

**T.C.
ISTANBUL GEDİK UNIVERSITY
INSTITUTE OF GRADUATE STUDIES**



**IDENTIFYING DELAY FACTORS FOR THE CONSTRUCTION INDUSTRY
OF IRAQ USING STRUCTURAL EQUATION MODELING**

MASTER'S THESIS

Salwan Majeed Ibrahim CHENANA

Engineering Management Department

Engineering Management Master in English Program

DECEMBER 2021

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Thesis Advisor: Assist. Prof. Dr. Gokhan KAZAR

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LİSANSÜSTÜ EĞİTİM ENSTİTÜSÜ MÜDÜRLÜĞÜ

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DECLARATION

I, Salwan Majeed Ibrahim CHENANA, do hereby declare that this thesis titled as “Identifying Delay Factors for the Construction Industry of Iraq Using Structural Equation Modeling” is original work done by me for the award of the master’s degree in the faculty of Engineering Management. I also declare that this thesis or any part of it has not been submitted and presented for any other degree or research paper in any other university or institution. (09/12/2021)

Salwan Majeed Ibrahim CHENANA



PREFACE

Firstly, I want to offer my profound thanks to my advisor Assistant Prof. Dr. Gokhan Kazar for the persistent support of my Master's study and conducting this research, the door to Dr Kazar was constantly opened at whatever point I ran into problem spot or had an inquiry concerning my study. He constantly permitted this reaserch to be my own Work, and guide me the correct way at whatever point he speculated I required it. Also, I would like to thank my friend Aws Maan, he always encourages me and helps me whenever I need him

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Desember 2021

Salwan Majeed Ibrahim CHENANA

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IDENTIFYING DELAY FACTORS FOR THE CONSTRUCTION INDUSTRY OF IRAQ USING STRUCTURAL EQUATION MODELING

ABSTRACT

The construction industry plays a vital role in supporting and developing the economics of countries all over the world. It deems one of the most important feeders of the national economy of the country

One of the features of fruitful administration for the development project is conveying the venture inside the particular date just as the responsibility with a dispensed spending plan with a superior grade.

Therefore, this study focuses on determining the main factors that cause a delay in construction projects in Iraq. Furthermore, this study suggested two groups of remedies aim to manage and resolve delay caused either by preventing or reducing time overrun magnitude before commencing projects and during the construction stage.

This study utilized from literature reviews conducted by other authors contributed to defining the main causes that lead to time overrun in construction projects in Iraq and other countries. The finding was 14 factors of delay considered the main delay factors that affected construction projects. Also, by conducting a questionnaire survey sent to the key parties in Iraqi construction projects (client, contractor, consultant, and others) for ranking the 14 delay factors according to their frequency of occurrence and severity. The Answers were collected from 140 experts who are professionals in construction projects.

Structural equation modeling (SEM) has been developed to analyze the data collected from the respondents to depict and quantify the influence of different causes of delay on construction projects.

Structural equation modeling (SEM) has been developed to analyze the data collected from the respondents to depict and quantify the influence of different causes of delay on construction projects.

Thus this research gives particular data to the central point that lead to postponement in development projects in Iraq. Moreover, this exploratory examination recommended two sorts of cures plans to further develop conveyance for development projects at a time.

Keywords: *Construction projects, Structural equation modeling, Time overrun, Schedule overrun, Questionnaire survey.*

YAPISAL DENKLEM MODELLEMESİ İLE İRAK İNŞAAT SEKTÖRÜ İÇİN GECİKME FAKTÖRLERİNİN BELİRLENMESİ

ÖZET

İnşaat sektörü, tüm dünya ülkelerinin ekonomilerini desteklemede ve geliştirmede hayati bir rol oynamaktadır. Ülke ekonomisinin en önemli besleyicilerinden sayar.

İnşaat projesi için başarılı yönetimin nitelik ve özelliklerinden biri, projeyi belirlenen tarihte ve taahhüt edilen bütçe ile yüksek kalitede teslim etmektir.

Dolayısıyla bu araştırma, Irak'ta inşaat projelerinde gecikmeye neden olan temel faktörleri ortaya çıkarmayı amaçlamaktadır. Ayrıca, bu çalışma, projelere başlamadan önce ve inşaat aşamasında zaman aşımı büyüklüğünü önleyerek veya azaltarak gecikme nedenlerini yönetmeyi ve çözmeyi amaçlayan iki çözüm grubu önerdi.

Diğer yazarlar tarafından yürütülen literatür incelemelerinden yararlanılan bu çalışma, Irak ve diğer ülkelerdeki inşaat projelerinde zaman aşımına neden olan ana nedenlerin tanımlanmasına katkıda bulunmuştur. Bulgu, inşaat projelerini etkileyen ana gecikme faktörleri olarak kabul edilen 14 gecikme faktörü idi. Ayrıca, anket yoluyla Irak inşaat projelerindeki kilit taraflara (müşteri, müteahhit, danışman ve diğerleri) gönderilen anket, 14 gecikme faktörünü sıklıklarına ve ciddiyetine göre sıraladı. Cevaplar inşaat projelerinde profesyonel olan 140 uzmandan toplanmıştır.

Yapısal modelleme (SEM), farklı gecikme nedenlerinin inşaat projeleri üzerindeki etkisini tanımlamak ve ölçmek için katılımcılardan toplanan verileri analiz etmek için geliştirilmiştir.

Bu nedenle bu çalışma, Irak'taki inşaat projelerinde gecikmeye neden olan başlıca faktörler için özel bir bilgi sunmaktadır. Ayrıca, bu keşif araştırması, inşaat projeleri için gecikmeden teslimatı iyileştirmeyi amaçlayan iki tür çözüm önerdi.

üzere çok çeşitli kaynaklardan kaynaklanabilir. Son olarak, çalışma, kaynak planlamasının proje başarısı üzerinde yüksek performansa sahip olduğunu, diğer iki hedefin ise Somali Hargeisa'daki özel inşaat şirketlerinin proje başarısı üzerinde düşük performansa sahip olduğunu önermektedir.

Anahtar Kelimeler: *Inşaat projeleri, Yapısal eşitlik modellemesi, Zaman aşımı, Program aşımı, Anket araştırması*

1. INTRODUCTION

TWO His chapter tries to offer the delay as an event that affects the construction industry in Iraq. Also, indicate the study focus, destinations, purposes, and the pertinence of the exploration and characterization of relations.

1.1 Background of Study

The construction industry plays a dynamic role in the economic growth of the country, the necessity of the construction industry came from the outputs and results of its exercises (Ofori, 2012). It adds to public financial advancement by giving the structures which are utilized in the creation of all products in the economy.

Moreover, the actual foundation worked through a development action, it is the foundation of the country's economy as it outlines the veins for the help of valuable development by enabling work and items to be appropriated inside and outside the locale (Ofori, 2012).

At the point when we talk about the development business or any creation area, we ordinarily need to construction or subject dependent on the factual realities which are generally finding the truth of construction industry situation, in 2020 the spokesman of the ministry of planning declared that they are more than 6000 lagging projects in Iraq according to Iraqi media network (imn) (INA, 2020), and according to (imn) the spokesman of the planning ministry mentioned this lagging project includes services project and hospitals, water, and sewage projects.

1.1.1 Delay in construction projects in Iraq

The construction industry distinguished that it seems like a small world, it depends on the numerous network of relationships dealing and interfering with each other at each period of the existence cycle for a task beginning from origination until the end. Various strengths, materials, and hardware to deliver a design or build a venture. this difference in the members need many elements to save orderly of work such as

coordinate, communicate system, powerful connections, the solid money system, etc. so, this operation of the construct will experience the ill effects of various issues and lead to tremendous harms in numerous viewpoints like morally, conservative, lawfully. Etc. in this way, it ought to be posted notices for any development projects. The cost, time, and execution of those three components are thermodynamic for any development project. Olawale and Sun (Yakubu Olawale, 2015), connected the venture execution with project control by the meaning of (APM, 2010), Undertaking control can be characterized as the utilization of cycles to gauge project execution against the venture plan, to empower fluctuations, to be recognized and amended, so that project destinations are accomplished.

Furthermore, Hayder K Aljamee et al. (Hayder K Aljamee, 2020) declared in their study The main issues in development projects in Iraq are project delay (project time overrun). Also, Al Hadithiet al. (Al Hadithi, 2018) announced that most construction projects in particular in Iraq and in the world too are experiencing a delay in execution. It could say that a venture that doesn't experience the ill effects of postponements is seldom found.

That load of realities invites us to manage the reasons for a deferral in the development business, recognize them, and resolve them.

1.2 Scope of Study

This research concentrates on the construction projects in Iraq, and the scope of this study will be the environment of the construction projects in Iraq and concentrate on the participants of the projects and normal conditions in construction sites.

As well, this research will include the contractual relationship between project parties and the external parties which play a fundamental role through the construction process.

1.3 Aims

This study aims to find the significant impact defer factors that impact the conveyance of development projects on schedule and the considering for a fact from different countries.

1.4 Objectives

The objective of this thesis is:

- 1- Recognize the main causes which lead to time overrun in the construction sector in Iraq.
- 2- suggesting the solutions that help to prevent delay before it occurs.
- 3- proposing a practical remedy that helps to reduce the effect of delay during the execution stage.
- 4- decrease the effect of delay on the construction projects.
- 5- To understand the literature reviews for different countries for the main delay causes and specify the most studies regarding the delays caused in Iraq.
- 6- Evaluate the possible opinions for decreasing the influence of the delay causes on construction projects
- 7- To provide recommendations that help to enhance the schedule for the construction industry in Iraq.

1.5 Value of Research

According to Alaghbari et al. (Alaghbari, 2007), the delay is in general known as the most well-known, exorbitant, mind-boggling, and hazardous issue face the construction projects. The previous fact related to construction performance in Iraq (more than 6000 construction project are lagging projects), indicate that there is a huge risk surrounding the construction industry in general, and the construction projects especially, also, impose more important to study the delay factors that influence the construction industry in Iraq. The contribution of the construction industry to the Iraqi economy gives worth to the study. And I hope that this study will be useful to reduce the influence of delay in time at Iraqi construction projects.

1.6 Research Structure

- **-Chapter one:** the introduction and background of study and research focus on the time overrun in the construction projects in Iraq. Likewise, the aims and objectives of this study.

- **-Chapter two:** providing information about the key themes in this study. Delay definition, types of delays, existing study about time overrun in different countries, and existing study about time overrun in Iraq.
- **-Chapter three:** discussing research methodology, also clarify research worldview, approaches, the methods utilize in executing the research besides the analyzing data.
- **-Chapter four:** providing the results of the search about the main causes of delay in the construction projects in Iraq.
- **-Chapter five:** this chapter include conclusions earned from result findings
- **-Chapter six:** offering the recommendations and the solutions which aim for improving the scheduled time for the Iraqi construction projects.

2. LITERATURE REVIEW

2.1 Introduction

One of the traits and provisions of effective administration for the development project is conveying the undertaking within the particular date likewise the responsibility with a dispensed spending plan with a superior grade. Chan et al. (Daniel WM Chan, 1997), confirmed that "delivering projects in time within the specified budget according to the quality standard that specified by the client is an indicator of successful project delivery"..

Delay in the construction industry was and still is a magnificent concern and chronic headache for all participants who are involved in the industrial realm. Not for the financial loss that occurs for the late completion of the projects but also for other consequences regarding the projects that are not accomplished in time. Arditi et al. (Arditi, 2006) mentioned that delays in development can cause various changes in a venture like late finishing, lost efficiency, speed increase, expanded expenses, and agreement end, just as the disputation between parties one of the significant items from the development delay and what will go with of notoriety influence for the organizations and customer.

In the construction sector around the world, there is struggling and it is not that easy to avoid time overrun. According to kazaz et al. (Kazaz A. a., 2012), In both creating and industrialized nations, deviation from an arranged time plan is one often experienced issue in development ventures.

Time delay in the schedule in construction projects in Iraq consider one of the major problems for the construction involver. So that it is important to define the causes that influence the time delay in construction projects .as well as describe the procedure for avoidance or decrease the effects of those causes from initiation, and then the remedies for those delay causes through the implementation. This chapter reviews literature focusing on the main delays causes and the remedies for those

causes either by keeping away from them or diminishing the impact on the task during the execution stage.

2.2 Definition of Time Overrun

Time is money, and this fact is true in a construction project, that is what Josh Johnson pointed out (Johnson, 2014) When the projects don't run on the scheduled time, the contractor suffers because his overhead and expenses increase eating into profits, and the owner suffers because he cannot open his new business on time, which causes lost profits that he could have been getting. So, it is very important to keep the projects on the critical path schedules.

Because of the necessity of the delay on the construction industry generally, because of its effect. It urges the researchers to define the delay according to their perspective so that there are a lot of definitions each one reflects aside from reality. For instance, Rao, et al. (Rao, 2014) described the delay as a late work in completion compared to the planned schedule". Also, Kaming, et al. (Peter F. Kaming, 1997) Defined the delay as an extension of time beyond planned completion dates and traceable to the contractors. Furthermore, at similar meaning but in more detail (Assaf, 2006) described the delay as "the time overrun either beyond completion date specified in the contract or beyond the date that parties agree upon for delivery of a project", Whereas Elinwa et al. (Elinwa, 2001), defined the delay as "the time lapse between the agreed estimation or completion date and the actual date".

Though, in the eightieth of the last century, Bramble and Callahan (Bramble, 1987), defined the delay as, the time during which some piece of the development project is finished past the undertaking fruition date or not proceeded as arranged because of an unexpected situation of fulfillment.

In that way, the delay for a construction project could be clarified by the required time to be added to the planned duration to complete the remaining tasks of a project which is in optimistic situations complete those activities through the planned duration.

2.3 Delay Types in Construction Projects

Delays in construction projects are normal since construction projects are muddled, have multiple activities, also contain many different elements. Everyone has to be working together smoothly to avoid delays. Nevertheless, the delay types at any construction project in any country are mostly the same but the classification for those types depends on the elements of the project, those elements cause a delay directly or indirectly. In other words, the responsibility for the delay who deserves compensation from those types? and who is worthy to be compensated? In return, who might be responsible for the consequences? liquidating damage in case of the client. or compensation in the case of the contractor. furthermore, which of those types request an extension in work duration.

Generally, to recognize the types of delay we should recognize the prospect source that might may be the cause. Those sources of delay could not accede to those probabilities.

Firstly, if the reason of delay from the project parties (the client or who behalf, the contractor or who behalf).

Secondly, if the reason of delay from out of control of the project parties and this typically happens as a result of human decisions like government decisions, fluctuation in the market, etc.

Thirdly, if the reason for delay from the environmental or natural conditions is not related with the power of the project parties like weather, unforeseen and unpredicted site obstruction... etc.

These three points mentioned above are entirely according to the language used in the construction contract according to josh (Johnson, 2014).

2.3.1 Excusable delay

There is no responsibility for the contractor for the time overrun. Usually, the reason for this delay comes from either client or who's behalf, an unpredicted and unexpected situation that affects the duration of the plan. The compensation to the contractor could be just time extensions, or the contractor might have compensated as well as extended time for the compensable delay which the client or who on behalf caused this delay directly.

2.3.2 Inexcusable delay

The contractor is reliable for the schedule delay. The contractor or who behalf in this case either fails to predict or did not take in his consideration what is deemed reasonable delays factors at an early stage of the project or during the work, also the lack of preparation could be part of these delay factors. Therefore, the responsibility rests with the contractor, and hence the contractor request time extension or additional compensation, on the contrary, the client in this case has the right to liquidate damage.

2.3.3 Concurrent delay

Where the client and the contractor are sharing the liability in this case. The contractor in this case perhaps obtain a time extension but without any compensation. Josh (Johnson, 2014), in his study, declared that all the types of delay mentioned above consider usual, and in the fact, the consequences of the delay depending on the contract between the parties.

2.4 Existing Studies for The delay in The Construction Projects

"The problem of delays in construction projects is a global phenomenon" (Kog, 2018). Therefore, the factors that cause a delay in the construction industry all over the world are similar, but the effects of those factors vary from one spot to another. That is what kog (Kog, 2018) Counted on in his article on the Practice Periodical on Structural Design and Construction in 2018, as well as shebob et al. (Shebob, 2012) made a comparison for the influence of the same factors of delay between the UK and Libya. So, what could be a minor factor of delay in a specific country is considered a major factor of delay in another country and so on.

Nevertheless, generally, there is a recurring set of causes that could be the main reasons for the delay in construction projects all over the world, those causes set could be illustrated on different construction projects in various countries.

2.4.1 Delay factors in construction industry in Turkey

The study conducted by Gündüz et al. (Murat Gündüz, 2013), to discover the major factor that affects time overrun in construction projects in Turkey, the study took place in Turkey, by a questionnaire filled by 64 professionals in the construction

industry. According to (Murat Gündüz, 2013) the results for the questionnaire conducted illustrated the major factors that affect the schedule for the projects in turkey. The result declared, there are 15 different main delay causes in construction projects in turkey. The respondents to the questionnaire chose these delay causes as the main causes of delay that affect the construction projects.

Table 2.1 shows the summary of the findings that conducted by Gündüz et al. (Murat Gündüz, 2013). The main ten factors delay causes in Turkish construction projects.

Table 2.1: The major ten delay factors that lead to a delay in the construction projects in Turkey

No	Most important factors causing delay	Factor group	Rank
1	Lack of contractor experience	Contractor related	1
2	Ineffective project planning and scheduling	Contractor related	2
3	Poor site management and supervision	Contractor related	2
4	Design change by agent or owner through the construction	Design Related	4
5	Late delivery for materials	Material related	5
6	unreliable of subcontractors	Contractor related	6
7	Delay in testing and inspection	Consultant Related	7
8	unskilled workers	Labor-related	7
9	Changing orders	Owner Related	9
10	Delay in site delivery	Owner Related	9

Source: (Murat Gündüz, 2013).

This study that concerned with the effect of the major factors on construction projects in Turkey showed that the first factor of delay is inadequate contractor experience. As well as, ineffective project planning and scheduling deem one of the main factors that affect time overrun, also Poor site management, supervision, changing the Design by owner or agent during construction respectively. All those factors cause influence negatively the execution of the project in Turkey. The study also declared other factors of delay which classified as the least important effect on construction schedule in turkey, like, slow site clearance, loss of time into traffic, disputes between workers, strike, ineffective using of advanced software for engineering design, Changes in regulations and laws of the government...etc.

2.4.2 Causes of delay in gas pipeline projects in Iran

This study was accomplished by Fallahnejad (Fallahnejad, 2013) to identify the causes of delay in gas pipelines projects, by investigating 24 projects of the gas

pipeline that have been executed by NIGC (National Iranian Gas Company) from 2004 to 2011. The mechanism of the study was through two phases, the first one was done through interviews with ten professionals like international procurement managers, project managers, contract managers, legal experts, and financial managers. The result of the interviews was a list of 43 delay factors. Among the factors of delay included in the list were Unrealistic project durations imposed by the client, Delays in contractor's payment by client, Frequent change of client managers, Inadequacy of incentives for early activities, or delay penalties, Slow land seizure because of opposition from occupants...etc.

to rank the list that contains 43 factors that contribute to delay on executed gas pipelines as (Fallahnejad, 2013) mentioned, 52 questionnaires were sent to three groups, including client, contractor, and consultant.

According to Fallahnejad (Fallahnejad, 2013) Table, 2.2 illustrates the final result of the most important delay causes of executed gas pipelines in Iran.

Table 2.2: The ranking of the most important ten factors that affected gas pipelines in Iran

No	Main causes of project delay	Rank
1	Lack of ability of contractor for providing imported material	1
2	Unrealistic project durations imposed by the client	2
3	Slow delivery of material by the client	3
4	Slow land seizure because of opposition from occupants	4
5	Chang orders	5
6	Type of project bidding and award	6
7	Delays in contractor's payment by client	7
8	Obtaining permits from governmental organization	8
9	Delays in suppliers and subcontractors' work	9
10	Contractor's poor cash flow management	10

Source: (Fallahnejad, 2013)

So the major causes effect time overrun on gas pipelines projects in Iran represented by imported materials, unrealistic project duration, client-related materials, land expropriation, change orders, contractor selection methods, Delays in contractor's payment by a client, obtaining permits, Delays in suppliers and subcontractors' work and contractor's cash flow respectively. Moreover, the study pointed out the causes of delay that categorized the least important like Labor problems, Changes in-laws and regulations, Vandalism, Accidents during construction... etc.

2.4.3 Delay factors on the construction industry in Jordan

This study was conducted by Ashraf Samarah et al. (Ashraf Samarah, 2016) to identify the delay causes on construction projects in Jordan. The questionnaire was conducted with the participants of the project which included contractors, consultants, and owners.

According to Ashraf Samarah et al. (Ashraf Samarah, 2016), the ranking of ten causes factor that influences the construction industry in Jordan are shown in table 2.3.

Table 2.3: The ranking the most important ten factors effected of construction projects in Jordan

No	Cause of Delay	Rank
1	Lack of management and supervision by the contractor	1
2	Client's changes of the design	2
3	Inadequate planning and control by the contractor	3
4	Using the lowest bid that leads to low performance	4
5	Change in project scope	5
6	Blunders in contract documents and design	6
7	Client delay in progress payments	7
8	Construction errors	8
9	Design change	9
10	Ineffective productivity	10

Source: (Ashraf Samarah, 2016)

We could notice from table 2-3 above that lack of management and supervision by the contractor came the first place of importance for the factors face schedule overrun on Jordan's construction projects, as well as changing the design from the Client, lack of planning and control by the contractor of the project, Utilizing most reduced bid that leads to low execution respectively, furthermore, Change in project scope, Blunders in contract documents and design, client delay in Progress payments, construction errors, ineffective productivity and design Change in the respectively.

2.4.4 Delay factors on the construction sector in the UAE

This study was conducted by ARSHI SHAKEEL FARIDI et al. (Arshi Shakeel Faridi, 2006). The contractors and the consultants were selected as the environment for this survey. The 8 groups (consultant, contractor, owner, designer, planning and scheduling, financial, government regulations, contractual relationship, unforeseen

conditions) for factors of delay include 44 different reasons of delay used to figure out which 10 major factors that cause time overrun in the construction industry. After that 93 responses ranked the causes of delay by defining them with (very important, important, less important, and not important). The findings of these studies show the major ten factors effect on construction projects schedule.

Table 2.4 illustrates the major ten factors which affect construction projects in the UAE (Arshi Shakeel Faridi, 2006)

Table 2.4: The Main ten causes of delay in the UAE

No	Cause of delay	Rank
1	Delay in preparing and approving the drawings	1
2	Lack of early planning of the project	2
3	The delay of the owner decision	3
4	Lack of manpower	4
5	Poor supervision and poor site management	5
6	Productivity of manpower	6
7	The skill of manpower	7
8	Non- availability of material on the time	8
9	Obtaining approval from the authorities	9
10	Financing by the contractor during construction	10

Source: (Arshi Shakeel Faridi, 2006)

It is apparent from this study that the major delay factor in the construction projects in the UAE is related to delay in preparing and approving the drawings also the inadequacy of planning for projects, however, the responsibility of delay because of owner decisions deems one of the major delay factors in the construction projects, as well as lack of manpower, poor supervision, and poor site management, Productivity of manpower, the skills of manpower, non-availability of material on the time, obtaining approval from the authorities, financing by the contractor during construction, all these mentioned delay factors considered the most important causes of schedule time overrun on the construction projects in the UAE.

2.4.5 Delay factors of construction projects in Malaysia

This study was conducted by Wa'el Alaghbari et al. (Wa'el Alaghbari, 2007) to identify the major causes of delays in construction projects in Malaysia. The questionnaire consisted of 31 factors which were grouped into four major groups by responsibility (contractor factors, owner factors, consultant factors, and external

factors). The respondents include contractors, consultants, developers, subcontractors, engineers, and architects who were involved in the system of building construction projects. A total of 450 questionnaires were distributed by post and 78 samples were collected from the survey. That the 78 questionnaires sampled, 37 % were from contractors, 40 % were from consultants, and 23 % were government bodies and developers. According to Wa'el Alaghbari et al. (Wa'el Alaghbari, 2007), the final result of the ranking of the most ten factors of delay in building construction projects is illustrated in table 2.5.

Table 2.5: Most important ten factors causing delay in building construction projects in Malaysia

Causes of delay	Rank
Economic problems and financial difficulties (related to the owner)	1
Financial problems (related to the contractor)	2
Late supervision and late in making decisions	3
The slowness for giving instructions	4
Lack of materials	5
Poor site management	6
Materials shortages on site	7
Mistakes in construction	8
Delay in delivery of materials	9
Slow in making decisions	10

Source: (Wa'el Alaghbari, 2007)

It's obvious to notice that the contractor can be considered as being mainly responsible for factors that result in the delay of construction projects. Five of the top ten factors that cause a delay in construction projects belong to the contractor's responsibility, like financial problems, poor site management, materials shortages on-site, mistakes in Construction, and Delay in delivery of materials, respectively. As well as two delay factors related to the owner responsibility, like economic problems and Financial difficulties and Slow in making decisions. Furthermore, two delay factors belong to consultant reliability like late Supervision and slowness in making decisions and being Slow to give instructions. Moreover, one delay factor related to external factors is the Lack of materials on market.

2.5 Main Factors Cause Delay on the Construction Industry in Iraqi Construction Studies

In the study presented by Hayder K Aljamee et al. (Hayder K Aljamee, 2020), to recognize the cause of schedule overrun in projects in Iraq, by taking a development project in the petrol business as a contextual analysis with the goal that it can recognize the reasonable reasons for project issues (Hayder K Aljamee, 2020), a questionnaire conducted with professional engineers, project managers, and department managers, asking about the root causes of delays in Iraqi construction projects, The data were gathered from the respondents whom specialists are consultant, client, and contractor.

Table (2.6) clarified the ten root causes factors of delay that face construction projects.

Table 2.6: Ten roots causes factors of delay that face construction projects in Iraq

Rank	The root causes of project delay
1	Contractor approves the lowest bidding price
2	Financial difficulty from the contractors
3	Unused software programs
4	Frequent official and unofficial holidays
5	Poor project management planning
6	Delay in importing materials
7	Lack of workers working with the contractor
8	Wrong project duration
9	Delay in decision-making by client
10	Inadequate numbers professional (contractors, sub-contractors, and vendors)

Source: (Hayder K Aljamee, 2020)

From the table (2.6) we could notice that the root factors that influence the construction projects in Iraq conducted by Hayder K Aljamee (Hayder K Aljamee, 2020) are contractor approves the lowest bidding price, contractors financial difficulty, unused software programs, frequent Official and unofficial Holidays, insufficient planning of project management, delay in Importing materials, lack of workers working with the contractor, wrong project duration, Delay in decision-making by a client, Inadequate numbers professional (Contractors, sub-contractors and vendors), respectively.

Furthermore, Bekr, (Bekr, 2015) carried out his study to identify the major delay factors in public projects in Iraq, the questionnaire conducted was divided into three parts. The main part focused on the causes of delays in construction sites. The questionnaire was sent to 300 professionals (100 clients, 100 contractors, 100 consultants,) the respondents were 134 (43 clients, 45 contractors, 45 consultants).

The ten most important factors affect the construction projects in Iraq according to Bekr (Bekr, 2015) shown in table (2.7).

Table 2.7: Ten most important factors affect the construction projects in Iraq

Rank	Cause of delay
1	Security measures
2	changing the regulations by the Government
3	Official and non-official holidays
4	choosing lowest bidder contractor from tendering system
5	Design changes by the owner
6	change the Design from consultant
7	Delay in progress payments by the owner
8	Problems with the local community
9	Owners' lack of experience in construction
10	local or global Economic conditions

Source: (Bekr, 2015)

It is apparent that from the table (2.7), the first most three important delay factors which security measures, changing the regulations by the Government, and Official and non-official holidays, respectively, are not due to any of the project parties, but because of the governmental regulation and legislation and because of the administrative and security system. Also, the eighth and tenth factors which are problems with the local community and local or global Economic conditions, respectively, are due to reasons that are out of the project parties' control. But the other causes of delay like choosing lowest bidder contractor from the tendering system, Design changes by the owner, Delay in progress payments by the owner and Owners' lack of construction experience belonging to the client, and some delay causes came from the consultant like changing the Design from a consultant. Nevertheless, what sparks attention in the study in the ten most important delay

factors influence the construction project there is no mention of any cause of delay belonging to the contractor, however, in the study conducted by Bekr (Bekr, 2015) there are some delay factors because of lack of competence of the contractor like unqualified contractor's technical staff. Etc.

Moreover, Mohammed et al. (Mohammed, 2017) conducted a study to recognize the key factors that cause time overrun in the construction projects in Iraq, by conducting the questionnaire to a set of experts working in the construction sector in Iraq. The questionnaire form consists of seventy-eight (78) causative factors collected from previous studies distributed to the eight origins groups (client, designer, materials, equipment, manpower, and external). The result of the questionnaire represents the essential causative factors on schedule overrun in construction projects, Tables (2.8) clarify the ten key factors that influence the construction projects in Iraq (Mohammed, 2017).

Table 2.8: Ten key factors that cause delays in the construction projects in Iraq

Rank	Key Factors of delay	Effect level
1	Inadequate financial capacity from contractors.	Very high
2	Inadequate financial allocations.	Very high
3	Contracting with an incompetent contractor.	Very high
4	Delay in progress payments by the client	Very high
5	unskilled design team	Very high
6	Poor management and supervision at the site.	Very high
7	design change	Very high
8	Poor planning and scheduling of the project.	Very high
9	Stop the work in the project	high
10	The mismatch between the designs drawings and BOQ.	high

Source: (Mohammed, 2017)

The ten key factors mentioned in table (2-8) represent the major factors of delay as indicated by respondents through the questionnaire for the eight groups conducted by Mohammed et al. (Mohammed, 2017).

As well as the study conducted by Al Hadithi (Al Hadithi, 2018). This investigation did to recognize the reasons for time overwhelm in parkway development projects in Iraq, Data was gathered utilizing polls that were appropriated to the key task members; workers for hire, proprietors, and specialists. The respondents made up of 28 workers for hire, 6 experts, and 13 proprietors were addressed by the General

Authority for Iraqi Roads and Bridges. The finding of this study which was carried out by Al Hadithi (Al Hadithi, 2018) illustrated the delay causes of construction projects in Iraq. Table (2.9) clarified the ten main causes of delay.

Table 2.9: The delay causes of highway construction projects in Iraq

No	Cause of delay	Rank
1	The monetary emergency for the country	1
2	Political decisions and political realities	2
3	Income issues looked by the project worker	3
4	Change in the agreement by the proprietor during the development cycle	4
5	Delay in monthly payments of contractor	4
6	Insufficient and incomplete feasibility studies	4
7	Postponements in the trial of material of and getting the outcomes	7
8	The impacts of climate, downpour and high temperatures	8
9	Insufficiencies in offering by workers for hire/making calling them to explain it in the phase of the honor of the agreement	9
10	Delay in activities during implementation	9

Source: (Al Hadithi, 2018)

This study deems the latest among the reviews related to deferring factors in Iraq. The findings of the study declared that The monetary emergency for the country, political decisions and political realities, cash flow problems faced by the contractor, and Insufficient and incomplete feasibility studies effect negatively on the delivery of highway construction projects in time.

2.6 The Common Delay Factors in the Studies Carried Out for Construction Projects in Iraq

The outline of the past investigations that recognized the central point which led to the time invade of the development business in Iraq portrait the mutual factors among those studies.

Table 2.10: The main factors that cause time overrun in construction projects in Iraq

No	Factor	(Bekr, 2015)	(Hayder K Aljamee, 2020)	(Mohammed, 2017)	(Al Hadithi, 2018)
1	The financial difficulty of the contractor		√	√	√
2	Frequent Official and unofficial Holidays	√	√		
3	Poor project management planning		√	√	√
4	Design changes	√		√	√
5	Delay in progress payments by the owner	√		√	√
6	Contracting with an incompetent contractor		√	√	
7	Use ordinary paperwork more than software programs		√		
8	Mistakes in estimating project duration		√		
9	Government change of regulations and bureaucracy	√			√
10	The economic crisis of the country	√			√

The observed from the table (2.10) that the most common factors of delay a chronic problem that influences the construction projects in Iraq are the financial difficulty of the contractor, Poor project management planning, Design changes, and progress payments by the owner. To a lesser extent Frequent Official and unofficial Holidays, Contracting with an incompetent contractor.

2.7 The Common Delay Factors in The Studies Conducted in Different Countries

Table (2.11) summarize factors of delay that affect the duration of the project in construction projects in different countries around the world.

Table 2.11: The common main factors that cause time overrun in construction projects in different countries

No	Factor of delay	Turkey	Iran	Jordan	UAE	Malaysia
1	Financial problems (related to the contractor)		√		√	√
2	Design change	√	√	√		
3	Late delivery of materials	√	√		√	√
4	Poor site management	√	√		√	√
5	Slowness in making decisions				√	√
6	Delay in site delivery	√	√			
7	Construction mistakes and defective work			√		√
8	Unqualified of workers	√			√	
9	Lack of early planning of the project	√		√	√	
10	Financial difficulties and economic problems (related to the owner)					√

The most common delay factors for different countries represented Late delivery of materials, poor site management, to a lesser extent, Financial problems (related with the contractor), design change, lack of early planning of the project, slowness in making decisions, delay in site delivery, construction mistakes and defective work, unqualified of workers.

2.8 Summary of the Existing Studies

It is unmistakably that there are similar lodge postpone factors which are much of the time happening on the development projects in Iraq and different nations throughout the planet, however in an alternate request. The avocation of that is the variety in the degree of advancement of those nations in the development business.

Generally, the normal delay factors paying little mind to the positioning could consider the significant defer factors in the development projects in Iraq depending on the current investigations that distinguished the postpone factors in Iraq just as the current examinations from various nations throughout the planet.

Table 2.12: The most common factors of delay for construction projects between Iraq and other countries from other studies

No	Delay factor	Rank
1	Poor project management planning	1
2	Financial problems	2
3	Design changes	3
4	Delay in progress payments by the owner	4
5	The economic crisis of the country/related to the owner	5

It is apparent from the aforementioned that poor project management planning and the financial problems are the most common delay factors between Iraq and other countries, and design changes are also an essential factor that influences project overrun, to a lesser extent delay in progress payments by the owner as well as the economic crisis of the country related with the owner appear as most common delay factors between Iraq and other countries.

2.9 Research Gap

Most of the researchers that investigated the delay factors which face the construction projects in Iraq conducted survey analysis by particular methods but there is a lack of studies that adopted a structural equation modeling method in results analysis.

In this study, the data gathered from the survey will be analyzed by structural equation modeling via SPSS software.

3. RESEARCH METHODOLOGY

3.1 Introduction

This research was meant to find the central point which cause the time to overwhelm in the development business in Iraq. This section will explain the philosophy of examination utilized in this investigation and distinguish the objective of this investigation likewise this part will depict the research area, poll plan, and survey content. The primary topics in this section are research methodology, research plan, and information assortment.

3.2 Research Strategy

Kothari in his book (Research methodology: Methods and techniques) characterize research techniques as " that load of strategies utilized by the analyst throughout contemplating his exploration issue " (Kothari, 2004). While S.G NAOUM (Naoum, 2012), Characterizes research procedures as to how the exploration destinations can be addressed.

As a general rule, there are two primary sorts of exploration systems which are subjective and quantitative techniques. As indicated by Bell in his book (Doing Your Research Project: A guide for first-time researchers) qualitative method tends to be interested to understand individual's perceptions of the world (Bell, 2014), on the other hand, he defined quantitative method in the same book as collect facts and study the relationships of one set of facts to another, also (Naoum, 2012), described the quantitative research as an investigation into a social or human issue.

the strategy that followed in this research relied on the qualitative and quantitative method by exploring the assessments of the development specialists in Iraq about what they accept about the central point create a setback for the development projects in Iraq.

3.3 Research Design

According to Martin Terre Blanche et al. (martin terre blanche, 2006), Research design is an essential system for the activity that fills in as a scaffold between research questions and the execution or execution of the examination. Furthermore, Creswell (Creswell, 2009) defined research designs as plans and techniques for research that length the choices from wide suspicions to expounded strategies for information assortment and examinations. Also, Ritchie et al. (Ritchie, 2013), alleged that " A decent subjective exploration study configuration has an unmistakably characterized reason, wherein there is a soundness between the examination questions and the techniques or approaches proposed, and which produces information which is legitimate and dependable".

So plan for the exploration to get legitimate and solid outcomes. This exploration intended to discover answers to the accompanying examination questions:

- What are the issues that this investigation center around and attempt to determine?
- At which place this exploration will happen?
- At which area this exploration will incorporate?
- Who will be involved in this study?
- What is the data anticipated from this examination?
- Who will profit from this study?
- How address the results?
- What is the technique that will follow to accomplish this examination?

In return, it is important to forecast the obstacles that could face the study, those obstacles clarified by Creswell (Creswell, 2009) by recognizing the benefits and hindrances for both exploration techniques, and suggesting that sometimes both methods approaches are inadequate to optimal understanding. By using both approaches could be the solution. As well, Creswell (2009, pp.18) recommends that quantitative methodology is smarter to recognize the variables which sway the result. As previously mentioned, the two methodologies utilized in this investigation to accomplish more precise outcomes.

3.4 Procedures

This research was conducted by gathering information for the construction factors of delays from a set of professionals who are involved in the construction sector. This assortment of the professionals who responded to the questionnaire survey gives the investigation the central hotspot for building up a clear vision of the significant postponed factors in the Iraqi development industry. Those specialists running various jobs in the development field differ from project directors, a worker for hire, engineering, and amount assessor. The experience a very long time for those who partake. Likewise, the significant job in the development for those specialists' changes from structures, common, streets, mechanical and electrical...etc.

3.4.1 Literature review

Creswell (Creswell, 2009), identified the objective of the literature review, "the writing survey achieves a few purposes. It imparts to the peruser the consequence of different investigations that are firmly identified with the one being attempted ". Furthermore, the literature review is a cumulative building that you could build upon what the others built. According to Nkhata (Nkhata, 1998), this technique developed it on what has been set up by others. Likewise, one of the benefits of relying upon past investigations is to feature the crucial issue which needs to emphasize. According to Denscombe (Denscombe, 2003), at the point when he recommended that past investigations, explores and past speculations give the way to choosing which elements of examination warrant the focal point of consideration.

The first stage of initiating this search included gathering data from varied resources such as books, science journals, and web databases. The search aimed to identify the main factors of delay in construction projects in Iraq in particular and in the world generally, is intended to find the commonsense answers for addressing the postponement in development projects. More than 30 varied articles contributed as a data source in this pursuit, every one of them related straightforwardly to the defer factors in development undertakings and impact of the time invade just as the result of postponed projects conveyance. Bryman (Bryman, 2008), refers to the fact that literature review helps to the interpretation of the research findings.

3.4.2 Questionnaires

Roopa et al. (Roopa, 2012), described the survey by questionnaire as a progression of inquiries posed to people to get genuinely helpful data about a given point. Thus, the questionnaire pointed toward gathering the essential information about the significant factors of delay that face the construction industry in Iraq, as well as figuring out the suggestions from the respondents about the solutions for tackling the timetable time invade, in addition, to discover the best strategies to keep away from delay in development in Iraq. The respondents were picked in a manner to guarantee the distinction of assessments about factors of delay, different specializations such as civil, mechanic, electric. And these various specializations include the consultant, contractor, and client.

3.4.3 Pilot study

Roopa et al. (Roopa, 2012), refers to a pilot review as A fundamental piece of examination directed before a total study to test the viability of the exploration strategy. Also according to Bell (Bell, 2014), the pilot study is all information gathering instruments ought to be directed by testing what amount of time it requires for beneficiaries to finish them, to watch that all inquiries and guidelines are clear and empower you to eliminate any thing which doesn't yield usable information ". Along these lines, the gathering of the inquiries for the survey was ready and planned by the data gathered from writing audits and different documentations, for example, diary articles and papers, then, at that point introduced to the research supervisor additionally those inquiries tried a few the respondents. All notes were taken into consideration about the appropriateness of the inquiries and the ideal opportunity for answers likewise explain of guidelines next to explain of the importance and the point of the inquiries. Furthermore, notes from the research supervisor about practical solutions for project delivery in time. All the recommendations and corrections had been considered and changes take place to the questions of the questionnaire.

3.5 Validity and Reliability of Research

Roopa et al. (Roopa, 2012), defined the research validity as how much a poll estimates what it was planned to quantify. however, Sapsford et al. (Sapsford, 1996),

mentioned that validity of research is a plan of examination to give valid ends whether the proof which the exploration offer can endure the heaviness of the understanding that is put on it. According to CRESWELL (Creswell, 2009), for expanding the legitimacy of the exploration it very well may be taken on triangulation procedure that is utilized to demonstrate that the more than one strategy, used in the examination. This examination depended on various wellsprings of information, the first is a writing survey and the subsequent one is a poll directed by respondents to surety the legitimacy of the investigation.

In return Bell (Bell, 2014) defined reliability of the study as extend to which a technique or test produces the same result under consistent conditions on all events. Moreover, Roopa et al. (Roopa, 2012), declared that reliability alludes to the degree to which an estimation gives predictable outcomes. As well as (Yin, 2009), portrayed the reliability of the exploration when two specialists get similar ends by following a similar contextual analysis plan. According to Suhr (Suhr, 2006), Confirmatory Factor Analysis permits the scientist to test the theory which a connection between the noticed factors and their fundamental inert construct(s) exists. The analyst utilizes observational exploration, information on the hypothesis, or both, proposes the relationship design deduced, and afterward tests the speculation genuinely.

Using of Confirmatory Factor Analysis could be affected by:

1. The examination theory being trying.
2. The prerequisite of adequate example size
3. Multivariate ordinariness.
4. Measurement instruments.
5. Outliers.
6. Parameter distinguishing proof.
7. Missing information.
8. Interpretation of model fit records. (Suhr, 2006).

This study used confirmatory factor analysis to check research reliability.

3.6 Sampling

The people who are involved in the construction sector in Iraq are numerous and varied in terms of specialization included consultants, contractors, clients, subcontractors, and suppliers...Etc. thus, it is not that easy to gather data from all those involved. so, it is important to choose a sample from this field to collect suitable data for the study. Walliman (Walliman, 2011), defined sampling as the operation of choosing a solely little gathering from a huge gathering. So, the followed procedure of choosing the populace to direct questionnaire survey for this study depends on the draw in the primary development projects partners like contractor, client, consultant and project manager, also the academic professionals. The operation of selecting the group of the sample considered the variance in the role of those participates in the construction realm.

3.7 Data Analysis

Previous studies that recognized delay causes did not examine how varied causes work together to affect project schedule time overrun. The method that is used in this study is structural equation modeling (SEM). According to Molenaar et al. (Keith Molenaar, 2000), SEM is viewed as an augmentation of standard regression demonstrating used to manage inadequately estimated autonomous factors and is unmistakably appropriate for some, research issues in the field of development designing and the executives. Kline (Kline, 2005), clarified that (SEM) could be utilized to portray the connections between two kinds of variables, which are latent (not directly measured) and observed (directly measured). The structural equation modeling method comprises two procedures, and those procedures are and structural component and measurement component (Byrne B. M., 1994). According to Islam et al. (Mainul Islam, 2005), the structural component points out relationships between latent variables while the measurement component identifies how latent variables are estimated in terms of observed variables.

Table (3.1), below clarifies data analyzing methods that were used in previous studies related to identifying the main factors of delay in the construction industry in Iraq from 2105-2020.

Table 3.1: Data analyzing methods that used in previous studies related to recognizing the main delay factors in the construction industry in Iraq from 2105-2020

Title of Related studies	Causes of Delay in Public Construction Projects in Iraq	Study and Analysis of the Delay Problems in Iraqi Construction Projects	The benefits of applying project management methodology to project Delay: A study in construction projects in Iraq	Controlling of Time-Overrun in Construction Projects in Iraq	An investigation into factors causing delays in highway Construction projects in Iraq
Data analyzing method	Statistical techniques and indices	Calculating The arithmetic mean and standard deviation	Statistical techniques and indices	Calculating The arithmetic mean and standard deviation	Calculating Frequency Index, Spearman's rank correlation

3.8 Scope and Limitation of the Study

In the construction industry, there are a lot of causes that affect the construction projects throughout the world in general and in Iraq in particular. those causes have different effects on the construction projects. This study concentrates on the main factors of delay that habitually happen and affect the construction sector in Iraq. during this research, there were restrictions by unwilling experts to respond to the survey questionnaire.

3.9 Summary

This chapter demonstrates the research methodology carried out in this study by defining the strategy of this study that portrays the path to find the answers to the questions. the other subject in this chapter was research design by utilizing the required plan to translate the assumptions to elaborated methods. The other subject was to select the systems for gathering data from the literature review and questionnaire survey, as well as clarify the pilot study for the questionnaire. The sections followed illustrated the validity and reliability of this research also clarify the sampling process and the technique for analyzing data. Finally, showing the scope and limitations of this research.

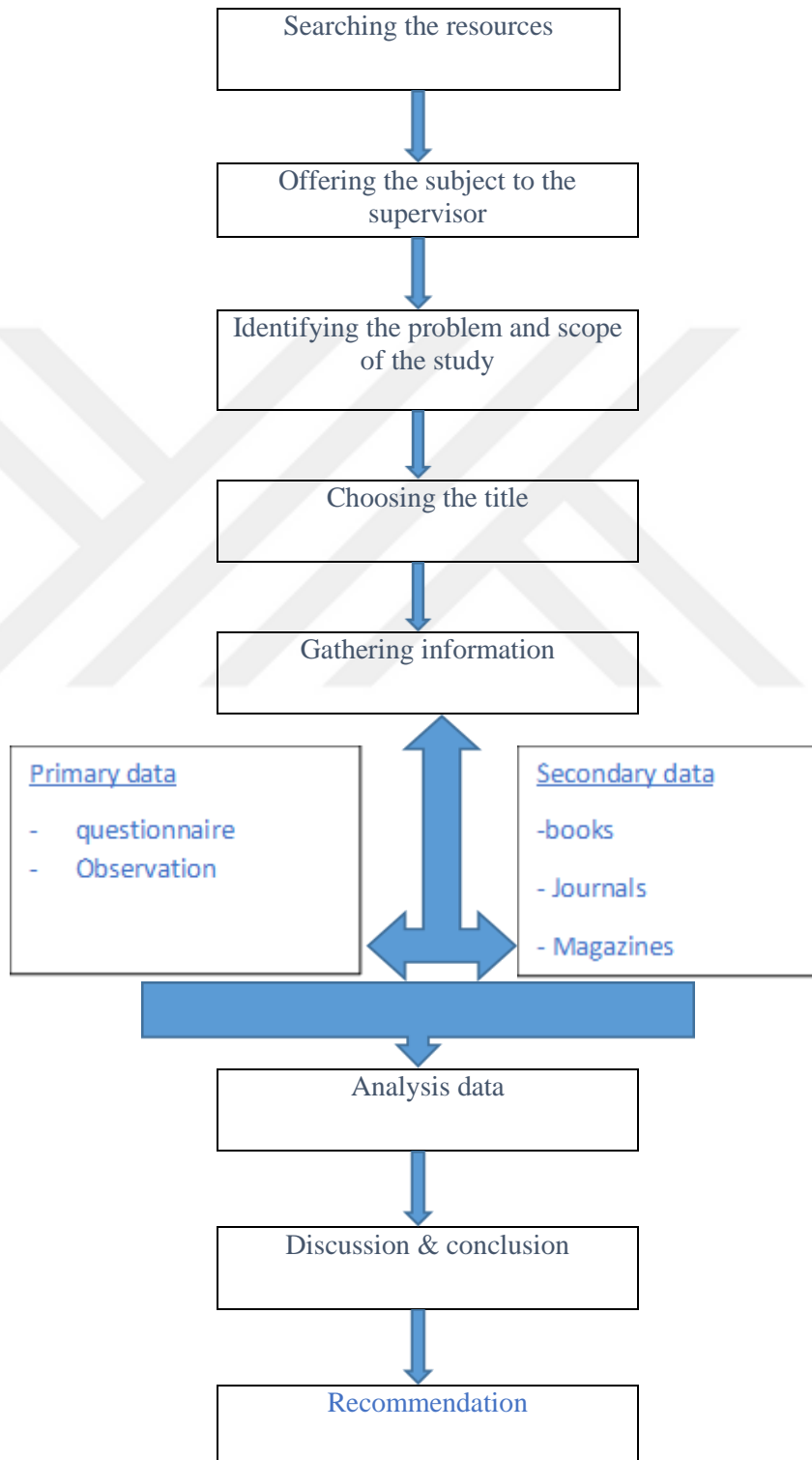


Figure 3.1: Flow chart clarifies the methodology of the research

4. RESULTS AND ANALYSIS

4.1 Introduction

The purpose of this chapter is to show the finding and results of the study for the main factors of delay that affect the Iraqi construction projects. As well, this chapter clarifies the main factors of delay for varied countries mentioned in the literature review compared with the main factors of delay in Iraq. Also, this chapter shows the data analysis gained by a questionnaire sent to professionals in the construction site in Iraq which represents respondents' experience and contractual methods they dealt with. Also, this chapter presents the other findings which are the proactive practical remedies before executing the project and the practical remedies through the execution phase.

4.2 Sample Description and Representative

The entire size of sample for this study is by 140 professionals in the Iraqi construction sector, who respond to the survey conducted by questionnaire to the main construction projects experts in Iraq. those participants have different roles in the construction field, like a client, consultant, and contractor, also they are working in the public sector, private sector, and both sectors together.

4.2.1 Respondents work sector in construction projects

The states of survey that the expert respondents are involving these sectors in construction projects which are clarified in figure 4.1.

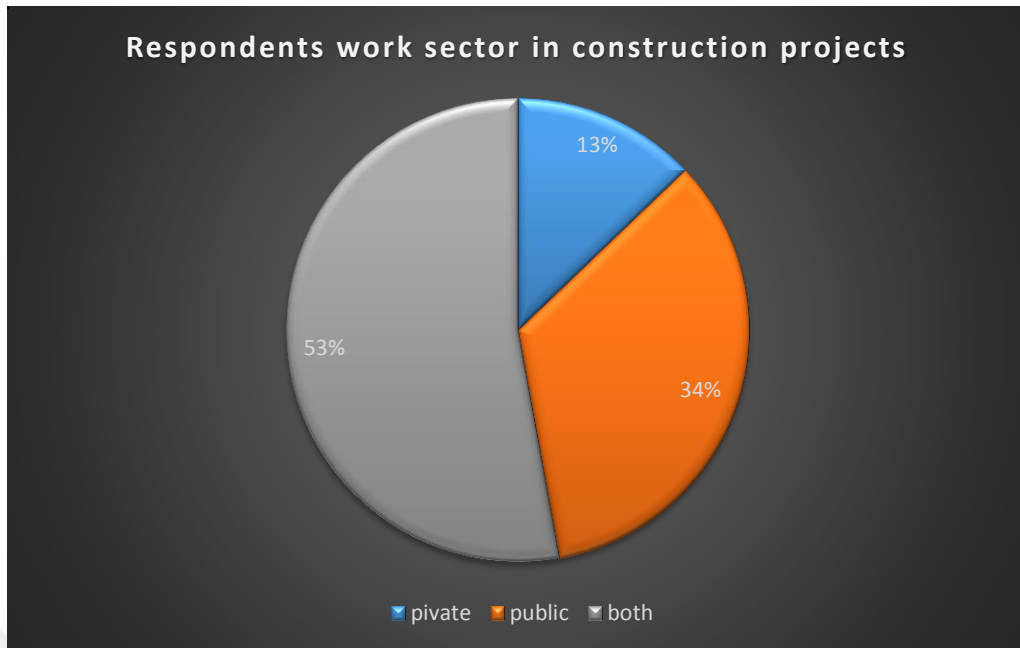


Figure 4.1: Pie chart shows the respondents' work sector in construction projects

Figure 4.1 portrait the sector of the respondents which they involved in construction projects, there were 48 experts which represent 34 % of the respondents working in the public sector, while the great percentage of the respondents who respond to the questionnaire which is 53% are working in both sectors (public and private), moreover 13% of the respondents are working in the private sector.

4.2.2 The experience years for the respondents in the construction sector

Figure 4.2 below shows the experience years for the respondents in the construction sector. The figure clarifies that the great percentage of the respondents which is 34% have experienced between 15-20 years, whilst 29% of the respondents have experienced more than 20%, also 21 % of the respondents have experienced below than 10 years, in return, 16% of the respondents have experienced between 10-15 years.

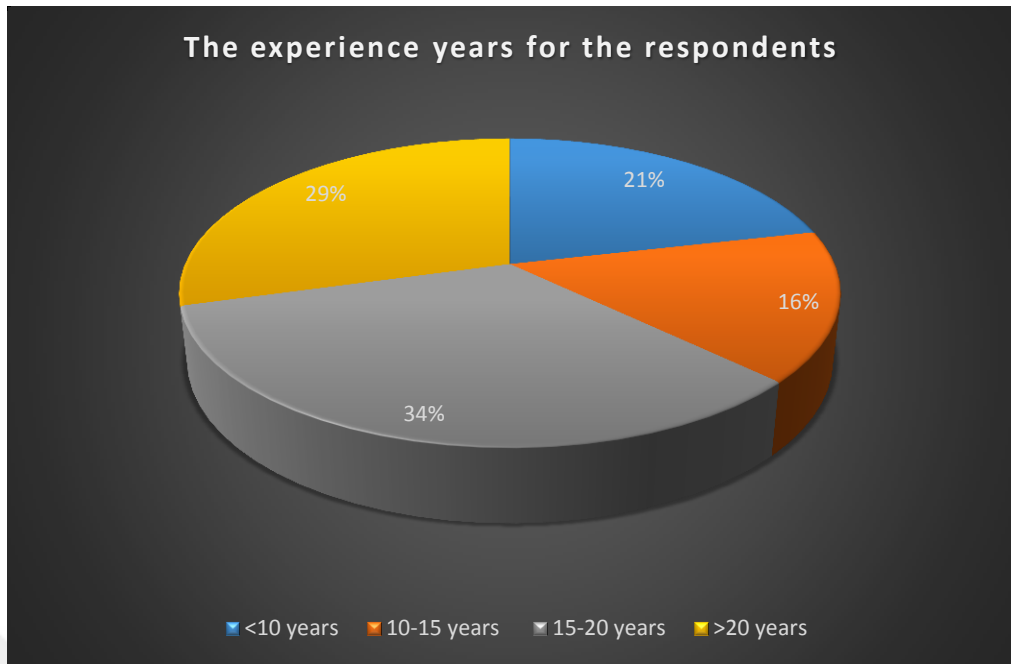


Figure 4.2: Pie chart shows the experience years of the respondents

4.2.3 Business of the respondents in the construction sector

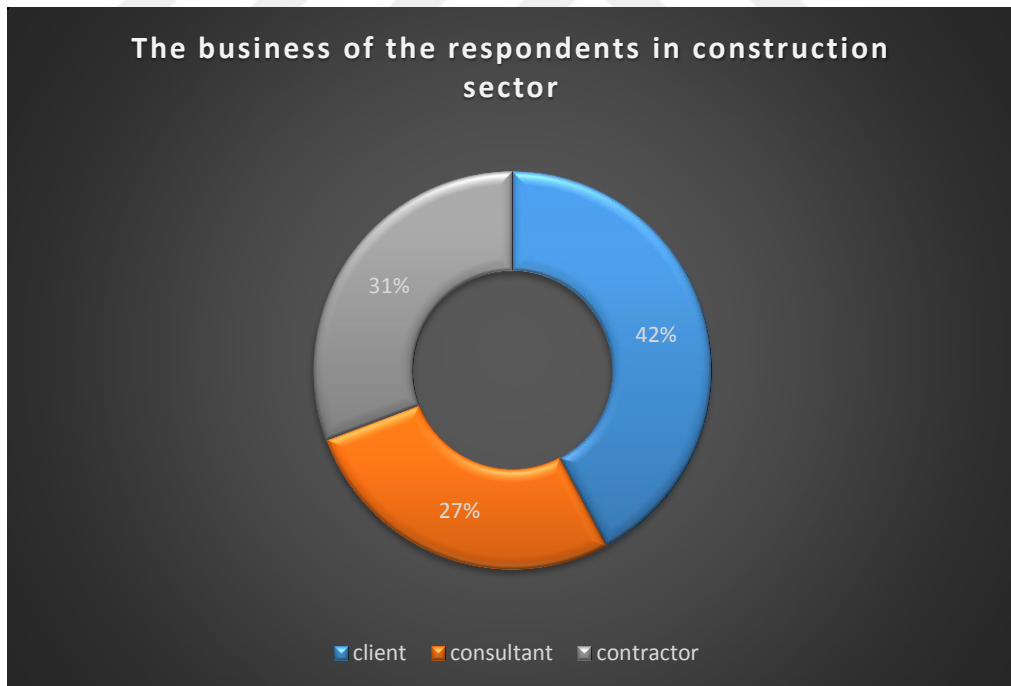


Figure 4.3: Pie chart shows the business of the respondents in the construction sector

Figure 4.3 clarified that 42% of the respondents to the questionnaire were clients, as well as 31% of the respondents, were contractors, while the percentage of the consultants was 27% of total respondents.

4.2.4 Respondent's major role in the construction sector

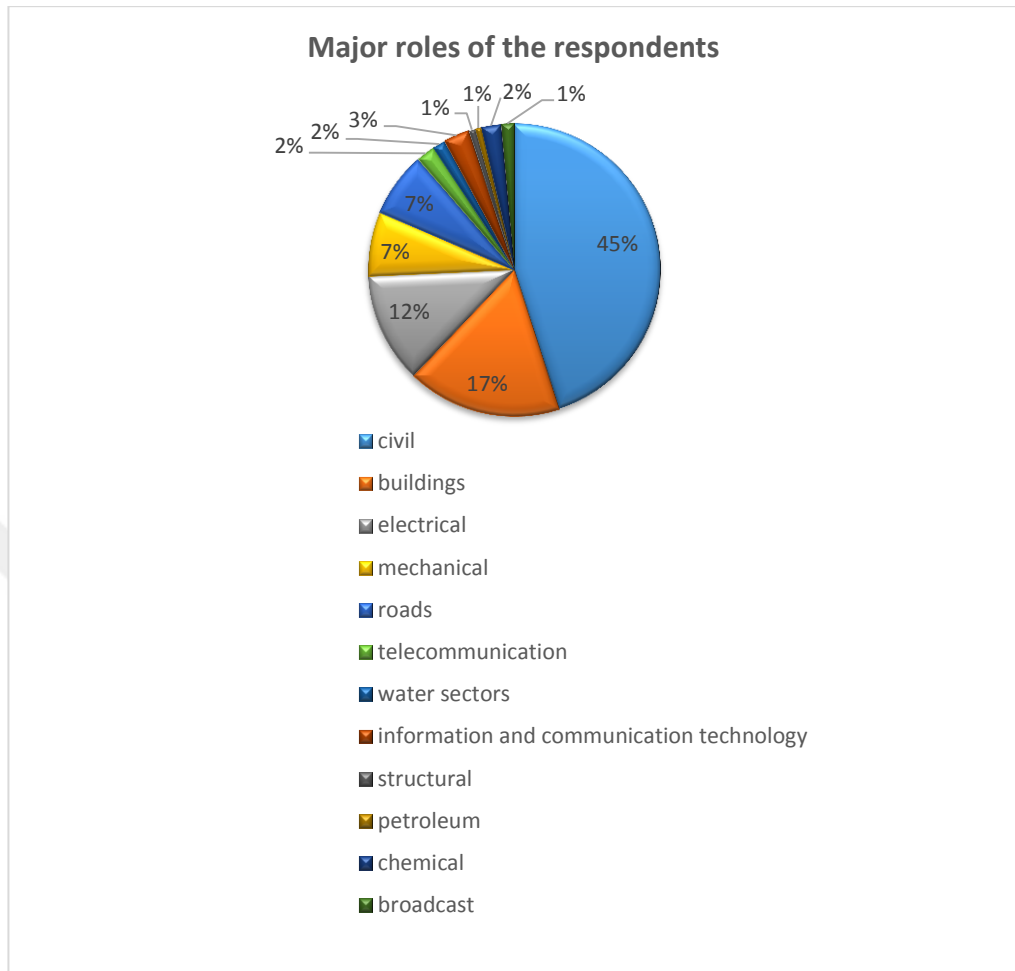


Figure 4.4: Pie chart shows the respondents major role in the construction sector

Figure 4.4 above illustrates that the major role in the construction sector for the great percentage of the respondents to the survey is civil projects by 45%, whilst the experts that respond to the questionnaire who working in building projects consist a ratio of 17%, followed by the respondents that working in the electrical projects by a ratio of 12%, in return the respondents who work in road projects, and the respondents who work in mechanical projects sharing the same percentage by 7%. Furthermore, the respondents that working in information and communication technology projects occupied the percentage of 3%. While the respondents that work in telecommunication projects, water resource projects, and chemical projects obtain a percentage of 2%. Finally, the respondents who work in broadcast, structural, and petroleum projects share the same percentage which is 1%. We could note from figure three that the respondents distributed between multiple projects sectors.

4.2.5 Contracting Method That the Respondents Involved

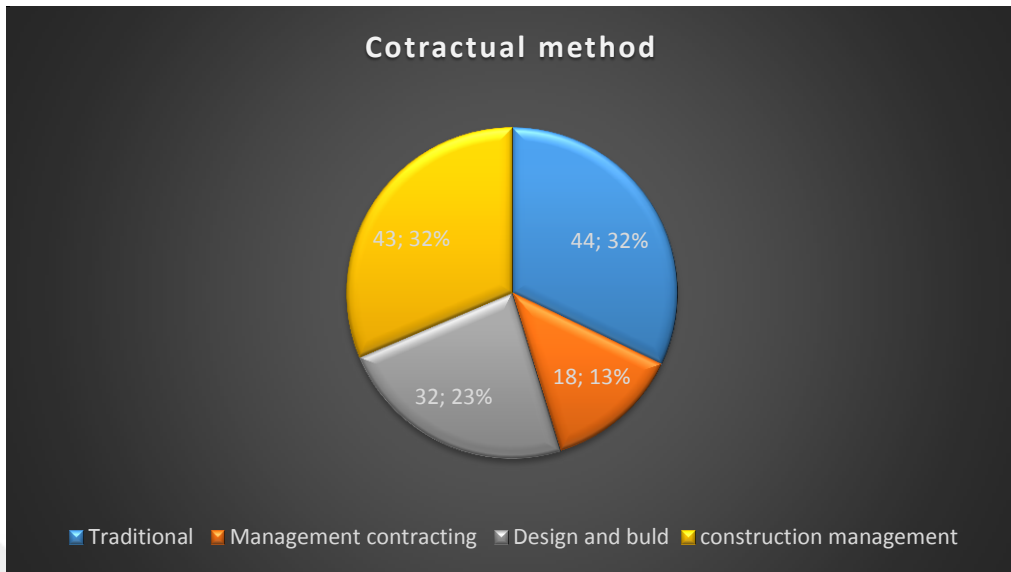


Figure 4.5: Pie chart shows the contracting methods that the respondents involved before

Figure 4.5 displays that the respondents' answer about, the contractual form which they prefer was as follows, 32% of the respondents preferred traditional form, as well as, the same percentage of the respondents worked in projects organized by construction management contract. While, 23% of the respondents choose a design and build as a contract form, in return, the remaining respondents' percentage which is 13% worked with the projects executed by management contracting.

4.2.6 Percentage of the projects that he respondents involved and experienced schedule overrun

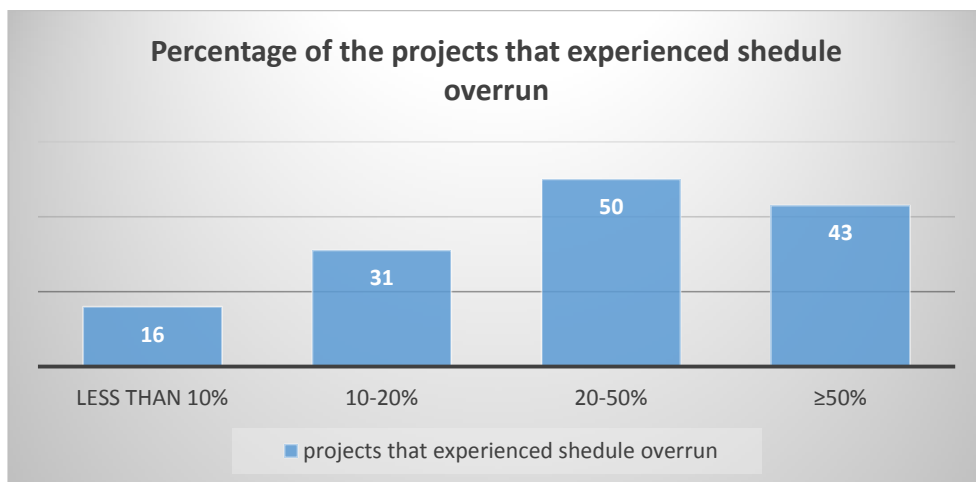


Figure 4.6: Column chart shows the percentage of the projects that the respondents involved and experienced schedule overrun

Figure 4.6 displays that 11% of the respondents had less than 10% of their construction projects faced schedule overrun, while 22% of the respondents had 10-20% of their projects encountered schedule overrun, whilst, 20-50% of the construction projects that have been involved by 36% of the respondents faced time overrun, in return, 31% of the respondents had $\geq 50\%$ of their construction projects affected by schedule overrun.

4.2.7 The average percentage of the schedule overrun on the projects that have been involved by the respondents

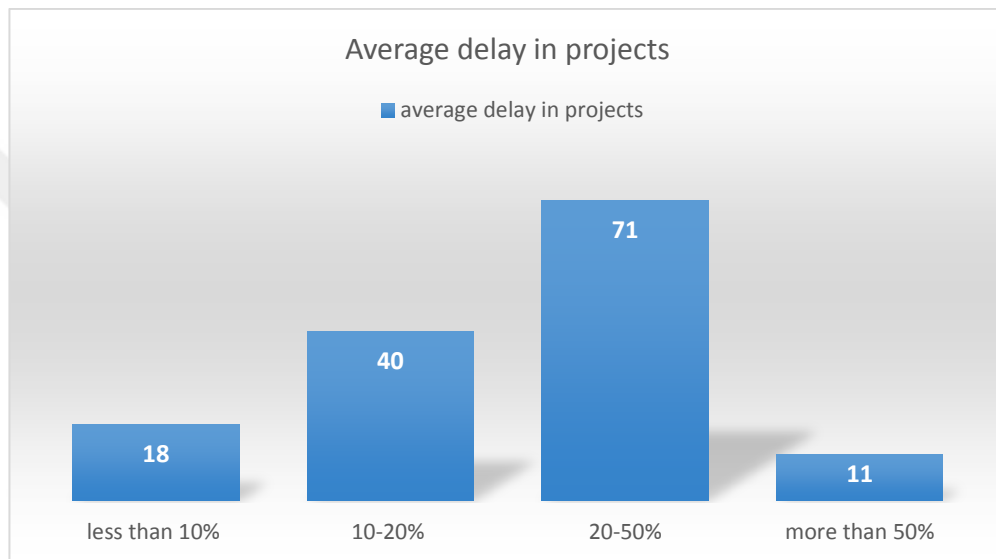


Figure 4.7: Column chart shows the percentage of the schedule overrun in the projects

Figure 4.7 above states that 13 % of the respondents had less than 10% as an average schedule overrun in their construction projects, while 29 % of the respondents had 10-20% as an average schedule overrun, while the great percentage of the respondents which are 51 % faced 20-50% as an average time overrun, in return 8% of the respondents their projects encountered $\geq 50\%$ as an average schedule overrun.

4.3 Respondents' Opinions for Delay Causes

4.3.1 Respondents' opinions for the best contractual method to avoid schedule overrun

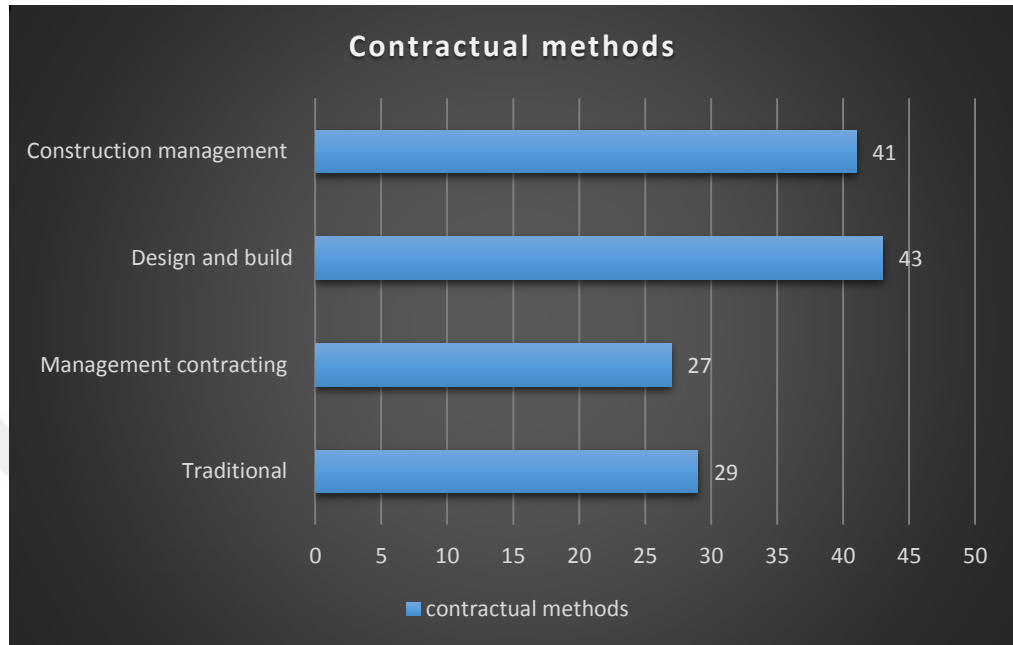


Figure 4.8: Bar chart shows the best contractual method to avoid schedule overrun

From figure 4.8 above the answer of the respondents of the survey about what is the best contractual method to avoid schedule overrun was as follows: 31% of the respondents thought that the design and build contractual method is the best method for avoiding time overrun, also 29% of the respondents preferred construction management method, in return, 21% of the respondents choose a traditional method (design-bid-construct) as the best method, while 19% of the respondents declared that they prefer management contracting method to avoid time overrun in construction projects.

4.3.2 Respondents' software package for planning and monitoring project duration

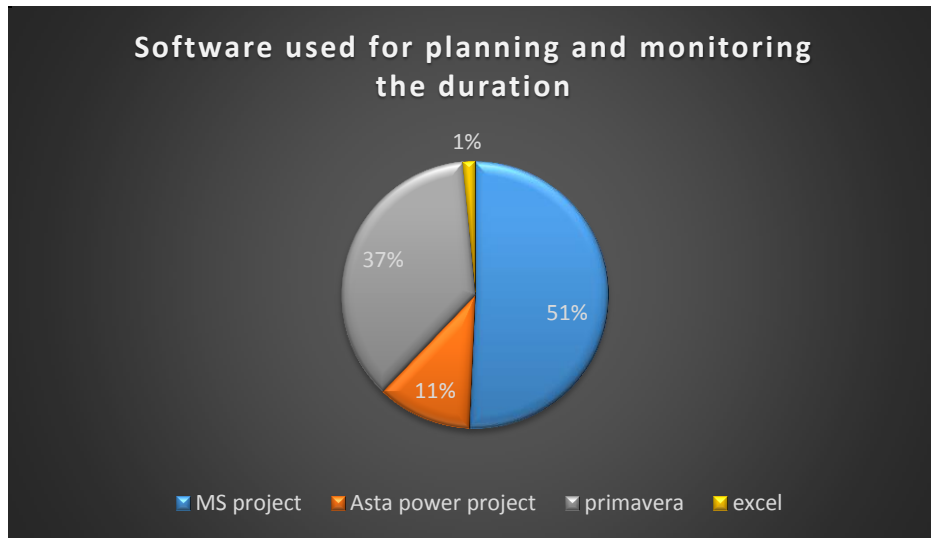


Figure 4.9: Pie chart shows the software package used to plan and monitor project duration

The majority of the respondents by 51% as figure 10 presents, preferred MS project software to plan and monitor their construction project duration, furthermore, 37% of the respondents have been used primavera software for planning and monitoring their construction. While 11% of the respondents accounted for Asta power project software in planning and following up the duration of their construction projects. Finally, a few percentages of the respondents which represent 1% choose the excel program for planning and monitoring the project duration.

4.3.3 Respondents' technique to monitor project duration

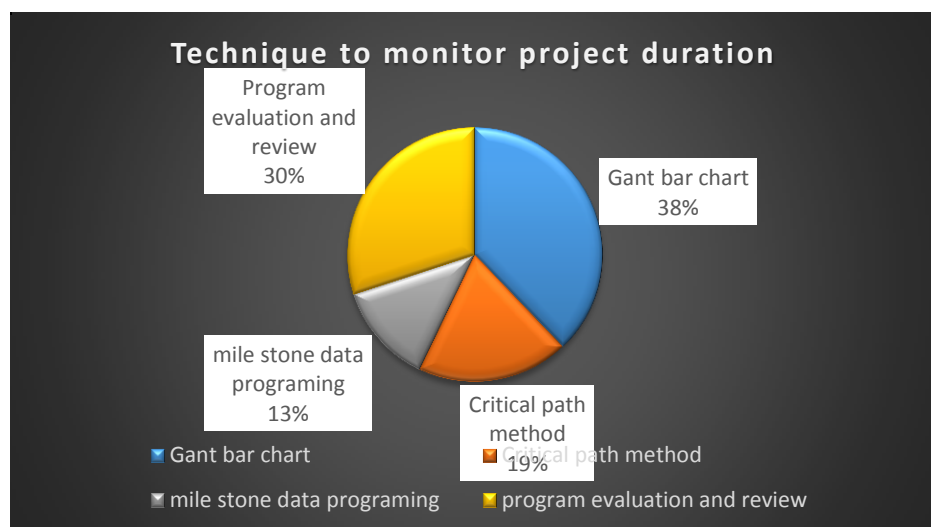


Figure 4.10: Pie chart shows the technique used to monitor project duration

Figure 4.10 above indicates that the tendency for 38% of the respondents for the Gant bar chart technique to monitor their project duration. While 30% of the respondents choose program evaluation and review for the construction project monitoring. Also, the critical path technique has been used for the project monitoring by 19% of the respondent, in return, 13% of the respondents preferred milestone data programming techniques in monitoring their construction project. Furthermore, figure 12 shown below clarified that 93% of the respondents declared that the software packages are the best choice in planning and monitoring project duration, and it could reduce schedule overrun, moreover, 2% of the respondents don't believe if there is any feasibility with the software package to reduce time overrun, while 5% of the respondents uncertain at all about if there are any benefits of software package regarding with time overrun in construction projects.

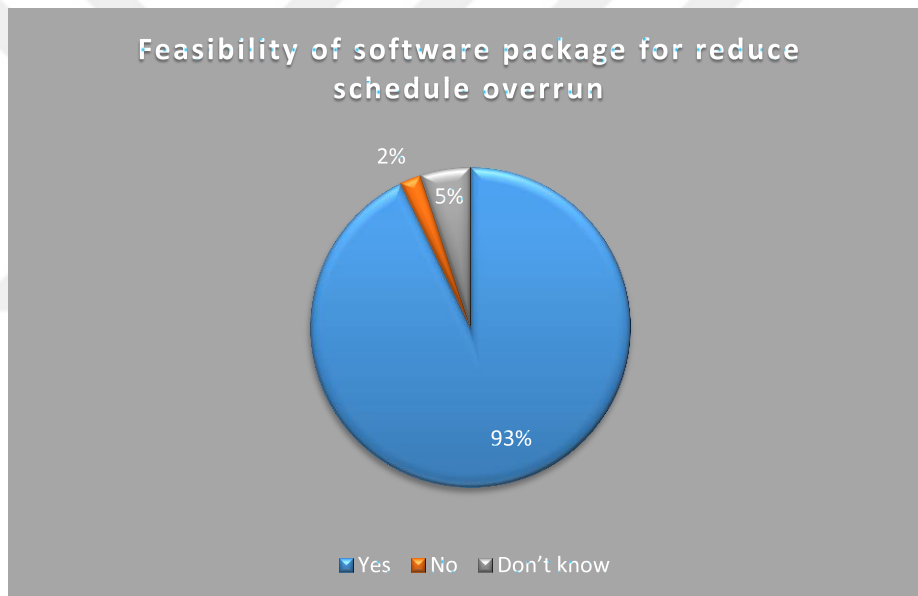


Figure 4.11: Pie chart shows the technique used to monitor project duration

4.4 Major Delay Factors by the Respondents' Feedback

4.4.1 Structural equation modeling technique

Yang et al. (Jyh-Bin yang, 2008), declared in their study that structural equation modeling is equipped for measuring the complete connections among explored factors. Also, it was proved by Yahya Rahsid et al. (Yahya Rahsid, 2013), that there is a strong relationship among the hypothesized categories that consist of delay causes and the project's delay in general by using structural equation modeling.

This study utilizes the structural equation modeling technique via SPSS AMOUS software to explore the relationships between delay factors according to the questionnaire survey, also the amplitude of effecting such delay factors on a construction project.

Confirmatory Factor Analysis (CFA) via AMOS software has been used to check the validity and reliability of the scales used in this study. For checking the model fitness of Confirmatory Factor Analysis, used Different statistical indicators.

Table (4.1) clarifies the fitness indicators for the confirmatory factor analysis model.

Table 4.1: The fitness indicators for the confirmatory factor analysis model

No	Delay factor	Factor loading	A
1	Design change	0.762	0.898
2	Financial difficulty from the contractors	0.587	0.898
3	Poor project management planning	0.689	0.898
4	Mistakes in estimating project duration	0.712	0.898
5	Contracting with the incompetent contractor	0.658	0.898
6	The economic crisis of the country	0.488	0.898
7	Using traditional paperwork more than software programs	0.640	0.898
8	Delay in progress payments by the owner	0.540	0.898
9	Frequent Official and unofficial Holidays	0.666	0.898
10	Government change of regulations and bureaucracy	0.716	0.898
11	Insufficient and incomplete feasibility studies	0.594	0.898
12	Political decisions and political realities	0.708	0.898
13	Inadequate the financial allocations	0.708	0.898
14	Unskilled workers	0.441	0.898

It's obvious from the table (4.1) that the Cronbach alpha (α) coefficient that used to check the reliability of the questionnaire is equal to 0,898 for all delays factor that is used in this study which is Design changes, Financial difficulty from the contractors, Poor project management planning, Mistakes in estimating project duration, Contracting with an incompetent contractor, The economic crisis of the country, Using traditional paperwork more than software programs, Delay in progress payments by the owner, Frequent Official and unofficial Holidays, Government change of regulations and bureaucracy, Insufficient and incomplete feasibility studies, Political decisions and political realities, Inadequate the financial allocations, Unskilled workers.

According to Nunnally (Nunnally, 1994), an (α) value equal to or greater than 0.7 is deemed satisfactory. Therefore, the survey data is deemed reliable.

Moreover, to recognize the key causes for further analysis using the structural equation modeling method.

Furthermore, Peterson (Peterson R. A., 2000) declared in his study that the threshold off factor loading is 0.4 so the value of factor loading greater than 0.4 is acceptable. From table (4.2) above its apparent that is the highest value of factor loading of the delays factor related to design change which is 0.762, while the lowest value of the factor loading which is 0.441 went to unskilled workers, while each of the factors mistakes in estimating project duration, Insufficient and incomplete feasibility studies, Poor project management planning, contracting with the incompetent contractor, Using traditional paperwork more than software programs, late progress payments by the owner, Frequent Official and unofficial Holidays, Government change of regulations and bureaucracy, Political decisions and political realities, Financial difficulty from the contractors, The economic crisis of the country, Inadequate the financial allocations obtained the values 0.712, 0.594, 0.689, 0.658, 0.640, 0.540, 0.666, 0.716, 0.708, 0.587, 0.488, 0.711, respectively. So the model is a good fit.

Client-related. Numerous researchers defined client-related factors. AL Hazmi (MH., 1987), also Mohammed I. Al-Khalil et al. (Mohammed I. Al-Khalil, 1999), saw that any delay either in payments or in nonpayment by a client to the contractor is the main delay caused in construction projects. Furthermore (Mohammed I. Al-Khalil, 1999), states client decision-making is the essential dilemma of delay in construction projects. Based on what was mentioned above, the following hypothesis has been proposed.

Hypothesis 1: Client-related factors have a major effect on project completion.

- Contractor related factors. According to Murali Sambasivan (Murali Sambasivan, 2007), improper planning by the contractor is the major cause of delay. Zaneldin (Zaneldin, 2006), declared that Financial problems of contractors, sub-contractor issues quality of contractor's work are the main and essential delay causes. . Based on what was mentioned above, the following hypothesis has been proposed.

Hypothesis 2: Contractor related factors have a major effect on project completion.

- Consultant related factors: according to Haseeb et al. (Haseeb, 2011), lack of consultants, drawing changes, preparation and approval of drawings, wrong site investigation, contract management, are the major problems that arose by the consultants in the construction industry of Pakistan. Based on what was mentioned above the following hypothesis has been proposed:

Hypothesis 3: Consultant-related factors have a major effect on project completion.

- External factors related: Murali Sambasivan et al. (Murali Sambasivan, 2007), identified the external factors as changes in weather, changes in rules and regulations. Also, Wei (Wei, 2010), announced that multiple factors cause a delay in construction projects related to external factors, like effects of subsurface and ground conditions getting licenses from a municipality, the effect of weather conditions on construction activities, accidents through the construction operation, traffic control and limitation at a place of work, offering types of assistance from utilities and modifications in government guidelines and rules, Based on what mentioned above the following hypothesis has been proposed.

Hypothesis 4: External related factors have a major effect on project completion.

- As per all mentioned above, and according to the nature of factors of delay that investigated and refined in this study. Below the groups are divided by the 14 factors of delay that affect construction projects in Iraq which are ranked by the respondents.
1. Client Related factors: consist of contracting with incompetent contractors, Delay in progress payment by the owners, Insufficient and incomplete feasibility studies, and Inadequate financial allocations.
 2. Contractor related factors: consist of financial difficulty from a contractor, Poor project management planning, Using traditional paperwork more than software programs, and unskilled workers.
 3. Consultant related factors: consist of Design changes and Mistakes in estimating project duration.

4. External related factors: consist of The economic crisis of the country, Frequent Official and unofficial Holidays, Government change of regulations and bureaucracy and Political decisions, and political realities.

Table (4.2) shows the four Hypotheses of factors of delay.

Table 4.2: The four hypotheses of factors of delay

Group	Delay factor
Client Related Factors	Contracting with incompetent contractors
	Delay in progress payment by the owner
	Insufficient and incomplete feasibility studies
	Inadequate the financial allocations
Contractor related factors	Financial difficulty from a contractor
	Poor project management planning
	Using traditional paperwork more than software programs
	Unskilled workers
Consultant related factors	Design changes
	Mistakes in estimating project duration
External related factors	The economic crisis of the country
	Frequent Official and unofficial Holidays
	Government changes the regulations and bureaucracy
	Political decisions and political realities

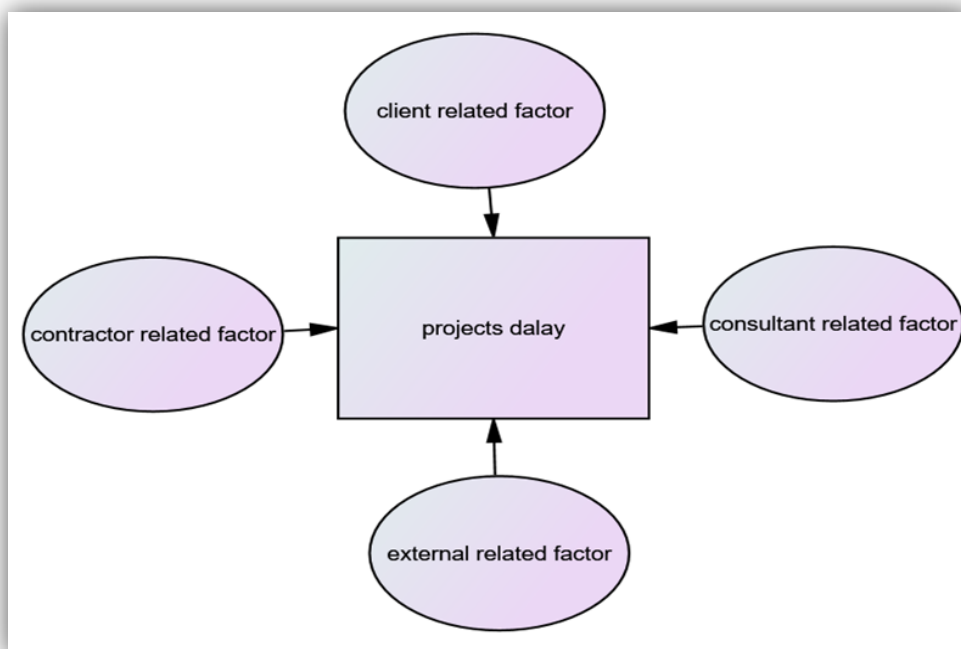


Figure 4.12: The main structural equation model for the main delay causes in construction

4.4.1.1 Model assessment

In structural equation modeling applications, the goodness of fit indices is an important tool for testing the model. By using SPSS AMOUS software. Table (4.3) clarify the popular goodness of fit indices for the required model.

Table 4.3: The popular goodness of fit indices for the required model

	The Indice	Indice value	Recommended value
1	RMSEA	0.073	Less than 0.1
2	Chi-square	104.863	
3	Df	59	
4	CMIN/DF	1.777	Less than 5
5	CFI	0.948	Greater than 0.9
6	PNFI	.579	Greater than 0.5

From table (4.3) above the model fit indices of the developed model are as follows: RMSEA = 0.073 less than 0.08, CMIN/DF= 1.777 less than 5, CFI = 0.948 Greater than 0.9, PNFI = .579 Greater than 0.5. So the model is good fitted.

Table (4.4) explains the relationships between the 4 groups that consist of delay factors and construction project delay.

Table 4.4: The relationships between the groups that consist delay factors and construction project delay

	Group	Standardized Regression Weights
1	Construction delay <--- client Related Factors	0.200
2	Construction delay <--- contractor related factors	0.206
3	Construction delay <--- Consultant related factors	0.230
4	Construction delay <--- External related factors	0.345

It's obvious from Table (4.4) above that external related factors have the greatest influence on construction delay by 0.345 while, client-related factors get the smallest effect on construction projects according to answers of the respondents by 0.200. Moreover, the Regression Weights between Consultant related factors and construction delay is 0.230, in return contractor Related Factors affect Iraqi construction projects by 0.206.

Table (4.5) states the relationships among the groups that contain factors of delay.

Table 4.5: The relationships among the groups that contain factors of delay

	Relationships between the groups	Correlation	P value
1	Client-related factors <-.> CONTRACTOR related factors	1.05	***
2	Client-related factors <-.> CONSULTANT related factors	0.82	***
3	External related factors <-.> client-related factors	0.82	***
4	CONTRACTOR related factors <-.> CONSULTANT related factors	0.94	***
5	External related factors <-.> CONTRACTOR related factors	0.59	***
6	External related factors <-.> CONSULTANT related factors	0.31	.032

Where (***) means that p value less than 0.010.

From table (4.5), the greatest relationships among the group containing factor of delay are between client-related factors and contractor-related factors by 1.05. moreover, the second greatest correlation is between contractor-related factors with consultant related factors by 0.938. whilst, the smallest relationships among the group are between external related factors and consultant related factors by 0.31. also, the correlation between each of client-related factors and consultant-related factors, external related factors and client related factors, external related factors, and contractor related factors are 0.82, 0.82, 0.59 respectively.

Furthermore, structural equation modelling technique provides via SPSS AMOUS software the relationships among the groups that consist of delay factors and delay factor itself.

Table (4.6) portrays the relationships between the delay factors and factors of delay that belong to them.

Table 4.6: The relationships between the groups of delay factors and delay factors the belong to them

	Relationships between delay groups and the factors of delay	Standardized Regression Weights	P value
1	Client related factors ---> Inadequate the financial allocations	0.45	_____
2	Client related factors ---> Contracting with incompetent contractor	0.48	***
3	Client related factors ---> Insufficient and incomplete feasibility studies	0.65	***
4	Client related factors --> Delay in progress payments by the owner	.46	***

Table 4.6: (Cont.) The relationships between the groups of delay factors and delay factors the belong to them

	Relationships between delay groups and the factors of delay	Standardized Regression Weights	P value
5	Contractor related factors ---> Using traditional paperwork more than software programs	0.51	_____
6	Contractor related factors ---> Unskilled workers	0.50	_____
7	Contractor related factors ---> Poor project management planning	0.78	***
8	Contractor related factors ---> Financial difficulty from the contractors	0.55	***
9	Consultant related factors ---> Design changes	0.65	***
10	Consultant related factors ---> Mistakes in estimating project duration	0.53	_____
11	External related factors ---> Political decisions and political realities	0.79	_____
12	External related factors --->Frequent Official and unofficial Holidays	0.21	.028
13	External related factors --->Government change of regulations and bureaucracy	0.84	***
14	External related factors --->The economic crisis of the country	0.48	***

From table (4.6) above, it's clear and beyond any doubt that Insufficient and incomplete feasibility studies the most delay factor affected on client-related factors by 0.65, also contracting with incompetent contractors affects Client related factors by 0.48. also, the delay factor namely Delay in progress payments by the owner affects client-related factors by 0.46. moreover, the client-related factors affected by Inadequate financial allocations were 0.45 according to the construction projects experts that respond to the questionnaire survey.

In return, Poor project management planning the most delays factor influence contractor related factors by 0.78. while Unskilled workers have the smallest effect on contractor-related factors by 0.50 according to the respondent's answers, furthermore, financial difficulty from the contractors influenced the contractor-related factors by 0.55. whilst Using traditional paperwork instead of software programs affects contractor-related factors by 0.51.

Furthermore, the effect of Design changes and Mistakes in estimating project duration, on consultant-related factors are by 0.65, 0.53.

Also, From table (4.6) above the fewest influence of the 14 delay factor that have been ranked by the expert respondent in this study on external related factors is to Frequent Official and unofficial Holidays by 0.21. while the greatest effect on external related factors is Government changes the regulations and bureaucracy by 0.84. also the influence of the Political decision and political reality also the economic crisis of the country on external related factors by 0.79 and 0.48 respectively.

SPSS AMOUS software also provides according to the questionnaire respondents the relationships among the factors of delay that belong to different groups.

Table (4.7) illustrates the relationships between the factors of delay apart from the groups that these delay factors belong to them.

Table 4.7: The relationships between the factors of delay

	Relationships between factors of delay	Standardized Regression Weights	P Value
1	Inadequate the financial allocations <--- Political decisions and political realities	0.34	***
2	Contracting with incompetent contractor<--- Inadequate the financial allocations	0.18	0.076
3	Using traditional paperwork instead of software programs <--- Contracting with an incompetent contractor	-0.22	0.016
4	Frequent Official and unofficial Holidays <--- Using traditional paperwork instead of software program	0.40	***
5	Unskilled workers <--- Frequent Official and unofficial Holidays	0.22	0.002
6	Design changes <--- Contracting with an incompetent contractor	0.29	***
7	Delay in progress payment by owner <--- Inadequate the financial allocations	0.21	0.029
8	The economic crisis of the country <--- Design changes	0.4	***
9	The economic crisis of the country<--- Contracting with an incompetent contractor	-0.25	0.005
10	Financial difficulty from the contractors <--- Inadequate the financial allocations	0.23	0.008
11	Mistakes in estimating project duration <--- Insufficient and incomplete feasibility studies	0.29	***
12	Mistakes in estimating project duration <--- Political decisions and political realities	0,02	0.847
13	The economic crisis of the country <--- Unskilled workers	0.20	0.007

From table (4.7) above the greatest relationships among delay, factors are between Frequent Official and unofficial Holidays and Using traditional paperwork more than software programs by 0.40. also, the smallest relationships are between Mistakes in estimating project duration and Political decisions and political realities by 0.02. furthermore, there are negative relationships among factors of delay which are between Using traditional paperwork instead of software program and Contracting with an incompetent contractor and between The economic crisis of the country and Contracting with an incompetent contractor by -0.22 and -0.25 respectively. While the relationships between Inadequate financial allocations and Political decisions and political reality by 0.34. and the regression weight for the remaining delay factors which are Contracting with an incompetent contractor and Inadequate financial allocations, Unskilled workers with Frequent Official and unofficial Holidays, Design changes and Contracting with an incompetent contractor, Delay in progress payments by owners with Inadequate financial allocation, also, The economic crisis of the country and Design changes, Financial difficulty from the contractors with Inadequate the financial allocations, Mistakes in estimating project duration and Insufficient and incomplete feasibility studies are 0.18, 0.22, 0.29, 0.21, 0.40, 0.23, 0.29 respectively.

Where, X1= Design changes, X2= Financial difficulty from the contractors, X3= Poor project management planning, X4= Mistakes in estimating project duration, X5= Contracting with an incompetent contractor, X6= The economic crisis of the country, X7= Using traditional paperwork more than software programs, X8= Delay in progress payment from owners, X9= Frequent Official and unofficial Holidays, X10= Government changes the regulations and bureaucracy, X11= Insufficient and incomplete feasibility studies, X12= Political decisions and political realities, X13= Inadequate the financial allocations, X14= Unskilled workers.

Another hypothesis has been developed to test it via SPSS AMOUS software to obtain another perspective according to the same expert's respondents via SPSS AMOUS software.

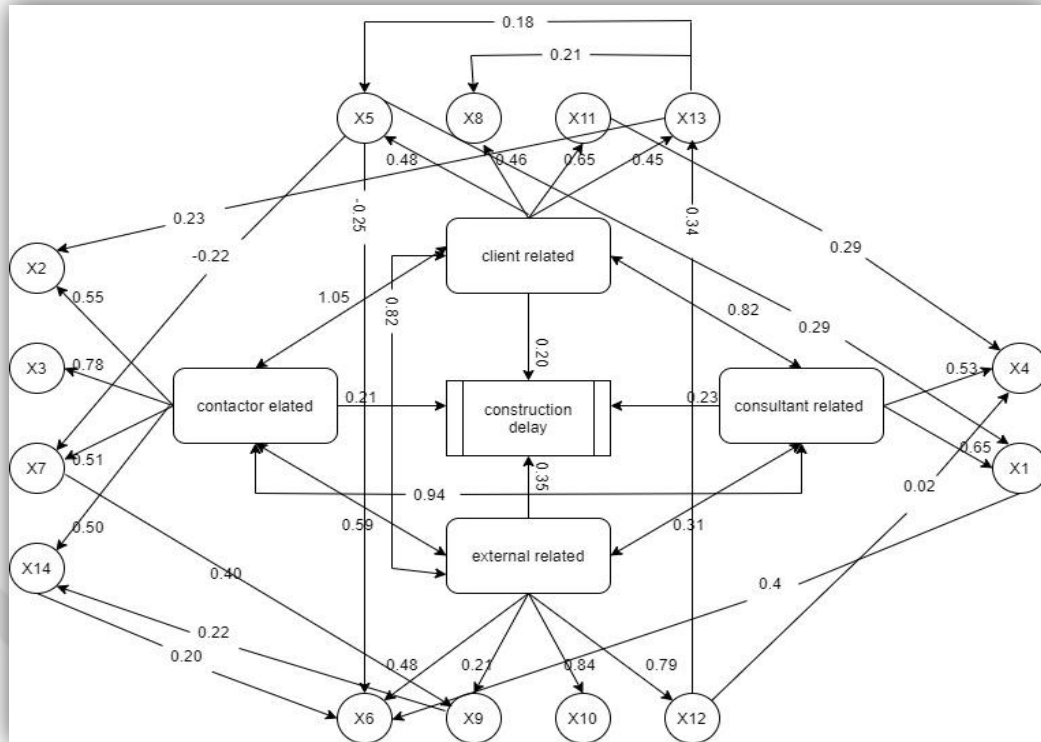


Figure 4.13: The main structural equation modeling for construction projects delay

Hypothesis 1: contract related factors have a major effect on project completion.

Hypothesis 2: management-related factors have a major effect on project completion.

Hypothesis 3: human and non-human-related factors have a major effect on project completion.

Hypothesis 4: finance-related factors have a major effect on project completion.

Table (4.8) explains the distribution of the delay factors in four groups regarding the new hypothesis.

Table 4.8: Distribution of factors o delay in new hypothesis groups

Group	Delay factor
1. Contract-related Factors	Design changes
	Mistakes in estimating project duration
	Insufficient and incomplete feasibility studies
2. Management-related	Poor project management planning
	Contracting with an incompetent contractor
	Using traditional paperwork instead of software programs
	Unskilled workers

Table 4.8: (Cont.) Distribution of factors o delay in new hypothesis groups

Group	Delay factor
3. Human and non-human related factors	Delay in progress payments by the owner
	Frequent Official and unofficial Holidays
	Government changes the regulations and bureaucracy
	Political decisions and political realities
4. Finance-related factors	Financial difficulty from the contractors
	The economic crisis of the country
	Inadequate the financial allocations

The hypothesis groups of the newly developed model are as follow:

Contract Related Factors: consist of Design changes, Mistakes in estimating project duration, and Insufficient and incomplete feasibility studies.

Management-related factors: consist of Poor project management planning, contracting with the incompetent contractor, Using traditional paperwork instead of software programs, and Unskilled Workers.

Human and non-human related factors: consist of Delay in progress payment by the owners, Frequent Official and unofficial Holidays, Government changes the regulations and bureaucracy, and Political decisions and political realities.

Finance-related factors: consist of Financial difficulty from the contractors, The economic crisis of the country, and Inadequate financial allocations.

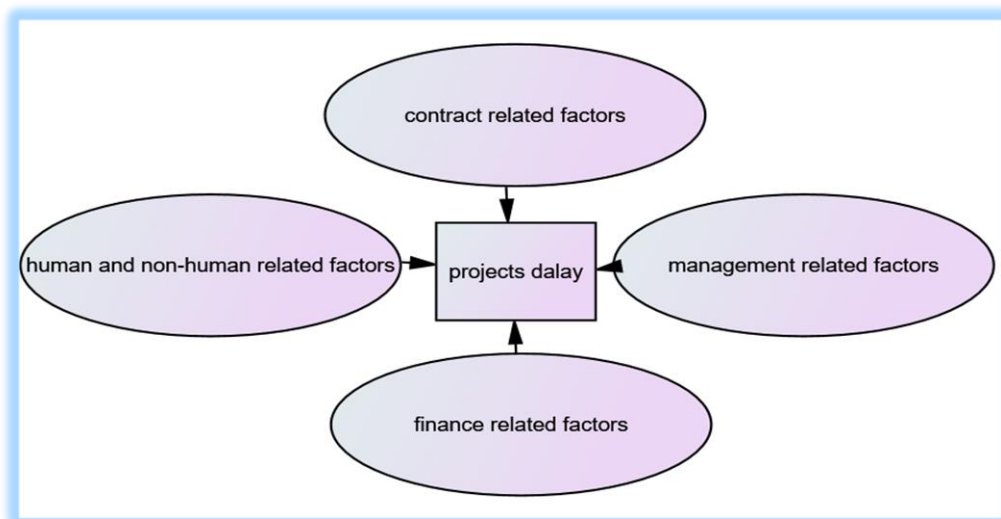


Figure 4.14: The main structural equation model for the main causes of delay in construction (new hypothesis)

4.4.1.2 Model assessment for new hypothesis

Table (4.9) clarify the popular goodness of fit indices for the required model.

Table 4.9: The popular goodness of fit indices for the required model

	The Indice	Indice value	Recommended value
1	RMSEA	0.058	Less than 0.1
2	Chi-square	92.778	
3	Df	63	
4	CMIN/DF	1.473	Less than 5
5	CFI	0.966	Greater than 0.9
6	PNFI	0.627	Greater than 0.5

From table (4.9) above the goodness fit indices of the developed model are as follows: RMSEA = 0.058 less than 0.08, CMIN/DF= 1. 473 less than 5, CFI = 0.966 Greater than 0.9, PNFI = 0.627 Greater than 0.5. So the model is good fitted.

Table 4.10: The relationships between the groups that consist delay factors and construction project delay

	Group	Standardized Regression Weights
1	Construction delay <--- contract Related Factors	0.14
2	Construction delay <--- management-related factors	0.30
3	Construction delay <--- Human and non-human related factors	0.33
4	Construction delay <--- finance-related factors	0.32

From Table (4.10) above that Human and non-human related factors, related factors have the greatest influence on construction delay by 0.33 while, contract-related factors obtained the smallest effect on construction projects according to answers of the respondents by 0.14. Also, the relationship between management-related factors and construction delay is by 0.30, in return finance Related Factors affect Iraqi construction projects by 0.32.

Furthermore, table (4.11) shows the relationships among the groups that contain factors of delay.

Table 4.11: The relationships among the groups that contain factors of delay

	Relationships between the groups	Correlation	P value
1	Management-related factors <--> finance-related factors	0.96	***
2	Management-related factors <--> contract-related factors	1.04	***
3	Management-related factors <--> human and non-Human related factors	0.69	***
4	Finance-related factors <--> contract related factors	0.75	***
5	Finance-related factors <--> human and non-human related factors	0.87	***
6	Contract-related factors <--> human and non-human related factors	0.43	.004

From table (4.11), the greatest relationships among the group containing factor of delay is between management-related factors and contract-related factors by 1.04. Also, the second greatest correlation is between management-related factors and finance-related factors by 0.96. while, the smallest relationships among the group is between contract related factors and human and non-human related factors by 0.43. in return, the correlation between each of management-related factors and human and non-human related factors, finance-related factors and contract related factors, finance-related factors and human and non-human related factors are 0.69, 0.75, 0.87 respectively.

In return, the relationships among the groups that consist of delay factors and delay factors that belong to them are shown in the table (4.12).

Table 4.12: The relationships among the groups of delay factors and delay factors the belong to them

	Relationships between delay groups and the factors of delay	Standardized Regression Weights	P value
1	Contract related factors ---> Insufficient and incomplete feasibility studies	0.36	_____
2	Contract related factors ---> Design changes	0.87	***
3	contract related factors ---> Mistakes in estimating project duration	0.52	***
4	management-related factors ---> Using traditional paperwork more than software programs	0.28	***
5	management-related factors ---> Poor project management planning	0.73	_____
6	management-related factors ---> Unskilled workers	0.86	_____
7	management-related factors --->Contracting with an incompetent contractor	0.85	***

Table 4.12: (Cont.) The relationships among the groups of delay factors and delay factors the belong to them

	Relationships between delay groups and the factors of delay	Standardized Regression Weights	P Value
8	Human and non-human related factors ---> Frequent Official and unofficial Holidays	0.38	***
9	Human and non-human related factors --->Political decisions and political realities	0.85	—
10	Human and non-human related factors --->Government change of regulations and bureaucracy	0.77	***
11	Human and non-human related factors --->Delay in progress payment by the owners	0.41	***
12	finance-related factors ---> The economic crisis of the country	0.65	***
13	finance-related factors ---> Inadequate the financial allocations	0.79	—
14	finance-related factors ---> Financial difficulty from the contractors	1.05	***

From Table (4.12) above, design changes the most delay factor affected on contract-related factors by 0.87. while Insufficient and incomplete feasibility studies consider the smallest delay factor effect on contract-related factors by 0.36. also, Mistakes in estimating project duration affect contract-related factors by 0.52.

Also, from Table (4.12), Unskilled workers considered by the experts' respondents the most delay factor affected on management-related factors by 0.86. while, using traditional paperwork more than software programs, Poor project management planning and Contracting with the incompetent contractor have Standardized Regression Weights 0.28, 0.73, and 0.85 respectively.

In return, Frequent Official and unofficial Holidays, Political decisions and political realities, Government changes the regulation and bureaucracy and Delay in progress payment by the owners, influence Human and non-human related factors by 0.38, 0.85, 0.77, and 0.41 respectively.

Moreover, the economic crisis of the country obtained Standardized Regression Weights 0.65, Inadequate the financial allocations got Standardized Regression Weights 0.79, and Financial difficulty from the contractors had Standardized Regression Weights 1.05.

Table (4.13) illustrates the relationships between the factors of delay individually apart from the groups that these delay factors belong to them.

Table 4.13: The relationships between the factors of delay individually

	Relationships between factors of delay	Standardized Regression Weights	P value
1	Using traditional paperwork instead of software program <--- Frequent Official and unofficial Holidays	0.43	***
2	Design changes <--- Frequent Official and non-official Holidays	-0.11	.049
3	Insufficient and incomplete feasibility studies <--- Political decisions and political realities	0.27	***
4	Insufficient and incomplete feasibility studies <--- Using traditional paperwork more than software programs	0.29	***
5	Delay in progress payment by owners <--- Design changes	0.37	***
6	Unskilled workers<--- Design changes	-0.46	***
7	Mistakes in estimating project duration <--- Insufficient and incomplete feasibility studies	0.28	***
8	Financial difficulty from the contractors<--- Political decisions and political realities	-0.45	***
9	Contracting with an incompetent contractor<--- The economic crisis of the country	-0.28	***

From table (4.13), the regression weight for factors of delay is as follow:

Using traditional paperwork instead of software program and Frequent Official and non-official Holidays, Design changes and Frequent Official and unofficial Holidays, Insufficient and incomplete feasibility studies with Political decisions and political realities, Insufficient and incomplete feasibility studies and Using traditional paperwork instead of software program, Delay in progress payment by owners and Design changes, Unskilled workers with Design changes, Mistakes in estimating project duration and Insufficient and incomplete feasibility studies, Financial difficulty from the contractors and Political decision and political reality and Contracting with an incompetent contractor with The economic problems of the countries are 0.43, -0.11, 0.27, 0.29, 0.37, -0.46, 0.28, -0.45 and -0.28 respectively.

Where, X1= Design changes, X2= Financial difficulty from the contractors, X3= Poor project management planning, X4= Mistakes in estimating project duration, X5= Contracting with an incompetent contractor, X6= The economic crisis of the country, X7= Using traditional paperwork more than software programs, X8= Delay in progress payment from owners, X9= Frequent Official and unofficial Holidays, X10= Government changes the regulations and bureaucracy, X11= Insufficient and

Figure (4.16), above clarified the respondents ranking for the proactive steps that avoid or reduce project delay factors on construction projects.

4.4.2.1 Managing the project through (building information modeling) (BIM)

9% of the respondents stated that this step is not important, while 15 % of the respondents found this step is fairly important, furthermore, 42 % of the respondents tend to choose this step to be important, in return, the last 34% of the respondents claim that this step is very important to avoid or reduce the factors that affect the construction projects delay.

4.4.2.2 Utilize new technology like (BLOCKCHAIN)

From Figure (4.16) above 7% of the respondents found this step is not important, whilst 38% from the respondents said that this step is fairly important, in return, 33% of the respondents admitted that utilizing new technology like blockchain is important, AS WELL AS, 22% of the respondents prefer to consider this step it as very important to avoid or reduce the factors that affect schedule overrun.

4.4.2.3 Establish a frequent meeting system with a consultant and the client

From the column chart above 6% of the respondents found this step is not important, as well as, 46% of the respondents confessed that this step is fairly important, while 34% of the respondents said that conducting multiple meeting systems with clients and consultants is important for avoiding or reducing construction project delay factors, in return 14 % of the respondents tend to make it very important step.

4.4.2.4 Employ professional staff to estimate the duration and cost of a project

It is obvious from Figure (4.16) above that 7% of the respondents stated that this step is not important, in return, 24% of the respondents convinced that this step is fairly important, while 40 % of the respondents with the opinion that says this step is important, furthermore, 29% of the respondents found this step is very important to avoid or reduce delay factors on construction projects.

4.4.2.5 Inventing more money for training staff that able in planning the project effectively

From the Figure (4.16) above 6% of the respondents said that this step is not important for reducing or avoiding construction project delay factors, as well as 23% of the respondents found this step is fairly important, while 35% of the respondents stated that this step is important, also 36% of the respondents admitted that this step is very important.

4.4.2.6 Emphasize the criteria for selecting the qualified contractor

Only 5 % of the respondents considered this step as not important, while 17% of the respondents confessed that emphasizing the criteria for selecting an eligible contractor is fairly important, in return, 21% of the respondents choose this step as important, whilst the great percentage of the respondents by 57% said that this step is very important to avoid or at least reduce the delay factors that affect the project.

4.4.3 The respondents ranking for remedies steps for reducing project delay

This study uses the structural equation modeling technique to identify the respondents ranking for remedies steps to reduce project delay.

By inserting the respondents' answers about their opinions regarding with proposed remedies which are:

1. Identifying the main reasons that lead to delay and the strategy required to solve this delay.
2. Divide the remaining work into smaller partitions and distribute it to the specialist subcontractors.
3. Increasing the working hours and intensifying supervision of work.
4. Offering incentives for early completion workgroup.
5. Utilizing new equipment that ensures high productivity and adopting modern execution methods.
6. Staged handover of a project.

Table (4.14) below shows the fitness indicators for confirmatory factor analysis new model.

Table 4.14: The fitness indicators for confirmatory factor analysis new model.

	Factors of delay and remedies	Factor loading	α
1	Design change	0.767	0.894
2	Financial difficulty from the contractors	0.586	0.894
3	Poor project management planning	0.688	0.894
4	Mistakes in estimating project duration	0.734	0.894
5	Contracting with an incompetent contractor	0.601	0.894
6	The economic crisis of the country	0.499	0.894
7	Using traditional paperwork instead of a software program	0.576	0.894
8	Delay in progress payment by owners	0.612	0.894
9	Frequent Official and unofficial Holidays	0.644	0.894
10	Government change of regulations and bureaucracy	0.725	0.894
11	Insufficient and incomplete feasibility studies	0.682	0.894
12	Political decisions and political realities	0.690	0.894
13	Inadequate the financial allocations	0.690	0.894
14	Unskilled workers	0.463	0.894
15	Identifying the main reasons that lead to delay and the strategy needs to solve this delay	0.617	0.894
16	Divide the remaining work into smaller partitions and distribute it to the specialist subcontractor	0.547	0.894
17	Increasing working hours and intensifying supervision of work	0.545	0.894
18	Offering bonus for early completion workgroups	0.580	0.894
19	Utilize modern equipment which ensures high productivity and adopt new execute methods	0.688	0.894
20	Staged handover of a project	0.656	0.894

From table (4.14) above, Cronbach's Alpha equals $0.894 \geq 0.7$ so the model is considered satisfactory. The highest value of factor loading belongs to design changes which are 0.767. the fewest value of factor loading related to unskilled workers equals 0.463. while factor loading for Financial difficulty from the contractors, Poor project management planning, Mistakes in estimating project duration, contracting with the incompetent contractor, contracting with the incompetent contractor are 0.586, 0.688, 0.734, 0.601 respectively. In return, the economic crisis of the country, using traditional paperwork more than software programs, Delay in progress payment by the owners, Frequent Official and unofficial Holidays and Government changes the regulation and bureaucracy obtained the factor loading values 0.499, 0.576, 0.612, 0.644, 0.725 respectively. Furthermore,

Insufficient and incomplete feasibility studies, Political decisions and political realities, Inadequate financial allocations, Identifying the main reasons that lead to delay, and the strategy required for solving this delay got the following factor loading values 0.682, 0.690, 0.690, 0.617, respectively. Also, the factor loading for Divide the remaining work into smaller partitions and distributing it to the specialist subcontractor, increasing working hours and intensifying supervision of work, offering incentives for early completion workgroup, utilizing new equipment that ensures high productivity, and rely on modern execution method and Staged handover of the project is 0.547, 0.545, 0.580, 0.688 and 0.656, respectively. All the loading factors are bigger than 0.4, so the model is considered fit.

4.4.3.1 Model assessment for new hypothesis

Table (4.15) clarify the popular model fit indices for the required model.

Table 4.15: The popular model fit indices for the required model

	The Indice	Indice value	Recommended value
1	RMSEA	0.098	Less than 0.1
2	Chi-square	359.536	
3	Df	154	
4	CMIN/DF	2.335	Less than 5
5	RMR	0.099	less than 0.1
6	PNFI	0.608	Greater than 0.5

From the table (4.15) above the model fit indices of the developed model are as follows:

RMSEA = 0.086, less than 0.1, CMIN/DF= 2.02 less than 5, RMR = 0.087 less than 0.1, PNFI = 0.620 Greater than 0.5. so the model is good fitted.

Moreover, table (4.16) shows the relationships among the groups that contain factors of delay.

Table 4.16: The relationships among the groups that contain factors of delay and remedies

	Relationships between the groups	Correlation	P value
1	remedies <--> contract related factors	0.20	0.092
2	remedies <--> management related factors	0.45	0.002
3	remedies <--> human and non-human related factors	0.33	0.007
4	remedies <--> finance related factors	0.38	0.003

Table 4.16: (Cont.) The relationships among the groups that contain factors of delay and remedies

	Relationships between the groups	Correlation	P value
5	Management-related factors <--> contract-related factors	1.02	***
6	Management-related factors <--> finance-related factors	1.01	***
7	Management-related factors <--> human and non-human related factors	0.77	***
8	Finance-related factors <--> contract-related factors	0.77	***
9	finance related factors <--> human and non-human related factors	0.84	***
10	contract related factors <--> human and non-human related factors	0.53	***

It is apparent from the table (4.16) above that the correlation between remedies and contract-related factors is equal to 0.2, Pvalue equal to 0.092 bigger than 0.05, so the relationship is not significant. While the greatest significant relationship between the remedies and the groups which contain delay factors is between remedies and management-related factors by 0.45. and P-value equals 0.002. while the correlation between remedies and human and non-human related factors considers the fewest significant relationships regarding the remedies by 0.33. In return, the correlation between remedies and finance-related factors is 0.38 and the P value is 0.003, so the relationship is significant according to (Byrne, 2010).

Furthermore, the correlation between the groups that contain a factor of delay are as follow: management -related factors with contract-related factors,

management-related factors with human and non-human related factors, management-related factors with finance-related factors, finance-related factors with contract-related factors, finance-related factors with human and non-human related factors, and contract-related factors with human and non-human related factors are 1.02, 1.01, 0.77, 0.77, 0.84 and 0.53 respectively, they all share the same P values which is less than 0.001, so the relationships that mentioned above are significant.

Also, the relationships among the proposed remedies and the factors of delay are shown in the table (4.17) below.

Table 4.17: The relationships among the proposed remedies and the factors of delay

	Relationships among proposed remedies and the factors of delay	Standardized Regression Weights	P value
1	Proposed remedies ---> identifying the main reasons that lead to delay and the strategy required to solve this delay	0.65	***
2	Proposed remedies --->Increasing working hours and intensifying supervision of work	0.65	***
3	Proposed remedies ---> Utilizing new equipment that ensure high productivity and adopting modern execution methods	0.35	***
4	Proposed remedies ---> Staged handover of a project	0.75	***
5	Proposed remedies ---> Divide the remaining work into a smaller partition and Divide it to the specialist subcontractor	0.62	***
6	Proposed remedies ---> Offer incentives for early completion workgroup	0.67	***
7	Utilizing new equipment which ensures high productivity and adopting modern execution methods -->Identifying the main reasons that lead to delay and the strategy required to solve the delay	0.19	0.009
8	Utilize modern equipment which ensures high productivity and adopt new executes methods ---> Design changes	0.29	***
9	Utilize modern equipment which ensures high productivity and adopt new executes methods ---> Poor project management planning	0.24	***
10	Identifying the main reasons that lead to delay and the strategy required to solve the delay ---> Contracting with an incompetent contractor	-0.24	0.002

From table (4.17) above, the greatest significant relationship between proposed remedies as a group and the six proposed remedies that have been ranked by the expert respondents is between Proposed remedies and Staged handover of a project by 0.75 and P value less than 0.001, while the smallest significant relationship is between Proposed remedies and Utilizing from new equipment that ensures high productivity and adopting modern execution methods by 0.35 and P value less than 0.001. also, the Regression Weights between the Proposed remedies and Identifying the main reasons that lead to delay and the required strategy to solve the delay, proposed remedies and Increasing working hours and intensifying work supervision are 0.65, 0.65, respectively, with sharing the same P value which is less than 0.001 so the relationships are significant. And the Regression Weights between Proposed remedies and Divide remaining work into a smaller partition and distribute it to the

specialist subcontractor and Proposed remedies and Offering bonuses for early completion workgroups are 0.62, 0.67, respectively, with sharing the same P value which is less than 0.001 so the relationships are significant.

Also, table 4.17 shows the relationships between the proposed remedies like The proposed remedy Utilizing new equipment that ensure high productivity and adopting modern execution methods with the proposed remedy, Identifying the main reasons that lead to delay and the required strategy for solving such delay with regression weight 0.19 and P value 0.009, so the relationship is significant.

In return, table 4.17 shows another kind of significant relationship between the remedies and the factors of delay like the significant relationships between the remedy Utilizing from new equipment that ensure high productivity and adopting modern execution methods with delay factor Design changes, regression weight 0.29, P value less than 0.001 and with delay factor Poor project management planning, regression weight 0.24, P value less than 0.001. also the significant relationship between the remedy Identifying the main reasons that lead to delay and the required strategy for solving such delay with the delay factor Contracting with an incompetent contractor, regression weight -0.24, P value 0.002.

In addition to the relationships with the purposed remedies with the factors of delay, there is another kind of relationship, regarding with the delay factors and the groups that it's related, as well as between the factors of delay table (4.18) exhibits the relations among the factors of delay.

Table 4.18: The relationships between the groups of delay factors and delay factors the belong to them

	Relationships between factors of delay	Standardized Regression Weights	P value
1	Management-related factors ---> Poor project management planning	0.64	***
2	Management-related factors ---> Contracting with incompetent contractor	0.74	***
3	Management-related factors ---> Using traditional paperwork more than software programs	0.32	***
4	Management related factors ---> Unskilled workers	0.55	***
5	Contract-related factors ---> Insufficient and incomplete feasibility studies	0.56	***
6	Contract-related factors ---> Mistakes in estimating project duration	0.76	***

Table 4.18: The relationships between the groups of delay factors and delay factors the belong to them

	Relationships between factors of delay	Standardized Regression Weights	P value
7	Contract-related factors ---> Design changes	0.72	***
8	Human and non-human related factors ---> Political decisions and political realities	0.90	***
9	Human and non-human related factors ---> Government changes the regulation and bureaucracy	0.83	***
10	Human and non-human related factors ---> Frequent Official and unofficial Holidays	0.45	***
11	Human and non-human related factors ---> Delay in progress payment by owners	0.45	***
12	Finance related factors ---> Inadequate the financial allocations	0.82	***
13	Finance related factors ---> The economic crisis of the country	0.68	***
14	Finance related factors ---> Financial difficulty from the contractors	0.75	***
15	Frequent Official and unofficial Holidays ---> Using traditional paperwork instead of software program	0.41	***
16	Using traditional paperwork instead of software program ---> Insufficient and incomplete feasibility studies	0.31	***
17	Design change --> Delay in progress payment by owners	0.34	***

From Table (4.18), all the relationships between the groups of delay factors and delay factors belong to them also between the delay factors are significant (P value less than 0.001) (Byrne, 2010). Moreover, contracting with an incompetent contractor considers by the experts' respondents the most delay factor affected on management-related factors by 0.74. While, Poor project management planning, using traditional paperwork instead of software program, and Unskilled workers have Standardized Regression Weights of 0.64, 0.32, and 0.55 respectively.

Also from Table (4.18) above, Mistakes in estimating project duration the most delay factor affected on contract-related factors by 0.80. while Insufficient and incomplete feasibility studies consider the smallest delay factor effect on contract-related factors by 0.56. also, the delay factor design changes influence contract-related factors by 0.72.

furthermore, Political decisions and political realities, Government changes the regulation and bureaucracy, Frequent Official and unofficial Holidays, and delays in

progress payment by owners, influence Human and non-human related factors by 0.90, 0.83, 0.45, and 0.45 respectively.

Moreover, Inadequate financial allocations obtained Standardized Regression Weights 0.82, The economic crisis of the country got Standardized Regression Weights 0.68 and Financial difficulty from the contractors had Standardized Regression Weights 0.75.

Furthermore, from a table (4.18) there are significant relationships between the delay factors itself apart from the groups that belong to them, like, the relation between the delay factor Frequent Official and unofficial Holidays and the delay factor using traditional paperwork instead of software program by regression weight 0.408. and between the delay factor using traditional paperwork instead of software program and factor of delay Insufficient and incomplete feasibility studies by regression weight 0.31. finally, the significant relationship between the factor of delay Design changes and factor of delay, Delay in progress payment by owners by regression weight 0.34.

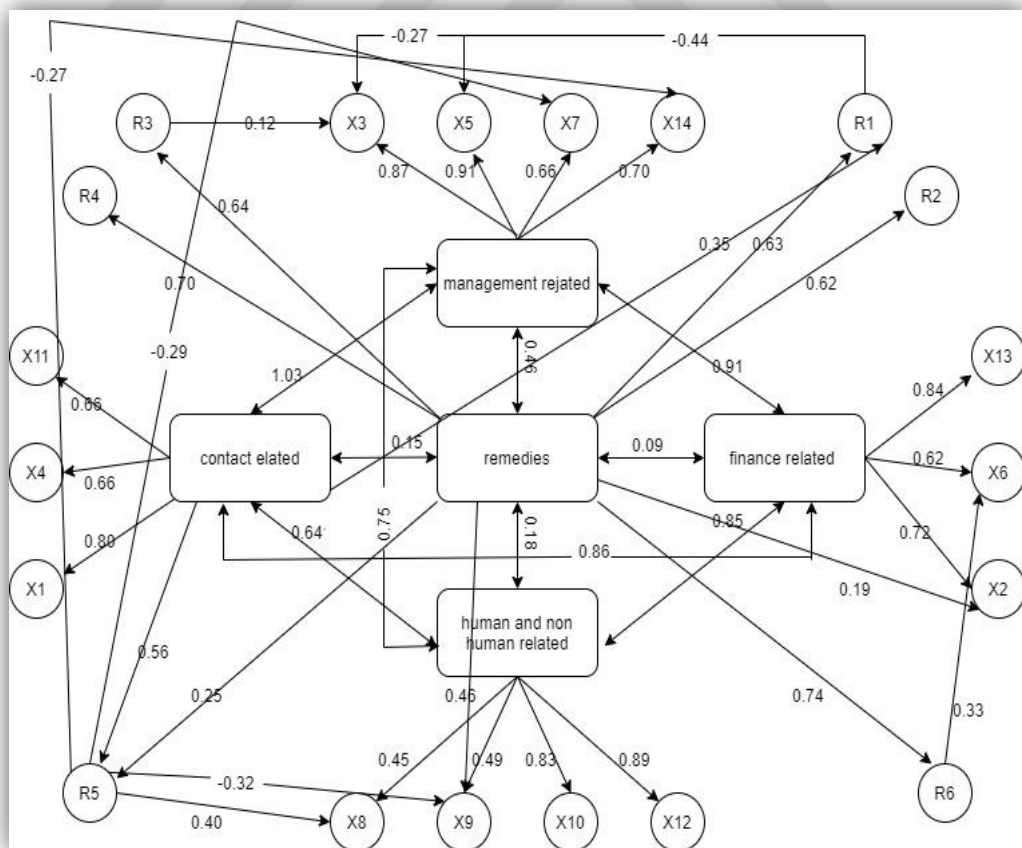


Figure 4.17: The main structural equation modeling for the purposed remedies

Where R1= Identifying the main reasons that lead to delay and the required strategy for solving the delay, R2= Divide the remaining work into a smaller partition and distribute it to the specialist subcontractor, R3= Increasing the working hours and intensifying work supervision, R4= Offering incentives for each early completion workgroup, R5= Utilizing from new equipment that insuring high productivity and adopting modern execution methods, R6= Staged handover of a project. X1= Design changes, X2= Financial difficulty from the contractors, X3= Poor project management planning, X4= Mistakes in estimating project duration, X5= Contracting with an incompetent contractor, X6= The economic crisis of the country, X7= Using traditional paperwork more than software programs, X8= Delay in progress payment from owners, X9= Frequent Official and unofficial Holidays, X10= Government changes the regulation and bureaucracy, X11= Insufficient and incomplete feasibility studies, X12= Political decisions and political realities, X13= Inadequate the financial allocations, X14= Unskilled workers.

4.5 Chapter Summary

This chapter explained the data collected from the expert's respondents to the questionnaire survey to find major factors of delay in Iraqi construction projects. furthermore, provided the common factors of delay for the construction sector in Iraq. Moreover, provided the proposed remedies that help to avoid delay before commencing the project also the remedies for decreasing the duration of the delay through the execution phase. Also, this chapter utilizes the structural equation modeling technique to analyze the collected data and portrait the relationship between either the factors of delay or proposed remedies and the delay factors.

5. DISCUSSION

5.1 Introduction

The design of this chapter is an analysis of the collected data from questionnaire survey respondents. The chapter aims to recognize the main causes factors to time overrun in the construction sector in Iraq. Also, specify groups of the supposed remedies that are designed for decreasing or avoiding the delay before commencing projects or through the execution phase.

5.2 Analysis of Respondents' Information

5.2.1 Analysis of contractual methods that came from data of respondents

Most of the respondents considered the procurement method design and build as the best option to reduce time overrun. And construction management is the second one whilst traditional procurement and management contracting became the final choice, (See figure 4.8). This classification for the contractual methods reveals the effects of procurement methods in preventing or reducing delay scale for construction projects.

5.2.2 Analysis of respondent's data projects monitor techniques

Gantt chart and program evaluation and review (PERT) method are the most technique utilized by the respondents. while the minority choose the critical path method and milestone data programming technique (see figure 4.11). Therefore, the expert's respondents are certain of the necessity of those methods in tracking construction projects.

5.2.3 Analysis of respondent's information about software packages used to plan and monitor the project

The most of respondents admitted that software package roles are required to plan and follow up the construction projects stages (figure 4.11). More than 50% of the respondents preferred MS project software to plan and monitor the projects, while the second choice for the respondents was primavera software. in return, the third

choice for the respondents was Asta power project software for planning and monitoring the projects.

5.3 Analysis of Respondents' Information about The Main Causes of Delay in Construction Project in Iraq

For the first instance used in this study (see figure 4.12). The first hypothesis is (Client-related factors have a major influence on project completion). in client-related factors, Insufficient and incomplete feasibility studies are the most significant factors followed by Contracting with incompetent contractors followed by a Delay in progress payments by owners followed by a lack of financial quotes. Therefore, Insufficient and incomplete feasibility studies are the most factor from client-related factors effect on construction delay indirectly.

Moreover, the second hypothesis is (contractor related factors have a major effect on project completion). The regression weight between construction delay and contractor-related factors is 0.21 from (figure 4.12). Also, in contractor-related factors, the factor Poor project management planning, the most significant cause, followed by Financial difficulty from a contractor after that Using traditional paperwork instead of software program followed by Unskilled workers. it's the factor of delay Poor project management planning the most factor which effects on construction delay by the indirect way.

In return, for the third hypothesis which is (consultant related factors have a major effect on project completion), the regression weight between construction delay and external-related factors equals 0.23. also, there are just two delay factors the first one which is Design changes, and the second one which is Mistakes in estimating project duration. moreover, design change effect construction delay a little bit more than Mistakes in estimating project duration indirectly.

While the fourth hypothesis in the first instance (external related factors have a major effect on project completion). The regression weight between external related factors and construction delay equals 0.35. that is considered the most effective related factor on construction delay. Furthermore, in comparison with the three related factors that aforementioned above, it consists of four causes and Government change of regulations and bureaucracy deemed the most effective one by regression weight

0.84 followed by Political decision and political reality followed by the economic crisis of countries and Frequent Official and unofficial Holidays. Therefore, the biggest influence on construction delay comes from Government change of regulations and bureaucracy in an indirect way.

In return, according to the results shown (see figure 4.12). Indirect influence has been found from individual factors. For instance, the cause Political decisions and political realities influence the cause of Inadequate financial allocations. And Inadequate financial allocations affect Contracting with an incompetent contractor. Also, the factor of delay Using traditional paperwork more than software programs influences Frequent Official and unofficial Holidays. Moreover, the cause of delay Frequent Official and unofficial Holidays effect on Unskilled workers which are simultaneously effected on The economic crisis of the country.

Furthermore, Contracting with incompetent contractor influence Design change. Also, the cause Delay in progress payment by owners is influenced by the cause of Inadequate financial allocations. And the cause of delay The economic crisis of the country is affected by the cause of Design changes. Furthermore, the delay factor Financial difficulty from contractor influenced by Inadequate financial allocations. Whilst, Mistakes in estimation project durations are affected by the factor of Insufficient and incomplete feasibility studies. While the relationship between Mistakes in estimation project durations and Political decisions and political realities is not significant because the P value equal 0.847 (table 4.7), and according to Byrne (Byrne, 2010), The threshold for p-values is 0.05, so, the factors below the 0.05, these causal relationships are considered significant. In return, by all the odds, there is negative influence from the factor Contracting with an incompetent contractor on the factor Using traditional paperwork instead of software program and on the factor The economic crisis of the country.

Regarding the second instance that has been tested in this study, to analyze respondent's data about the major factors that cause a delay in the construction project in Iraq, (see figure 4.14). The first hypothesis is (contract related causes have a major influence on project completion). in contract-related factors, Design changes have the most effectiveness followed by Mistakes in estimating project duration followed by Insufficient and incomplete feasibility studies. so, it's obvious that

Design changes the most factor from contract-related factors effect on construction delay indirectly.

Furthermore, the second hypothesis is (management-related factors have a major effect on project completion). Also, in management-related factors, the factor Unskilled workers, the most significant factor, followed by Contracting with an incompetent contractor after that Poor project management planning followed by Using traditional paperwork more than software programs. it's the cause Unskilled workers the most cause of delay that effect on construction delay by the indirect way.

While the third hypothesis is (human and non-human-related factors have a major effect on project completion). The Delay causes Political decisions and political realities, and Government change of regulations and bureaucracy have the most significant influence. whilst, the less effect come from the delay causes Delay in progress payment by owners, and Frequent Official and unofficial Holidays. Also, the factor Political decisions and political realities got the biggest influence of construction delay by the indirect way.

In return, for the fourth hypothesis (finance-related factors have a major effect on project completion). the cause of Financial difficulty from the contractors has the most effectiveness followed by Inadequate financial allocations followed by The economic crisis of the country. Also, Financial difficulty from the contractors is the most factor from finance-related factors effect on construction delay indirectly.

Also, there are some indirect influences between the individual delay factors, for example, the delay factor Frequent Official and unofficial Holidays influence on the delay factor Using traditional paperwork instead of software program and the delay factor Design changes. While the delay factor Design changes influence on Delay in progress payment from owners and Unskilled workers simultaneously. Furthermore, the delay factor Political decisions and political realities effects on Financial difficulty from the contractors, and Insufficient and incomplete feasibility studies. moreover, the delay factor Using traditional paperwork instead of software programs affects Insufficient and incomplete feasibility studies. Also, Insufficient and incomplete feasibility studies influence Mistakes in estimating project duration. And finally, Financial difficulty from the contractors, effect on Contracting with an incompetent contractor.

5.4 Analysis of Respondent's Information for Proactive Steps to Avoid or Decrease Delay

Respondent's appearance information for the proposed proactive techniques thinks about incredible fulfillment regarding those procedures. Most of the interviewees tracked down those six procedures either important or very important for staying away from or lessening plan overwhelm (figure 4.15).

5.5 Analysis of Respondent's Information for Practical Remedies for Reduce Construction Projects Delay

This hypothesis that tested to figure out the relationships between the remedies suggested to the respondents to reduce delays in construction projects.

Its apparent the expert respondents chose management-related factors (Poor project management planning, contracting with the incompetent contractor, Unskilled workers) to be the most group-related factor which has a significant relationship with the suggested remedies. While contract-related factors (Design changes, Mistakes in estimating project duration, Insufficient and incomplete feasibility studies) have no significant relationship with the purposed remedies. But there are relationships between the groups that contain related factors, the most significant relationship between contract-related factors and management-related factors, so, hence, there is a relationship between contract-related factors and remedies indirectly.

As well, the most significant proposed remedy is the Staged handover of a project. Then, Distinguish the primary reasons which lead to deferment and the system's need to settle these deferral feasibility studies and Increment the functioning hours and heighten oversight of work shared in the second place (figure 4-17).

While using current hardware which guarantees high efficiency and embraces new executes techniques, the most remedy that has a direct significant relationship with the factors of delay.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter intends to present the conclusions and the recommendations of the research. This overview relied upon the audit past investigations shrouded reasons for a delay in development projects in Iraq and better places of the world. Additionally, this investigation relied upon gathering data from the development expert's respondents to the poll review. Additionally, this section plans to give proposals to further develop development projects conveyance time in Iraq.

6.2 Study Objectives

The significance of the development business in the Iraqi economy and the commitment of this area to other life viewpoints inclinations create and further develop development execution overall and activities conveyance specifically. so, the objective targets for this examination were to incorporate recognizable proof the principle defer factors in Iraq and look for and present reasonable solutions for those components. Furthermore, recognize the most severe and frequent factors and rank them at the head of a list of major factors of delay. So, to achieve those targets, this study covered previous studies in Iraq and other countries searched for the same subject .as well as this study achieved a questionnaire survey with construction experts in Iraq.

6.3 Conclusion

This examination introduced an original methodology by using the structural equation modeling method to identify the impact of varied delay factors on Iraqi schedule delays.

according to the results of analyzing data collected from previous studies in Iraq and other countries studies as well as the questionnaire survey with construction experts this study provides the following conclusion.

The essential goal of this research was to identify the main delay factors in Iraqi construction projects. Respondent's opinions according to the previous studies that have adopted summaries the major causes of delay in Iraq to 14 main delay factors. Structural equation modeling technique was utilized to identify the most effective delay causes on construction projects and to recognize the relationships among these causes of delay, two instances were tested, below the most effective delay factors that influence a construction project in Iraq.

1. Frequent Official and unofficial Holidays.
2. Government changes the regulation and bureaucracy.
3. Political decisions and political realities.
4. The economic crisis of the country.
5. Delay in progress payment from the owner.
6. Design change.
7. Mistakes in estimating project duration.

The other goal of this study was to identify the possible strategies that help to reduce or prevent project delays activates before the execution. The data collected from respondents indicated the apparent agreement for the suggested procedures. Also, this agreement from the experts' respondents supports the application of these strategies.

1. Managing the project through (building information modeling) (BIM).
2. Utilize new technology like (BLOCKCHAIN).
3. Establishment of a successive gathering framework with specialists and the customer.
4. Employ qualified staff to estimate the duration and project.
5. Invest more cash for preparing staff ready to design the undertaking successfully.
6. Emphasize the criteria for selecting a qualified contractor.

The last goal of the research is to suggest practical remedies that help to reduce the effect of delay at the project. The response of the respondents found those methods

very important and help to solve delay projects, and by structural equation modeling technique found relationships between the suggested remedies and the causes of delay. Below is the remedies ranking that was conducted by the respondents according to their importance.

1. Staged handover of a project.
2. Offering bonus for early completion workgroups.
3. increasing the functioning hours and escalating oversight of work.
4. Identifying the principal reasons which lead to postponing and the technique needed to settle this deferral.
5. Dividing the remaining work into more modest parcels and circulating it to the expert subcontractors.
6. Utilizing new equipment ensures high productivity and adopts modern execution methods.

6.4 Recommendations

According to the aforementioned above, also, to gain the objective of this research which is foster the presentation of development projects delivery in Iraq. The accompanying focuses are general suggestions for all development projects parties.

1. Achieve intensive meetings between project gatherings to survey and alter plan drawings and bill of quantity to build up the last origination for the undertaking at the beginning phases of the task and before starting the work.
2. It's important to choose qualified and competent contractors, sub-contractors for the work execution.
3. It's important to Secure the monetary assets until complete all projects and build up a clear installment framework between works parties.
4. Employ expert and expert architects in overseeing and screening development projects and assessing project span.
5. Select design and build or construction management technique as procurement method if it is meet your needs.
6. use appropriate methods and software packages to plan and for following up

the projects.

6.4.1 Recommendations before commence the execution to avoid or reduce influence of time overrun

1. Managing the project through (building information modeling) (BIM).
2. Utilize new technology like (BLOCKCHAIN).
3. Establish a continuous meeting system with the client and the consultant.
4. Employ proficient staff for assessing the span and cost of an undertaking.
5. Invest extra money for preparing staff ready to design the venture successfully.
6. Emphasize the criteria for selecting a qualified contractor.

6.4.2 The required remedies for reducing the effects of time overrun in construction projects

1. Recognize the fundamental reasons which lead to deferment and the system's need to settle this postponement.
2. Separating the remaining work into more modest parcels and circulating it to the expert subcontractors.
3. Increment the functioning hours and escalate oversight of work.
4. Offering incentives for early consummation work gatherings.
5. Use current hardware which safeguards high efficiency and embraces new executes strategies.
6. Staged handover of a task.

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APPENDICES

APPENDIX 1: Questionnaire Questions

Section 1: Respondent's Experiences

1.1 What construction business is your company contribute?

- A. Client
- B. Consultant
- C. contactor
- D. other please classify

1.2. In which sector do you work?

- A. public
- B. private
- C. both

1.3. How long had you been working in the construction field??

- A. <10 years
- B. 10-15 years
- C. 15-20 years
- D. >20 years

1.4. What is your major role in construction?

- A. Roads
- B. Buildings
- C. Civil
- D. Mechanical
- E. Electrical
- G. Other please classify.

Section 2. Contractual Arrangement

2.1. What kind of contractual arrangement (S) have you involved before

- A. Traditional (Design – Bid – Construct)
- B. Management contracting (All works are sub-contracted except the management responsibility)
- C. Design and build
- D. Construction management (A construction manager is engaged to supervise planning, design, Construction & commissioning)
- E. Other please specify _____

2.2. Which contractual method do you think better for avoid schedule overrun on construction projects?

- A. Traditional
- B. Management contracting
- C. Design and build
- D. Construction management
- E. Other please specify _____

2.3. Do you think that contracting methods affect the completion of projects?

- A. yes
- B. no
- C. don't know

Section 3. Performance of projects you have been involved in

3.1. What percentage of those projects experienced schedule overrun?

- A. Less than 10%
- B. 10to 20%
- C. 20 to 50%
- D. \geq 50%

3.2. What was the average percentage of delay on projects you were involved in?

- A. Less than 10%
- B. 10 to 20%
- C. 20 to 50%
- D. \geq 50 %

3.3. Please rank the major delay factors on construction projects according to their frequency occurrence and severity by checking in the proper space gave the scope of weighting is from 1 to 4 as displayed in the table beneath

Scale	Frequently	Severity
1	Never	Not Effect
2	Occasionally	Fairly Sever
3	Frequently	Severe
4	Always	Very Severe

NO	Major delay factor	Frequency				Severity			
		1	2	3	4	1	2	3	4
1	Design changes								
2	Financial difficulty from the contractors								
3	Lack in project management planning								
4	Mistakes in estimating project duration								
5	Contracting with an incompetent contractor								
6	The economic crisis of the country								
7	Using traditional paperwork more than software programs								

8	Delay in progress payments by the owner								
9	Frequent Official and unofficial Holidays								
10	Government changes the regulation and bureaucracy								
11	Insufficient and incomplete feasibility studies								
12	Political decisions and political realities								
13	Inadequate the financial allocations								
14	Unskilled workers								



Section 4. Control and Management Major Delay Factors

4.1. Which strategy was utilized for the screen project term?

- A. Gantt bar chart
- B. Critical path method (CPM)
- C. Milestone date programming technique
- D. Program evaluation and review (PERT)
- E. Other please specify _____

4. Which programming bundle was utilized for arranging and screen length for a project?

- A. MS project
- B. Asta power project
- C. Primavera
- D. Other please specify _____

4.3 Do you consider utilizing a programming bundle to lessen the chance of timetable overwhelm?

- A. YES
- B. NO
- C. DON'T KNOW

4.4 The following is a rundown of proactive strides to keep away from or lessen project delays. Sympathetically rate their significance concerning improving timetable on a size of 1 to 4, with 1 having the least and 4 the most noteworthy significance score as displayed beneath, by stamping in the fitting space gave

NO	Proactive step	Importance			
		1	2	3	4
1	managing the project through (building information modeling) (BIM)				
2	Utilize from new technology like (BLOCKCHAIN)				
3	establish incessant gathering framework with expert and the customer				
4	Employ proficient staff for assessing the length and cost for a venture				

5	Invest more cash for preparing staff ready to design the venture viably				
6	Emphasize the criteria for selecting the qualified contractor				



Section 5. Solutions for The Time Overrun Projects

The following is a rundown of proposed cures ventures for a decreased project delay. Mercifully rate their significance as for upgrading plan on a size of 1 to 4, with 1 having the least and 4 the most elevated significance score as displayed underneath, by stamping in the proper space gave

NO	Proposed remedies	Importance			
		1	2	3	4
1	Distinguish the principal reasons which lead to deferring and the methodology need to settle this postponement				
2	Separating the remaining position into more modest parcels and disseminating it to the expert subcontractors				
3	Increment the functioning hours and increase management of work				
4	Offering a reward for early culmination work gatherings				
5	Utilize new equipment that insuring high productivity and adopt modern execution methods				
6	Staged handover of a project				

RESUME

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