

## تطبيق طريقة التحليل الهرمي AHP لمعرفة العوامل المؤدية إلى فشل المشاريع الإنشائية في المملكة العربية السعودية

إعداد الطالب

أحمد حسن موسى الكحلوت

252001759

إشراف/

د. فيصل عبد الحميد

د. فايز جراد

العام الدراسي:

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# **Applying the Analysis Hierarchy Process (AHP) to identify the factors leading to the failure of construction projects in Saudi Arabia**

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أحمد حسن موسى الكحلوت

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تُعد جميع حقوق الطباعة محفوظة لجامعة ميدأوشن

## الشكر والتقدير

الحمد لله ربّ العالمين الذي بنعمته تتم الصالحات، وبتوفيقه تتحقق الغايات، فله الحمد والشكر على ما أنعم به من توفيقٍ وعونٍ حتى تم إنجاز هذا البحث.

أتقدم بخالص الشكر والتقدير إلى جامعة ميدأوشن على ما وفرته من بيئة أكاديمية داعمة ومحفزة للبحث العلمي، وعلى ما قدمته من إمكانيات علمية وتسهيلات أسهمت في إنجاز هذه الدراسة وإتمامها على الوجه التام .

كما أتوجه بجزيل الشكر وعظيم الامتنان إلى المشرفين الكريمين د. فيصل عبد الحميد محمد و د. فايز علي جارد، على ما قدماه من توجيهات علمية قيّمة، وملاحظات بناءة، ودعم متواصل خلال مراحل إعداد هذا البحث، حيث كان لإرشاداتهما وخبرتهما العلمية أثرٌ بالغ في تطوير هذه الدراسة وتعزيز جودتها العلمية.

كما أعبر عن خالص تقديري للدكاترة المحكمين للاستبيان، ولجميع أفراد عينة الدراسة على تعاونهم الكريم ومشاركتهم الفاعلة في تقديم البيانات والمعلومات التي أسهمت في إثراء هذه الدراسة وتعزيز نتائجها.

ولا يفوتني أن أتقدم بالشكر والتقدير إلى الباحثين والمؤلفين في المجتمع الأكاديمي الذين شكّلت أعمالهم العلمية أساساً معرفياً مهماً أسهم في بناء الإطار النظري والمنهجي لهذه الدراسة.

كما أتقدم ببالغ الامتنان إلى عائلتي الكريمة وأصدقائي الأعزاء على دعمهم المتواصل وتشجيعهم الدائم وصبرهم خلال مراحل هذه الرحلة الأكاديمية، فقد كان لدعمهم وثقتهم الأثر الكبير في إتمام هذا العمل.

وفي الختام، أتقدم بالشكر الجزيل لكل من قدّم لي العون والمساندة، خلال مراحل إعداد هذا البحث، سائلاً الله أن يجزي الجميع خير الجزاء.

الباحث

أحمد حسن الكلوت

## الملخص

تتناول هذه الدراسة عملية البحث في العوامل الأكثر تأثيرًا على تأخير مشاريع البناء في المملكة العربية السعودية. وقد تم تحديد أربعة معايير رئيسية بناءً على مراجعة الأدبيات المتعلقة بالعوامل المؤثرة على مدة إنجاز مشاريع الإنشاءات، بالإضافة إلى آراء الخبراء. وتشمل هذه المعايير: مسؤولية المقاول (بما في ذلك مخالقات المواصفات والجدول الزمني والميزانية، وعدم الالتزام بتعليمات المالك)، ومسؤولية المالك (بما في ذلك نقص رأس المال وكثرة أوامر التغيير)، ومسؤولية الاستشاري (ضعف الإشراف)، والقوة القاهرة (الحرائق والانفجارات والزلازل). وقد تم استخدام أسلوب التحليل الهرمي (AHP)، المعروف بأنه من أقوى أساليب اتخاذ القرارات متعددة المعايير. وتم جمع البيانات المستخدمة لتحديد الأولويات من خلال استبيان وُزِعَ على 25 خبيرًا متخصصًا في إدارة مشاريع البناء في المملكة العربية السعودية. وقد قيّم الاستبيان آراء الخبراء حول الأهمية النسبية لكل معيار. وتُظهر النتائج أن القوة القاهرة تحظى بأعلى أولوية (49%)، ولها التأثير الأكبر على تأخير مشاريع الإنشاءات. مع ذلك، تشمل المعايير الفرعية الثلاثة الأعلى تصنيفًا مخاطر الحريق، وضعف الإشراف، وعدم كفاية رأس المال، وهي مسؤولة عن أكثر من 63.43% من حالات تأخير المشاريع. تُبرز هذه النتيجة أهمية الاستعداد لمواجهة الحرائق واتخاذ الاحتياطات اللازمة، والإشراف المختص، وتأمين التمويل اللازم لنجاح مشاريع الإنشاء.

**الكلمات المفتاحية:** تأخير المشروع، عملية التحليل الهرمي، القوة القاهرة، الحريق، المنشأة.

## **Abstract**

This study examines the process of investigating the most affecting factors on the construction projects delays in Saudi Arabia. Four main criteria's were identified based on a literature review of factors influencing construction project completion times, as well as expert opinion. The selected criteria's are: Contractor's (including Violations to Specification, Schedule, Budget and Failure to meet owner instructions), Owner's (including Insufficient Capital and Large number of change orders), Consultant's (Weak Supervision) and Force Majeure (Fire, Explosion and Earth quakes). The Analytical Hierarchy Process (AHP), recognized as one of the most powerful multi-criteria decision-making techniques, was employed. Data used to determine the priorities were collected through a questionnaire administered to 25 experts specializing in construction project management in Saudi Arabia. The questionnaire assessed the experts' opinions regarding the relative importance of each criterion. The results show that Force Majeure has the highest priority (49%) and has the major effect on construction projects delays. However, the three top-ranked sub-criteria's includes Fire Risks, weak supervision and insufficient capital and account for more than 63.43% of the project delays. This outcome highlights the significance of fire preparedness and precautions, competent supervision and securing the funds for construction project's success.

**Key Words: Project Delay, Analytical Hierarchy Process, Force Majeure, Fire, Construction.**

## Contents

|                                                                                                |    |
|------------------------------------------------------------------------------------------------|----|
| المخلص .....                                                                                   | 4  |
| Abstract .....                                                                                 | 5  |
| List of Figures .....                                                                          | 8  |
| List of Tables .....                                                                           | 9  |
| Chapter (1) Introduction .....                                                                 | 10 |
| 1.1. Overview.....                                                                             | 11 |
| 1.2. Problem Statement .....                                                                   | 12 |
| 1.3. Aim and methodology .....                                                                 | 13 |
| 1.4. Sampling and Data Collection.....                                                         | 13 |
| 1.5. Questionnaire Development.....                                                            | 13 |
| 1.6. Data Analysis.....                                                                        | 13 |
| 1.7. Project overview .....                                                                    | 13 |
| Chapter (2) Literature Review.....                                                             | 14 |
| 2.1. Introduction .....                                                                        | 15 |
| 2.2. Project management in the construction industry .....                                     | 15 |
| 2.2.1. planning .....                                                                          | 16 |
| 2.2.2. Organization.....                                                                       | 16 |
| 2.2.3. guidance .....                                                                          | 17 |
| 2.2.4. Follow-up .....                                                                         | 17 |
| 2.3. The contracting stage and its impact on the implementation of the construction project .. | 18 |
| 2.4. Basic features of the contracting business .....                                          | 21 |
| 2.5. Decision making in times of project failure.....                                          | 22 |
| 2.5.1. The role of leadership in times of faltering projects .....                             | 23 |
| 2.5.2. The success of non-faltering projects .....                                             | 25 |
| 2.5.3. The concept of tripping .....                                                           | 26 |
| 2.5.4. Means of improving the ability of organizations to predict the causes of failure:.....  | 27 |
| 2.6. Types of delay in bids: .....                                                             | 29 |
| 2.6.1. Compensable delays .....                                                                | 29 |
| 2.6.2. Unexcused delay .....                                                                   | 29 |
| 2.6.3. Excuse the delay .....                                                                  | 30 |
| 2.6.4. concurrent delay .....                                                                  | 30 |
| 2.7. Reasons for failure in project management .....                                           | 30 |
| 2.8. Reasons surveyed for project delay: .....                                                 | 35 |
| 2.8.1. Delayed by the contractor .....                                                         | 35 |
| 2.8.2. Project delayed by the owner .....                                                      | 37 |
| 2.8.3. Project delayed due to the consultant.....                                              | 39 |
| 2.8.4. Delays caused by force majeure .....                                                    | 40 |
| 2.9. Previous studies .....                                                                    | 40 |

|                                                                                                                    |           |
|--------------------------------------------------------------------------------------------------------------------|-----------|
| 2.9.1. Arabic Studies .....                                                                                        | 41        |
| 2.9.2. Foreign studies .....                                                                                       | 44        |
| 2.10. Conclusion .....                                                                                             | 48        |
| <b>Chapter (3) Methodology .....</b>                                                                               | <b>49</b> |
| 3.1. Introduction .....                                                                                            | 50        |
| 3.2. Research Design.....                                                                                          | 50        |
| 3.3. Study Setting .....                                                                                           | 52        |
| 3.4. Target Population .....                                                                                       | 52        |
| 3.5. Sampling Techniques.....                                                                                      | 52        |
| 3.6. Data Collection Method .....                                                                                  | 52        |
| 3.7. Ethical Considerations .....                                                                                  | 54        |
| 3.8. Limitations of this Study .....                                                                               | 54        |
| 3.9. Data Analysis.....                                                                                            | 54        |
| <b>Chapter (4) Findings And Analysis.....</b>                                                                      | <b>56</b> |
| 4.1 Data Collection .....                                                                                          | 57        |
| 4.2 AHP for the Sub-Factors Affecting the construction projects accomplishment time in Saudi Arabia 57             |           |
| 4.2.1 AHP Scoring for The Owner’s Sub-Criteria’s .....                                                             | 60        |
| 4.2.2 AHP Scoring for The Elevation Sub-Criteria’s.....                                                            | 61        |
| 4.2.3 AHP Scoring for The Force Majeure Sub-Criteria’s.....                                                        | 64        |
| 4.3 AHP Analysis for the Main Factors Affecting the construction projects accomplishment time in Saudi Arabia..... | 65        |
| 4.4 Results and Discussion.....                                                                                    | 67        |
| <b>Chapter (5) Discussion of Results .....</b>                                                                     | <b>69</b> |
| 5.1. Conclusion .....                                                                                              | 70        |
| 5.2. Recommendations and Future Study .....                                                                        | 71        |
| <b>Reference .....</b>                                                                                             | <b>72</b> |
| <b>APPENDIX: Project Questionnaire .....</b>                                                                       | <b>74</b> |

# List of Figures

**Figure 3.1 Study AHP Model..... 51**

**Figure 4.1: Pie Chart of Responders Positions..... 58**

**Figure 4.2: Pie Chart of the Responders Academic Qualifications..... 58**

**Figure 4.3: Pie Chart of the Responders Age Category. .... 59**

**Figure 4.4 Pareto Analysis For the Sub-Factors Affecting Construction Projects Completion Time. .. 68**

## List of Tables

|                                                                                                                                         |    |
|-----------------------------------------------------------------------------------------------------------------------------------------|----|
| <b>Table 4.1: Criteria's and Sub-Criteria's which affects the construction projects accomplishment time in Saudi Arabia.</b>            | 57 |
| <b>Table 4.2: AHP Scale comparing between Owner's Insufficient Capital and the Large number of change orders.</b>                       | 60 |
| <b>Table 4.3: AHP scores for the Owner's Insufficient Capital and the large number of change orders.</b>                                | 60 |
| <b>Table 4.4: Normalized AHP scores for the Population Sub-Criteria's.</b>                                                              | 61 |
| <b>Table 4.5: AHP Scale for the Contractor Sub-Criteria</b>                                                                             | 62 |
| <b>Table 4.6: AHP scores for the Contractor Sub-Criteria's.</b>                                                                         | 63 |
| <b>Table 4.8: AHP Scale for the Force Majeure Sub-Criteria.</b>                                                                         | 64 |
| <b>Table 4.9: AHP scores for the Force Majeure Sub-Criteria's.</b>                                                                      | 64 |
| <b>Table 4.10: AHP Normalized Scores for the Force Majeure Sub-Criteria's.</b>                                                          | 65 |
| <b>Table 4.11: AHP scores for the choosen Criteras.</b>                                                                                 | 65 |
| <b>Table 4.12: AHP scores for the Main Criteras Affecting the construction projects accomplishment time in Saudi Arabia.</b>            | 66 |
| <b>Table 4.13: Normalized AHP scores for the Main Criteras Affecting the construction projects accomplishment time in Saudi Arabia.</b> | 66 |
| <b>Table 4.14: Overall Sub Criteria Scores.</b>                                                                                         | 67 |

## **Chapter (1) Introduction**

## **1.1.Overview**

Delay in construction projects is a common challenge faced by many countries around the world, including Saudi Arabia. These delays can result from various factors such as bureaucratic processes, funding issues, regulatory hurdles, and unforeseen complications during project execution. Such delays not only hinder the timely completion of public infrastructure and services but also have implications on economic growth, public satisfaction, and overall development.

In Saudi Arabia, known for its rapid urbanization and ambitious development plans, addressing delays in construction projects is of paramount importance. It requires a comprehensive understanding of the underlying causes and the implementation of appropriate solutions to mitigate and prevent future delays.

This article will explore some of the key factors contributing to the delay in construction projects in Saudi Arabia and propose potential solutions to address these challenges. By identifying the root causes and implementing effective strategies, it is possible to enhance project management practices, streamline processes, and ensure the timely delivery of critical infrastructure and services to meet the needs and aspirations of the city's residents and businesses.

The timely completion of construction projects is crucial for the development and progress of cities. However, the issue of delay in construction projects persists in many urban centers, including cities in Saudi Arabia. Delays in these projects can have significant consequences, such as increased costs, client dissatisfaction, and missed opportunities for economic growth and social welfare.

This research aims to explore the causes of delay in construction projects in Saudi Arabia and propose appropriate solutions to address these challenges. By understanding the underlying factors contributing to project delays and identifying effective strategies, it is possible to improve project management practices and ensure the timely delivery of public infrastructure and services.

The cities in Saudi Arabia, has experienced rapid urbanization and ambitious development plans in recent years. However, several construction projects have faced delays, leading to concerns among stakeholders and the general public. Therefore, it is essential to examine the specific causes of these delays and develop tailored solutions that can be implemented within the local context.

This research will adopt a comprehensive approach, considering various aspects that contribute to project delays, such as bureaucratic processes, funding issues, regulatory challenges, design changes, and unforeseen complications. By analyzing these factors, it becomes possible to gain insights into the root causes of delays and identify appropriate strategies to mitigate them.

The findings of this research will provide valuable insights for projects owners, project managers, and stakeholders involved in the execution of construction projects in Saudi Arabia. By implementing the proposed solutions, it is expected that the efficiency and effectiveness of project delivery will be enhanced, leading to improved urban development, increased owner satisfaction,

and overall progress in the Saudi Arabia.

The subsequent sections of this research will delve into a detailed analysis of the causes of delay in construction projects in Saudi Arabia and present potential solutions to address these issues. By examining case studies, conducting interviews, and reviewing relevant literature, a comprehensive understanding of the problem and its potential remedies can be achieved.

## **1.2. Problem Statement**

The timely completion of construction projects is crucial for the development and progress of cities. However, the issue of delay in construction projects poses significant challenges in cities of Saudi Arabia. These delays have broader implications on economic growth, owners satisfaction, and overall development in Saudi Arabia.

The problem to be addressed in this research is the causes of delay in construction projects in Saudi Arabia and the identification of appropriate solutions to mitigate these delays. Understanding the underlying factors contributing to project delays is essential for implementing effective strategies that can streamline project management practices and ensure the timely completion of critical projects.

The delay in construction projects in Saudi Arabia can be attributed to several factors, including lengthy bureaucratic processes, funding issues, regulatory hurdles, design changes, and unforeseen complications during project execution. These challenges not only result in increased project costs but also lead to owners dissatisfaction and missed opportunities for economic development.

Furthermore, the impact of these delays extends beyond individual projects, affecting the overall development and quality of life in Saudi Arabia. It is imperative to address this issue to enhance the efficiency and effectiveness of project implementation, promote sustainable urban growth, and meet the evolving needs of the city's residents and businesses.

By conducting comprehensive research on the causes of delay in construction projects in Saudi Arabia and proposing appropriate solutions, this study aims to provide valuable insights and recommendations for private owners, project managers, and stakeholders involved in the execution of construction projects. The findings of this research will contribute to improving project management practices, streamlining processes, and ensuring the timely completion of critical projects in Saudi Arabia.

### **1.3.Aim and methodology**

This research aims to address the primary causes of delays in construction projects by identifying and ranking them. To achieve this, the study will conduct a questionnaire survey among construction experts involved in construction projects in Saudi Arabia. The survey will collect data on the causes of delays by utilizing an AHP scale to rate the importance of each factor in comparison with another factor. The questionnaire will be designed through collaboration with a focus group consisting of owners, consultants, and contractors, who provided their expertise and background information. The survey will be distributed to a targeted group of participants, including owners, consultants, and contractors.

The data for the study was also supplemented by a comprehensive literature review of related papers. By analyzing the survey responses and reviewing existing literature, the research aims to identify the most frequently occurring and significant causes of delay in private projects. With this information, the study will provide recommendations to address these identified problems effectively.

In summary, this research utilizes a questionnaire survey and literature review to identify and rank the causes of delays in construction projects. The findings will be used to offer recommendations for mitigating these delays, ultimately contributing to improved project management practices and timely completion of private projects in Saudi Arabia.

### **1.4.Sampling and Data Collection**

A purposive sampling method was used to select participants working in the field of private projects in Saudi cities who have experience and knowledge in this field, including project managers in different agencies, consultants and contractors.

### **1.5.Questionnaire Development**

A structured questionnaire is developed, consisting of closed-ended questions. The questionnaire aims to capture information regarding the reasons for delays in construction projects, the severity and frequency of each factor, and potential solutions.

### **1.6.Data Analysis**

The collected data are analyzed using the Analytical hierarchy process.

### **1.7.Project overview**

This chapter provides an overview, and Chapter two summarizes the work done so far on construction project delays. Chapter three describes Data collection and analysis method. Chapter four presents the analysis of questionnaire responses. Chapter five concludes the work and offers some Recommendations.

## **Chapter (2)      Literature Review**

## **2.1.Introduction**

This chapter presents a review on the theoretical framework, project management in construction projects including; planning, organization, guidance and follow-up. This chapter also includes the contracting stage and its impact on the implementation of the construction project, features, decision making in times of project failure. This chapter also review the types of delays.

## **2.2.Project management in the construction industry**

It is known that every project has an entity based on its management, and management in this context means coordinating all resources through the process of planning, organizing, commanding and controlling in order to achieve the objectives of the process (Abiola, 2000). Project management is the professional services that are provided during the design and construction phases of projects with the aim of ensuring that the project is completed on time and planned, with the desired quality and within the financial resources allocated to it, which ultimately leads to the realization of the project's objectives. This case study takes place in the kingdom of Saudi Arabia.

In light of the foregoing, there is an urgent and necessary need to choose a project manager from the supervision department with high efficiency who possesses the necessary expertise and skills in this field to be able to manage design and construction contracts, apply project control systems, and carry out coordination and follow-up work between all parties concerned with the project, represented by design consultants and supervision of Construction contractors, audit their work, and be the main link and channel of communication between the owner and all parties involved in the project.

Among the most important duties assigned to the project manager is to assist the owner of the project in determining the best ways to complete the project and estimate the risks that may occur, and thus take the necessary measures to prevent them from occurring, deal with them, and deal with the negative damages resulting from them in the event of their occurrence.

The project manager carries out many main activities, which are represented in a group of activities, planning, organizing, directing and following up. These activities can be explained as follows: (Inshasi, 1997, 7-9).

### **2.2.1. planning**

It is intended to draw up an integrated program (scenario) to prevent defaults in project management, by taking appropriate preventive measures that work to prevent the causes of delay in project completion (Koushki, et al., 2005), reduce their negative effects, and achieve the greatest amount of results (McCaffer, 1998). By accurately imagining the reality and the future, anticipating the events that may coincide with that reality, and preparing for emergencies by specifying in advance what must be done, the manner in which this work is to be done, the time set for it, who will do this work, and the material and human capabilities necessary for that. (Abd. Majid, & McCaffer, 1997).

The current study believes that planning of construction projects in the kingdom of Saudi Arabia aims to bring about changes in work for the better and to adopt policies, programs and procedures for this purpose. It aims to study the past and present and predict the future, including the internal and external environment. Difficulties in building its future goals and policies and drawing up a sound strategic plan. Evaluating the environmental factors of the problem completes the stage of identifying and diagnosing the problem of delay.

### **2.2.2. Organization**

It means integrated coordination and compatibility between the various efforts that are being made in managing the project, by identifying the members entrusted with the work to address the problems facing the project, the tasks associated with each member, the external bodies supporting the members, defining the lines of authority and responsibility, and the communication that links them, provided that the work is done in a manner collectively, identifying the tools and elements necessary to overcome diffusion in project management, confrontation and implementation venues (Abdul-Rahman, et.al, 2008).

The proper organization of project management requires knowing the surrounding environmental conditions, explaining the nature of the task, describing the work itself, the scope of the intervention, the goal of the intervention and the delegated authority in addressing the problems of stumbling in project management, and displaying maps, pictures and diagrams to show how the activities are divided, and how they relate to each other horizontally and vertically (Enshassi et al., 2008).

The current study believes that the benefits achieved by organizing in the Saudi

cities are represented in identifying the required skills, optimal use of resources, reducing burdens, distributing roles and feeling responsible.

### **2.2.3. guidance**

The guidance process includes the following characteristics: That the direction (the matter be reasonable and executable, clear and unambiguous, and complete indicating the work required to be performed, whether in terms of quantity or quality, place, and time. That is, a complete diagnosis and description of the assigned task, defining all powers and their limits so that there are no abuses or misunderstandings, and to make it easy to refer to them if necessary (Levy, 2002).

The current study believes that guidance in the Saudi cities is related to the factors influencing the identification of the problem it faces, such as material factors and non-material factors, as well as the proposed solutions must be studied in light of the environmental conditions surrounding the project, which include economic, social, political and technological aspects, and unexpected events must also be taken into account. Such as the issuance of new laws, the emergence of new technology, new discoveries, or any events that are difficult to predict. The search for alternatives is associated with several characteristics.

### **2.2.4. Follow-up**

It means: the supervision in cooperation with (contractors, consultants, owners) on how the work proceeds in the event of a failure, and to ensure the correctness of paths and implementation of emergency plans, and the role of each member, and the proper use of available resources (Kaming, et al., 1997). To provide the necessary support and reinforcements to face the delay of projects in order to know the weaknesses to avoid them, and the strength to maintain them (Salamah, 2009).

Follow-up is considered an essential pillar in the success of project management, because it helps the management to support the work team in terms of clarifying the implementation of some aspects of the plan in case of ambiguity, or justifying a specific action, or clarifying a specific method, or encouraging them for the purpose of carrying out a specific action, and ensuring the adequacy of means and tools used in the plan, its proper employment, making appropriate modifications to the plan, and ensuring the presence of support bodies to face project delays (Miozzo & Ivory, 2000).

In order for the follow-up to achieve its objectives, the supervisor management

team leader must follow the following procedures: Pay full attention to following up on all aspects of the project, and be present in the project continuously; To follow up the events first, and to create the appropriate atmosphere of cooperation and harmony among the workers so that they can perform their roles in an optimal way (Abu Al-Alam, 2007).

The Most construction owners in Saudi Arabia is keen to follow up all executive work related to construction projects, to ensure that there is no delay in the delivery of projects, in addition to following up on the contractor's work, to ensure that the work is implemented as required and according to the required time period, and to follow up the implementation work of the projects through field visits during the contractor's work, and to record any Defective projects through field visits to them during implementation, follow-up of repairs to them by the contractor, and ensure the progress of work according to the project schedule and ensure no delays, follow-up change orders on projects and find out their reasons from the concerned authorities.

### **2.3.The contracting stage and its impact on the implementation of the construction project**

It is well known that any engineering project goes through three main stages, especially large projects, and these stages are (Hamid, and Al-Shouk, 2009):

1. The stage of the economic feasibility study, which means collecting the basic requirements for the project and preparing the necessary reports for its components and the estimated cost for it, i.e. a simplified feasibility report with preliminary designs on a scale of 1/200, indicating the spaces and blocks and linking them. With road, industry or irrigation projects. It is preferable to prepare an accurate economic study for each project of special importance and high cost. The feasibility study stage is considered important, as the use of the project and the cost of its maintenance have a direct performance and economic relationship with the general evaluation of that work, in addition to the direct financial return of the project, whether it was investment or commercial.
2. The engineering stage, which includes (design, contracting, implementation, and delivery).
3. Operation and maintenance phase.

The contracting stage begins during the preparation for the final part of the

engineering design stage, where the architectural and executive drawings and appendices of the project plans have been prepared, in preparation for the work of counting quantities, and choosing the appropriate contractor to implement the project. In fact, the contracting stage is considered as a small project for the owner work and need to good planning, and the most important steps that this stage goes through can be summarized as follows (Naseer, 2007):

1. Preparing tender documents: These are documents that are usually given to contractors to study the project, and then submit the bid to the owner (employer) in preparation for selecting the appropriate contractor who will implement the project. These documents include the following:

First, the requirements and conditions of the owner: It is an invitation from the owner of the project to the contractors to enter the tender, in which he explains: (Hamid, and Al-Shawk, (2009).

- (1) The name of the tender, its number and title, and the classification included in the budget.
- (2) A brief and clear description of the project or contract required to be implemented, indicating the required services and goods.
- (3) The duration of the tender announcement or direct invitation.
- (4) Statement of the date and place of submission of bids, the validity period required for them, and the place and date of selling the tender documents.
- (5) Statement of the amount of the initial insurance required from the bidders.
- (6) Bid closing date.
- (7) The price of the tender documents is not refundable.
- (8) The website of the contracting party, and the email address of the administrative formation responsible for tenders therein.

Secondly, Tender offer letter: It is the letter addressed by the contractor to the owner stating the first's approval to enter the tender under the conditions mentioned in the owner's invitation, in which the tender (amount) and that the various terms of the tender have been studied.

Third, the form of the contract the contract is defined as a final, formal, written agreement document between the two contracting parties for the implementation of a specific engineering project, namely the employer (the contracting entity), and it is usually symbolized in the engineering contracts of the first party and the

executing company (the contractor), and it is usually symbolized in the engineering contracts of the second party. The contract clarifies the rights and obligations of each party towards the other. The contract contains:

- (1) The name and full details of each of them.
  - (2) The name of the witnesses to the contract, usually an official body familiar with the legal aspects.
  - (3) The name of the project to be implemented with an overview of its main contents.
  - (4) The duration of project implementation and its total cost.
  - (5) The method of material dealings between the owner and the contractor, the method of disbursing monthly advances and dues).
  - (6) The contents of the contract, such as engineering drawings, technical conditions, letters of guarantee, insurance and fines.
  - (7) Any special conditions required from the employer.
2. Contractor selection: This is done according to the instructions for implementing government contracts, and there are many tenders, the most important of which are (Hamid and Al-Shawk, 2009):

Firstly. Open bids.

secondly. Limited tenders.

Third. Multiple tenders.

Usually, the business owner sends an official letter (referral letter) when selecting the appropriate contractor for the project, informing him that he has chosen him to implement the project, with specifying a date for signing the contract document in its final form.

3. Signing the contract: It means the final formal agreement between the owner and the contractor, and it is binding on both parties from a legal point of view on the contents of the contract and according to the tables of quantities for the contracting, so that it includes the contractor's approval to carry out construction works in exchange for sums of money paid by the owner, in a specific way and time agreed upon based on the conditions that It has been approved and there are basic points to note when contracting, namely:
1. All clauses of the contract must be formulated in a clear, easy and simple manner and not carry more than one meaning.
  2. There should be no conflict in the terms of the contract, and all terms of

the contract must comply with the laws of the country in which the project is to be established.

3. The contract must stipulate the method of material dealings between the two parties, as well as when making any technical changes in limiting the business items (an increase or decrease in the project items and how to deal with them in terms of quality, implementation and cost.
4. The contract should contain the rights and duties of each party in easy-to-understand language.
5. The contract should contain late penalties in terms of how to deal with them.
6. The need to refer to the approved documents in the contract and their sequence or refer to them in case of disagreement and according to their logical sequence.
7. Applicability of general conditions and specifications to contracts in addition to the conditions contained in the contract.
8. Considering all appendices, drawings, warranty books, catalogs and technical specifications as part of the contract by stipulating that in the original contract concluded with the other party.

#### **2.4. Basic features of the contracting business**

The contracting business is specialized in work that distinguishes it from other businesses, in terms of characteristics, methods and methods of dealing that differ from the rest of the commercial business, and for this reason we list some of those features in this part:

##### **1. Great variety:**

Contracting contracts differ according to the type of project, for example, building a house or a hotel, establishing a factory or power station, or building a bridge and constructing a canal. According to the purpose of its establishment and the extent of the services and facilities required to be available in it, the project is divided into several stages of implementation and each stage has its own requirements, style, needs and timing, i.e. the stages of one project differ among themselves, meaning that the nature of each project and each stage imposes the method and manner that must be followed in implementation (Al-Ja'louk, 1999).

##### **2. Time factor**

The time factor in contracting works is of particular importance, because all

contracts contain conditions for the completion of works within a specified period of time, in case the contractor exceeds them, he must pay delay fines. (2002, Levy).

### 3. Technical Specifications

There are usually general conditions and administrative and financial conditions attached with a book of technical conditions that must be adhered to in the implementation of the project, and the contractor must adhere to these conditions during work, and failure to adhere to them as a result of inability to implement them, saving costs, or weakness in efficiency results in serious problems Such as refusal to receive and fines.

### 4. Cost

The good implementation and completion of a project in terms of time and with the required specifications is not sufficient for the project to be successful for the contractor, as he must complete his project at a cost less than the value of the contract he concluded with the employer, and for this there must be a prior study of the project by specialists and practitioners in all fields. Technical, financial and legal aspects.

### 5. Legal requirements

The contracting contract contains a set of legal provisions agreed upon between two parties. These laws clarify the obligations incurred by both parties (Al-Jamlouk, 1999).

## **2.5.Decision making in times of project failure**

It means: selecting the appropriate alternative from several alternatives in the light of some possible criteria in the possibility of implementing the decision within the limits of the available capabilities in times of project failure, lack of time and speed of events, simplicity and clarity to be able to implement it (2002 Vitalis, & Najafi). The effectiveness of decisions in times of project stumbling is the sum of three main elements. The first element is effectiveness, which is intended to suit the decision for technical and objective aspects. The second element is prudence, which means that its costs and losses are as low as possible, and then the return is the maximum possible, so that the decisions are creative (innovative). The third element is acceptance, which refers to the response of the administration in cooperation with the (owner-consulting contractors) to this decision (Al-Ghafly, 1995).

It should be noted that decisions at times of project failure are not only related to

the material factors influencing and affected by the project, which can be measured and expressed in numbers, but also related to objective factors and intangible things that cannot be measured, such as personal and social relationships. Therefore, the decision-maker faces pressures regarding making a decision in times of project stumbling, represented by: the lack of clarity of vision, the speed of events that require making quick decisions to control the situation in order to reduce losses, the lack of time available, and the lack of information; Due to the multiplicity of sudden situations, and the follow-up that falters due to the stumbling in the project, and the influence of decisions on the personality of the leader in times of stumbling because he is usually a different personality from normal circumstances, because he is more effective than what does not allow him to guarantee thinking, and the aggravation of the consequences of the continuity of stumbling and the exacerbation of its consequences.

The decision-making process in the Jeddah increases understanding and trust among engineers and contributes to spreading a democratic atmosphere and enhancing communication between the various administrative levels. Encouraging initiative, facing challenges and freely expressing opinions and proposals, which encourages the detonation of latent energies and creativity in work, and improves the quality of decisions, as participation gives the decision strength and speed in implementation. Such as improving the level of job satisfaction, raising the morale of engineers, enhancing their motivation, and encouraging them to assume responsibility.

### **2.5.1. The role of leadership in times of faltering projects**

Bureaucratic and non-permissive management is one of the complex organizational manifestations that cause delays in projects, which are usually characterized by inflexibility, lack of interest in people, inertia, slowness in completing tasks, evading responsibility, and maintaining familiar habits and methods of work. Where many leaders and managers hesitate to abandon the old methods, whether in work or practices (Asfour, 2007).

(Kumaraswamy & Chan, 1998) stresses that the reasons for project delays are adherence to the letter of laws and instructions, focus on formalities rather than content, administrative centralization, lack of delegation of powers and rejection of colleagues, lack of material and moral incentives for creative individuals, incompetent administrative leaders, presidential breaks, and the difficulty of

Communication between senior management and workers, and organizational obstacles, such as defining the behavior of workers in the lights set for them and not deviating from them, financial obstacles and unwillingness to cover the costs that creative activities may require, weak organizational loyalty, and in-depth thinking.

(Biren, 2005) tried to explain the results of the causes of project delays that they lead to a decrease in the prevailing work climate in organizations, as it leads to a weak rule of interaction and dialogue between individuals, and to a lack of cooperation and harmony between workers and management, and to reduce opportunities for growth and development, and to achieve ambitions. Individualism, weak ways and methods of work, and thus the low possibility of benefiting from the energies and capabilities inherent in individuals and employees of the organization.

Gerhar (2007) believes that the study of the causes of project delays, in fact, represents an important additional dimension for management, and its study must be taken into account during the present and the future, when analyzing the integrative nature of management, and when studying and evaluating it; Where this includes the management of managers, the management of tasks, the management of human resources, and the creation of interdependent harmony between all of these aspects, because the complexity of work procedures has a significant impact on making administrative organizations permanently vulnerable to preoccupation with problems and immersion in a cycle of continuous failure to achieve goals, especially what is related to calculated waste. It affects the time and performance of administrative processes, such as overlapping, insufficient administrative systems, slackness in the number of employees, weak leadership vision, involvement in the specter of mock meetings, lack of information, the absence and insufficiency of comprehensive information systems and databases, and the failure of communication and subsequent control systems.

Also, rumors are the most important source of stumbling in the implementation of projects. In fact, much of the stumbling is its only source is a rumor that was launched in a specific way, and it was employed and harnessed using a set of truthful facts that have actually occurred, and therefore, surrounding it with a halo of false and misleading data and information and announcing it at a certain time, and within a specific climate and environment lead to the detonation of the crisis. Rumors are usually launched in certain forms or images after they have been

employed and surrounded by a halo of false and misleading information. The rumor is often launched at a specific time and in an environment that was well prepared by exploiting a specific event with the aim of providing all the atmosphere for failure in the implementation of projects (Mustafa and Al-Hussein, 2010).

As for (Valentine, 2001), he believes that the reasons for project delay are:

1. Inadequate communication channels in all directions, and lack of support for the participation of workers in decision-making.
2. Weak abilities of employees to learn and self-development, and a lack of self-management teams.
3. Reduce dealing with organizational conflict effectively and efficiently.

### **2.5.2. The success of non-faltering projects**

Project success is generally based on cost, time, quality and performance criteria (2003). (Frimpong et al., 2003; Williams et al., 2003). The project is considered successful if it meets the technical specifications, if there is a high level of satisfaction with the results of the project among clients, and if it is completed within the stipulated cost or budget and the start of project work on the target date. (Hall & Rwelamila, 1995) believes that the timely completion of the project is considered the main criterion for project success. The researchers added that project success is a function of the management effort to complete the project in a timely manner, and this approach helps in controlling costs and quality and supports and believe that project delays could have significant cost implications.

A study of (Ogunlana & Promkuntong, 1996) in Thailand and a study (Kaming et al., 1997) in Indonesia) indicated that the delay in completing projects is due to the contractors. A study conducted by Abd Majid & McCaffer (1998) on the causes of delay in the implementation of the project indicated that (50%) of the delay can be classified as delay without excuse for which the contractors are responsible.

A study conducted by Kunaraswangy & Chan (1998) indicated that there are six important common factors for delay in construction projects and civil engineering projects, which are poor site management and supervision, slow decision-making for all project teams, changes of client and changes needed for works, and insufficient contractor experience. . Mezher & Tawil (1998) study indicated that among the reasons for the delay in the implementation of projects in Lebanon: financial problems, changes in design by the owners and the lack of availability of

executive plans.

The effective use of equipment and the suitability of equipment for contractors' work in executing the proposed project are of vital importance in construction activities (McCaffer, 1998). Efficient management of plant and equipment on the part of contractors promotes proper project implementation (Omole, 2002).

A team believes that the overall success of a construction project includes achieving goals related to cost, schedule, quality and safety. The performance of the contractor is crucial to the success of any construction project, as the contractors are the ones who turn the designs into practical reality (Xiano & Proverbs, 2005). It is known that improving the performance of the contractor leads to an increase in customer satisfaction and an improvement in the reputation of the contractors. Therefore, the aim is to take the necessary precautions and legal procedures. Due in the selection of contractors for all implementation of any construction project is to ensure the performance of the project.

### **2.5.3. The concept of tripping**

The concepts of stumbling have multiplied with the multiplicity of writers and researchers, and their different views on how to deal with stumbling, and if there are common features among them. Some concepts of stumbling can be presented as follows:

A transitional circumstance that is characterized by imbalance and represents a turning point in the light of which future events that lead to a major change are determined (Makhul and Atani, 2003).

Some have defined it as a process and a state. In terms of its being a process, it is not a product of the moment, but rather a result of many causes and factors that interacted and interacted other than the time stages, lengthening or shortening, and leading to the state in which the project is in terms of its inability to pay its obligations and obtain new obligations, but also to return. to what it was before, or to restore its financial, monetary or operational balance (Gharib, 2001). Stumbling is a difficult and severe matter that is difficult to confront, and it results from mistakes that cannot be tolerated because of the negative effects they leave that make the administrative entity suffer from them for long periods. Stumbling has introductions and manifestations that indicate it. (Koushki et al., 2005).

Obaidat al-Julani (1993) defined it as a state of tension and a turning point that requires a decision that results in new positions, whether positive or negative, that

affect the various relevant entities. (Al-Ja'louk, 1999).

The research defines stumbling as an unusual situation that goes out of control and leads to work movement stopping or falling to an unusual degree, threatening the achievement of the goals required by the organization at the specified time.

#### **2.5.4. Means of improving the ability of organizations to predict the causes of failure:**

people can improve its ability to predict the causes of default by the following:

1. Early warning signs detection stage: The problem usually sends long before it occurs a series of early warning signals or symptoms that predict the possibility of a failure in the project, and unless sufficient attention is paid to these signals, it is very likely that default will occur. Project management sends its own signals, and it may be difficult to distinguish between the signals for each problem separately. Among the means of detecting early warning signs (Al-Momani, 2000): the need to establish methods for detecting warning signs of potential problems, an internal team to test the procedures followed, reward detectives and whistleblowers, describe the official functions used in the system, and spread an organizational culture supportive of the system of detecting alarm signals.
2. Preparedness and prevention stage the community must have sufficient preparations and methods to prevent problems in managing the project, and this confirms the importance of early warning signals, because it is difficult to prevent the occurrence of something that you did not predict or warn of the possibility of its occurrence. The aim of prevention is to discover weaknesses in Community prevention system, and there is a relationship between predicting the causes of failure and preparing and preventing them. Among the means of preparedness and prevention (Alaghbari et al, 2007): routine inspection and maintenance of all equipment, formal technical guidance and procedures using problem management tools (risk analysis, risk tree) and human factors analysis of risky equipment, load control to prevent overload, system management and waste prevention.
3. The stage of containing and limiting the damage, which is summarized in the preparation of means to limit the damage and prevent it from spreading to include other parts that have not yet been affected in society. obtain the necessary information, update containment capabilities, test containment

capabilities, implement containment, estimate and reward damage content, and allocate resources for damage containment.

4. The stage of recovery of activity This stage includes the preparation and implementation of programs (ready and already tested short and long-term, and if these programs are not tested in advance, it is difficult to respond and develop appropriate solutions when the problem arises, and the stage of recovery includes several aspects, including (Promkuntong & Ogunlana, 1996) Determination Important stakeholders for the stage of recovery, determining the minimum level of tasks, services and products required to conduct business, procuring the necessary resources for the process of restoring activity after failure and restoring confidence, identifying internal and external needs, identifying means to restore self-confidence, setting priorities for basic needs, and determining the most important work required To resume activity and identify the interaction between technical means and human requirements in activity recovery plans.
5. The learning phase, which is continuous education and re-evaluation to improve what has been accomplished in the past, as learning is vital, and the recovery phase includes several aspects, including Meher & Tawil 1998: The necessity of reviewing previous problems, reviewing the method of dealing with stumbling without blaming anyone, and comparing between Work done well and not well, learning about other potential problems, presenting lessons learned formally, brainstorming and innovation, recalling and recalling past problems periodically (eg annually).

There are mechanisms to deal with the failure of projects, which can be summarized as follows:

1. Adopting early warning and good planning systems to contain any failure in project management before it occurs by setting appropriate scenarios and solutions for all expected problems in project management before, they occur, training workers on them, providing a database that includes all the necessary information about the project and preventing them from occurring or getting out of them with minimal losses (Arditi & Pattanakitchamroon, 2006).
2. Readiness in project management: the time factor is of great importance at the level of individuals and organizations, whenever the individual or organization is prepared and super ready and has the ability to deal with the

event with the things it requires, the reasons leading to the failure of the project can be controlled, contained and exited with minimal losses (Gothand, 2003) Direct dealing is an important element of spreading reassurance and a reflection of confidence in the ability to deal with the causes leading to the failure of the project. It also cuts rumors and takes the initiative. It also helps to know the size of the problem and its seriousness, which enables the work team or whoever is entrusted to deal with the problem to prepare and plan. good to contain them (Al-Jalouk, 1999).

3. Transparency in dealing with the reasons leading to the failure of the project: Transparency plays an important role in dealing with the reasons leading to the failure of the project, whether for organizations or individuals. or limiting its effects (Levy, 2002).

## **2.6.Types of delay in bids:**

Delays can be grouped into the following four broad categories according to the way they operate contractually:

- (1) Excusable delay.
- (2) Delay without excuse.
- (3) Unreasonable delay.
- (4) Synchronous delay (Ahmed et al., 2003).

### **2.6.1. Compensable delays**

Compensable delays are those usually caused by the owner or his agents. The most common form of compensable delays is inadequate drawings, specifications, but compensable delays can also arise from failure of owners to respond in a timely manner to requests for drawings or information and owners changes in design or materials, disruption of the owners and change in the sequence of work, the contractor is entitled to money and additional time resulting from causes of delay caused by the owner or his agents (Alaghbari, 2005).

### **2.6.2. Unexcused delay**

These delays are caused by contractors, suppliers or material providers, through no fault of the Owner. The contractor is entitled to supplier delay compensation, but no compensation is due from the owner. Therefore, the irreparable delay and its consequence is not giving any additional money or any additional time to the

contractor (Alaghbari, 2005).

### **2.6.3. Excuse the delay**

Excused delay is also known as force majeure, which is the third general category of delay. These delays are commonly called God-given because they are not the responsibility or fault of any party. Most contracts allow the contractor to obtain an extension of the bid for the time of delay with an excuse and do not allow additional funds for that (Alaghbari, 2005).

### **2.6.4. concurrent delay**

If there is any element delaying the project, it is relatively easy to account for both the time and money caused by the issue. The situation is more complicated if there is more than one factor delaying the project at the same time or in overlapping time periods, and these delays are called concurrent (Alaghbari, 2005).

## **2.7.Reasons for failure in project management**

The stumbling in its content expresses an administrative failure of the decision-maker as a result of the occurrence of some defect in confronting it, and one of the reasons for this defect may be the lack of experience enjoyed by the decision-maker, or his lack of interest in the evidence that indicates the occurrence of stumbling, or it may be related to underestimating the problem itself, Here the biggest problem lies with the institution and its decision makers.

The factors that cause defaults do not arise fragmentary, and are not a result of the moment, but rather the result of the interaction of reasons and factors that arose before the emergence of the problem of defaulting in project management. (Hamid and Al-Shawk, 2009) mentions that the reasons for the failure of projects in general can be as follows:

1. Causes beyond the control of some people, such as earthquakes, volcanoes, hurricanes, weather fluctuations and other natural disasters whose dimensions are difficult to predict and control.
2. Weak material and human capabilities, which leads to exacerbating crises in project management, turning them into disasters and doubling the resulting losses.
3. Ignoring early warning signs that indicate the possibility of exacerbating crises in project management, such as customer complaints or competitor

problems, which could be an indication of failure or deficiencies in the manufacture of a particular product.

4. Not conducting a periodic review of the different positions, and the consequent lack of learning from mistakes, not realizing the importance of holding meetings in developing the workflow.

(Salamah, 2009) deals with random management, as he indicates that the presence of a scientific administration capable of making the right decision in a timely manner and according to accurate, recent and realistic information will be the protective shield for the trust to protect it from stumbling or reduce its notification if it occurs, and this is what we do not see in most administrations that follow the method randomness in its management of these organizations.

Whereas (Al-Gahtani & Taher, 2007) deals with human errors, which constitute one of the biggest causes of stumbling, as mistakes made by workers cause problems and crises and sometimes lead to disasters, due to the negligence of many institutions to train their workers to do these works, as well as lack of interest. industrial security.

(Abu Al-Othma, 2007) focuses on the lack of planning in envisioning the future and preparing for it in project management. Good planning and preparation to confront the potential causes of project failure must take into account a set of factors, including identifying the human, material and technical resources necessary and necessary to implement a plan to confront the causes of failure, and identifying Methods of providing and communicating information and data, and ensuring an effective system of communication with internal and external stakeholders.

Whereas (Yang, 2005) focuses on the lack of prior preparations and scenarios capable of facing the causes leading to the failure of the project, and one of the most important elements of dealing with these reasons is early preparation in the form of providing modern devices and equipment, as well as allocating and monitoring the necessary funds for emergencies and training workers to face problems Effectiveness and continuous readiness, information gathering, confidence in the ability to overcome problems, and transparency in dealing with the event.

(Kim et.al 2005) reviews the causes leading to project failure by focusing on postponing or ignoring problems, so that postponing or ignoring the problem does not solve it. Also, the lack of a mechanism to discover the causes leading to project

failure before they occur represents the real test in the method of dealing by adopting systems. Early warning provides clear instructions to the various stakeholders, as well as an assessment of the various possible and actual results, and helps to ensure the continuity of business operations management during and immediately after the reasons leading to failure.

Jyh-Bin & Chih-Kuei (2009) deals with misperception, which is one of the main stages of behavior, as it represents the stage of assimilating the information that could be obtained and the discretionary judgment on matters through it. between the real performance of the administrative entity and the decisions taken in project management, which constitutes pressure that may lead to stumbling in the project, while (Mohan & Al-Gahtani, 2006) addresses human errors, which are among the most important causes. Projects falter, so crises may occur as a result of negligence, incompetence of workers, their failure to work, and negligence of superiors.

(Abdul-Rahman et al., 2008) finds that delays and cost overruns cause project costs to rise in many countries for many years, and delays at the macro level lead to a negative rate of national economic growth and loss of cash. Project time and cost overruns, disputes, and arbitration (Abdul-Rahman et al., 2008; Enshassi et al., 2008) The time overrun is the delay after planned completion dates attributed to contractors (Kaming et al. 1997). Delays can be considered as factors affecting project progress and postponing project activities. Project delays may occur due to bad weather, unavailability of resources, and design delays. The delay in completion in government projects is due to various reasons, most notably red tape, loopholes in contract law, repeated failure of bids, or the contractor's failure to comply with the terms of the contract. Among the reasons impeding completion are the inaccuracy of prior studies, which leads to the emergence of gaps during implementation, and recurring obstacles. In this case, the project owner bears the consequences of the delay. Part of the defect falls on the supervisory body in charge of follow-up. Sometimes its manager tries to create excuses for delay in the interest of the executing agency, especially if the executing agency is from the private sector, and its goal is to preserve the gains made. At the very least, he has a car, a monthly stipend, etc. In general, project delays result from activities that have both an external and an internal cause and affect relationships (Vidalis and Najafi, 2002).

There is a wide range of viewpoints on the reasons for delaying construction

engineering projects, some of these reasons are attributed to one party and others to several others (Hancher and Rowings 1981). Many researchers have conducted studies on factors affecting delay and cost overruns (Alghbari, 2007). et al), for example (Odeh and Battaine, 2002) studied the causes of delay in traditional construction contracts in Jordan and found that worker productivity is the most important delay factor, however, the contractor's inappropriate experience was more delay factors are important for consultants. The researchers noted that all parties generally agreed that inadequate contractor experience and financing of the work were among the top five most important factors.

It was found (Koushki et al., 2005) in his study related to the delay and high costs in the construction of private housing projects in Kuwait. The value of delay in time and high costs is greater than the total cost of the project. It was also found that among the main factors that contribute to the delay in time and cost are insufficient funds and time allotted for the design phase. In the following order: contractor problems, related materials, and employers' financial constraints. The results of this study are consistent with the situation in the Kingdom of Saudi Arabia, especially with the similarity of the geographical, social, legal and construction environment.

Lo et al. (2006), stated that in Hong Kong found that delays were caused by unforeseen circumstances, poor site management and supervision by consultants, environmental constraints, and client changes were too great. Kaming et al., (1997).

In cost overruns are: design changes, improper planning, unforeseen weather conditions, and fluctuations in the cost of materials, and these factors are no different from what is found in Saudi Arabia (Mansfield et al., 1994). He studied the causes of delay and cost overruns in construction projects in Nigeria. He indicated that financing and payment for completed works, mismanagement of contracts, changes in site conditions, lack of materials, and poor planning were among the main factors of delay. In this context, some of these factors indicated by the studies exist in the Kingdom of Saudi Arabia, such as mismanagement of contracts.

Assaf et al. (2009), studied the main reasons for delay in construction projects in the Kingdom of Saudi Arabia and found that there are (56) reasons for delay. According to the opinions of contractors, the most important delay factors are the preparation and approval of plans and changes in design. Engineers believe that

financial problems during work Relationships between contractors and slow decision-making on the part of the owners, The owners believe that the reasons for the delay are design errors, labor shortages and insufficient work skills.

(Ogunlana and Promkuntong, 1996) summarized the reasons for delay in construction projects in Bangkok, Thailand, and compared them with other delays and cost overruns to determine whether there are special problems that generate delays. They summarized the reasons for delays in the construction industry in three reasons:

1. Problems of shortage or deficiencies in the infrastructure of the industry (mainly supply sources).
2. Problems caused by clients and consultants.
3. Problems caused by incompetence of contractors.

Mezher and Tawil (1998), conducted a field study on the causes of delay in the construction industry in Lebanon from the viewpoint of owners, contractors and architectural firms. The study found that owners and contractors care about financial issues and contractors consider contractual relations the most important factor, while consultants consider project management to be the most important reason for delay. Chan and Kunaaraswamy (1998), examined the causes of project delays in Hong Kong as perceived by clients, contractors, and consultants and examined factors influencing productivity. The study revealed differences in perception of the relative importance of factors including financing and payment for work completed, contract mismanagement, and changes in site conditions, lack of materials, poor planning.

(Al-Momani, 2000) examined the causes of delay in 130 public projects in Jordan, and the results showed that the main reasons for delay in building public projects related to designers, user changes, weather, site conditions, late delivery, and its economic conditions.

Fringpong and Oluwoye (2003) identified important factors causing delays and cost overruns in the construction of groundwater projects in Ghana. The results of the survey indicated that consultants, contractors and owners agreed that project financing conditions, economic and natural conditions and MOQ are the four main causes of delay and cost overruns. It was found that the consultants, contractors and owners fully agreed on the arrangement for the categories of delay and overrun costs. It was also found that all three groups included in the study considered project financing and cost overruns as the main factors. The employment category

was in the lowest rank.

## **2.8. Reasons surveyed for project delay:**

There are four main reasons around which the efforts of the researchers revolve, and they were adopted in this study as dimensions to measure the causes of project delay, and we will address them by reviewing and consolidating the observations of these researchers and scholars:

### **2.8.1. Delayed by the contractor**

This is the result of lack of proper planning. It is known that at the beginning of the project, the contractor is required to submit a time plan for all project work and specify the total time. This means that poor estimation of the times and rate of workers' performance affects the project. As well as the incompetence of the workers and the provision of materials and coordination between all parties to the project leads to a delay in the total time of the project. The issue of qualifying contractors and evaluating their bids was discussed by many researchers, such as (Al-Qibli, 1994) when he suggested a number of criteria for evaluating contractors' bids to measure their efficiency and good performance. Russell (1996), proposed a number of bid evaluation methods, and he put forward some analysis steps that must be followed to identify and exclude incompetent contractors and choose the best bid, while AL-Alwai (1991), developed a professional model for calculating the efficiency of public project contractors in Bahrain.

An experienced contractor with high technical experience and accumulated administrative competence is the one who bears in mind the contractual duties entrusted to him and understands them correctly legally, and he must carry out them on his own without the need for warnings, warnings, or warnings he receives, whether verbal or formal, by the owner. or whoever represents it. These duties are almost limited to (Assaf & Sadiq, 2006):

1. Commitment to carry out the work entrusted to him in accordance with and in consistency with what was stated in the terms of the contract and its general and special specifications and quantities. Violation of this aspect and non-compliance with it may, with its repetition, be a reason for the owner to withdraw the project and assign it to another contractor, and this usually results in losses Financial and moral for the contractor. It is the responsibility of the contractor not to violate the conditions or

specifications, and if he violates them, the assigning authority has the right to issue orders to him to remove the constructions and rebuild them or change the materials used to match the agreed specifications, and in the event that the contractor fails to implement these orders, the owner has the right to repair the defective. The Contractor shall not be responsible for the incoming errors as a result of negligence on the part of the owner, whether in the plans or its failure to implement its contractual duties.

2. Commitment to the specified time agreed upon for the implementation of the project, and this necessitates the development of logical, realistic, executable time programs and the provision of the necessary resources for implementation during this period. In the event that the errors were caused by the errors of the owner, such as its delay in handing over the site or handing over the documents and plans, or its delay in the works, or its delay in disbursing the financial payments, the contractor may request an extension of the contract period. A breach of the contractor's discretion would cause the imposition of delay fines that may lead to a percentage of the profits, and perhaps more, and it would be a material and moral loss related to the reputation that the circles circulate about the contractor's delay in implementation, especially if the project is developmental that the community is waiting for, such as roads and electricity projects (Mohan & Al-Gahtani, 2006).
3. Commitment bears the expenses of executing the works according to the principles of workmanship, and this requires bearing the expenses of all resources, including human elements, materials, construction equipment, and the necessary cash flow, whether it is self-financing or bank loans, and this requires that he have an expert financial body that improves follow-up of expenses and expenses and works to generate financial sources in the correct time to avoid the occurrence of a material deficit or financial failure during implementation and if the contractor miscalculated the price he submitted, then discovered later that the cost of the project is greater than his expectations and calculations, then he must not stop and complete his project until the end, even if he loses in it. This must be in the mind of the contractor (Al-Momani, 2000).
4. Obligation to implement the directives and instructions of the owner or whoever acts on its behalf or represents it, such as the consultant appointed

by it; Because a breach of this aspect would create an atmosphere of tension between the contractor and the owner, as it in fact plays an effective and influential role in the conduct of the course of the project and has the right to monitor, follow-up, audit and make observations on the project schedule and what should be added or amended in it, and this does not negate the right of the contractor In his claim for additional wages in exchange for the additional work or the changes assigned to him, but he must be aware of the necessity of having administrative skills in writing claims and the period allowed for submitting claims and how to rely on the claim, and always refer to the manual or brochure of terms and conditions and its texts, directives and formulations. The contractor's lack of these skills is considered an administrative defect and weakness in skill that is unforgivable, and therefore we can say that it is the duty of project management in contracting companies to master the method of claiming their rights before the owner, which preserves the company's money and capabilities. (Al-Ghafly, 1995).

Accordingly, the contractor must be well acquainted with the legal and administrative procedures related to awarding projects, and he must have the legal human elements who understand the procedural stages, starting from entering the tender, then awarding, then implementing, then handing over. The expert contractor is the one who is always alert to deal with the procedures that the outsourcing party may take against him in terms of procedures and work to preserve his legal rights, as some of the owners may exaggerate the use of their powers, and may be keen to acquire conditions or works that are not included in the contract, or they may be late in providing the contractor documents necessary for implementation, delay in approving materials, respond to contractor inquiries, or delay in delivery procedures.

### **2.8.2. Project delayed by the owner**

The owner is the first beneficiary of the completion of the project as planned, and the owner may be one of the reasons for the failure of the project when the objectives are not clear, and thus the scope of the project is not clearly defined, and when he does not coordinate with the rest of the project stakeholders whose interests are affected by it, as well as when the project's contractual documents are incomplete, ambiguous, or unclear, or when his management of the project is in an

unorganized or unprofessional manner, or when he does not cooperate with the rest of the project parties in the required manner and does not understand the importance of the project's cash flows, and when he is not interested in closing the project and its contractual belongings. (Jaaluk, 1999).

The delay from the owner may be due to the large number of changes, such as replacing materials with others or adding other works, and this is often found in construction projects, and they affect the completion of the work of the project. Proper cost planning and its calculation is a very important and influential factor for project completion. Spending in a random manner, or starting the project with insufficient capital, or the wrong way of distributing it, or delaying the disbursement are the biggest mistakes in the process of completing the project (Gothand, 2003).

The owner is the main driver for all parties in the project, as everyone works for his interest, and therefore his influence in the project is the strongest and most capable of directing the project to the right track when it is not, and he is the most capable of managing relationships in the project in a manner that serves the interest of the project and ensures its completion in the best way. Therefore, he must first of all make his goals for the project clear and precise, to ensure that changes are avoided except for those that are necessary. He also has to ensure the completion of the basic project documents according to the type of contract, because their incompleteness, lack of clarity, or conflict may cause delays pending clarification and amendment, whether of the documents or of the work that is carried out on them before amendment and clarification. In addition, the owner's choice of the type of contract may have a significant impact on the success of the project, as it is compatible with the level of detail available to the owner, the nature of the project and the complexity of its operations, as well as the funding available to it (Abu Al-Atham, 2007).

The way the owner manages the project is the basis for its success. As the engine of the rest of the parties. The method of his supervision, follow-up, cooperation and support is the basis for success in the project, as it is the way in which any problems that projects usually encounter can be overcome. Projects are negatively affected when the management of the owner of the project is indifferent or unprofessional with regard to the basic operations of project management or managing the relationship and communication between the parties to the project and those concerned with it. As the owner is required to confirm to the rest of the

parties to the contract that the main goal is for all of them to cooperate to achieve the main goal of the project and to finish it as planned, and this can be done when each party achieves its interests from behind its participation in the project, which the owner must be its guarantor and keen on. on achieving his interests from the completion of the project. (Al-Gahtani & Taher, 2007).

### **2.8.3. Project delayed due to the consultant**

The basis for this matter is that the consulting engineer works according to the rules of practice of the profession that emphasize the work to make the project a success, but it may cause the project to falter when he does not care about the goal of the project or the final product, and his work is limited only to receiving works and checking for quality, as well as when he does not choose his elements working with him carefully, and when he does not cooperate with the rest of the parties in the project in what achieves their interests and what pushes the rates of completion and progress of work and follow-up to the schedule, and in managing the relationship and communications in the project, when there is a lack of clarity in the scope of his work, his responsibilities and powers, and the way he follows up on the project , and time limits for the decisions it takes, or when its reports are inaccurate or even misleading (Yang, 2005).

The prevailing culture between the contractor and the consultant is considered a positive point in the eyes of the owner, and it is undoubtedly a wrong culture that results in the faltering of many projects. The relationship between the parties to the contract must be at its best to achieve the goal of their work as a team, which is the completion of the project. The consultant is the eye of the owner on the project, and he works to achieve the owner's requirements of the project through the contractor in an environment governed by contracts and covered by the engineer's charter and the ethics of practicing the engineering profession.

Although the consultant is appointed by a separate contract, and is not a party to the contract that is usually concluded between the owner and the contractor, his name appears in many of the clauses of this contract, especially in the clauses related to approving works, selecting materials and final receipt of outputs, but his role in reality must be It includes focusing on the main goal, which is to finish the project on time, within its cost and according to its specifications, and to be a helper for the owner and the contractor in overcoming the difficulties that the project is exposed to (Salamah, 2009).

Weak supervision is one of the issues that projects complain about, whether it was self-supervision by the owner or externally by a consultant, due to the lack of follow-up by the contracting authority of the project in the field and office to ensure the presence of the technical supervision staff with the same competencies and qualifications stipulated in the contract. It is a point in the heart known by those who work in the field of projects, as the engineers of the administrative agencies do not all care about the work entrusted to them, at a time when most of those responsible for them do not follow them closely, and even with the reports of those responsible for them about their practices that put pressure on contractors or even unjust them, these managers They do not move a finger, and most of what they do is apply fines to the contractor, even if the reason for the delay is from within the administration. But when the consultant is an external party, the problem is doubled, as the owner's engineer has a pretext, and the consultant may not be able to choose the most suitable of the engineers due to the arbitrariness of the recruitment laws, which caused the emergence of some cases of corruption in project management. (Mohan & Al-Gahtani, 2006).

#### **2.8.4. Delays caused by force majeure**

They are those causes that occur suddenly and without prior warning, such as the facility being exposed to a fire, explosion, or earthquake. This type is the most dangerous, as the losses resulting from it are more severe, especially in light of the lack of sufficient time to collect information when trying to develop a plan to address the problem. Many organizations have written plans ready in advance to address this type of sudden problem (Levy, 2002). In addition, the accumulated problems that can be expected to occur, as the process of their formation and the interaction of their causes may take a long time before they explode. Consequently, these problems develop with the passage of time, such as the workers' strike, for example, which usually occurs after a long period of discussions and negotiations between the workers and the management, as there are many opportunities for the management to prevent or mitigate their occurrence before it reaches a decisive stage (Hamid and Al-Shawk, 2009).

#### **2.9.Previous studies**

The results of the desk survey of the literature and previous studies indicated that there are no studies examining the management of delays in government projects in

the Jeddah city in the Kingdom of Saudi Arabia. Therefore, this study attempted to employ what was stated in previous studies as much as possible, and where possible to achieve its objectives, noting that the field studies in The Saudi environment was limited:

### **2.9.1. Arabic Studies**

#### **The Saudi Council of Engineers (2012) conducted a study entitled The Role of Project Planning and Management in the Success of Projects in the Kingdom.**

The research aimed to find out why government projects in Saudi Arabia were not being implemented smoothly, and to find ways to measure and keep track of the progress of these projects. This study included 300 Project managers. The research found some important findings. One of them is that about 21 percent of project managers don't use special systems for managing projects in their workplace. This causes information to be transmitted slowly and creates a big difference between decision makers and project managers. The hard work of the work team using project management and follow-up programs is one of the main reasons why projects fail. More than 75 percent of businesses do not use any specific programs to implement their projects and rely solely on hard work.

**The General Audit Bureau (2011), conducted a study entitled the causes of project faltering and ways to address them.** The research discovered many reasons why projects struggled. These included not planning properly at the beginning, making changes while the project was happening, and hiring too many outside companies. These factors made the project take longer and cost more money. It also meant that people had to wait longer to use the project. To solve the problem of struggling government projects in the Kingdom or delays in their completion, we need to establish a national mechanism focused on planning and monitoring. Carrying out government projects in the entire Kingdom, rather than within a specific ministry, agency, or region.

**Mustafa and Al-Hussein 2010 conducted a study entitled the causes of delays in construction projects in Syria and their effects.** The main aim of this study was to find out the main reasons for delays in construction projects and how important they are. They also wanted to understand the impact of these delays. So, a survey was done to see how well the construction projects in Syria are going. They used a method called a questionnaire to find out the reasons for delays and how important those reasons are. Each reason can be seen differently by the project

parties like the owner, contractor, and consultant. Seventy reasons for being late were discovered and sorted into eleven groups and five outcomes. The research found that the main causes of delays are: 1. The contractor having problems getting money for the projects. 2 The project site not being ready on time. 3 Arguments between the contractor, supervisor, and owner. 4 Mistakes and conflicts in the design papers. 5 Workers not being skilled enough. 6 Not enough workers available for work. (7) The process of finding and bringing construction materials takes longer than expected. Delay causes several negative outcomes, including: 1. Taking longer than expected to complete a task or project. 2 Spending more money than originally planned. 3 Disagreements and conflicts arising from the delay. 4 Demands for compensation or damages due to the delay. 5 Resorting to third-party dispute resolution methods like arbitration to resolve the issues caused by the delay.

**Al-Jammaz (2010), conducted a study entitled “Evaluating the Administrative Factors Causing Delay in Completion of Construction Projects from the Internal Environment of Contracting Companies in the State of Qatar.”** The study wanted to see how much certain skills, like leadership and administrative ability, affect the time it takes to finish building projects in Qatar. The study consisted of 50 project managers and 45 project managers who work for contracting companies. The research found some important findings. The most significant one was that administrative efficiency has a notable effect. This effect can be seen in different aspects such as building the work team, understanding the contractor’s internal environment, and dealing with external parties. Human relations between management and workers are focused on the specific timeframe required to finish construction projects. The skills and knowledge of the people involved in a construction project have a big impact on how long it takes to finish. This includes things like their scientific and cognitive abilities, legal skills, and understanding of the technical and social aspects of the job. The same goes for their leadership skills, like their ability to select the right people for the project and manage resources effectively. All of these factors can significantly affect the time it takes to complete a construction project.

**Salama (2009), conducted a study entitled Administrative Policies and their Impact on Developing Contracting Business (an applied study on construction companies and engineering consulting offices in the State of Qatar).** This study took place in Qatar and looked at 32 consulting offices and 31 contracting

companies. The goal was to understand the roles of these offices and companies and find out what problems they face in terms of administration, finances, and technology that hinder their efficiency. The study also aimed to find ways to improve the performance of these offices and companies.

**(Abu Al-Othm, 2007), conducted a study entitled “Assessing the Organizational and Environmental Factors Affecting the Performance of Contractors for Construction Projects in Jordan.”** The study took place in Jordan and looked at 115 government construction projects from 2000 to 2004. It aimed to see how things like the environment and how the organization is set up affect how well contractors perform. The study considered things like leadership skills, teamwork, relationships between contractors, and the environment itself as factors that can affect the cost, time, and quality of the projects. The research found that these factors have a significant impact on the outcome. Based on the factors of cost, time, and technical specifications. The research found that these factors have a noticeable impact on the outcomes.

**Alkathami (2004), study entitled: Examination of the correlations of critical success and delay factors in construction projects in the Kingdom of Saudi Arabia.** The research looked at seven important reasons for success or delay in a project. They also looked at several other factors in total. The study then examined the connections between these factors to find out which ones were the most important in stopping project delays. Two surveys were given to people in Saudi Arabia. The first survey asked project owners and contractors about what they think makes a project successful and what causes delays. The second survey asked engineers about their general opinions. We collected and studied data using math methods to see the relationship between factors that affect success and delays. We also looked at how study owners and contractors see these factors. Lastly, we checked how important factors for success affect delays. Additionally, analysis of variance was used to determine how engineers, project owners, and contractors assessed the significance of important factors for avoiding or preventing delays.

This study is similar to the current study in several aspects, the most important of which is that it was conducted in the same nature and geography, and used the questionnaire method and statistical analysis. However, it differed in that it aimed and studied the project success factors and the delay factors.

**A study (Toufic, 1993), entitled “Causes of delays in the construction industry in Lebanon. This study addressed the most important causes of delays in the**

**construction industry in Lebanon and the relative importance of delays.** The survey picked 11 owners, 15 contractors, and 10 consulting architectural engineering companies by chance. The survey asked people to rate how important different reasons for delay were. There were 64 reasons for delay, sorted into 10 main groups. The causes of delay were measured and ranked based on how important they were for owners, contractors, and companies. It was discovered that all three groups generally agreed on the order of the main reasons for delays. Owners were mainly worried about money matters, whereas contractors thought that the agreements they made with others were more significant. This research looked at why projects get delayed. It is one of the studies that is connected to the current study, either because they looked at similar things or because they were done in similar settings.

### **2.9.2. Foreign studies**

**Wichan (2009), presents a study which was entitled Forecasting final budget and duration of highway construction projects.** This study aimed to develop models to predict the final budget and duration of the highway construction project during the construction phase in Thailand. Highway construction project data was collected and analyzed to know the factors that affect Final draft budget and timeline. The study discussed the development of a model to predict the budget and duration of a road construction project. This study is related to the topic of the current study in terms of indicating the duration of the project. Hence, the current study can benefit from this study in identifying the determinants of the project duration and thus the reasons for delaying the project. This study is similar to the current study. In terms of dealing with the duration of project implementation, it differs from the study in terms of the method of analysis, environment, nature, and geographical location.

**The study of Kazaz, Ulubeyli and Tunçbilekli (2012); entitled "Cause of delays in construction projects in Turkey"** the study aims to determine the factors that cause time extensions in Turkey construction project and to find out the important of these factors. They used 34 causes and divided the causes into 7 categories; they identified the causes from the literature review. They used the relative important index in order to rank the causes from the viewpoint of contractor, consultant, and owner. They found the 4 most important causes from overall viewpoint are: design and material changes, delay of payment, contractor's

financial problems, and poor labor productivity.

**Study (Michael et al., 2009) Housing supply and planning delay in the South of England.** This study aims to present the results of empirical research on the time it takes to obtain planning permission for large housing projects selected from local authorities in the south of England. The study collected information on 180 major residential projects in the south from planning authority records and analyzed the data to obtain information on the extent of delays in processing applications. The study found that the size of the delay was much greater than the rate mentioned in official data to measure the extent to which local authorities met the targeted planning delay. The study examined the reasons for delays in planning housing projects in southern England, and was used to identify the reasons for delays in planning housing projects.

**Long and Young (2009), study entitled Time-cost relationships of building construction projects in Korea Facilities.** This study aimed to investigate the relationship of time-costs with data from construction projects in Korea. Data were collected from 34 projects in Korea and the construction cost was adjusted using the construction price index. Analysis was conducted on various project characteristics and it was found that the time-cost relationship applies to the Korean construction industry. It should be noted that this study agrees with the current study in terms of the importance of the time factor in implementing projects and differs from it from a geographical standpoint and its focus only on the time factor.

**Study (Christian et al., 2007): entitled Construction duration of residential building projects in Germany.** The study aimed to discuss the issue of planning the construction period as one of the important considerations in any construction project. Indicators that help in predicting the construction period have been identified. In addition, a simple regression model has been provided to assist in selecting construction speed indicators. This experimental analysis was based on data collected from 115 German residential buildings, and the study concluded that the size of the project measured in square meters and the level of the project are among the biggest drivers of speed of construction. It should be noted that this study focused on indicators for predicting the duration that construction takes and a coefficient was used. Simple regression to test these indicators. This study differs from the current study geographically and is not directly related to the current study. The study discussed the issue of planning the construction period, and this

study can be used to identify the most important indicators that help in estimating the construction period for construction projects.

**A study (Pollaphat and Zijin, 2007) entitled “Determinants for effective performance of external project management consultants in Malaysia.”** This study aims to investigate the important roles of project management consultants, the main factors contributing to their effective performance, and the appropriate measurement standards for evaluating performance. A list of potential success factors was verified by a selected panel of experts. Expert opinions regarding the importance of the roles of project management consultants were also analysed, after which a questionnaire was designed to collect data from industry practitioners who have experience with construction projects. The results determined a success model based on the survey responses. field, as well as defining the roles of project management consultants, as well as 12 success factors in addition to five important criteria for evaluating performance. This study focused on the impact of using consultants on projects and provided a list of project success factors. It relied on theoretical literature and also used a questionnaire. This study is consistent with It is similar to the current study in terms of its treatment of one of the factors influencing projects, represented by consultants, in using a questionnaire to collect information, and it differs from the current study in terms of geographical location.

**A study (Lukumon and wok, 2005) entitled: Examining architects' performance in Nigerian private and public sectors building projects.** This study aimed to research and compare the performance of consultants with regard to the importance of classifying clients for a set of performance standards in construction projects in the public and private sectors in Nigeria. Conduct a survey of public and private sector clients of recently completed construction projects in Nigeria. The data analysis included a comparison of similarities and differences using a standard ratio, and the results showed that private sector clients are more concerned about cost, while public sector clients are more concerned with the constructability of the design. It also showed that consultants work better in the public sector than in the private sector. The study discussed performance standards in the public and private sectors for construction projects, which can benefit from identifying and using these standards in this study because the subject of the study focuses on the public sector.

This study focused on performance standards, which are ultimately reflected in the implementation of the project and is similar to the current study in terms of its use

of a questionnaire to collect information, but it differs because it compares performance between the public and private sectors and differs geographically from the current study.

**Sudip (2005), study entitled Highway Construction: Improved Procedures to Overcome Challenges and Limitations** Public transportation departments and highway contractors share a desire to complete highway projects on time at reasonable costs, and completing highway construction projects is considered an important goal in the United States of America. As delays in completing public road construction projects result in the Ministry of Transport and contractors alike bearing additional costs, in addition to delays causing inconvenience, inconvenience and great discomfort to the public when construction projects are not completed in a timely manner as well as when project progress is longer. necessary, thus increasing the duration of inconvenience and threatening the safety of workers and road users. It should be noted that there is a relationship between economic and social well-being and safety in completing projects on time. Although it is important to complete projects in a timely manner, delays remain a common and long-standing problem. Although DOT and contractors strive to avoid construction delays and reduce the time and costs associated with delays, they often find it difficult to control the conditions that cause delays.

The study addressed the reasons for delaying road projects and the negative effects of delaying the implementation of these projects. This study was used to build the theoretical framework for the study. This study is similar to the current study because it deals with the factors delaying road construction projects, which are within the scope of the current study, but it differs from the current study in terms of Geographic aspect.

**The study of Mohammed and Isah (2012); entitled "Causes of delay in Nigeria construction industry"** the study aims to identify the major causes and effect of delay in Nigeria construction industry. They used 43 causes and divided the causes into 6 categories; they identified the causes from the literature review. They used the Mean and Standard Deviation in order to rank the causes from the viewpoint of contractor, consultant, owner, and stakeholders. They found the 3 most important causes of delay are: improper planning, lack at communication, design error; and they identified 4 impacts of delay are, loss of interest by the stakeholder, black list by authorities, waste of money and time, and declination of reputation.

**2.8.3. What distinguishes this study from previous studies:**

The study (Saudi Council of Engineers (2012) studied the role of project planning and management in the success of projects in the Kingdom, and the study (General Audit Bureau, 2011) looked into the causes of projects faltering and ways to address them, and the study (Mustafa and Al-Hussein, 2010) addressed the reasons for delaying construction projects. In Syria and its effects, Al-Jammaz's study (2010) investigated the administrative factors causing delay in the completion of construction projects based on the internal environment of contracting companies in the State of Qatar.

It is clear that this study coincides with some previous studies that dealt with the management of delays in construction projects in the of the Jeddah city in the Kingdom of Saudi Arabia in some sub-variables and dimensions, but what distinguishes it, in addition to the difference in terms of the goal, the study population, and the sample, is that it contains these dimensions in addition to other dimensions within the framework of the study and its limitations. The previous presentation shows that despite the growing interest in studying the reasons for delaying the implementation of government projects, this concept still faces many challenges, whether in the theoretical or applied fields. The review of previous studies has helped in taking a look at the reasons for delaying the implementation of construction projects, and in light of from the above review of previous studies, we did not find any study that dealt with the management of delays in construction projects in the Kingdom of Saudi Arabia. In addition, this study examined the causes of delay through a referendum of the project parties (consulting contractors, owners), and this is what distinguishes this study from Its predecessors.

## **2.10. Conclusion**

This chapter has discussed the project management in governmental sector, the contracting stages, features of contacting project failures and suggested solutions according to the previous studies. The next chapter shall present the methodology of this project.

## **Chapter (3)**

## **Methodology**

### **3.1. Introduction**

This chapter outlines the tasks, study design, data collection, sample size and data analysis that is utilized in this study to identify the factors affecting the construction project timing using the Analytical Hierarchy Process (AHP). It is also designed to determine the correlation between the identified factors and the project performance. As these factors influence the project management performance whatever positively or negatively. If the identified factors are utilized appropriately, they will have a positive side on work performance; if not, they would lead to negative results.

Thus, the adopted study approach will be the descriptive correlational study design where interviews were conducted with 3 individuals to collect the required data. The interviews is developed based on the literature review and researchers' experience to support the AHP method to identify the main and sub-factors and to find the most factors affecting the performance of construction Project management. The AHP is used to find the highest percentage of the main factors affecting the main aim and the highest percentage of sub-factors affecting each main factors. In addition, fishbone diagram is also used to track down the defects, variations and imperfections that represent the sub-factors.

### **3.2. Research Design**

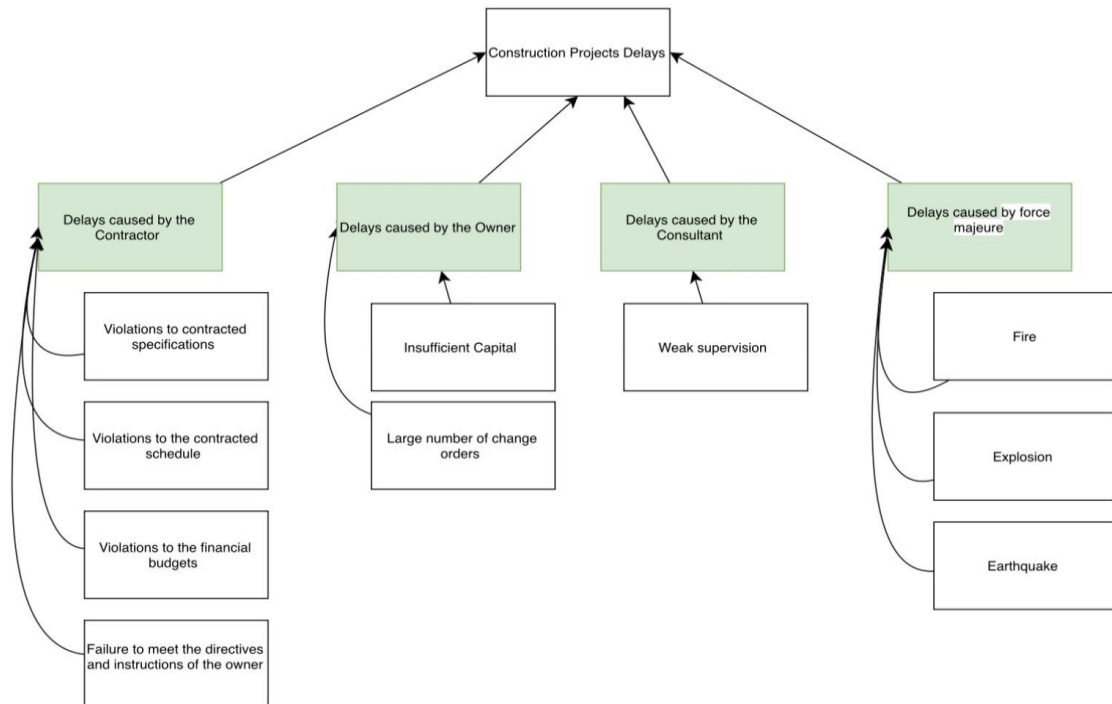
In the current study, the aim is to identify the factors that affect project management performance using AHP. Following the descriptive correlational study design, interviews questions are developed to find the most affecting factors. The AHP is used to find the highest percentage in the main factors affecting the project performance and the highest percentage of sub-factors affecting each main factor. The factors that will be investigated are (See Figure 3.1):

- **Delayed by the contractor;** violations to carry out the work entrusted to him in accordance with what was stated in the terms of the contract and its general and special specifications and quantities.; violations to the specified time agreed upon for the implementation of the project, and this necessitates the development of logical, realistic, executable time programs and the provision

of the necessary resources for implementation during this period.; violations bears the expenses of executing the works according to the principles of workmanship, and the required expenses to all of the associated resources.; and the failing to meet the obligation to implement the directives and instructions of the owner or whoever acts on its behalf or represents it, such as the consultant appointed by it.

- **Project delayed by the owner:** large number of changes; and insufficient capital.
- **Project delayed due to the consultant:** Weak supervision.
- **Delays caused by force majeure:** fire; explosion; or earthquake.

The above factors were identified following multiple brainstorming sessions about the current construction projects performance in Saudi Arabia. Besides, the sessions were supported by in-depth reading to fill the fish's skeleton to highlight the main factors. Further details on those factors are detailed in the next section. The interviews were conducted the frontline experienced project managers, professionals and specialists responsible for managing construction projects in Saudi Arabia.



**Figure 0.1 Study AHP Model.**

### **3.3. Study Setting**

The research was conducted at the cities of the Kingdom of Saudi Arabia.

### **3.4. Target Population**

The population includes all individuals working at construction projects in Saudi cities, mainly project managers.

### **3.5. Sampling Techniques**

Purposive sampling method was adopted as the number of the study population is small to some extent. Accordingly, 3 individuals from those working as project managers in the Saudi cities were selected.

### **3.6. Data Collection Method**

Two techniques were used to identify the factors that influence the timing of the construction projects in the Kingdom of Saudi Arabia. The first tool includes the interview, while the second tool included a questionnaire conducted and filled as a face to face interview. Furthermore, the AHP method that is based on the factors concluded from the interviews was utilized to further identified the sub factors under the four major factors identified.

- **Interviews**

Interviews are the most logical instrument used in research if the study objective is qualitative exploratory. In general, five categories of interviews can be conducted during qualitative research, namely: Structured interviews, Semi-structured interviews, Non-directive interviews, Focused interviews and Informal conversational interviews. Among these categories, Semi-Structured interview is the appropriate instrument chosen for this qualitative study. Semi-Structured interviews are a non-standardized interview. They are based on specific themes to discuss issues and questions that should be covered during the research, but the questions do not need to be addressed in every interview. The questions may change according to the direction of the interview. In some of the interviews, some of the interviewees took longer time to discuss the issue of study. Therefore, following the Semi-structured methodology allows the transformation of the interview into new paths that were not arranged before, but helped in achieving the study objectives (Gray, 2019).

Semi-structured interviews were designed, refereed and held with the study sample where they included the following questions:

1. What are the contractor-related factors that influence the performance timing of construction projects?
2. What are the owner-related factors that influence the performance timing of construction projects?
3. What are the consultant-related factors that influence the performance timing of construction projects?
4. What are the external forces-related factors that influence the performance timing of construction projects?

Additional questions would be provided by the researcher during the interviews to enrich the discussion.

- **Questionnaire**

The choice of using the questionnaire in data collection is given a greater priority because of its advantages over the other methods and its efficiency or ability to capture more information from the source (Edmonds and Kennedy, 2017). Questionnaire forms was distributed and collected via a face to face interviews among the study sample along with some verbal explanation and instructions. The questionnaires included both closed questions where respondents were required to choose among the alternatives given and tick in space provided and the dominant opinion is selected.

- **The Analytic Hierarchy Process (AHP)**

AHP is a multi-dimensional, multi-level and multi-factorial decision-making approach focused on the premise that elements can be prioritized by grouping them into meaningful categories and subcategories; conducting peer-to-peer comparisons; establishing a consistent system of quantitative and qualitative information; measuring intangible domains; and determining the basis of analytical knowledge (Pecchia, Crispino & Morgan, 2014). In this study, it is divided (AHP) technique into three levels: level (0) main aim, level (1) main factors and level (2) sub-factors. The main aim includes identifying factors affecting the delivery time of construction projects in Saudi cities.

### **3.7. Ethical Considerations**

Ethics is regarded as a significant aspect to be maintained in any study. The key ethical aspects, which have been maintained in the study included data representation. In other words, two key ethical aspects have been considered in the study in terms of plagiarism and academic fraud. Correspondingly, to avoid plagiarism, proper citations have been mentioned to represent data of different writers. On the other hand, to deal with academic fraud, valid sources have been used (Polonsky and Waller, 2010).

The purpose of this data collection is only for study purpose and not for other misuses. Therefore, to consider, the ethical issue, the participants should not be harmed, by clarifying the purpose of the interview to use it in the research. If the respondent is annoyed with the interview, it is better to end the interview. Also, respondents have the right not to answer personal or undesirable questions. Therefore, submitting an informed consent form is essential before initiating the interview (Gray, 2019). As some respondents feel uncomfortable during the interview, confirmation of confidentiality of the information will be needed.

### **3.8. Limitations of this Study**

The researcher faced limitations associated with the time availability where additional interviews would be an advantage of this study. The researcher was not able to broaden the scope of the research study by incorporating all cities and more target respondents. The sample size selected is limited and also the convenience sampling made it difficult to generalize the results of the research study to the whole population.

### **3.9. Data Analysis**

After transcribing the interviews, thematic analysis was used to analyze the qualitative data. It was used because it brings qualitative research and deductive analysis to understand, describe, and analyze the answers. This helps to determine the thinking towards the research topic from a wide reading of data to a specific reading to discover and develop research topics; this supports the AHP method. When performing a thematic analysis, the main themes should be identified. Analytical Thematic may be inductive or deductive. In the deductive analysis, the researcher uses an existing theory and formulate a theoretical framework (AHP) to analyze its data by imposing theories and structures based on the collected data and then analyzing it. Therefore, this method helps the researcher to organize and guide data analysis. Using such an approach is useful for the researcher in linking the proposed research to a set of

knowledge related to similar areas of study subject and by asking questions to classify the main groups to collect data and find the differences and similarities to answer the researcher's question (Saunders & Bezzina, 2015).

After that, the AHP was applied since it generates a weight for each evaluation criterion according to the research sample 'pairwise comparisons of the criteria. The higher the weight, the more important the corresponding criterion. Next, The AHP standard for each component is determined by distributing a questionnaire form to the participants, evaluating each component, and then taking an average and using it in Microsoft Excel, and then taking the results. The higher the ranking, the better the performance of the alternative concerning the criteria considered. Finally, the AHP combines the weights of the parameters and the scores of the options, thereby deciding the total score for each option and the corresponding rating. The total score for a given choice is the weighted sum of the scores obtained concerning all the parameters. The variables could therefore be illustrated and listed after their weights.

## **Chapter (4)**

## **Findings And Analysis**

## 4.1 Data Collection

For the projects manager's opinions regarding the construction projects contractors, owners, consultants, and force majeure. The project managers have given the highest importance for construction projects delays to the Force majeure. The projects managers explained the importance of fire compared to explosions and earth quakes. Thus, construction projects facing fires could lead to the demolition of buildings and repeating the works.

After the Methodology has been set for this project, this project studies the Factors affecting the construction projects accomplishment times in Saudi Arabia. The first section Details the Weighting of the sub-factors affecting the main Criteria, while the second section details the Weighting of the main criteria affecting the construction projects accomplishment times in Saudi Arabia.

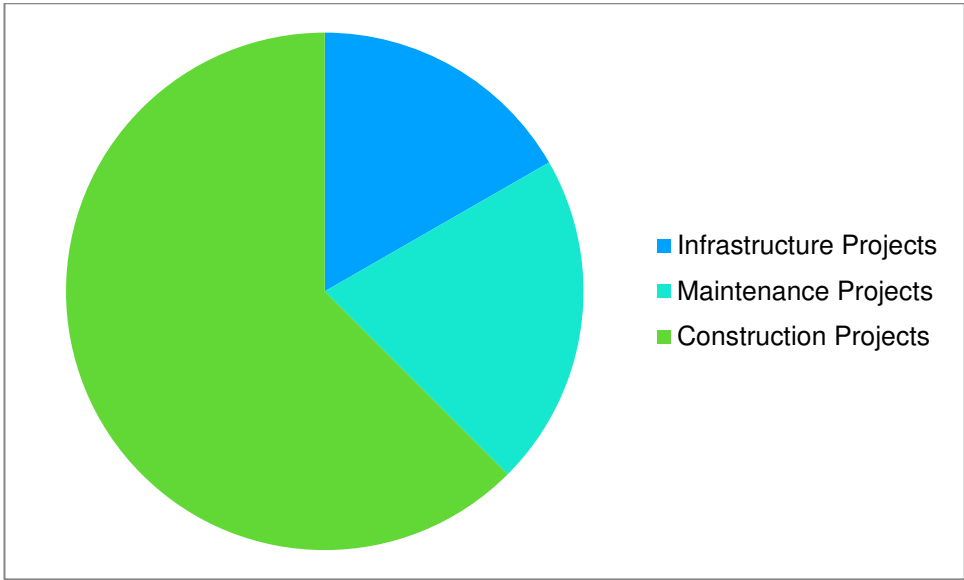
## 4.2 AHP for the Sub-Factors Affecting the construction projects accomplishment time in Saudi Arabia

As a first attempt, the criteria and sub-criteria used in this study is based on the Literature Review for previous similar studies. The factors are; owners, contractors, Force majeure and consultants. These are listed in table 4.1.

**Table 0.1: Criteria's and Sub-Criteria's which affects the construction projects accomplishment time in Saudi Arabia.**

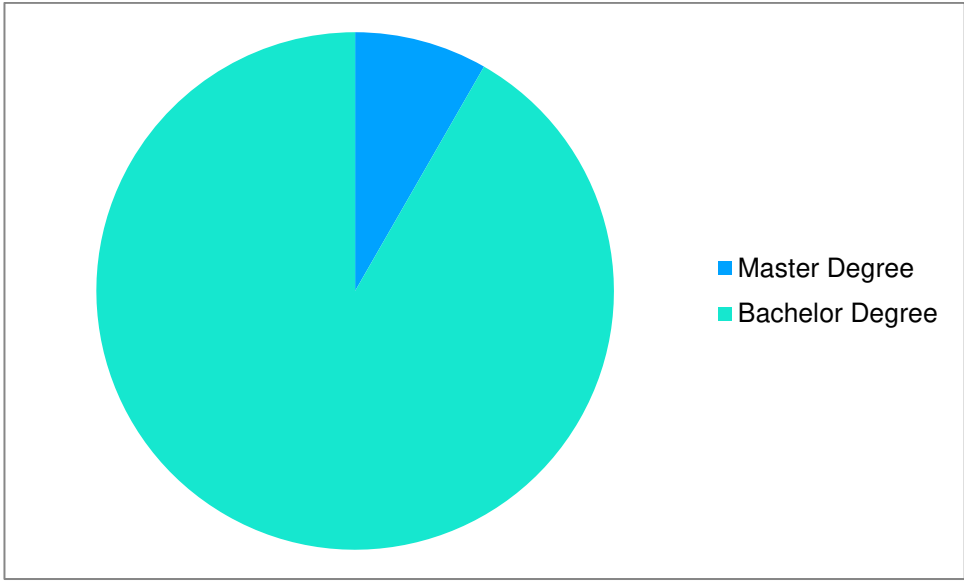
| # | Main Criteria | Sub-Factor                         |
|---|---------------|------------------------------------|
| 1 | Owner         | Insufficient Capital               |
|   |               | Large number of change orders      |
| 2 | Contractor    | Violations to Specification        |
|   |               | Violations to the Schedule         |
|   |               | Violations to the Budget           |
|   |               | Failure to meet owner instructions |
| 3 | Force majeure | Fire                               |
|   |               | Explosion                          |
|   |               | Earth quakes                       |
| 4 | Consultant    | Weak Supervision                   |

25 Responders have responded to the questionnaire. From the demographical data collected, Most of the responders are working on Buildings Construction Projects (62.5%), followed Maintenance Projects (20.8%), and then Infrastructure Projects (16.7%). See figure 4.1.



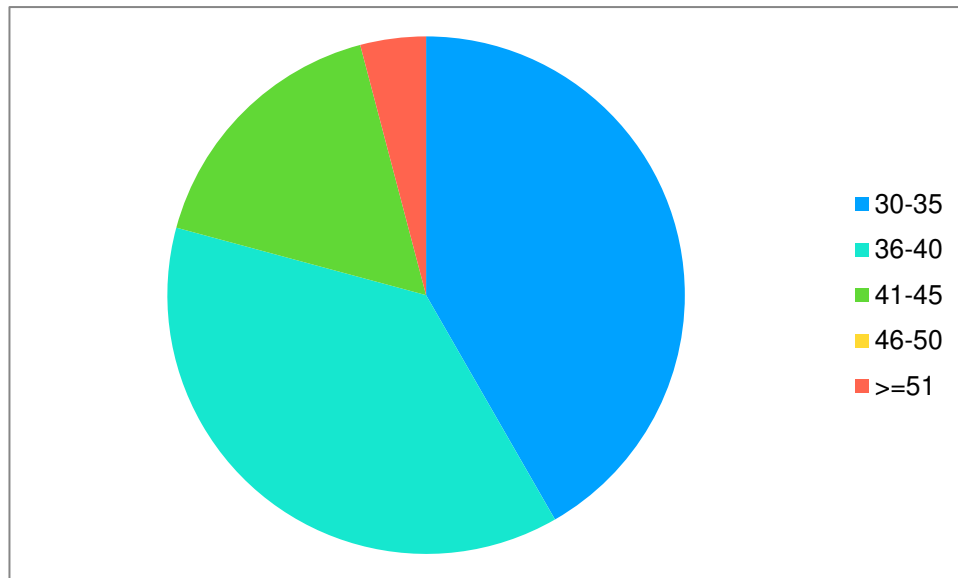
**Figure 0.1: Pie Chart of Responders Positions.**

Figure 4.2 show that most of the responders hold Bachelor Degrees (91.7%), while the remaining holds Master’s in Engineering (8.3%).



**Figure 0.2: Pie Chart of the Responders Academic Qualifications.**

Figure 4.3 show that most of the responders work as projects managers with an age category (30-35) with a percentage of 41.7%, while, 37.5% are between the ages (36-40), 16.7% are between the ages (41-45) and 4.1% are above 51 years.



**Figure 4.3: Pie Chart of the Responders Age Category.**

#### 4.2.1 AHP Scoring for The Owner's Sub-Criteria's

The AHP scoring is based on the most repeated scores for the individual Responses. The readings shown in table 4.2 shows that most of the respondents thinks that the Insufficient Capital is extremely important when compared to the large number of change orders. The scale is 1 for Equality, 2 for Moderate, 3 for Strong, 4 for very strong and 5 For Extremely Important.

**Table 0.2: AHP Scale comparing between Owner's Insufficient Capital and the Large number of change orders.**

| Factor               | Compare the relative importance with respect to : Owner’s |             |        |          |       |                      |        |             |         | Factor                        |
|----------------------|-----------------------------------------------------------|-------------|--------|----------|-------|----------------------|--------|-------------|---------|-------------------------------|
|                      | More importance than                                      |             |        |          | Equal | Less importance than |        |             |         |                               |
|                      | Extreme                                                   | Very Strong | Strong | Moderate |       | Moderate             | Strong | Very Strong | Extreme |                               |
| Insufficient Capital | 6                                                         | 3           | 2      | 1        | 2     | 2                    | 4      | 1           | 4       | Large number of change orders |

Table 4.3 shows the AHP Matrix for the Owner's Sub-criteria's. Hence, the importance of Insufficient Capital is 5 times the importance of the Large number of change orders. The Diagonal is equal to 1 and the right hand side of the diagonal equals to the inverse of the Left hand side of the diagonal.

**Table 0.3: AHP scores for the Owner's Insufficient Capital and the large number of change orders.**

|                               | Insufficient Capital | Large number of change orders |
|-------------------------------|----------------------|-------------------------------|
| Insufficient Capital          | 1                    | 5                             |
| Large number of change orders | 0.2                  | 1                             |
| COL. TOTAL                    | 1.2                  | 6                             |

Table 4.4 shows the Normalized score table for the Owner's Sub-criteria's. Cells have been divided over the column sum. The Insufficient Capital has a weight of 83.3%, which is the raw sum over the number of sub-criteria's. The Large number of change orders has a relative weight of 16.7%.

**Table 0.4: Normalized AHP scores for the Population Sub-Criteria's.**

|                                      |             |             |             |               |
|--------------------------------------|-------------|-------------|-------------|---------------|
| <b>Insufficient Capital</b>          | <b>0.83</b> | <b>0.83</b> | <b>1.67</b> | <b>83.3%</b>  |
| <b>Large number of change orders</b> | <b>0.17</b> | <b>0.17</b> | <b>0.33</b> | <b>16.7%</b>  |
| <b>COL. TOTAL</b>                    | <b>1</b>    | <b>1</b>    | <b>2</b>    | <b>100.0%</b> |

#### 4.2.2 AHP Scoring for The Elevation Sub-Criteria's

The Readings shown in table 4.5 shows that the majority of the respondents think that the Violations to the Schedule has an extreme importance when compared to Violations to Specification. While, The Violations to Specification has an equal importance when compared to the Violations to the Budget. The Violations to Specification has an Extreme importance when compared to the Failure to meet owner instructions. The Violations to the Schedule has an extreme importance when compared to the Violations to the Budget. The Violations to the Schedule has an extreme importance when compared to the Failure to meet owner instructions. While, the Violations to the Budget has an extreme importance when compared to the Failure to meet owner instructions.

**Table 0.5: AHP Scale for the Contractor Sub-Criteria.**

| Factor                      | Compare the relative importance with respect to : Contractor’s |             |        |          |       |                      |        |             |         | Factor                             |
|-----------------------------|----------------------------------------------------------------|-------------|--------|----------|-------|----------------------|--------|-------------|---------|------------------------------------|
|                             | More importance than                                           |             |        |          | Equal | Less importance than |        |             |         |                                    |
|                             | Extreme                                                        | Very Strong | Strong | Moderate |       | Moderate             | Strong | Very Strong | Extreme |                                    |
| Violations to Specification | 6                                                              | 0           | 1      | 1        | 4     | 2                    | 1      | 2           | 8       | Violations to the Schedule         |
| Violations to Specification | 7                                                              | 1           | 4      | 2        | 3     | 0                    | 0      | 1           | 7       | Violations to the Budget           |
| Violations to Specification | 6                                                              | 0           | 4      | 1        | 5     | 1                    | 2      | 2           | 4       | Failure to meet owner instructions |
| Violations to the Schedule  | 9                                                              | 1           | 4      | 1        | 4     | 0                    | 0      | 3           | 3       | Violations to the Budget           |
| Violations to the Schedule  | 9                                                              | 1           | 4      | 1        | 4     | 0                    | 0      | 3           | 3       | Failure to meet owner instructions |
| Violations to the Budget    | 7                                                              | 2           | 2      | 3        | 4     | 3                    | 0      | 0           | 4       | Failure to meet owner instructions |

Table 4.6 shows the AHP Matrix for the Contractor Sub-criteria. The Diagonal is equal to 1 and the right hand side of the diagonal equals to the inverse of the Left hand side of the diagonal.

**Table 4.6: AHP scores for the Contractor Sub-Criteria's.**

|                                    | Violations to Specification | Violations to the Schedule | Violations to the Budget | Failure to meet owner instructions |
|------------------------------------|-----------------------------|----------------------------|--------------------------|------------------------------------|
| Violations to Specification        | 1                           | 0.2                        | 1                        | 5                                  |
| Violations to the Schedule         | 5                           | 1                          | 5                        | 5                                  |
| Violations to the Budget           | 1                           | 0.2                        | 1                        | 5                                  |
| Failure to meet owner instructions | 0.2                         | 0.2                        | 0.2                      | 1                                  |
| COL. TOTAL                         | 7.2                         | 1.6                        | 7.2                      | 16                                 |

Table 4.7 shows the Normalized score table for the Contractor's Sub-criteria's. Cells have been divided over the column sum. The Violations to Specification has a weight of 17.9%, which is the raw sum over the number of sub-criteria's. The Violations to the Schedule has a relative weight of 58.2%. The Violations to the Budget has a weight of 17.9%. Finally, the Failure to meet owner instructions has an importance of 6.1%.

**Table 0.7: AHP Normalized Scores for Elevation Sub-Criteria's.**

| <b>NORMALIZED SCORE TABLE</b>      |      |      |      |      |      |        |
|------------------------------------|------|------|------|------|------|--------|
| Violations to Specification        | 0.14 | 0.13 | 0.14 | 0.31 | 0.72 | 17.9%  |
| Violations to the Schedule         | 0.69 | 0.63 | 0.69 | 0.31 | 2.33 | 58.2%  |
| Violations to the Budget           | 0.14 | 0.13 | 0.14 | 0.31 | 0.72 | 17.9%  |
| Failure to meet owner instructions | 0.03 | 0.13 | 0.03 | 0.06 | 0.24 | 6.1%   |
| COL. TOTAL                         | 1    | 1    | 1    | 1    | 4    | 100.0% |

### 4.2.3 AHP Scoring for The Force Majeure Sub-Criteria's

The Readings shown in table 4.8 shows that the majority of the respondents thinks that the Fire Risk has an Extreme importance when compared to Explosion Risk and Earth quakes. While, The Slope Explosion risks have an extreme importance when compared to the Earth quakes.

**Table 4.7: AHP Scale for the Force Majeure Sub-Criteria.**

| Factor    | Compare the relative importance with respect to :<br><br>Force Majeure |             |        |          |       |                      |        |             |         | Factor       |
|-----------|------------------------------------------------------------------------|-------------|--------|----------|-------|----------------------|--------|-------------|---------|--------------|
|           | More importance than                                                   |             |        |          | Equal | Less importance than |        |             |         |              |
|           | Extreme                                                                | Very Strong | Strong | Moderate |       | Moderate             | Strong | Very Strong | Extreme |              |
| Fire      | 10                                                                     | 0           | 2      | 4        | 3     | 3                    | 0      | 0           | 3       | Explosion    |
| Fire      | 10                                                                     | 1           | 0      | 4        | 3     | 1                    | 1      | 2           | 3       | Earth quakes |
| Explosion | 11                                                                     | 0           | 0      | 1        | 4     | 4                    | 1      | 1           | 3       | Earth quakes |

Table 4.9 shows the AHP Matrix for the Force Majeure Sub-criteria. Hence, the importance of the Fire risks are 5 times the importance of the Explosion risks. The Risks are also 5 times the importance of the Earth quakes. The Diagonal is equal to 1 and the right hand side of the diagonal equals to the inverse of the Left hand side of the diagonal.

**Table 0.8: AHP scores for the Force Majeure Sub-Criteria's.**

|              | Fire | Explosion | Earth quakes |
|--------------|------|-----------|--------------|
| Fire         | 1    | 5         | 5            |
| Explosion    | 0.2  | 1         | 5            |
| Earth quakes | 0.2  | 0.2       | 1            |
| COL. TOTAL   | 1.4  | 6.2       | 11           |

Table 4.10 shows the Normalized score table for the Force Majeure Sub-criteria's. Cells have been divided over the column sum. The Fire Risks has a weight of 65.8%, which is the raw sum over the number of sub-criteria's. The Explosion risk has a relative weight of 25.3% and the Earth quake has a relative weight of 8.9%.

**Table 0.9: AHP Normalized Scores for the Force Majeure Sub-Criteria's.**

|              |             |             |             |             |       |
|--------------|-------------|-------------|-------------|-------------|-------|
| Fire         | 0.714285714 | 0.806451613 | 0.454545455 | 0.714285714 | 65.8% |
| Explosion    | 0.142857143 | 0.161290323 | 0.454545455 | 0.142857143 | 25.3% |
| Earth quakes | 0.142857143 | 0.032258065 | 0.090909091 | 0.142857143 | 8.9%  |

### 4.3 AHP Analysis for the Main Factors Affecting the construction projects accomplishment time in Saudi Arabia

The Readings shown in table 4.11 shows that the majority of the respondents think that the Contractor's has an extreme importance when compared to the Owner's, Consultant's and Force Majeure have an extreme importance when compared to Contactor's. Consultant's has an extreme importance when compared to Owner's. Force Majeure have an extreme importance when compared to Contactor's and Consultant's.

**Table 0.10: AHP scores for the choosen Criteras.**

| Factor     | Compare the relative importance with respect to : Factors Affecting the construction projects accomplishment time in Saudi Arabia |             |        |          |       |                      |        |             |             | Factor        |
|------------|-----------------------------------------------------------------------------------------------------------------------------------|-------------|--------|----------|-------|----------------------|--------|-------------|-------------|---------------|
|            | More importance than                                                                                                              |             |        |          | Equal | Less importance than |        |             |             |               |
|            | Extreme                                                                                                                           | Very Strong | Strong | Moderate |       | Moderate             | Strong | Very Strong | Extr<br>eme |               |
| Contractor | 10                                                                                                                                | 1           | 3      | 1        | 6     | 0                    | 1      | 0           | 3           | Owner         |
| Contractor | 4                                                                                                                                 | 1           | 2      | 3        | 6     | 0                    | 2      | 0           | 7           | Consultant    |
| Contractor | 5                                                                                                                                 | 5           | 1      | 1        | 2     | 2                    | 1      | 2           | 6           | Force Majeure |
| Owner      | 7                                                                                                                                 | 5           | 1      | 1        | 6     | 0                    | 2      | 0           | 3           | Consultant    |
| Contractor | 3                                                                                                                                 | 1           | 2      | 1        | 3     | 3                    | 1      | 2           | 9           | Force Majeure |
| Consultant | 3                                                                                                                                 | 2           | 4      | 1        | 2     | 0                    | 3      | 1           | 9           | Force Majeure |

Table 4.12 shows the AHP Matrix for the Main criteria's affecting the construction projects accomplishment time in Saudi Arabia. The Diagonal is equal to 1 and the right hand side of the diagonal equals to the inverse of the Left hand side of the diagonal.

**Table 4.11: AHP scores for the Main Criteras Affecting the construction projects accomplishment time in Saudi Arabia.**

|               | Contractor | Owner | Consultant | force majeure |
|---------------|------------|-------|------------|---------------|
| Contractor    | 1          | 5     | 0.2        | 0.2           |
| Owner         | 0.2        | 1     | 5          | 0.2           |
| Consultant    | 5          | 0.2   | 1          | 0.2           |
| force majeure | 5          | 5     | 5          | 1             |
| COL. TOTAL    | 11.2       | 11.2  | 11.2       | 1.6           |

Table 4.13 shows the Normalized score table for the Main criteria's affecting the construction projects accomplishment time in Saudi Arabia. Cells have been divided over the column sum. The Contractor's has a weight of 17%, which is the raw sum over the number of sub-criteria's. The Owner's has a relative weight of 17%. The Consultant's criterion has a relative weigh of 17%. The force majeure has a weight of 49%.

**Table 0.12: Normalized AHP scores for the Main Criteras Affecting the construction projects accomplishment time in Saudi Arabia.**

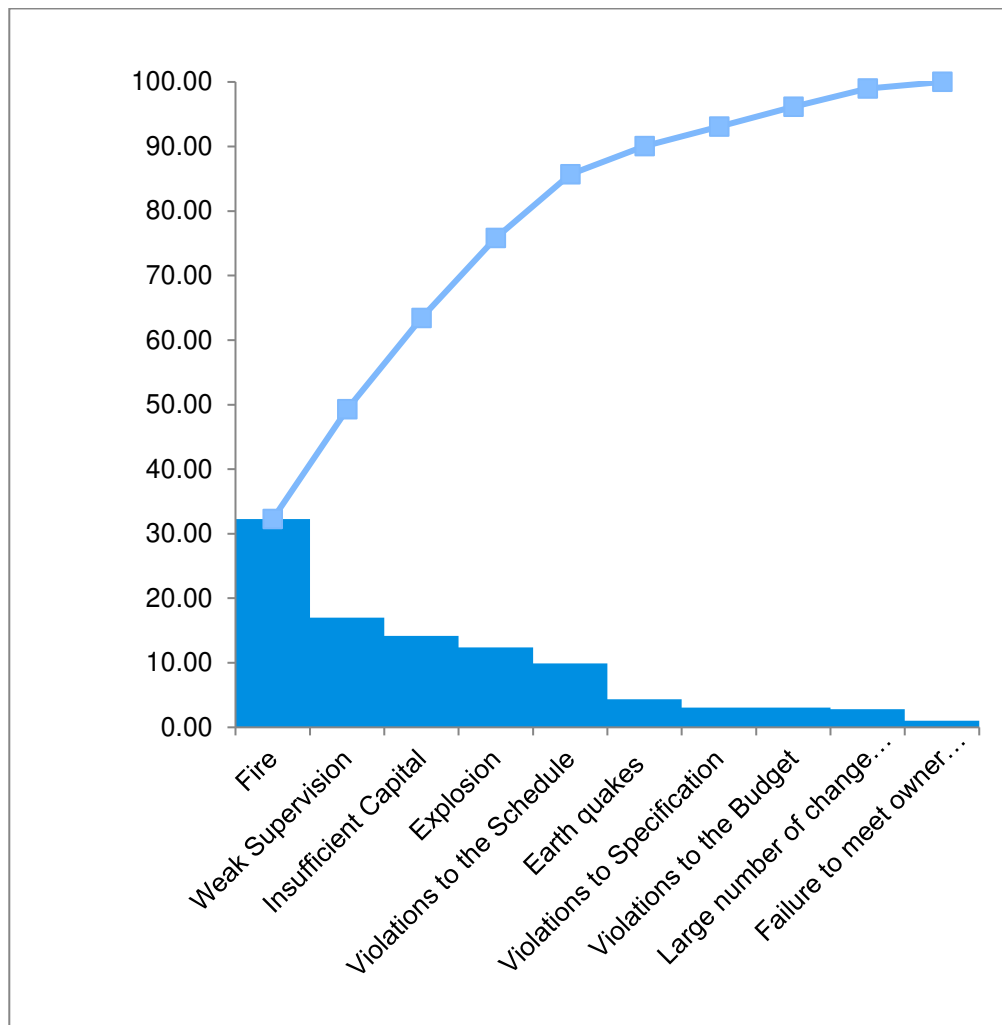
| Contractor    | 0.09 | 0.45 | 0.02 | 0.13 | 0.68 | 17%    |
|---------------|------|------|------|------|------|--------|
| Owner         | 0.02 | 0.09 | 0.45 | 0.13 | 0.68 | 17%    |
| Consultant    | 0.45 | 0.02 | 0.09 | 0.13 | 0.68 | 17%    |
| force majeure | 0.45 | 0.45 | 0.45 | 0.63 | 1.96 | 49%    |
| COL. TOTAL    | 1    | 1    | 1    | 1    | 4    | 100.0% |

## 4.4 Results and Discussion

As per the results, table 4.14 shows the sub criteria and its scores and the criteria scores. The product is by the multiplication of the criteria score and the sub criteria score. The most important Criteria to be considered to avoid projects delays is the Force Majeure (49%) and specifically fires (65.8%) and this because fires may lead to the demolish of the constructions to rework of activities that is on the critical path causing a delay in the project. The second important sub-criterion is the weak supervision that may be caused by delay in RFI's (Request for inspection). The Third important Sub-Factor to consider is the Insufficient Capital (14.17%), and this is due to starting the project with limited funds. The Fourth important Sub-Factor is the Explosion risk with 12.39% causing re-work for project activities. The remaining sub-factors weights are shown in the table.

**Table 0.13: Overall Sub Criteria Scores.**

| Main Criterions | Sub-Factor                         | Criteria Weight | Sub-Criteria Weight | Product |
|-----------------|------------------------------------|-----------------|---------------------|---------|
| Owner           | Insufficient Capital               | 17%             | 83.30%              | 14%     |
|                 | Large number of change orders      |                 | 16.70%              | 3%      |
| Contractor      | Violations to Specification        | 17%             | 17.9%               | 3%      |
|                 | Violations to the Schedule         |                 | 58.2%               | 10%     |
|                 | Violations to the Budget           |                 | 17.9%               | 3%      |
|                 | Failure to meet owner instructions |                 | 6.1%                | 1%      |
| Force Majeure   | Fire                               | 49%             | 65.8%               | 32%     |
|                 | Explosion                          |                 | 25.3%               | 12%     |
|                 | Earth quakes                       |                 | 8.9%                | 4%      |
| Consultant      | Weak Supervision                   | 17%             | 100.00%             | 17%     |



**Figure 0.4 Pareto Analysis For the Sub-Factors Affecting Construction Projects Completion Time.**

The next chapter is a conclusion and some recommendations according to this project results.

## **Chapter (5)**

## **Discussion of Results**

## 5.1. Conclusion

This chapter presents the results for this project. In the previous chapter the most important factors causing construction projects delays have been highlighted. This chapter presents some recommendations regarding the improvement of the efficiencies in the construction projects completion time in Saudi Arabia.

Four main criteria's were compared based on a review of literature on the factors affecting the construction projects completion time. Those main criteria's have been chosen based on a literature Review of similar works and on expert opinion. Namely; Contractor's, Owner's, Consultant's and Force Majeure.

Analytical Hierarchy Process (AHP), which is considered one of the most powerful multi-criteria decision-making approaches, has been used. Data used to obtain the priorities were collected via a Google forms questionnaire. The questionnaire involved 25 of experts in construction projects management in Saudi Arabia to know their opinions' regarding the relative importance of each criterion compared to the other criterion.

The ranking of criteria shows that the Force Majeure has the highest priority (49%), followed by Contractor's, Owner's and Consultant's with the same scores (17%), respectively.

For the Sub-criteria level, The ranking of sub-criteria shows that the Fire risk has the highest priority (32.26%), followed by weak supervision (17%), Insufficient Capital (14.17%), Explosion (12.39%), violations to Schedule (9.89%), Earth quakes (4.35%), violations to specification (3.04%), violations to budget (3.04%), number of change orders (2.83%) and the failure to meet owner instructions (1.03%).

The ranking of criteria shows that the three Sub-criteria's (Fire, weak supervision and insufficient capital) have more than 63.43% of the weight. The high weights for those sub-factors are explained by:

- 1- Fire; this could lead to re-work of projects activities, this will need operational and Construction Costs. Thus, fire's leads to new activities that wasn't scheduled in the project program.

- 2- Weak Supervision; Weak Supervision is considered a draw back for the project. The supervisor roles are to help in the project accomplishment not trying to delay the project.
- 3- Insufficient capital; lack of funds leads to major delays.

## **5.2. Recommendations and Future Study**

As per this study results, it is recommended to:

- 1- Assessment of the Current Undergoing construction projects in Saudi Arabia in preparedness of fires and fire precautions. Thus, Some Projects such as the fire happened in Jeddah main train station has led to the commence and delay of the project handover.
- 2- As per the literature Review, The safety factor is added as the fourth pillar to a project success. This includes time, cost, quality and safety. This study shows that fires are considered as a major and critical to project success.

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## **APPENDIX: Project Questionnaire**

# تحديد العوامل المؤثرة على تأخر المشاريع الانشائية في المملكة العربية السعودية

## Assessing the Criterias behind the construction projects delays in Saudi Arabia Using AHP Approach

السلام عليكم ورحمة الله وبركاته.

شكرا جزيلا على موافقتك على المشاركة في هذا الاستبيان.  
هذا الاستبيان هو جزء من مشروعي البحثي لتتطلبات الحصول  
على درجة الماجستير في الإدارة الهندسية من جامعة ميداوثن.  
الهدف من هذا المسح هو تقييم العوامل المؤثرة في تأخر المشاريع  
الانشائية في المملكة العربية السعودية.

نحن نضمن لك أنه في حالة استخدام أي من المعلومات الناتجة عن  
البحث في العروض التقديمية أو التقارير، سيتم تغيير جميع  
معلومات التعريف للحفاظ على الخصوصية والسرية.  
مشاركتك في هذه الدراسة طوعية تمامًا. لأغراض التحليل العلمي  
لهذا الاستبيان نتشجعك على الإجابة على جميع الأسئلة.  
سيستغرق هذا الاستبيان 4 دقائق كحد أقصى لإنهائه.  
لديك الحق في سحب المعلومات الخاصة بك في أي وقت خلال فترة  
الدراسة. سيتم عرض النتائج في الأطروحة وسيطلع عليها مشرف  
البحث، والمحدد الثاني والمخصص الخارجي.  
سيتم إتلاف جميع البيانات التي جمعناها من هذا الاستبيان بعد  
عام واحد من الانتهاء من هذه الدراسة.

شاكرا لكم -  
أخوكم/ أحمد الكلوت

\* Indicates required question

### التعريفات Definitions

ملخص تعريفات مصطلحات تأخيرات مشاريع البناء

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#### 1. تأخيرات مشاريع البناء

أي حدث أو حالة تؤدي إلى تمديد وقت إنجاز المشروع عن التاريخ المخطط أو التعاقدى.

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#### 2. تأخيرات ناتجة عن المقاول

تأخيرات تنشأ عن أفعال أو إهمال المقاول، مثل سوء الإدارة، مشاكل العمالة، أو عدم الامتثال للمواصفات.

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#### 2.1 مخالفات للمواصفات المتعاقد عليها

عدم الالتزام بالمتطلبات الفنية والمعايير المحددة في العقد، مما يؤدي إلى إعادة العمل أو التصحيحات.

#### 2.2 مخالفات للجدول الزمني المتعاقد عليه

عدم الامتثال للجدول الزمني المتفق عليه للمشروع، مثل تأخير المواعيد أو القرارات، مما يسبب تأخيرات في المشروع.

#### 2.3 مخالفات للميزانيات المالية

تجاوز أو سوء إدارة الميزانية المخصصة، مما يؤدي إلى نقص التمويل وتوقف المشروع.

#### 2.4 عدم الامتثال لتوجيهات وتعليمات المالك

عدم اتباع توجيهات المالك أو تغييراته المحددة، مما يسبب ارتباكاً وتأخيرات.

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#### 3. تأخيرات ناتجة عن المالك

تأخيرات ناتجة عن فشل المالك في الوفاء بالتزاماته، مثل توفير المعلومات، المواعيد، أو الدفعات في الوقت المحدد.

### 3.1 عدم كفاية رأس المال

نقص الموارد المالية الكافية لدى الاستشاري لأداء الخدمات المطلوبة، مما يؤدي إلى انقطاع العمل.

### 3.2 كثرة أوامر التغيير

التغييرات المتكررة التي يطلبها الاستشاري أو المالك والتي تعطل سير العمل وتطيل مدة المشروع.

### 4. تأخيرات ناتجة عن الاستشاري

تأخيرات بسبب قصور الاستشاري، مثل أخطاء التصميم، التأخر في الردود، أو الإشراف غير الكافي.

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### 5. تأخيرات ناتجة عن القوة القاهرة

تأخيرات ناتجة عن ظروف غير متوقعة خارجة عن إرادة الأطراف، مثل الكوارث الطبيعية.

#### 5.1 حريق

الحرق غير مسيطر عليه يتسبب في تلف الممتلكات ويوقف أنشطة البناء.

#### 5.2 انفجار

إطلاق مفاجئ وعنيف للطاقة بسبب دمارا وتوقف العمل.

#### 5.3 زلزال

اهتزاز مفاجئ للأرض ناتج عن نشاط زلزالي، مما يؤدي إلى أضرار هيكلية وتأخير المشروع.

—

## 1. \* الإسم Name

\_\_\_\_\_

## 2. إسم المشروع Project Name

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3. Email

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4. نوع المشروع \*

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- ☐ مشاريع إتش.إم.إت
- ☐ مشاريع بنية تحتية
- ☐ مشاريع صيانة وتشغيل

5. المؤهل العلمي \*

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- ☐ بكالوريوس
- ☐ ماجستير
- ☐ دكتوراة

6. الفئة العمرية \*

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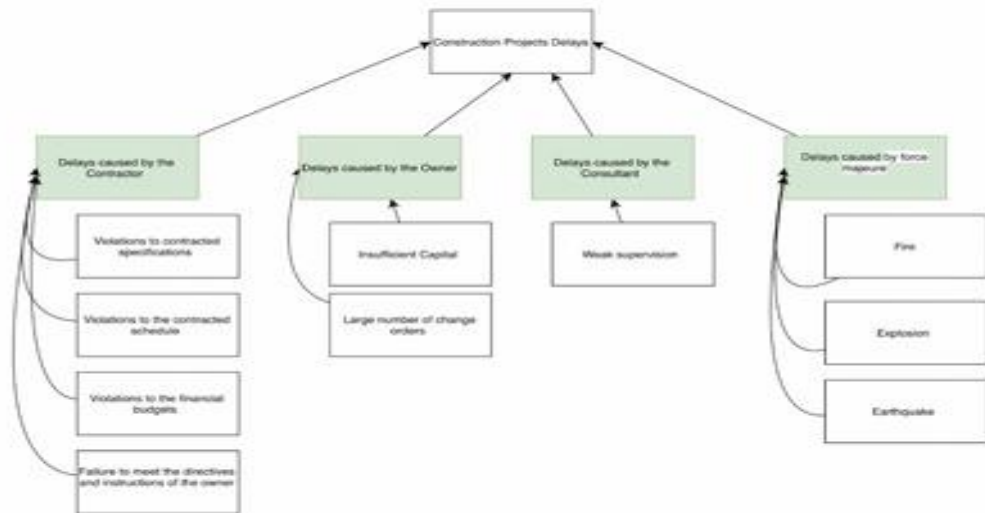
- ☐ ٢٠-٢٥ سنة
- ☐ ٢٦-٤٠ سنة
- ☐ ٤١-٤٥ سنة
- ☐ ٤٦-٥٠ سنة
- ☐ أكثر من ٥١ سنة

### ملخص طريقة التقييم - مقياس ساتي (Saaty Scale)

يتم التقييم بمقارنة العامل الأيمن (أ) بالعامل الأيسر (ب) باستخدام الأرقام من 1 إلى 9:

- 1: العامل الأول يمثل أهمية عالية.
- 3: العامل الأول أهم قليلاً من الثاني.
- 5: العامل الأول متساويان .
- 7: العامل الثاني أهم قليلاً قوي جداً من الأول.
- 9: العامل الثاني يمثل أهمية عالية (أعلى درجة)
- الأرقام الزوجية (2, 4, 6, 8): تستخدم للتعبير عن درجات وسطية عندما يصعب التحديد الدقيق.

### AHP



7. برأيك، من الأكثر تسبباً في تأخير المشروع (المقاول أم المالك)؟

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|   | المقاول               |
|---|-----------------------|
| 1 | <input type="radio"/> |
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| 3 | <input type="radio"/> |
| 4 | <input type="radio"/> |
| 5 | <input type="radio"/> |
| 6 | <input type="radio"/> |
| 7 | <input type="radio"/> |
| 8 | <input type="radio"/> |
| 9 | <input type="radio"/> |

المالك  
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8. برأيك، من الأكثر تسببًا في تأخير المشروع (المقاول أم الاستشاري)؟

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المقاول

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الاستشاري

9. **يرأيك، من الأكثر تسببًا في تأخير المشروع (المقاول أم الكوارث الطبيعية)؟**

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المقاول

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الكوارث الطبيعية

10. رأيك، من الأكثر تسيباً في تأخير المشروع (المالك أم الاستشاري)؟

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المالك

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الاستشاري

11.  برأيك، من الأكثر تسببًا في تأخير المشروع (المالك أم الكوارث الطبيعية)؟

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الكوارث الطبيعية

12. \* برأيك، من الأكثر تسببًا في تأخير المشروع (الإستشاري أم الكوارث الطبيعية)؟

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الإستشاري

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الكوارث الطبيعية

المعايير الفرعية (المقاول)

لا توجد معايير فرعية محددة للمقاول في هذا التحليل  
العوامل المتعلقة بالمقاول

الهدف: تحديد أي إجراء أو تقصير محدد من جانب المقاول يساهم بشكل  
أكبر في التأخيرات

ملاحظة: لا توجد عوامل فرعية للمقاول في هذا التحليل

13. ★ برأيك أيهما أكثر أهمية في التسبب بتأخيرات المقاول؟  
مخالفة المواصفات مقابل مخالفة الجدول الزمني؟

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مخالفة المواصفات

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مخالفة للجدول الزمني

14. برأيك أيهما أكثر أهمية في التسبب بتأخيرات المالك؟ مخالفة المواصفات مقابل مخالفة الميزانيات المالية:

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مخالفة الميزانيات

15. ★ برأيك أيهما أكثر أهمية في التسبب بتأخيرات المقاول؟  
مخالفة المواصفات مقابل عدم الامتثال للتوجيهات

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مخالفة المواصفة

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عدم الالتزام للتوجيهات

16. ★ برأيك أيهما أكثر أهمية في التسبب بتأخيرات المقاول؟  
مخالفة الجدول الزمني مقابل عدم الامتثال للتوجيهات

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مخالفة الجدول

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عدم الامتثال للتوجيهات

17. أيهما أكثر أهمية في التسبب بتأخيرات المقاول؟ مخالفة الميزانيات المالية مقابل عدم الامتثال للتوجيهات \*

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مخالفة الميزانية

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عدم الامتثال للتوجيهات

العوامل المتعلقة بالمالك

الهدف: تحديد أي عامل مرتبط بالاستشاري هو السبب الرئيسي للتأخيرات.  
عوامل المالك

18. \* برأيك أيهما أكثر تأثيراً في تأخيرات المشروع الناتجة عن المالك؟ نقص رأس المال مقابل كثرة أوامر التغيير

ملاحظة: العوامل المذكورة (نقص رأس المال، كثرة أوامر التغيير) تتبع عادةً "التأخيرات الناتجة عن الاستشاري" وليس المالك. يرجى التأكد من دقة التصنيف

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عدم توفر المال

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كثرة اوامر التغيير

## عوامل القوة القاهرة

الهدف: تحديد أي حدث خارجي هو الأكثر تعطيلاً عند حدوثه  
عوامل الكوارث الطبيعية

19. برأيك أيهما يسبب تأخيرات أشد عند حدوث القوة القاهرة؟ حريق مقابل انفجار؟

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الحرائق (لا قدر الله)

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الانفجارات (لا قدر الله)

20. برأيك أيهما يسبب تأخيرات أشد عند حدوث القوة القاهرة؟ حريق مقابل زلزال؟

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Mark only one oval.

الحرائق

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الزلازل

21. برأيك أيهما يسبب تأخيرات أشد عند حدوث القوة القاهرة؟ انفجار مقابل زلزال؟

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*Mark only one oval.*

الانفجارات

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الزلازل

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