-الوظيفة الذي تقوم بها حاليا :

☐ مدير مشاريع ☐ مهندس إشراف ☐ مهندس

☐ مهندس تصميم ☐ مدير مكتب التصميم

2-عدد المشاريع التي شاركت بها:

☐ اقل من 5 ☐ 5 –اقل من 10 ☐ اكثر من 10

3-عدد سنوات الخبرة:

☐ اقل من 5 ☐ 5 – اقل من 10 سنوات ☐ اكثر من 10

الجزء الثاني: العوامل التي تؤثر على التأخير في وقت تصميم المشاريع الإنشائية(مرحلة التصميم)

حدد درجة التأثير السلبي للأسباب التالية و التي تؤثر على وقت التصميم المدرجة في الجدول، مع العلم بان درجة التأثير قسمت إلى 5 مستويات على النحو التالي (اوافق بشدة , اوافق , محايد , ارفض , ارفض بشدة)

م.	عوامل متعلقة بالطواقم الفنية	أوافق بشدة	أوافق	محايد	أرفض	أرفض بشدة
1	نقص الطواقم الفنيه (مهندسين , رسامين , مساحين...)					
2	ضعف مهارات و مؤهلات مهندسي التصميم					
3	تدني مرتبات الطواقم الفنية					
4	عدم الحصول على دورات تطويريه في مجال التصميم					
5	عدم وجود الحوافز					

م.	عوامل متعلقة بممثل المالك	أوافق بشدة	أوافق	محايد	أرفض	أرفض بشدة
1	قلة عوامل التحفيز في طواقم ممثل المالك					
2	ضعف الاتصال بين ممثل المالك و أطراف المشروع					
3	التأثير الغير فعال وضعف متابعة ممثل المالك					
4	التخطيط و الجدولة غير الفعالة للمشروع من قبل ممثل المالك					
5	التأخير في الدراسة و المسح الموقعي من قبل ممثل المالك					
6	ضعف المتابعة لتقدم مراحل تصميم المشروع من قبل ممثل المالك					
7	ضعف المتابعة و التحكم للجودة من قبل ممثل المالك					
8	ضعف المؤهلات لدى طاقم ممثل المالك					
9	سوء تجهيز دراسة الجدوى للمشروع					
10	بطئ تجهيز التغييرات المطلوبة من قبل ممثل المالك					
11	ضعف الإشراف العلوي من قبل ممثل المالك					

م.	عوامل متعلقة بالمالك	أوافق بشدة	أوافق	محايد	أرفض	أرفض بشدة
1	قلة خبرة المالك في مجال التشييد					
2	قلة التنسيق بين اطراف المالك التابعة للمشروع					
3	تغييرات العقد (إضافة أعمال للعقد، و تغيير في المواصفات)					
4	مشاكل مالية (تأخير الدفعات، صعوبات مالية)					
5	عدم واقعية فكرة المشروع					
6	البطء باتخاذ القرارات من قبل المالك					
7	تدخل المالك في عمليات التصميم و اعطاء تعليمات شفويه					
8	التغيير في هدف و نطاق المشروع					

م.	عوامل متعلقة بالاستشاري	أوافق بشدة	أوافق	محايد	أرفض	أرفض بشدة
1	ضعف مؤهلات مهندسي الاستشاري الخاص بالمشروع					
2	التأخير بعملية التخطيط					
3	قلة خبرة الاستشاري بواقع المشروع					
4	التأخير و بطئ الاستشاري في اتخاذ القرارات					
5	عدم كمالية و جاهزية المستندات اللازمة					
6	سوء التواصل و الاتصال بين إدارة الاستشاري و مهندسي التصميم					
7	استخدام طرق و آليات تصميم غير مناسبة من قبل الاستشاري					
8	الصعوبات المالية التي تواجه الاستشاري في المشروع					
9	إعادة التصميم نتيجة الأخطاء أثناء مرحلة التصميم					
10	التنبؤ الغير دقيق بمعدل انتاجية الطواقم الفنية لدى الاستشاري					
11	استخدام خطة عمل غير ملائمة من قبل الاستشاري					
12	استخدام البيروقراطية في تنظيم العمل داخل المكتب					
13	عدم التزام طاقم الاستشاري بالدوام الرسمي					
14	البطء في إعطاء التعليمات					
15	عدم وجود الأمان الوظيفي لطاقم الاستشاري					

م.	عوامل خارجية	أوافق بشدة	أوافق	محايد	أرفض	أرفض بشدة
1	سوء الأحوال الجوية					
2	اختلاف أسعار المواد					
3	سوء الأحوال الاقتصادية(العملة، معدل التضخم،,, الخ)					
4	المشاكل مع جيران الموقع					
5	ظروف جيولوجية غير متوقعة					
6	بطئ تجهيز و إخلاء الموقع					
7	القوانين و الأعراف غير المستقرة					
8	البيروقراطية و صعوبة الحصول على الأذونات الحكومية					

م.	مقترحات لتقليل وقت التأخير في مشاريع التشييد (مرحلة التصميم)	أوافق بشدة	أوافق	محايد	أرفض	أرفض بشدة
1	التعاون الفعال بين اطراف المشروع					
2	تحسين الاجور و التحفيز لطواقم العمل الفني					
3	اختيار الاستشاري على اسس مهنيه وليست ماديه					
4	اشراك الاستشاري في مرحلة ما قبل التصميم (الفكرة الأولية)					
5	توفير المال و الوقت الكافي للتصميم					
6	توفير الدورات المناسبة لتطوير أداء الطواقم الفنية					
7	استخدام طرق تصميم حديثه و برامج متطورة					