Analyse and Ranking the factors of Causes and Effect of Delays In Kurdistan Region Construction Industry

BY

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ABSTRACT:

This research aims to identify and analyse the causes and effects of delay in construction projects in Kurdistan Region, particularly, in the city of Sulaymaniyah. For analyzing the causes and effects of delay regarding time overrun, an assessment on construction project's time performance was preceded and assigns the most serious causes and effects of delay in the construction project through a field survey of a questionnaire contained 59 causes of delay identified for this study, classified in 12 groups of delay causes. The domain survey undertook include 132 engineers perform the project three participants (owner, contractor and consultant). The outcomes show that all the survey's participants agree together that the most serious cause of delay is (Contractor's poor site management) by relative important index (RII) of 62 %, followed by (Poor Site Management and Supervision & delay in design work). While managing factor of delay causes was ranked the highest instead of location factor that was ranked the lowest group of delay causes. Six main effects of delay were time overrun, cost overrun, disputes, arbitration, litigation and abandonment. This study also includes the comparison research between Kurdistan Region which is considered as a developing region and seventeen countries (both developing and developed countries) which based on previous researches conducted for the delay on time problem that faced construction industry in the other countries. The developing countries are fourteen and three developed countries which are United Kingdom, United States and Japan. The results show that the order variation is a recurring cause of delay in both developing and developed countries; while all the developing countries are faced almost the same causes of time overrun which are management, financial and contractor problems. Furthermore, this project provide some suggestions and recommendation to minimize these delays in construction projects in Kurdistan which all had been taken from the engineers whom participants in the survey, previous researches in the same field and implementation a new technology such as Building Information Modeling (BIM) to overcome the time overrun problems in construction industry in the region.

***Keywords*: Delay causes; Delay effects; Construction projects; Kurdistan; Sulaymaniyah city**

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List of Abbreviations:

(BIM) Building Information Modeling
(BOQ) Bill Of Quantities
(RII) Relative Important Index
(TOR) Term of Reference

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CHAPTER 1: INTRODUCTION

1.1 Introduction:

1.1.1 Background:

This research paper focuses on Kurdistan Region, Iraqi Kurdistan or South Kurdistan which indicates the northern part of Iraq. It borders Iran to the east, Turkey to the north, Syria to the west and the rest of Iraq to the south. Kurdistan's capital is Erbil which has three cities Sulaymaniyah, Duhok and Halabja which are officially governed by the Kurdistan Regional Government. Between 1986 and 1988, culminating in 1989, the regime of Sadam Hussein conducted the so called Anfal Campaigns (BBC, 2014). 95% of the region had been destroyed by Sadam Hussein. Following the 1991 revolution of Kurds in the north against Iraqi central government and created the basis for Kurdish self-rule. The 2003 invasion of Iraq and the subsequent political changes derived to the declaration of a new constitution of Iraq in 2005 which defines the Iraqi Kurdistan as a federal entity of Iraq and establishes Arabic and Kurdish as Iraq's joint official language (Kurdistan Regional Government, 2014). The Kurdistan government has started to reinvent the entire towns (Kurdistan Regional Government, 2009). However, during the recovery, everything was constructed and reinvented with only speed in mind to meet the ultimate necessities; nevertheless, there is a deep concern that the construction industry as a whole is underachieving, and the particular problem is delay in delivering construction projects within the contractual time.

1.1.2 Construction projects in Kurdistan:

The booming of construction projects in the Kurdistan region in Iraq in the past decade has become obviously huge, but unfortunately construction industry had a bad reputation of delays in delivering projects within the required time which created significant financial problems in ground (Institution of construction projects in Sulaymaniyah; Governorate of Sulaymaniyah; Directorate of

Construction and Housing; Directorate of the road and bridges in Sulaymaniyah, 2013). The general critical factors existed in Kurdistan construction projects which lead to time overrun are low skills of construction project managers, change in the scope of project, slowness in giving instruction, poor qualification of consultant, funding's problem, delay in delivering site project to contractor, allocate ineligible contractors and political problem are all causes for delay in delivering the projects.

In recent years, Kurdistan economy has upgraded considerably, following by infrastructure development and the urbanization which are prospering. And as consequences of them, the value (significance) of the construction industry in the national economy has been soaring. According to Economic Development Assessment Report (2008) the Kurdistan construction sector has been the head in economic development and job creation ; however, many constraints keep emerging during the implementation of the construction project, delay has been considered as most critical issue; moreover, as a result of rapid growth in construction industry, deficiency has appeared between capacities of project manager and requirements of leading huge and complex projects that outcome with many bad results such as many uncompleted projects, many stops in processes, ignoring of some project stages, constructions with low quality, and many other accidents**.** However, the major challenges faced by the Kurdistan Regional Government are a lack of experienced managers, technicians, and engineers (Economic Development Assessment Report, 2008). Delay could be defined as " Time overrun beyond completion date specified in a contract, or beyond the date that the parties agreed upon for delivery of a project slipping over its planned schedule" (Assaf, Hejji, 2006); furthermore, delay's definition by Stumpf is " Act or event that extends the time required to perform a task under a contract. It usually shows up as additional days of work or as delayed start of an activity." (Stumpf, 2000). A crucial criticism confronting the Kurdistan construction industry is the increasing rate of delays in project delivery. Delivering projects within contractual time is considered as an indicator of efficiency (Latham, 1994); however, the construction process often faced barriers which are subject to many unpredictable and diverted factors outcome from many variable resources; such as, parties' performance, availability of resources, environmental conditions, participant of the parties and contractual relations. Therefore, delivering projects within

the specified time is rarely to achieve in the region. Delays in construction projects have undesirable influence on all participants; owner, contractor, and consultant which often lead to create dispute relationships, mistrust, claim, adjudication and a general sense of concern towards each other; furthermore, it is always measured as expensive to all parties concerned in the projects (Chan and Kumaraswamy, 1997). In term of owner, construction delay indicates to the loss of revenue, lack of productivity, dependency on existing facilities, and lack of facilities for renting; whilst, construction delay for the contractor refers to the higher costs, longer work duration, increase labor cost, higher material and equipment costs (Desai and Bhatt, 2013).

Similar research in 2013 by Jahanger was conducted in Baghdad city which is a capital of Iraq, the outcome of the study showed that the most significant causes of delay is " Mistake and discrepancies in design documents", followed by "Ineffective planning and scheduling of project by contractor". Whilst design factor of delay causes was ranked the highest, but the environmental factor was ranked the lowest factor of delay causes; however, Baghdad city and Sulaymaniyah city are totally different politically, geographically and culturally, they have a different language and flag and Kurdistan Region is far from the political and security problems that have paralyzed in the rest of the country. Thus, it is very important to perform similar research in other Iraq which is Kurdish part in order to find out the causes of delay in the region because delays can be minimized only when their cause are identified and analysed.

1.2 Aim:

This research aims to investigate the causes of delay of building construction projects in Kurdistan region, particularly in the governance of Sulaymaniyah which is located in the eastern part of the Kurdistan region and considered as one of the biggest city in the region regarding to the number of population. The primary aim is to identify, analyse and rank the perceptions of the three main parties (Owners, Consultants and Contractors) regarding the causes of delays in construction projects and to

suggest possible ways of eradicating or minimising them. This research paper is based on public project and the owner and client mentioned in this paper are related to government.

1.3 Objective:

The main objective of this research is to examine the major causes of delays of building construction projects in Kurdistan region using an opinion survey. The other factors included in this research are;

- To analyse the major causes of delays in construction projects.
- To rank the causes of construction projects delays.
- To analyse the effects of delays in construction project.
- To compare, the current position of Kurdistan with those of other countries around the world.
- To analyse and presenting an innovative solution for minimizing construction project's delays.

1.4 Consequences of delays in Construction Projects:

Delays in construction projects are insidious often resulting in time overrun, cost overrun, disputes, litigation, and complete abandonment of projects (Sambasivan and Soon, 2007). Clough (1986) reported that many projects are of such a nature that the client will suffer hardship, expense, or loss of revenue if the work is delayed beyond the time specified in the contract; then again, delay has cost consequences for the contractor: standby costs of non-productive workers, supervisors, and equipment, expenses caused by disrupted construction and material delivery schedules and additional overhead costs which would be an evident for the delay effects of construction projects in the province of Sulaymaniyah. According to this research (2013) the proposed methods for finding

and ranking the data collection regarding the consequences of delays is Relative Important Index Method (RII) which is considered as a very important method and always used to find out the most serious effects which influence the construction industry. This technique is deemed to be the mutual methods among all the researches which were taken to calculate the causes and effects of delays in different countries such as [(Baghdad- Iraq), Saudi Arabia, Jordan, Malaysia and United Arab Emirate] which all have taken a part in this research and that considered as a main reason to use the RII in this study.

1.5 Chapter Summary:

This chapter clearly explains the aims and objectives of this research. A background research about the government and construction projects in Kurdistan and its consequences is also discussed under this chapter. The next chapter presents the literature review of this research paper and it emphasize the problems faced and suggestions to overcome the delay problems in construction project.

CHAPTER 2: LITERATURE REVIEW

2.1 Chapter Objective:

This chapter explains the issues and difficulties of construction projects in Kurdistan region. It also discusses the review of delays in construction projects in both developed and developing countries and comparisons are also done. This chapter overall reviews the finding of Author's opinion about construction projects and its complications in Kurdistan region.

2.2 Delays in Construction Project:

Delay is considered as a risk which often generate from mismanaged events that need to be analyze its impact on all circumstances in order to be managed, minimized, mitigated, shared or accepted (Kean, Caletka, 2008); however, delay and risk are very uncommon to realize in construction project within the contractual time (Arditi, Akan & Gurdamar, 1985; Assaf, Al-Khalil & Al- Hazmi, 1995; Oglesby, Parker & Howell, 1989).

Sanders and Eagles (2001) define delay as an event that causes extended time to complete all or part of a project. Delay may also be defined as the time overrun, either beyond the date for completion specified by the contract or beyond the extended contract period where an extension of time has been granted. The type of delay we focus on in this study is the time overrun beyond the date for completion specified by the contract not considering whether an extension of time has been granted. Delay in construction is a global phenomenon (Sambasivan and Soon, 2007) affecting not only the construction industry but the overall economy of countries as well (Faradi and El-Sayegh, 2006). Delay involves multiple complex issues all of which are invariably of critical importance to the parties to the construction contract. These issues concern entitlement to recover costs of delay or the necessity to prolong the project with the consequential entitlement to recovery costs for adjustments

to the contract schedules. Questions arise as to the causes of delay and the assigning of fault often evolves into disputes and litigation (Trauner, 2009). Today, many stakeholders in construction are becoming increasingly concerned about the duration of construction projects because of increasing interest rates, inflation, commercial pressures (Nkado, 1995), and of course, it's potential to result in disputes and claims leading to arbitration or litigation. As Sullivan and Harris (1986) reported that delays in construction industries have become a global phenomenon, and always associates to cost and time overruns which are calculated as a mutual problem. It can be seen that the vast majority of the causes of most construction globally claims are based on delay (McCullough, 1989).

Therefore, construction delay is a globally phenomenon not just in Kurdistan, but it is a recurred problem among the construction projects universally (Assaf & Hejji,2006; Sullivan & Harris, 1986); There is a French dictum " When the construction industry prospers everything prospers", so the prosperity of construction sector is a device for enhancing national and international economy, as well as each participated in the industry such as engineers, architects, financiers, contractors and workers (Ogunlana, Promkuntong and Jearkjirm, 1996). Generally, delays is recognized as a chronic, common, expensive, risky and complicated problem accrued in construction projects particularly in construction phase (Al Kass and Mazerol, 1996; Odeh and Battaineh, 2002), but the causes of delays are different according to the diversity of places, so "A delay is the time during which some part of the construction project has been extended or not performed due to an unanticipated circumstance." (Bramble and Callahan, 1987).

The success of any project is achieved on meeting objectives within the required time and budget and specified quality (Akinsola, 1996); while, mechanisms and tools play major role in managing project (Burati, Mattews and Kalidindi, 1992). Regrettably, due to variable reasons, project successes are not common in the construction industry, particularly in developing countries. From different studies and empirical evidence it is obvious that project overrun comprising delays during

the construction phase; therefore, professionals and scholars have been stimulated to meet this challenge.

2.3 Review of Construction Delays across developing and developed countries:

Globally, Yates J.K (2007) illustrated that there are several factors that cause delays across construction projects universally, for instance, political factors, religious and social beliefs factors, technological and economic limitations factors, labor dispute and strike factors, natural disasters factors, and government restriction factors (Yates, 2007); therefore, delays can determine as a common problem of the construction scope, time extension have been noticed in many developing and developed countries to date (Sullivan and Harris, 1986; Kaming, 1997; Long, Ogunlana, Quang, and Lam, 2004; Lo, Fung and Tung, 2006; Sambasivan and Soon 2007).

In developing country, generally, the common problem that causes delays in construction projects is design problem, as a construction industry going with quick booming; it ought to more considerable attention of design related problem. The factor of design is effected by three various " mistake in design", "design change, and " additional works ". Inaccuracies in design generate from inefficiency of designer have considerably occurred. The poor checking of design, slowness and impractical design consequences in delayed (Sweis, 2013). Furthermore, financial problem of owner and contractor and client caused delays not just in Kurdistan but in many other nations, particularly in developing countries (Azhar & Farouqi, 2008).

Ogunlana and Promkuntong (1996) illustrated that there are three particular problems in developing economies that causes delays in construction projects, they have categorized into three groups the first one is problem of shortage or insufficient in industry infrastructure, the second one is problem caused by client and consultants regarding to financial problem and order variation and third one is problems caused by contactor inefficiency/ineligible.

Management Assaf and Al- Heji (2006) in Saudi Arabia cited that just 30% of construction projects were delivered within the scheduled time and the average time exceed was among 10% and 30%. Alkhathami and Mohammed (2005), found that the substantial delay factors were approval of drawings, design errors, changing in design, delays in contractor's processes, financial problems and poor communication among subcontractors; in addition, labor shortage and shortage of workers skilled were serious delay factors; while, he clarified that the most affected factors which caused time overruns was order variation.

In Nigeria, Ajanlekoko (1987) found that the time constraints in the execution of the construction sector were under achievable. Furthermore, Odeyinka and Yusif (1997), have observed that seven out of ten projects sustained delays in their performance, they illustrated that the causes of delay in the construction projects in Nigeria were featured to finance and payment problems, poor management, materials shortage problem, inexact estimation and gross fluctuation in price. Ogunlana and Promkuntong (1996) undertook a research on delays in construction projects in Thailand. They observed that the causes of delays in their area could be the shortage and inadequacies in infrastructure's industry, which is considered as a main problem in developing countries which is affected managing any construction projects.

Al-Moumani (2000), found the main causes of delays in construction sectors in Jordan were related weather, site condition, designers and financial problems; moreover, the owner interference and change orders, poor contractor experience, labor productivity, slow decision making, poor labor productivity, inappropriate planning, slow decision making and poor subcontractors' performance were the most important factors.

In Ghana, Frimpong (2003) carried out a research to clarify the factors that contributing to delay construction projects were financial problems, poor management by contractors, improper material selection, poor technical performance, inflation in material prices.

Nepal suffered from time overrun in construction projects because of problem in delivering material and equipment to construction sites, the main causes of these difficulties were organization weaknesses, defaults by suppliers, problem with government's regulations and transportation delays (Manavazhia & Adhikarib, 2002).

In Malaysia Sambasivan and Soon (2007), indicated that the most considerable causes of delays were inappropriate planning and poor site management by contractors, incompetent contractor experience, client's financial problem, subcontractors' problems, material shortage, labor shortage, equipment availability and failures, poor communication among parties and mistake through construction phase.

Kazaz, Ulubevli and Tuncbilekli (2012) conducted survey in Turkey and found that the considerable factors causing delays in construction projects were found " design and material change", "delay of payments", " cash flow problems", contractors' financial problems which all related to the financial difficulties and "poor labor productivity"; furthermore, order variations and poor management as considered as a problem which cause delay in construction projects.

A major problems in United Arab Emiratis that caused delays in construction projects clarified by Motaleb and Kishk (2009) and reported that the lack of preparation and slow approval of drawings, incompetent early planning of project. Slow decision making by owners, poor labor productivity, poor site management and supervision and labor shortage were the common problems that faced the construction industry in their area.

In Kuwait, the financial problems, poor client's and contractors experience, changing orders were explored as a major problem that causes delays in construction industry ; furthermore, material and weather were engaged into the causes of delays in Kuwait (Koushki, Al-Rashid & Kartam 2005).

Long, Ogunlana and Lam (2004) found the most delays problem in Vietnam formulated from poor management and supervision, poor contractor's experience , inaccurate time and cost estimation which led to financial problems by owner and contractor, lack of designers' competency, and design changes.

The survey in Pakistan showed that the substantial factors which caused delay are related to client factors which are financial problems, poor communication between client and consultant, not having suitable project information, lack of design information and lack of details in drawings; furthermore, contractors problem by providing unguaranteed material, shortage of labors, management and supervision problem, accident during construction work related to health and safety; moreover, the political problem affected the construction work negatively (Haseeb, Lu, Bibi, Dyian, & Rabbani,2011) . Mezher and Tawil (1998) studied the causes of delay in the construction industry in Lebanon and found the most important causes of delay included financial issues problem, poor communication, poor management and supervision, order variation, owner's slow decision and inappropriate planning and design errors considered to be the most significant causes of delays.

Construction's delays risk's survey in Libyan conducted by Tumi, Omran and Pakir (2009). The research clarified the serious causes of delays that it was inappropriate planning, poor communication, shortage of material supply, shortage of material, design errors, slow decision making and financial problems.

Chan and Kumaraswarry (1997) undertook survey to find out the considerable factors that cause delays in Hong Kong, they categorized the factors to two groups the first one is the role of the

parties in the local construction industry due to client, consultants or contractors. The second reason is the type of projects and upon on this classified the causes to five major causes of delays were; inadequate site management and supervision, unexpected ground condition, slow in decision making participating all project teams, client change orders and important diversities of works.

In Florida, many construction projects suffer from delays, and the most important causes of this problem were respectively slow in building permits approval, change order, changes in drawings, insufficient document, Inspection, specifications' changes, decision during development stage and design development; furthermore it considered that the contractors based factors had the significant affects to cause delays by 44% of whole other delay factors (Ahmed and Azhar, 2003).

National Audit Office published a report, UK and edited by John Bourn under the title "Modernising Construction", explored that 70% of the construction projects executed by public department and agencies were delayed in delivering with the scheduled time; furthermore, a recent study by Building Cost Information Service (BCIS, UK) found that about 40% of all researched construction projects had exceeded the contract period (Bourn, 2003). It is considered that the typical problems driving to unexpected delays are delays in approval and providing information by the clients and excessive comments or delay in comments can cause chains of delays problem particularly in complex project, change orders, ground problem, and bad weather respectively(Sullivan and Harris, 1985); furthermore, disruptions in complex project in UK is considered as a cause of delays and time overrun through rework which is caused by errors and mistakes by both contactor and client (Howick, Ackermann, Eden and Williams, 2009).

It is clear that all developing and developed countries are suffered from managing problems that caused overrunning time which definitely been met in all of 17 countries; furthermore, it should be considered that financial problems are the only factor that has not been experienced in developed countries like USA and UK but it has been the mutual problem in all other developing countries;

moreover, it should be carefully noted that the construction projects in the developing countries undergo more delay than the developed countries (Kazaz, Ulubeyli and Tuncbilekli, 2012).

Table (1): Major Causes in Developing and Developed Countries

NO	Country	The Major Five Causes				
		1	**2**	**3**	**4**	**5**
1	Kurdistan- the city of Sulaymaniyah (this study, 2013)	Contractor's poor site management	Poor Site Management and Supervision & delay in design work.	Variations, absence of consultants filter & lack of design information	Contractor's Financial Problem & poor labor Productivity	Errors in BOQ, inadequate contractor experience, inadequate construction planning, poor subcontractors performance & labor shortage.
2	Saudi Arabia(Alkhathami, 2004)	Slowness in approval of drawings	Design error	Financial problem	Order variations	Labor shortage and shortage of labor skilled
3	Nigeria(Odeyinka &Yusif,1997)	Financial problem	Poor management	Material shortage	Inaccurate time estimation	Fluctuation in material price
4	Thailand (Ogunlana & Promkuntong, 1996)	inadequacies in infrastructure's industry	Order Variations	Financial Problem	Contractor's Incompetence/ Inadequacies	Management
5	Jordan (Al-Mornani, 2000)	Financial problem	Order Variations	poor contractor's experience	Slow decision making	Poor subcontractors' performance
6	Ghana (Frimpong, 2003)	Financial problem	Poor management and supervision	improper material selection	poor technical performance	Inflation in material price
7	Nepal (Manavazhia & Adhikarib, 2002).	problem in delivering material & equipment to construction site	Financial problem	defaults by suppliers	Regulation problems	Order variations
8	Malaysia(ambasivan, 2007)	Inappropriate Planning	Poor site management and supervision	poor contractor's experience	Financial problem	Poor subcontractors' performance

9	Turkey, (Kazaz, Ulubevli & Tuncbilekli,2012)	Design and material change	Financial Problem	Poor labor productivity	Order variations	poor management and supervision
10	United Arab Emirate(Motaleb & Kishk, 2009)	The lack of preparation and slow approval of drawings	Incompetent early planning of project	Slow decision making by owners	Poor labor productivity	Poor site management and supervision
11	Kuwait (Koushki, 2005)	Financial problem	Poor client's and contractors experience	Order variations	Material	Weather
12	Vietnam (Long, Ogunlana, Quang & Lam, 2004).	Poor management and supervision	Poor contractor's experience	Financial problems	Lack of designers competency	Design Changes
13	Pakistan (Haseeb, Lu, Bibi, Dyian & Rabbani,2011)	Financial problem	Poor management and supervision	Lack of design information	Shortage of labors	Accident during construction work
14	Lebanon (Mezher & Tawil, 1998)	Financial problem	Poor management and supervision	Order variations	Owner's slow decision	Inappropriate planning and design errors
15	Libyan (Mezher et al, 1998)	Inappropriate planning and design errors	Poor communication	Shortage of material	Slow decision making	Financial difficulties
16	Hong Kong(Chan and Kumaraswarry , 1995; 1997)	Poor management and supervision	unexpected ground condition	Slow in decision making by all project's team	poor contractor's experience	Order variations
17	Florida (Ahmed and Azhar, 2002)	Slow in building permits approval	Order variations	Changes in drawings	Insufficient document	Poor contractors performance
18	UK (Sullivan and Harris, 1986) & (Howick, Ackermann, Eden & Williams, 2009)	Waiting for information from the client	Order variations	Ground problem	Weather	Disruptions through rework caused by errors and mistakes by both contactor and client

It can be seen from the table (1) that developing countries generally are struggling from financial problem, management and supervision. However, the developed countries like US, UK and Hong Kong did not influence by the financial problem and management factor, but it can be considered that all developed and developing countries had the same difficulties that cause delays in

construction problem which is order variations. It is evident from the table (1) that Kurdistan can be seen as other developing countries which are also having the financial problem and management difficulties and as developed and developing countries which all have the " order variation" problem.

2.4 Classification of Delay:

Delays in construction are caused by several factors. Ahmed, Azhar, Kappagntula and Gollapudil (2003) grouped delays into two categories – internal causes and external causes. Internal causes arise from the parties to the contract (e.g. contractor, client, and consultant). External causes, on the other hand, arise from events beyond the control of the parties. These include the act of God, government action, and material suppliers. Trauner (2009) classifies delay as follows:

- Excusable but non-compensable delay -these are delays caused by occurrences which are not attributable to any of the parties.
- Compensable delay - these delays result from acts or omissions of the owner or someone for whose acts an owner is liable.
- Inexcusable delay - these delays result from a contractor's own fault or his subcontractors or material suppliers.

2.5 Construction Industry:

The Construction industry is playing an important role in the region's economy because its size and its effect on other sectors, construction is engaged considerably to the gross domestic product of the region and job opportunities; furthermore, construction industry is the rapid growing sector in the economics of the region (Development Economic Assessment, 2008); whilst, vast majority of construction projects in Kurdistan have struggled with several difficulties, but the common problem is the time overrun, and it is considered as one of the chronic problems in the construction industry

in the region. As the Development Economic Assessment (2008) reported that the crucial problems that caused delays in the construction industry in the region is related to shortage of sufficient infrastructure; furthermore, it is indicated that a barrier that causes problems in front of delivering the projects within the required time are a lack of experienced managers, technicians, and engineers, and also inadequate quality control on materials being used in the construction industry. In addition, Without any doubt, it is clear that delay is expensive for all project's participants and there are wide varieties of reasons that causes delays which are all related to the client, the contractors, the consultants or any other parties which are involved in the project (Theodore and Trauner, 2009).

2.6 Construction Industry in Kurdistan:

The Kurdistan construction sector has been the head in economic development and job creation; whilst, there are constraints such as delays in construction projects which should be concentrated on to overcome the difficulties and try to improve and develop the construction industry in the region (Economic Development Assessment, 2008). As the USAID (2008) reported that the size of construction industry in Kurdistan is apprised at $208 billion; therefore, the construction sector has played an important role of Kurdistan Region' Economy (Economic Development Assessment, 2008). However, the unique set of circumstances that justify an independent investigation of delay in Kurdistan are related to shortage of sufficient infrastructure, lack of experienced managers, technicians, and engineers and also inadequate quality control on materials being used in the construction industry (USAID, 2008); furthermore, according to the New Iraq report (2012) the major problem for all the construction sector in Iraq is the lack of formally qualified labour; workers have experience but it does not often meet the Health and Safety Executive requirements; moreover, claims of corruption are still prevalent, and the legacy of central planning and ineffective state owned projects continues to inhibit economic development (U.S Department of State, 2013).

In addition, there would be new issues of delay occurring in the region, according to the table (1) which is clarified as the comparison among developed and developing countries regarding time overrun in construction projects such as (slowness in approval of drawings) in Saudi Arabia, United Arab Emiratis and Florida ; (material shortage, inaccurate time estimating and fluctuation in material price) in Nigeria, (improper material selection, poor technical performance and inflation in material price) in Ghana; (problem in delivering material & equipment to construction site, default by supplier and regulation problem) in Nepal; (accident during construction work) in Pakistan; (poor communication) in Libyan and (unexpected ground condition) in UK and Hong Kong.

The research from other countries shows that all developed and developing countries almost having the same issues regarding the causes of time overrun in construction projects with Kurdistan issues of delays; for instance the table (1) shows the causes of delays in Kurdistan Region has seemed to be the same as Jordan, Turkey, Kuwait, Vietnam and Lebanon. According to USAID (2008) the shortage of sufficient infrastructure is a crucial problem in Kurdistan Region which is considered from the table (1) as the most serious problem in Thailand.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

The objective of this chapter is to present the design of the conducted research for this master thesis. Furthermore, this chapter provides a presentation of available research methods and their advantages and disadvantages. This chapter starts with presenting different research methods. These methods are qualitative, quantitative, and mixed methods. The presentation starts with the selected research approaches and strategy of inquiry. Furthermore, the questionnaire lay out is presented and finally a presentation of how to analyse the data is provided.

3.2 Research Method

Creswell (2003), divides the process of research design into three steps: elements of inquiry, approaches to research, and design process of research. Elements of inquiry include choosing knowledge claims, strategies of inquiry, and methods. Strategies of inquiry in empirical research are divided into three categories (Robson, 1993).

Survey: Surveys are cross-sectional (data collected at one point) or longitudinal (Data collected over a longer time) studies (Creswell, 2003) in a large scale. The researcher needs to identify a sample that represents the whole population. Surveys use mainly questionnaires or structured interviews for data collection, where the aim is to understand the population by generalizing from the sample (Babbie, 1990).

Case study: Case studies are conducted on a single project, situation, or problem within a specified time period. Case studies are conducted in typical conditions where interviews, observations, studying reports or documents are used as data collection (Dawson, 2000). According to (Wohlin,

2000), case studies are easier to plan than experiments, but the results are more difficult to interpret and draw general conclusions from.

Experiment: There are two kinds of experiments: true and quasi experiments (Creswell, 2003). True experiments use random design, while quasi experiments use non-random design. The purpose with an experiment is to compare a relationship between factors [Daws00] with more than one treatment.

Experiments can be conducted in laboratories with control or in the field without control (Babbie, 1990). The next step for the researcher is to conceptualize the three elements into one of three existing research approaches: qualitative, quantitative, or mixed methods approach (Creswell, 2003). Once the second step is completed, the theory needs to be translated into practice. This includes data collection and data analysis. Each one of the three mentioned research approaches handles these steps in different ways which is presented in the following sections.

3.3 Research Design

This section presents an overview of the design of this research study. The used process in this study is shown in Figure (1).

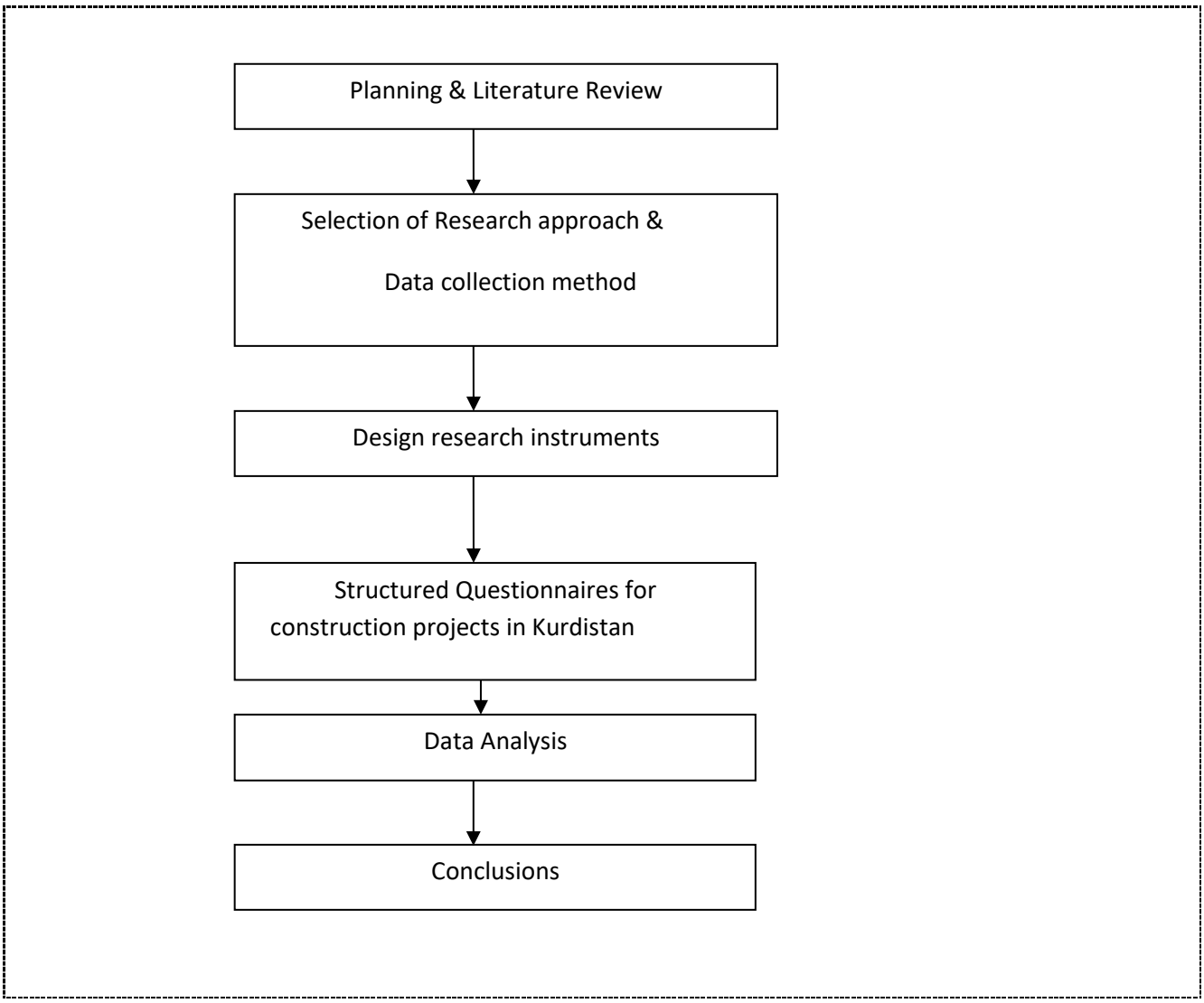

Figure (1): Research Process Model

3.3.1 Selected Research Approach

In order to fulfil the purpose of thesis, the selected research approach for this study was Mixed-Method approach. This mixed method approach is combined with both qualitative and quantitative. It consists of structured interviews as well as general opinion from the participants which will be discussed later in this chapter. The aim of structured interviewing is usually to gather data from large samples and to ensure consistency of response, and is therefore more often associated with quantitative research. Structured interviews are what Cohen et al (2007 p 355) call 'frontloaded'. In other words, as with a self-completion questionnaire, all the categories and coding are worked out in

advance. A structured approach is premised on the view that the meanings and assumptions underlying the questions will be clear and understood by the respondents.

3.3.1.1 Why Mixed method Approach?

Mixed methods research is a combination of methods, techniques, etc. from both qualitative and quantitative research approaches. In a mixed methods research approach, the defined problem is more important than which method to use (Johnson & Onwuegbuzie, 2004). This provides the researcher with the ability to choose from any method, technique, etc. without limitations. This is the basis for pragmatic knowledge claims, which is used in mixed methods. To be able to use the mixed methods in a good manner, the researcher needs to understand the advantages and disadvantages for both qualitative and quantitative research approaches, which is called the fundamental principle of mixed research (Tashakkori & Teddlie, 2002). The fundamental principle of mixed research means that the researcher should use different strategies of inquiry for data collection to reduce overlapping disadvantages. The mixed methods research process model suggested by (Johnson & Onwuegbuzie, 2004) comprises eight steps: determine the research question(s), decide if a mixed design is the most useful, select a mixed-method, collect data, analyse the data, interpret the data, legitimate the data, and draw conclusions. Strategies of inquiry in a mixed methods research approach include sequential procedures, concurrent procedures, and transformative procedures (Creswell, 2003).Sequential procedures are when the researcher first uses one method (for example a qualitative method) and then follow up the findings from this method with another method (for example a quantitative method).

In a concurrent procedure, data is collected at the same time with both quantitative and qualitative methods. In transformative procedures, a theoretical lens (a framework that contains topics, data collection methods etc.) is used as perspective in the design by the researcher. The design contains both quantitative and qualitative data. Transformative procedures are discussed in (Creswell, 2003).

Advantages with mixed methods research approach are: words can add meaning to numbers and that the researcher can answer broader research questions since the research does not use a single method or approach (Johnson & Onwuegbuzie, 2004). Disadvantages of mixed methods are expensive and time consuming (Johnson & Onwuegbuzie, 2004). Furthermore, the researcher has to learn methods from both qualitative and quantitative research approaches.

3.3.2 Data Collection:

The purpose of the collected data was to draw general conclusions from the findings of causes of delays in construction project in city of Sulaymaniyah. Research will take place in Kurdistan/ Iraq particularly in the city of Sulaymaniyah which is considered as the biggest city in the region in terms of large number of population that accounted about 1,855,268 residents (Kurdistan Region Statistics Office, 2010). The research methodology for this study is based on a questionnaire survey to gather and analyses the cause's factors and their effects on the construction projects in the region, the survey forms distributed in the city of Sulaymaniyah and surroundings; however, the survey for this paper is restricted just in one city (Sulaymaniyah) because the period when the information gathered for the survey coincidence with the election time in the region which sometimes was difficult to get unbiased information from some of the government's directorates; therefore, it was difficult to obtain an adequate data from other region's cities. Delays in construction industry seem to be one of the critical issues which related to the political problem in the region; therefore, it was most difficult to interview and record some directors' voices because of the election time.

3.3.2.1 Why not Online?

The survey for this research paper has been conducted in person and in a written format where the participants have to rank the affected factors from the scale of 1 to 5. People living in region of

Kurdistan are not really interested to take part in online questionnaire and it is much easier to contact them in person than online.

3.3.3 Research Instruments:

A quantitative and qualitative questionnaire was used as research instrument in this study. By selecting a questionnaire as research instrument, it was important to consider both advantages and disadvantages. According to Babbie (2004) a questionnaire has the following advantages: economy (does not cost a lot of time or money to reach a large sample as possible), ability to reach large samples, and good for describing characteristics of a population. The disadvantages according to Babbie (2004) are: standardized questions do not necessary fit everybody, inflexibility (once the design is done it must not be changed throughout the study), do not deal with context in real life, and questionnaires cannot measure social actions. Babbie (2004) also states that surveys are weak on validity, but strong in reliability. This is due to the artificial format of a survey. It is not always true that people's opinions can be measured by strongly agree, agree, disagree, and strongly disagree with a specific statement. Therefore, the responses should be seen as an approximate answer of a question.

3.3.4 Population and Participants Sample:

A total of 132 questionnaires were responded to the survey which was sent to construction engineers involved in large medium projects located in the province of Sulaymaniyah and their surroundings. The participants from the (Owner which mostly is the government, contractor, consultant and site engineers) as demonstrated in the table (2) below:

Table (2): Percentage of the Participants in the Questionnaire Survey

Participants	Responses	Percentage of Responses
Client (Owner)	42	31.818%
Contractor	89	67.424 %
Consultants	1	0.758 %
Total	132	100 %

The below formula is used to calculate the percentage of responses.

Percentage of Responses = Responses No ÷ The Total Number of responses×100

According to the number of years' experience involved in construction which asked in the first section of the survey's form, (6.818 %) of respondents have less than 5 years, (36.363 %) of those have between 5 to 10 years, (44.696%) from participants have experienced between 11 to 20, (6.060%) from the respondents have between 20 to 30, and (6.060%) of those have 30 to 40; furthermore, all respondents have the engineering background and diverse degrees for example bachelor, diploma and master. It is obvious that there was just one consultant participated in the survey and that refers to the lack of the number of consultants in the region. The experience of the participants is very important in order to show different level of perceptions regarding delays in construction projects.

Table ()3: Participants Experience in Construction Field

Number of years' experience	**Respondents %**
Less than 5 years	6.818 %
5 to 10 years	36.363%
11 to 20 years	44.696%
20 to 30 years	6.060%
30 to 40 years	6.060%

3.3.5 Questionnaire:

The type of projects that involved in the survey were various and from several sector which includes: residential complexes, residential tower, governorate' buildings, office buildings, prison building, factories, university, hospitals, veterinary building, schools, kindergartens, hotels, restaurants, parks, tourism complexes, roads, bridges, tunnel, mall, market, ceremony halls, computers hall, mosque, banks, sport centres and open and close sport yards, water projects such as (sewerage, water filtration unit, water tank and pumping house), survey and design projects, oil refinery and complementary works.

Questionnaire survey will rely on the problems regarding time overrun which faced on delivering the construction projects within the required time in the province of Sulaymaniyah and its surroundings; so the interviews had been with the engineers and experts who managing and working on construction projects in the region, and the stakeholders who have the direct impact on the construction projects. The questions concentrated on evaluation of main classifications of construction project problems regarding to time overrun. Therefore, the questionnaire will find out the weakness and what the difficulties that would impact negatively on delivering the construction projects on the required time. The questionnaire covered three sections; the first section inquired general information about the respondents for instance name, specialist, and years of experience; moreover, it illustrated if the number of the existing laboratories are adequate for construction booming in the city and meet the city's needs, also showed if the owner or his representative approve material samples, or finished work within the specified time in the contract; furthermore, the last part on the first section contained the clarification of the authority and performance of the

project manager, following by the second section which concentrated on the factors that cause of construction delay and the third section requested the effected of construction delays on the construction project.

3.3.5.1 Questionnaire Layout for this Study

On the second section the respondents were asked to evaluate their answer category on 59 well- prepared construction delay causes. These factors were classified into the following twelve major groups.

1- External Factor: climatic/ weather condition, geological, accident during construction (health and safety) and delay in providing service from utilities (water, electricity, telephone).

2- Location Factor: Site (Location, Layout), do not allocate any site to establish the project, customizing the site to another project and presence the owner of the land.

3- Financial Factor: client's financial problem, delay in payments, fluctuation in material prices and inflations.

4- Owner Factor: delay in furnish and deliver the site, change order by owner during construction and late approval on design documents.

5- Client Factor: change order, slow decision making by client, lack of experience of client in construction, client financial difficulties and errors in BOQ (such as units mistake, ignoring and forget clauses).

6- Consultant Factor: delay in approving major changes in the scope of work by consultant, inflexibility of consultant, lack of communication between consultant and other parties, lack of consultant experience, lack of consultant number and absence of consultant filter.

7- Contractor Factor: inadequate contractor experience, contractor's poor site management, subcontractors and mistakes during construction stages.

8- Planning and design Factor: inadequate construction planning, delay in design work, lack of design information, impractical design and lack of designer experience.

9- Managing Factor: ineligible project team, poor site management and supervision, inaccurate time estimating, lack of contractor's experience, poor subcontractor performance, inappropriate project planning/ scheduling, and lack of communication / coordination.

10- Project Factor: lack of feasibility study, inappropriate construction methods, poor maintenance of works, materials, and equipment, variations (design change, extra work).

11- Labor and equipment problem Factor: labor shortage, poor labor productivity, shortage of skilled workers, equipment availability and failures.

12- Resource Factor: improper material selection, material storage problem, poor material management/ late material delivery, transportation problem of resources, delays in the result of testing the materials and lack of proper testing laboratories in the region.

The participants were inquired to express their answers to present the performance of Kurdistan construction sector by selecting the degree of the causes' effect; the options were ranked from 1 (not serious) to 5 (extremely serious).

3.4 Causes of Delays:

Construction projects have been faced many barriers that cause delays, delays factors in this research categorized into eleven groups which are calculated as 59 factors that contributed to causes time overrun in construction projects, the delays and factors are clarified by questions and rating in the tables below: the questions for this research paper is placed in Appendix A.

Rating the causes of delays by ticking and fill the blanks.

Each level illustrates the following rating:
(1) Not Serious.
(2) Somewhat Serious.
(3) Serious.
(4) Very serious.
(5) Extremely serious.

Similarly, on the third section the respondents were asked to evaluate their answer about the effects of construction delays. These effects were classified into the six effects which are time overrun, cost overrun, dispute, arbitration, litigation and abandonment which are detailed below.

3.4.1 Effects of Delays:

Aibinu and Jagboro (2002); Sambasivan & Soon (2007); and also Motaleb and Kishk (2009), concluded their research in the causes and effects of delays in construction projects in Nigeria, Malaysia and United Arab Emirates by six effects which are:

Time overrun
Cost overrun
Dispute
Arbitration
Litigation
Abandonment

Similarly, this research depended on the six effects types which were outcome in the effects of delays in construction project in Nigeria, Malaysia and United Arab Emirates.

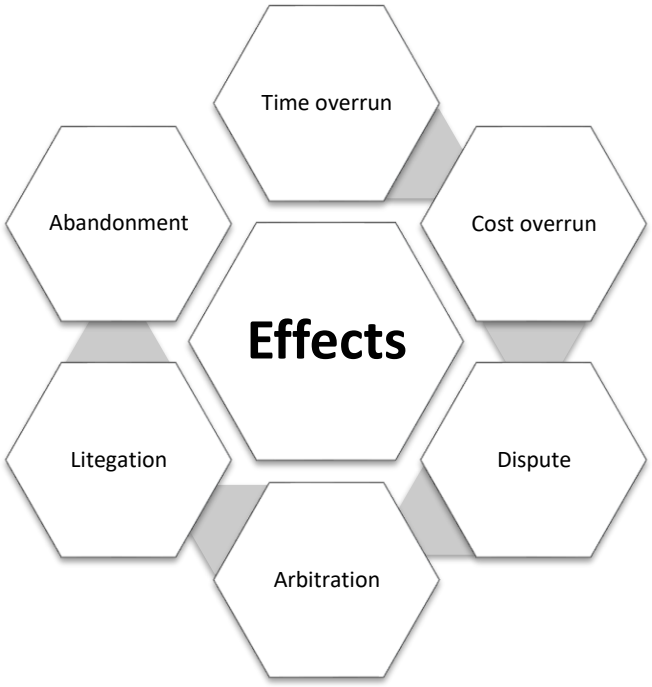

Figure (2): Effects of Construction Delays

In the questionnaire, the effects represented in the third section by evaluating and tick the quality of the effects and ranking them from 1 (Never) to 5 (Always). The table for the effects of delay is placed in Appendix B

Each level illustrates the following rating:

(1) Never

(2) Seldom

(3) Sometime

(4) Mostly

(5) Always

3.4.2 Ethics:

According to 1998 Data Protection Act and the 2000 Freedom of Information Act, It was very important to secure the participants' privacy. Therefore, this research will not mention the name of respondents that participated in the questionnaire but will indicate the directorate or the company that belonged to the respondents

3.4.3 Relative Importance Index Method (RII):

Kometa, S; Olomolaiye, P; and Harris, F. (1995) utilized the relative importance index method to calculate the relative importance of the several causes and effects of delay. This method was selected in this research within several groups such as clients, contractors and consultants. The five point level coordinated from 1 (not serious) to 5 (extremely serious) was relayed on and transformed to relative important indices (RII) for each factor, and the method for RII is as clarified below:

$$RII = \sum W \div (A \times N) \times 100$$

Where W is the weighting given to each factor by the participants (setting from 1 to 5).

A is the highest weight (setting from 1 to 5).

N is the total number of participants.

The RII value had a result from 0 to 1, the more serious of the cause or effect of delays has the higher value of RII.

The RII was used to rank the various causes. The ranking made it possible to make a comparative among the relative importance of the factors. Every participant cause's RII recognized by all participants were used to determine the general and total ranking in order to show an overall image of the cause's factors of construction delays in Kurdistan construction sector. The same process was selected for ranking the effects, then the index RII were used to define the rank of every item (effect), that led to make a comparative between the RII and ranked to find out the most serious one.

3.5 Data Analysis

For this study, the collected data's are analysed using Excel software. This software tool helps to analyse the data more accurately. Quantitative methods of data analysis can be of great value to the researcher who is attempting to draw meaningful results from a large body of qualitative data. The main beneficial aspect is that it provides the means to separate out the large number of confounding factors that often obscure the main qualitative findings. The calculations are done based on the opinion of the public and each data is analysed using excel software and this questionnaire has been distributed to Contractors, Clients and Consultants. Unfortunately, only one consultant was able to take part in the questionnaire and the opinion cannot be judged as it will draw unbiased results for this research so the consultant information has been ignored and only clients (Owners) and Contractors information are taken into account and based on the information (ranking) provided by them, the discussions will take place in the next chapter.

Calculations for this Research Paper:

1- Causes of Delay:

Table (4): Calculating the Causes of Delays Client, Contractor and Overall

Delays type and causes			**RII%**		
Factor(group)	**NO**	**Cause of delay**	**Client**	**Contractor**	**Overall**
External	1	Climatic/Weather condition	46%	49%	48%
	2	Geological	45%	37%	39%
	3	Accident during construction - including Health & Safety issues	22%	38%	32%
	4	Delay in providing service from utilities	37%	44%	41%
Location	5	Site (Location, Layout)	35%	44%	41%
	6	Do not allocate any site to establish the project	24%	35%	31%
	7	Customizing the site to another project	21%	30%	26%
Financial	8	Presence owners for the land	32%	38%	36%
	9	Client's financial problem	32%	37%	35%
	10	Contractor's Financial Problem	54%	53%	53%
	11	Delay in Payments	47%	53%	51%
Financial	12	Fluctuation in Material Prices	52%	48%	48%
	13	Inflations	49%	46%	46%
Owner	14	Delay in furnish and deliver the site	38%	48%	44%
	15	Change order by owner during construction	46%	49%	48%
	16	Late approval on design documents	42%	50%	47%
Client	17	Change Orders	46%	44%	45%
	18	Slow decision making by client	51%	50%	50%
	19	Lack of experience of Client in Construction	35%	46%	42%
	20	Client Financial difficulties	32%	36%	34%
	21	Errors in BOQ (such as units mistake, ignoring and forget clauses)	55%	50%	52%
Consultant	22	Delay in approving major changes in the scope of work by consultant	26%	43%	37%
	23	Inflexibility of consultant	21%	36%	31%
	24	Lack of communication between consultant and other parties	18%	40%	32%
	25	Lack of consultant experience	21%	45%	37%
	26	Lack of Consultants Number	28%	44%	38%
	27	Absence of consultants filter	71%	47%	54%
Contractor	28	Inadequate contractor experience	59%	50%	52%
	29	Contractor's poor site management	62%	58%	58%
	30	Subcontractors	57%	50%	51%
	31	Mistakes during construction stages	53%	52%	51%
Planning and Design	32	Inadequate construction planning	59%	49%	52%
	33	Delay in design work	57%	54%	56%
	34	Lack of design information	55%	54%	54%
	35	Impractical design	21%	46%	37%
	36	Lack of designer experience	51%	50%	50%
Managing	37	Ineligible Project Team	54%	45%	47%
	38	Poor Site Management and Supervision	69%	51%	56%
	39	Inaccurate time Estimating	47%	50%	49%

	40	Inaccurate cost Estimating	57%	48%	50%
	41	Lack of Contractor's Experience	60%	49%	51%
Managing	42	Poor subcontractors performance	57%	51%	52%
	43	Inappropriate Project planning/ Scheduling	58%	47%	50%
	44	Lack of communication/ coordination	42%	49%	46%
Project	45	Lack of feasibility Study	58%	41%	35%
	46	Inappropriate Construction Methods	56%	44%	38%
	47	Poor maintenance of works, materials, and equipment	48%	40%	37%
	48	Variations (design change, extra work)	43%	49%	54%
Labour	49	Labour shortage	58%	51%	52%
and	50	Poor Labour Productivity	56%	52%	53%
equipment	51	Shortage of skilled workers	48%	50%	48%
	52	Equipment availability and failures	43%	49%	46%
Resource	53	Improper Material Selection	34%	38%	36%
	54	Material Storage Problems	35%	40%	37%
	55	Materials shortage	38%	42%	40%
	56	Poor Material Management/ Late material delivery	41%	46%	44%
	57	Transportation Problem of Resources	34%	41%	39%
	58	Delays in the result of testing material	43%	48%	46%
	59	Lack of a proper testing laboratories	32%	43%	39%

2- Effects of Construction delay:

Table (5): Effects of Construction Delay Percantage based on Client, Contractor and Overall

Effects type		**Total Effect (%)**			
NO	**Effect of Delay**	**Client**	**Contractor**	**Overall**	**Rank**
1	Time Overrun	86%	61%	68%	1
2	Cost Overrun	60%	53%	55%	2
3	Dispute	51%	51%	50%	3
4	Arbitration	52%	36%	41%	4
5	Litigation	23%	31%	28%	5
6	Abandonment	23%	31%	28%	5

3.6 Chapter Summary

This chapter provided an introduction to different research methods, their advantages and disadvantages, different strategies of inquiry and this chapter also included the questionnaire layout and the result for this research paper. The next chapter will explain the percentage calculation of each factor that affects the construction projects in Kurdistan region and the factors affecting most in the construction projects will be considered as critical and recommendations will be placed according to the ranking order.

Chapter 4: Discussion and Research Findings

4.1 Introduction:

The objective of this chapter is to present the findings from the questionnaire. The objectives of the study and the research questions are reiterated and analysed in light of these findings. This is followed by a discussion of the implications of the results. The results of this study are based on Client and Contractor responses. The questionnaire for this study has been ranked in order and each factor will be discussed according to the ranking given.

4.2 Research Finding and Result:

The perspective of client, contractor and consultant of the 12 delay's factor and 59 delay causes analysed based on relative importance index (RII). The results are presented in table (6) and (7) below.

Table (6): Relative Important Index and Rank Delay Causes based on (Client and Contractor)

Causes	**Overall**		**Client**		**Contractor**		**Factor (Group)**
	RII	**Rank**	**RII**	**Rank**	**RII**	**Rank**	
Contractor's poor site management	58%	1	62%	3	58%	1	Contractor
Poor Site Management and Supervision	56%	2	69%	2	51%	5	Management
Delay in design work	56%	2	57%	7	54%	2	Planning and Design
Variations (design change, extra work)	54%	3	43%	19	49%	7	Project
Absence of consultants filter	54%	3	71%	1	47%	9	Consultant
Lack of design information	54%	3	55%	9	54%	2	Planning and Design
Contractor's Financial	53%	4	54%	10	53%	3	Financial

Problem							
Poor Labor Productivity	53%	4	56%	8	52%	4	Labor and equipment Problems
Errors in BOQ	52%	5	55%	9	50%	6	Client
Inadequate contractor experience	52%	5	59%	5	50%	6	Contractor
Inadequate construction planning	52%	5	59%	5	49%	7	Planning and Design
Poor subcontractors performance	52%	5	57%	7	51%	5	Management
Labor shortage	52%	5	58%	6	51%	5	Labor and equipment Problems
Delay in Payments	51%	6	47%	16	53%	3	Financial
Subcontractors	51%	6	57%	7	50%	6	Contractor
Mistakes during construction stages	51%	6	53%	11	52%	4	Contractor
Lack of Contractor's Experience	51%	6	60%	4	49%	7	Management
Slow decision making by client	50%	7	51%	13	50%	6	Client
Lack of designer experience	50%	7	51%	13	50%	6	Planning and Design
Inaccurate cost Estimating	50%	7	57%	7	48%	8	Management
Inappropriate Project planning/ Scheduling	50%	7	58%	6	47%	9	Management
Inaccurate time Estimating	49%	8	47%	16	50%	6	Management
Climatic/Weather condition	48%	9	46%	17	49%	7	External
Fluctuation in Material Prices	48%	9	52%	12	48%	8	Financial
Change order by owner during construction	48%	9	46%	17	49%	7	Owner
Shortage of skilled workers	48%	9	48%	15	50%	6	Labor and equipment Problems
Late approval on design documents	47%	10	42%	20	50%	6	Owner
Ineligible Project Team	47%	10	54%	10	45%	11	Management
Inflations	46%	11	49%	14	46%	10	Financial
Lack of communication/ coordination	46%	11	18%	31	49%	7	Management
Equipment availability and failures	46%	11	43%	19	49%	7	Labor and equipment Problems
Delays in the result of testing material	46%	11	43%	19	48%	8	Resource
Change Orders	45%	12	46%	17	44%	12	Client
Delay in furnish and deliver the site	44%	13	38%	22	48%	8	Owner
Poor Material Management/ Late	44%	13	41%	21	46%	10	Resource

material delivery							
Lack of experience of Client in Construction	42%	14	35%	24	46%	10	Client
Delay in providing service from utilities	41%	15	37%	23	44%	12	External
Site (Location, Layout)	41%	15	35%	24	44%	12	Location
Materials shortage	40%	16	35%	24	42%	14	Resource
Geological	39%	17	45%	18	37%	18	External
Transportation Problem of Resources	39%	17	34%	25	41%	15	Recourses
Lack of a proper testing laboratories	39%	17	32%	26	43%	13	Resource
Lack of Consultants Number	38%	18	28%	27	44%	12	consultant
Inappropriate Construction Methods	38%	18	56%	8	44%	12	Project
Delay in approving major changes in the scope of work by consultant	37%	19	26%	28	43%	13	consultant
Lack of consultant experience	37%	19	21%	30	45%	11	consultant
Impractical design	37%	19	21%	30	46%	10	Planning and Design
Material Storage Problems	37%	19	38%	22	40%	16	Resource
Poor maintenance of works, materials, and equipment	37%	19	48%	15	40%	16	project
Presence owners for the land	36%	20	32%	26	38%	17	Location
Improper Material Selection	36%	20	34%	25	38%	17	Resource
Client's financial problem	35%	21	32%	26	36%	19	Financial
Lack of feasibility Study	35%	21	58%	6	41%	15	Project
Client Financial difficulties	34%	22	32%	26	37%	18	Financial
Accident during construction	32%	23	22%	29	38%	17	External
Lack of communication between consultant and other parties	32%	23	42%	20	40%	16	consultant
Do not allocate any site to establish the project	31%	24	24%	28	35%	20	Location
Inflexibility of consultant	31%	24	21%	30	36%	19	Consultant
Customizing the site to another project	26%	25	21%	30	30%	21	Project

Table (7): Overall Percantage of Each Factor (Client and Contractor)

Factor (Group)	**Overall**		**Owner**		**Contactor**	
	RII%	**Rank**	**RII%**	**Rank**	**RII%**	**Rank**
Contractor	53%	1	58%	1	53%	1
Managing	51%	2	56%	2	49%	3
Planning and Design	50%	3	49%	4	51%	2
Labor and equipment problems	50%	3	51%	3	51%	2
Financial	47%	4	47%	5	47%	4
Owner	46%	5	42%	7	49%	3
Client	44%	6	44%	6	45%	5
Project	41%	7	38%	8	44%	6
Resource	40%	8	37%	9	43%	7
External	40%	8	38%	8	42%	8
Consultant	38%	9	31%	10	43%	7
Location	34%	10	28%	11	37%	9

4.2 Discussion of Result:

It is obvious from table (5) above, that overall agreed that the top ten most serious causes resulting delay in the construction projects in Sulaymaniyah city are:

1- Contractor's poor site management.

2- Poor Site Management and Supervision & delay in design work.

3- Variations (design change, extra work), absence of consultants filter & lack of design information.

4- Contractor's Financial Problem & poor labor Productivity.

5- Errors in BOQ, inadequate contractor experience, inadequate construction planning, poor subcontractors performance & labor shortage.

6- Delay in Payments, subcontractors, mistakes during construction stages & lack of Contractor's Experience.

7- Slow decision making by client, lack of designer experience, inaccurate cost Estimating & inappropriate Project planning/ Scheduling.

8- Inaccurate time Estimating.

9- Climatic/Weather condition, fluctuation in Material Prices, change order by owner during construction & shortage of skilled workers.

10- Late approval on design documents & ineligible Project Team.

Furthermore, from table (7), based on different factors (groups) of delay causes, the participated generally agreed that the top three factors are:

1. Contractor.

2. Managing.

3. Planning and Design.

The following summarized discussion for 59 causes of delay clarified with their factors, demonstrated in the downward order of the groups ranking:

First- Contractor:

The contractor factor of delay causes ranked as the first most serious causes responsible for construction delay. The table (6) shows the ranking of the overall causes of delays contractor's poor site management, inadequate contractor experience, subcontractors and mistakes during construction stages were ranked as 1^{st}, 5^{th}, 6^{th}, and 6^{th} causes respectively from the 59 causes, this illustrates the serious and main effect of that causes factor in resulting delay in the construction project in Sulaymaniyah;

therefore, table (8) clarifies the ranking of causes from contractor factor and overall ranking.

Table (8): Ranking for Causes of Delay from Contractor Factor and its Overall Ranking Cause

Causes of delay	RII%	Ranking in their group	Overall Ranking
Contractor's poor site management	58%	1	1
Inadequate contractor experience	52%	2	5
Subcontractors	51%	3	6
Mistakes during construction stages	51%	4	6

Second- Managing Factor*:*

The managing factor of delay causes was ranked the second most important causes responsible for construction delay. The table (9) below clarifies the overall causes of delays poor site management and supervision, poor subcontractors' performance, lack of Contractor's Experience, inaccurate cost estimating, inappropriate project planning/ scheduling, inaccurate time estimating, ineligible project team and lack of communication/ coordination were ranked as 2^{nd}, 5^{th}, 6^{th}, 7^{th}, 7^{th}, 8^{th}, 10^{th} and 11^{th} causes respectively from the 59 causes, that demonstrated the important effect of that causes factor in resulting delay in the construction project in Sulaymaniyah. The table (9) below illustrates the ranking of causes from managing factor and overall ranking.

Table (9): Ranking for Causes of Delay from Managing Factor and its Overall Ranking Cause

Causes of delay	**RII%**	**Ranking in their group**	**Overall Ranking**
Poor Site Management and Supervision	56%	1	2
Poor subcontractors performance	52%	2	5
Inaccurate cost Estimating	50%	3	6
Inappropriate Project planning/ Scheduling	50%	3	7
Lack of Contractor's Experience	51%	4	7
Inaccurate time Estimating	49%	5	8
Ineligible Project Team	47%	6	10
Lack of communication/ coordination	46%	7	11

Third-Planning and Design & Labour and equipment problems

Contractor and clients together ranked both planning and design with labour factor and equipment problems factor as the third most crucial source in construction delay with RII of {49%&51%}, {49%&51%}and {50%&50%} respectively.

The factor based planning and design indicate particularly the delay in design work, lack of design information, inadequate construction planning, lack of designer experience and impractical design represent the 2nd, 3rd, 5th, 7th and 19th in overall causing delay ranking in construction projects. The following table (10) clarifies ranking for causes of delay from planning and design factor and overall ranking.

Table (10): Ranking for Causes of Delay from Planning and Design Factor and its Overall Ranking Cause

Causes of delay	**RII%**	**Ranking in their group**	**Overall Ranking**
Delay in design work	56%	1	2
Lack of design information	54%	2	3
Inadequate construction planning	52%	3	5
Lack of designer experience	50%	4	7
Impractical design	37%	5	19

According to labour and equipment problems was ranked the third highest group like planning and design factor. The table (6) shows that poor Labour Productivity, labour shortage, shortage of skilled workers and equipment availability and failures perform the 4^{th}, 5^{th}, 9^{th} and 11^{th} respectively. The table (11) shows ranking for causes of delay from labour and equipment problems and overall ranking.

Table (11): Ranking for Causes of Delay from Labor and Equipment factor and its Overall Ranking Cause

Causes of delay	**RII%**	**Ranking in their group**	**Overall Ranking**
Poor Labor Productivity	53	1	4
Labor shortage	52	2	5
Shortage of skilled workers	48	3	9
Equipment availability and failures	46	4	11

Fourth-Financial:

This group of delay causes was ranked fourth. In this group, the cause (client's financial problem) is ranked as 4^{th} cause from overall 59 causes of delay of RII (54%)

and the first cause of delay in their group ranking, then (fluctuation in material prices) was ranked the second serious cause in their group of overall rank 6th of RII (47%). Following by inflations, delay in payments and client's financial problem.

Fifth-Owner:

Client and contractor together ranked owner factor as the fifth most critical source in construction delay with RII of 44% and 49% respectively. All the participants indicate particularly (the change order by owner during construction) as the first important cause of delay in their group and 9th in overall ranking. Following by (late approval on design documents) and (Delay in furnish and deliver the site) indicates the 10th and 13th in overall causing delay among 59 causes of delay in construction projects in the city.

Sixth-Client:

Client and owner are considered as the same side of causing delay; because this research study is done with the only public project in the city of Sulaymaniyah where the client is the owner of the project. Client as delay factor was ranked sixth and the most crucial causes of delays in this group is errors in BOQ such as units' mistake and ignoring and forget clauses which is ranked the 5th causes of delays in overall ranking for 59 causes and the 1st in their group ranking of RII (52%).

Seventh-Project:

The entire participants group ranked this factor as seventh. The 1st and 2nd most serious cause in that group are (Lack of feasibility Study) of RII (58%) and (Inappropriate Construction Methods) of RII (56%) were ranked as 3rd and 18th from overall causes respectively.

Eighth-Resource, external:

The total participants ranked the resource factor, external factor and consultant factor as eighth factor that causing delay in construction project in the city of Sulaymaniyah. Due to resource factor, client and contractor agreed that (delays in the result of testing material) and (Poor Material Management/ Late material delivery) was the most serious two causes of that factor of overall rank 11th and 13th respectively; Furthermore, the external factor has of (40%) was ranked eighth as well which has the (climatic/weather condition) and geological of rank 9th and 15th with RII (48%) and (39%) respectively.

Ninth-Consultant:

The consultant factor as delay factor has RII of (38%) was ranked eighth as well. The entire participants agreed all that (Absence of consultants filter) was the most crucial cause of delay in the city, ranked as 3rd from overall cause.

Tenth-Location:

All parties ranked the location factor of delay causes as the lowest with RII of (34%). From all causes in the group, all responsible have seen {Site (Location, Layout)} a high cause, ranked 15th from 59 causes that causing delay in construction projects identified for the city of Sulaymaniyah.

4.3 Construction Industry Problems in Sulaymaniyah City- Kurdistan Region:

The initial problem in the region is the weak system to distribute the project to concerned authorities. For instance, the directorate of the governorate allocated a huge budget for a massive number of construction projects in the city and managing all the processes which includes tendering, selection, assessment, planning, design and contract process, then the project be shifted to the dedicated department without having enough information about any processes which were held previously with the governorate; therefore, always the shifting processes are facing the shortage in design documents and lack of communication which create a significant dilemma between the new department and the contractor who allocated by the governorate particularly in managing and supervision scope which would often leads to provoke both parties and be a bottleneck in processing delivering the project within the required time (Governorate of Sulaymaniyah, 2013).

Furthermore, there is not an adequate database in the region to collect and unite the annual data from all the government departments; because of the technique that uses to preserve the data is deemed to be feeble and the department keeps the data on papers in a documents, then formatted the data from the computer year by year;

therefore, that are driving the data to be easy to loose and when the previous data needed the manual process takes a long time to provide the required data for the any project and sometimes the data lost (Governorate of Sulaymaniyah; Institution of construction projects, 2013). In addition, sometimes when the government allocate required project for the province and sometimes when the government allocate required project for the province and signed the contract with the specific time of completion , they faced non-having a proper location for that or struggled with customizing the location to another projects which make it impossible to start the construction stage in the direct time which lead to start looking for another place to construct the project, often this process exceed the contractual time and lead to time overrun ; therefore, this is considered as an evident for the lack of communication and coordination among the governorate departments; This creates a bottleneck at the beginning and causes to delay (Institution of construction projects, 2013).

Generally, the construction bidding in the region depends on the *Iraqi condition of contracts* which illustrates that it does not matter to depend on selecting the lower tender price; however, this clause is not taking in consideration and always the lower price winning the bidding that has considered as a recurrent dilemma that subsequent dealing with ineligible contractors which drive to create many problems in the construction stages in terms of financial difficulties and inadequate managing skills that all cause slowing the project construction or cause to ultimately abandon the project(Directorate of construction and Housing, 2013). Furthermore, as the Iraqi general condition for contracts of civil engineering work (1973) instructs tendering processes in the construction industry are depending on a bill of quantities (BOQ) which enable a contractor to price all the construction work in the bidding processes,

the clause 5 which is the extent of contract in the Iraqi condition of contracts illustrates the definition of BOQ " Bill of Quantities is deemed comprehensive for all expenses, costs, risks whatsoever for the contractor to execute, complete, deliver and maintain the works. It is assumed that the contractor has included in Bill of Quantities all what is necessary the value of whole works which deemed reasonable and necessary for the execution of contract". However, errors in BOQ (such as units' mistake for instance accounting by m3 instead of m2 or ignoring and forget some of very important clauses) always accruing in the BOQ in the region which lead to create cost overrun in the construction stage and causes time overrun. Therefore, as a rule, bill of quantities are counting on a blueprints and take offs in which the cost of a building or other structure is estimated by measuring the cost of the quantities for the whole project's contains, and measuring the architect works and how many architectures will be needed, structural engineering, and other building consultants drawings, all that lead to outcome with a cost estimate for the required project that is known as "abstracting" (Iraqi general condition for contracts of civil engineering work, 1973). However, the bill of quantities process in the region is always creating with many errors, and there are not any projects without BOQ errors; therefore, the mistakes and the lack of the BOQ items are considered as one of a main causes of construction projects delays and there are not an adequate BOQ for the construction projects; the obvious examples for an inadequate BOQ in the region is the new supreme court building's BOQ in Sulaymaniyah which was ignored the estimating of the roof item and having a huge other mistakes which caused to delays the projects about two years from the estimated time (Governorate of Sulaimanyah,2013). According to the research survey (2013), about 99% of the survey's participants clarified that the lack of the laboratories number and the shortage of experienced

laboratories staff are considered as an obvious delays problem in the region; for example in the province of Sulaymaniyah, they are just three laboratories which are obviously under the region's needs, the first one is the central laboratory which running by the government directly and loaded by a huge numbers of requesting tests and two private laboratories which have to be controlled by the central one which is creating slowness problem in providing the construction testing samples results in the proper time; furthermore, sometime the testing results from both private laboratories are untrusted by the government for their projects. Moreover, the province of doesn't Sulaymaniyah have a laboratory for testing polyethylene pipes; therefore, polyethylene testing needs to be tested in Turkey or Erbil which is another city in the region, and to complicate his problem in the province of Sulaymaniyah the governorate customized a proper budget and provided all the required equipment, but regrettably the directorate which manages the laboratories in the city has not allocated any location to construct the suitable polyethylene laboratories, so that is taking into account that the lack of the communication among the province's directorates is one of the crucial delays problem; therefore, all those stand to decelerate the delivering of the construction projects within the required contractual time (Institution of construction projects, 2013).

Typical designs in the region which are always using for the government department buildings for instance schools, police units, health centre and electricity units are considered as a reason that cause delays in the construction industry in the region the problems appear when the government allocate the same budget for construct the units in different places and then the difficulties starts from the type of the land that is related to the geological problem which is different from location to another that

create a tangible financial problems and lead to cost overrun which will then be a significant cause of delay for delivering the project in the required time because the topographies are various among the locations and the budget is the same; therefore, the project budget faced a shortage and will be not sufficient from the early construction stages in the project, this problem appears widely with using the typical designs in different places with the same budget; for example, the balance centre for heavy load cars in Kalar delivering within the contractual time and did not exceed the estimated budget; however, the same balance centre design constructed in Dokan with the same Kalar balance centre budget but Dokan project was delayed for 2 years because of executing the typical design with the same budget which was faced difficulties from the foundation stages and coasted a large budget's proportion which is considered as a very early stage in the constructing process, so that derived to delay Dokan's balance centre project within the estimated time and cost comparing with Kalar balance centre that shows how the implementing of typical design in the region affects the cost and similarly affect the time for delivering the project (Directorate of construction and Housing in Sulaimanyah,2013). Therefore, implanting a typical design in the region always creates financial problem which leads to causes of time over run and non-completion of project within the required time. Delay in providing the service from utilities such as water, electricity and roads is considered as one of the remarkable delay's problem and the main causes behind that is implemented an inadequate strategies for the construction industry by providing the service after constructing the project; therefore, services' delay lead to delays in habilitating the project or sometimes be a reason for abandonment a project totally; the obvious examples to show this situation are the 170 housing units for the university of Sulaymaniyah, and the retirees centre in Sulaymaniyah (Directorate of construction

and housing, 2013). The construction industry in the region scrabble about absence of consultants filter for the construction projects which is considered as a chronic difficulties that cause to decelerate the construction actions and drive to appear many mistakes and problems from the early stages in the construction projects (Directorate of construction and housing, 2013).

In addition, according to the information from the directorate of the road and bridges in Sulaymaniyah (2013) that illustrated, Furthermore, road projects are always had inadequate general term of reference (TOR) which is enforced by the ministry of construction and housing in Kurdistan region, which is considered as an insufficient TOR and always has chronic mistakes without any improvement. Furthermore, in the region, road projects always be a tool that cause to kill the natural environment along the roads' alignment; therefore, environmental problem, especially in road projects, is the serious problem that affecting the area; for instance, Warmawa- Darbandikhan Road is considered as a project that influenced the environment negatively and cause to be an appliance for losing the naturally in the area by deforesting the trees which led to cost overrun and consequently time overrun. Regrettably, there is not any effective environmental administration in the region to preserve the green life when any project need to be established; and cutting these trees add an additional cost which lead to paralyze the executive time. Therefore, environmental problem and incompetent TOR are considered as serious problems which threat the flourish of the construction industry in the region.

According to the research survey (2013) that illustrated about (95%) of the participants expressed that the project manager has limited authority on managing the

construction project, and the manager has not the entire domination for running the project which affected the required decisions on the site and cause to discourage the manager and decelerate the project's construction stages which be a handicap for delivering the projects within the required time.

Chapter 5: Conclusion and Recommendation:

5.1 Avoiding Delays in construction Project in Kurdistan:

Understanding the causes of construction delay might assist to reveal the fundamental causes and their importance in order to reduce and avoid the effect of delays in construction projects. As Ballard and Howell (1998) debated that, when task not meeting the successful construction work criteria, the construction planners have to make just "quality assignment" for instance: adequately well defined (to be arranged with other work and the information to be identified and gathered), are prepared to begin (material, design, and forerunner works complete), have preference in the critical way for transmission to the customer, are proportional in scale with the obtainable labor, are executed within a system where the reasons of insufficient or bad quality assignment are investigated and specified, should be postponed. Monitoring provides early warning of the potential contractor's delays and assists in expecting the outcomes of variations that might be required (Cleland, 1999; Abdul-Rahman and Berawi, 2002). Young and Jinijoo (1998) illustrated that superior management support is wanted and this can be determined as the desire of superior management to prepare substantial resources, authority and power; furthermore, decision making at the right time is considerably important step for any successful construction work (Ahuja, Dozzi and Abourizk, 1994); furthermore, decision making process is anticipated as the key and the path to efficient project management particularly in value and risk analysis (Stuckenburck, 1982)

Regarding Kurdistan construction projects delays problem, it is evident that there were not any proper techniques or strategies to deal with the existing delays or to

avoid delays' impacts on the construction sectors from the early stages in any construction projects.

This research concentrated on finding the gaps that cause delays in construction sectors in Kurdistan and concluded with initial steps to mitigate delays impacts which are starting with understanding the causes of delays and making an adequate and detailed risk management, adequate planning, solving all the payment problem particularly from the client side, provide insurance claim, proper/ good scheduling program, selecting proper representative from the client side for the project, choosing proper experts who understand their assignment, preparing detailed and obvious BOQ, and counting the size of financial damages .

Furthermore, data base system needs to be established in the region to collect all the construction industry's information in the directorate of governorate for providing a strong background data for all the projects in the city and help to distribute the projects in proper formula, and the distribution system meets the region needs and be a tool to improve bidding process in the city. Improving the elaborate of the laboratories in the region, increase the number of working staff and develop the staff by a proper training.

In addition, revising all the construction conditions and preparing detailed TOR and design document with fully information. Constructing an adequate network of infrastructure in the region which is a tool to support the construction industry to be developed and booming and starting to provide all the services . The solicitude of

consultant stages, and allocates a proper consultant team to start thinking of taking all the advantages for the project's interest and speed up the constructing stages.

Promoting the project manager by giving a significant authority on the site for running the project to accelerate the constructing stages and be a support for delivering the project within the contractual time.

The disaster background of other Iraq (Kurdistan Region) has been replaced to very dynamic democratic society and becoming a very prosper area to investment, as part of future solution to respond and control the construction delay problems, Kurdistan Region Government can take benefits from the UK experience regarding implementing the Building Information Modelling (BIM), and taking in consideration that this tool would be a key to analyse and presenting an innovative solution for minimizing construction project delays and also make the construction industry more efficient in the Kurdistan region. According to Cabinet office report (2011) BIM is a tool to reduce risk in projects regarding cost and time overrun, so it would be a key solution for time overrun problems in the area. The construction sector is a substantial part of the UK economy. It forms about £110bn per annum of expenditure; about 40% of this being in public sector, with central government being the industry's biggest customer. However, the UK does not obtain entire value from public sector construction; therefore, it has been failed to exploit the potential for public procurement of construction and infrastructure projects to drive growth; therefore, in 2011, the UK Government announced the "Government Construction Strategy" which include an authorization for the enforcement of BIM "Building Information Strategy" on all public projects by 2016 in order to make the UK construction industry more

efficient (Cabinet Office, 2011). The Government believes that BIM will reduce waste, ensure better procurement decisions and improve the construction process. With industry and government backing BIM is likely to be an essential process for engineers, architects and all those participated in the work flow process (Kymmel, 2008), This stage plan in the effort to make public sector, as client, more efficient by improving several aspects including procurement, cost benchmark, asset management, supplier management, with assistance of digital information collaboration which all these be a catalyze to minimize the time overrun risks on construction projects (HM Government, 2012) . Gajendran and LeGoff (2012) clarified BIM as a new software program; it is 3D CAD (three-dimensional computer-aided design) which is data base of building lifecycle information that can be visually represented as a three-dimensional virtual object. The power of BIM lies in between the data and virtual object. Basically, BIM is a powerful tool that can enable all the different project stakeholders from engineers, contractors and owners to make better decision and as it can be seen from the comparison between the developed and developing countries, the mutual delay factor is the "order variation"; therefore enforcing BIM would help to take a better decision which lead to reduce the time overrun risk regarding that (Cabinet Office, 2011). However, Implementing BIM would be a risky solution for the region because it is considered as an expensive software and it also needs different level of training to fully understand the process; moreover, people in the region might not accept changes regarding the traditional way of working, and they may feel not enthusiastic for this type of strategy; on the other hand, boom time and wealth sweep Kurdistan, so the best way to improve the region is to implement BIM because it is an integrated process which built on coordination, reliable information about a project from design through construction and into operations; it will help enhance

coordination, communication, enhance accuracy, reduce waste and enable better-informed decision earlier in the process. A BIM project would typically model all data relating to design, coasting, built ability and clash detection, scheduling and procurement which all that would mitigate the entire delays problem in the region and in general level, BIM would be a key to enhance the construction industry in the region.

5.2 Summary and Conclusion

The delay in construction projects in the city of Sulaymaniyah is investigated in a field survey. The relative importance index (RII) is calculated for the 59 causes of delay that were identified by research for Sulaymaniyah city. In the field survey, 132 engineers represent (owner and contractor) completed a questionnaire form to denote relative importance index for each cause.

The research presented that all parties of participants agreed that the most twelve serious causes of delay for construction projects sorted in descending order of importance are:

1- Contractor's poor site management.

2- Poor Site Management and Supervision & delay in design work

3- Variations (design change, extra work), absence of consultants filter and lack of design information.

4- Contractor's Financial Problem & poor labour Productivity.

5- Errors in BOQ, inadequate contractor experience, inadequate construction planning, poor subcontractors performance & labor shortage.

6- Delay in Payments, subcontractors, mistakes during construction stages & lack of Contractor's Experience .

7- Slow decision making by client, lack of designer experience, inaccurate cost Estimating & inappropriate Project planning/ Scheduling.

8- Inaccurate time Estimating.

9- Climatic/Weather condition, fluctuation in Material Prices, change order by owner during construction & shortage of skilled workers.

10- Late approval on design documents & ineligible Project Team.

The 59 causes were classified into 12 factors of delay causes and were ranked. The outcomes indicate that all parties agreed together that contractor factor was the most crucial and effective causes factor. Managing factor was deemed as the second most serious causes followed by both planning and design factor & labor and equipment problems factor of delay causes.

5.3 Recommendation:

Results in this research illustrate that the most serious ten causes mainly outcome from contractor factor, managing and labor & equipment problem; the following recommendation can be suggested in order to mitigate and control delays in construction projects in the city of Sulaymaniyah.

A- Contractor (Companies, Persons).

1- As the contractor financial difficulties is one of the crucial problem that cause delays, contractor should address and administrated his financial resources to not face money problems and scheme a cash flows.

2- Site management and supervision from project manager and project technical staff should be allocated as early as project is obtained even earlier to do their tasks to attain completion within the estimated time, estimated cost and the required quality.

3- Select good experienced subcontractors whom have a good reputation and performance.

4- Contractor have to employee manpower well qualified particularly skilled labors with high productivity and work usually to progress their skills, obtain a good experienced and productivity; therefore, that will be a tool to avoid mistakes in work and that consequences exact execution in specific time.

B- Managing:

1- Avoiding delay need a manager that have an extensive knowledge and skills to respond to all site problems through good planning communication, motivation and coordination which help to build an effective team a proper team which lead to long term success to complete the project in required time.

2- The site supervision's quality has a major effect on the overall performance and adequacy of construction projects. Unsuitable supervision is considered to be one of the major causes of rework and delay; therefore, well-trained and experienced supervisors have a serious role in avoiding delay in construction projects.

3- Accurate time and cost estimating are a skill substantial for good project management; therefore, accurate time and cost estimating lead to set the deadline for delivery and planning of projects.

C-Planning and Design & Labour and equipment problems:

In term of planning and design:

Mistakes and variation in design documents should be abstracted entirely and make an adequate project planning through selecting a proper and experienced designers for the project's drawings and giving the full design's detail and description; however, they are:

1-Recur causes for redoing designs and drawings and might take further time to make important correction.

2- Data collection process from project site and accurate survey information lead to a good base to design the projects facilities from maps and drawings adequately; therefore, no lost time in redoing design some details that are incorrect.

In term of labor and equipment problems:

Construction site supervision is a crucial eliminates to solve labor and equipment problems. Most of the labors are unqualified and unskilled; as a result, extra adjustment and supervision required to be given; furthermore, the success in

completing the project in the contractual time depends significantly on the quality of supervision which relies on supervision's skill and experienced.

Eckles et al (1975) cited that supervisors are managers, whose major tasks depend on leading, coordinating and managing the work of others for avoiding delay in the construction projects. In addition, a successful supervisor need to deal with different skills, for instance management skills, human relation skills and skills in leadership, motivation, communication and frame behaves.

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Appendices:

Appendix A:

Question:

Which of the following factors which illustrated below are participated to causes of delays of Kurdistan Region of Iraq construction project?

1-External Factor:

NO	Causes of delay	1	2	3	4	5
1	Climatic/Weather condition					
2	Geological					
3	Accident during construction - including Health & Safety issues					
4	Delay in providing service from utilities (such as water, electricity, etc)					

2- Location Factor:

NO	Causes of delay	1	2	3	4	5
5	Site (Location, Layout)					
6	Do not allocate any site to establish the project					
7	Customizing the site to another project					
8	Presence the owner of the land					

3- Financial Factor:

NO	Causes of delay	1	2	3	4	5
9	Client's financial problem					
10	Contractor's Financial Problem					
11	Delay in Payments					
12	Fluctuation in Material Prices					
13	Inflations					

4- Owner Factors:

NO	Causes of delay	1	2	3	4	5
14	Delay in furnish and deliver the site					
15	Change order by owner during construction					
16	Late approval on design documents					

5- Client Factors:

NO	Causes of delay	1	2	3	4	5
17	Change Orders					
18	Slow decision making by client					
19	Lack of experience of Client in Construction					
20	Client Financial difficulties					

21	Errors in BOQ (such as units mistake, ignoring and forget clauses)					

6- Consultant Factors:

NO	Causes of delay	1	2	3	4	5
22	Delay in approving major changes in the scope of work by consultant					
23	Inflexibility of consultant					
24	Lack of communication between consultant and other parties					
25	Lack of consultant experience					
26	Lack of Consultants Number					
27	Absence of consultants filter					

7- Contractor factor:

NO	Causes of delay	1	2	3	4	5
28	Inadequate contractor experience					
29	Contractor's poor site management					
30	Subcontractors					
31	Mistakes during construction stages					

8- Planning and Design Factor:

NO	Causes of delay	1	2	3	4	5
32	Inadequate construction planning					
33	Delay in design work					
34	Lack of design information					
35	Impractical design					
36	Lack of designer experience					

9- Managing Factor:

NO	Causes of delay	1	2	3	4	5
37	Ineligible Project Team					
38	Poor Site Management and Supervision					
39	Inaccurate time Estimating					
40	Inaccurate cost Estimating					
41	Lack of Contractor's Experience					
42	Poor subcontractors performance					
43	Inappropriate Project planning/ Scheduling					
44	Lack of communication/ coordination					

10- Project Factors:

NO	Causes of delay	1	2	3	4	5
45	Lack of feasibility Study					
46	Inappropriate Construction Methods					
47	Poor maintenance of works, materials, and equipment					
48	Variations (design change, extra work)					

11- Labor and equipment Problems Factor:

NO	Causes of delay	1	2	3	4	5
49	Labor shortage					
50	Poor Labor Productivity					
51	Shortage of skilled workers					
52	Equipment availability and failures					

12- Resource Factors:

NO	Causes of delay	1	2	3	4	5
53	Improper Material Selection					
54	Material Storage Problems					
55	Materials shortage					
56	Poor Material Management/ Late material delivery					
57	Transportation Problem of Resources					
58	Delays in the result of testing material					
59	Lack of a proper testing laboratories					

Appendix B:

NO	Effect of Delay	1	2	3	4	5
1	Time Overrun					
2	Cost Overrun					
3	Dispute					
4	Arbitration					
5	Litigation					
6	Abandonment					

Appendix C:

SECTION A

General Information

Project Name: …….

Name/ Company Name: ……..

E Mail: ……..

Telephone: …….....

Major: ……..

Number of years in construction field: ……

Please rank each of the following in terms of your level of previous professional experience.
(1= most experience)
……Design
……Construction
……Maintenance
……Other please specify
…….

Please rank each of the following project types in term of your level of experience.
(1= most experience)
……Offices Building ……School ……Residential
……Hospital …….Road
Other, please specify: ……

Have you ever worked as a Site Engineer?

- ☐ Yes, please specify approximate number of projects ……..
- ☐ No

Have you ever worked as a Project Manager?

- ☐ Yes, please specify approximate number of projects ……..
- ☐ No

From your experience, do you think there are an adequate number of laboratories in the region?

 Yes

 No

From your professional experience, compared to the contract specifications, how long does it generally take the Owner or his representative to approve material samples, or finished work?

- Faster than specified in the contract.
- Approximately the same amount of time as specified in the contract.
- Longer than specified in the contract.
- Other,please specify……

From your experience, what is the level of authority of an average project manager has in running a project?

- Complete authority
- Significant authority
- Some authority
- Little authority
- No authority

SECTION B

Factors that Causes Construction Delays

From your experience, please evaluate and tick the quality of the following factors, including adding any other delay factors that you may have experienced in this project that are not covered in this list:

Please, rating the causes of delays by ticking and fill the blanks.

Each level illustrates the following rating:

(1) Not Serious
(2) Somewhat Serious
(3) Serious
(4) Very serious
(5) Extremely serious.

1- External Factor:

NO	**Causes of delay**	1	2	3	4	5
1	Climatic/Weather condition					
2	Geological					
3	Accident during construction - including Health & Safety issues					
4	Delay in providing service from utilities (such as water, electricity, etc)					

2- Location Factor:

NO	**Causes of delay**	1	2	3	4	5
5	Site (Location, Layout)					
6	Do not allocate any site to establish the project					
7	Customizing the site to another project					
8	Presence owners for the land					

3- Financial Factor:

NO	**Causes of delay**	1	2	3	4	5
9	Client's financial problem					
10	Contractor's Financial Problem					

11	Delay in Payments					
12	Fluctuation in Material Prices					
13	Inflations					

4- Owner Factors:

NO	**Causes of delay**	1	2	3	4	5
14	Delay in furnish and deliver the site					
15	Change order by owner during construction					
16	Late approval on design documents					

5- Client Factors:

NO	**Causes of delay**	1	2	3	4	5
17	Change Orders					
18	Slow decision making by client					
19	Lack of experience of Client in Construction					
20	Client Financial difficulties					
21	Errors in BOQ (such as units mistake, ignoring and forget clauses)					

***NOTE: Errors in BOQ (such as units' mistake for instance accounting by m3 instead of m2 or ignoring and forget some of very important clauses).**

6- Consultant Factors:

NO	**Causes of delay**	**1**	**2**	**3**	**4**	**5**
22	Delay in approving major changes in the scope of work by consultant					
23	Inflexibility of consultant					
24	Lack of communication between consultant and other parties					
25	Lack of consultant experience					
26	Lack of Consultants Number					

27	Absence of consultants filter					

7- Contractor factor:

NO	**Causes of delay**	**1**	**2**	**3**	**4**	**5**
28	Inadequate contractor experience					
29	Contractor's poor site management					
30	Subcontractors					
31	Mistakes during construction stages					

8- Planning and Design Factor:

NO	**Causes of delay**	**1**	**2**	**3**	**4**	**5**
32	Inadequate construction planning					
33	Delay in design work					
34	Lack of design information					
35	Impractical design					
36	Lack of designer experience					

9- Managing Factor:

NO	**Causes of delay**	**1**	**2**	**3**	**4**	**5**
37	Ineligible Project Team					
38	Poor Site Management and Supervision					
39	Inaccurate time Estimating					
40	Inaccurate cost Estimating					
41	Lack of Contractor's Experience					
42	Poor subcontractors performance					
43	Inappropriate Project planning/ Scheduling					
44	Lack of communication/ coordination					

10- Project Factors:

NO	Causes of delay	1	2	3	4	5
45	Lack of feasibility Study					
46	Inappropriate Construction Methods					
47	Poor maintenance of works, materials, and equipment					
48	Variations (design change, extra work)					

11- Labor and equipment Problems Factor:

NO	Causes of delay	1	2	3	4	5
49	Labor shortage					
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12- Resource Factors:

NO	Causes of delay	1	2	3	4	5
53	Improper Material Selection					
54	Material Storage Problems					
55	Materials shortage					
56	Poor Material Management/ Late material delivery					
57	Transportation Problem of Resources					
58	Delays in the result of testing material					
59	Lack of a proper testing laboratories					

SECTION C

Effects of Construction Delays

From your experience, please evaluate and tick the quality of the following effects:

Each level illustrates the following rating:
(1) Never
(2) Seldom
(3) Sometime
(4) Mostly
(5) Always

NO	**Effect of Delay**	**1**	**2**	**3**	**4**	**5**
1	Time Overrun					
2	Cost Overrun					
3	Dispute					
4	Arbitration					
5	Litigation					
6	Abandonment					