T.C.
ISTANBUL GEDİK UNIVERSITY
INSTITUTE OF GRADUATE STUDIES

THE INTEGRAL MANAGEMENT OF MAJOR ARCHITECTURAL PROJECTS IN THE SCOPE OF DESIGNING AND PLANNING

MASTER'S THESIS

Mustafa Majid Hussein AL-JUMAILI

Engineering Management Department

Engineering Management Master in English Program

JUNE 2022

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LİSANSÜSTÜ EĞİTİM ENSTİTÜSÜ MÜDÜRLÜĞÜ

Yüksek Lisans Tez Onay Belgesi

Enstitümüz, Engineering Management Department İngilizce Tezli Yüksek Lisans Programı (191281050) Mustafa Majid Hussein AL-JUMAILI'nin "The Integral Management of Major Architectural Projects in the Scope of Designing and Planning" adlı tez çalışması Enstitümüz Yönetim Kurulunun 26.07.2022 tarihinde oluşturulan jüri tarafından *Oy Birliği* ile Yüksek Lisans tezi olarak *Kabul* edilmiştir.

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DECLARATION

I, Mustafa Al-Jumaili, hereby declare that this letter is entitled “The Integral Management of Major Architectural Projects In the Scope of Designing and Planning" is the original work I did for master's degree awarded in the college of engineering management. Also declared that this thesis or any. Part of it has not been submitted and submitted for any degree or other research paper in any other university or institution. (26/07/2022)

Mustafa Majid Hussein AL-JUMAILI

In the name of God the Merciful

{And of knowledge, you mankind have been given only a little.}
Great truth of God

(Surah Al-Isra verse.85

DEDICATION

To my dearest people, my dear mother (Sundus) May God have mercy on her and make her among the people of Paradise.

To my first example and the beacon of knowledge on which I walk my dear father

(Majid)May God protect you and prolong your life.

To the one who raised me and stayed up the nights and carried everything , my mother (Hanan), may God protect you and prolong your life.

To the dearest thing in my heart, my brothers (Hanan, Ali, Nihad, Istabraq, Sundus and Noureddine), may God protect you and make you the happiest of people.

To those who sacrificed and labored for my uncles (Jamal , Salam , Dhaher) May God protect you and prolong your life.

For those who supported me and gave me what they could for me, my cousins and grandparents, you have all my love and respect.

I present to you my research

Mustafa Majid Hussein AL-JUMAILI

PREFACE

In the name of Allah the Merciful Praise be to God, Lord of the Worlds, and blessings and peace be upon our Prophet Muhammad, the best of the messengers, and upon his family The good, pure and his companions.

It is my pleasure, as I finish my letter, to extend my sincere thanks and gratitude to who supervised my letter for directing me and for his valuable remarks that had a great impact in producing the message in this way, and may God grant them success to what he loves and pleases.

I also extend my thanks, appreciation, and gratitude to (my professors in (Prof. Gokhan Kazar) for what they presented.

Atta was the reason for my reaching this stage, and I extend my thanks and gratitude to the professors on the committee

The discussion of what they provided enriches and strengthens the position of the research.

I also extend my thanks and gratitude to my colleagues at the Masters level for their valuable cooperation in completing my journey Scholasticism.

June 2022 Mustafa Majid Hussein AL-JUMAILI

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ABBREVIATIONS

IT : I nformation technology
USA : United States of America
B.C : B.C.E.
TOC : Theory of Constraints
RBT : Resource based theory
RAT : Resource advantage theory
RDT : Resource definition theory
TQM : The development of total quality management
CPM : Cost Per Mille
WBS : Work Breakdown Structure
PMI : Project Management Institute
FBI : In the US Federal Bureau of Investigation
WBC : Work Breakdown CHART
ADM : Arrow Diagramming Method
AOA : Activity Network Diagrams
PDM : Method of Precedence Diagramming
AON : Activity-On-Node
CPM : Critical Path Method
JIT : Just-in-time

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THE INTEGRAL MANAGEMENT OF MAJOR ARCHITECTURAL PROJECTS IN THE SCOPE OF DESIGNING AND PLANNING

ABSTRACT

Engineering management is a comprehensive discipline that combines planning and engineering management to enable professionals and others in the engineering sector to enhancement a well sympathetic of command structure of employees, specialists, and support workers that collaborate on the structure's construction. Project management needs deep study and understanding in order to be applied accurately, to be able to manage projects, whether engineering, development or small projects with high professionalism. Project management requires that work be done with the participation of engineering disciplines working on the implementation of the project

Each specialization is complementary to the other specialization, and the life of the project begins first with the architect, who sets the required plans chosen by the customer, where the architect draws the basic plans, facades, interior decoration, lighting type, finishing materials, and lighting type Then comes the role of the civil engineer, who designs the building structurally, calculates the materials used in the construction and their quality, and calculates costs, and comes in several roles for the rest of the engineering departments that will participate in the completion of the project The research problem is the lack of integration of local engineering project management in its planning, design, construction, mechanical and electrical decisions.

But through the engineering management program, we will be able to address the problems facing engineers in the future.

Keywords: *Construction project management, Project, Actions, Time and Cost Management, Mechanism of work between engineering departments*

BAŞLICA MİMARİ PROJELERİN TASARIM VE PLANLAMA KAPSAMINDA BÜTÜNSEL YÖNETİMİ

ÖZET

Mühendislik yönetimi, mühendislik sektöründeki profesyonellerin ve diğerlerinin, çalışanların, uzmanların ve yapının inşasında işbirliği yapan destek çalışanlarının sempatik bir komuta yapısını geliştirmelerini sağlamak için planlama ve mühendislik yönetimini birleştiren kapsamlı bir disiplindir. Proje yönetimi, doğru bir şekilde uygulanabilmesi, mühendislik, geliştirme veya küçük projeler olsun, yüksek profesyonellik ile projeleri yönetebilmek için derin bir çalışma ve anlayış gerektirir. Proje yönetimi, projenin uygulanması konusunda çalışan mühendislik disiplinlerinin katılımıyla çalışmaların yapılmasını gerektirir.

Her ihtisas diğer ihtisas için tamamlayıcıdır ve projenin ömrü önce mimarın müşteri tarafından seçilen gerekli planları belirleyen, mimarın temel planları, cepheleri, iç dekorasyonu, aydınlatma tipini, bitirme malzemelerini çizdiği yerde başlar. Ardından, binayı yapısal olarak tasarlayan, inşaatta kullanılan malzemeleri ve bunların kalitesini hesaplayan ve maliyetleri hesaplayan inşaat mühendisinin rolü gelir ve projeye katılacak diğer mühendislik departmanları için çeşitli roller üstlenir. projenin tamamlanması Araştırma sorunu, planlama, tasarım, inşaat, mekanik ve elektrik kararlarında yerel mühendislik proje yönetiminin entegrasyonunun olmamasıdır.

Ancak mühendislik yönetimi programı aracılığıyla, gelecekte mühendislerin karşılaşacağı sorunları çözebileceğiz.

Anahtar Kelimeler: *İnşaat proje yönetimi, Proje, Eylemler, Zaman ve Maliyet Yönetimi, Mühendislik departmanları arasındaki çalışma mekanizması*

1. INTRODUCTION TO PROJECT MANAGEMENT

1.1 Overview

The construction sector is probably the most experienced industry in terms of job coordination and project management. The pyramids of Egypt. The third millennium (BC). The theory of the golden ratio, which was not known at that time, in addition to the pipes that delivered water to the sites of cities in ancient Babylon and how water rose to the upper floors of them, as well as mines, and palaces built of marble are well-known examples, the first of which was It was built in Rome around 312 BC. Through broader development activities and even a heterogeneous mix of materials and parts development began quickly with the specialization in complex structures. Separately from recent achievements of building calibration with associated or pre-engineered dwellings as well; Off-the-shelf modular works, perceptions have taken over the industrial sectors, plus the project-based organizational structure in construction has largely remained the same for centuries. Despite its age, development remains an unreasonable industry in terms of the lowest triple component of maintainability, which takes financial and naturalistic views as well as social ones.

Figure 1.1: Project Management

Specifically, development projects are regularly deferred and over spending plan. This isn't only because of issues looked during project booking, yet additionally

during related cycles like material obtainment and material administration Furthermore, the development sector can be called a unique industry because the duties are client-driven, unusual in character, and united by privately focused creation with high speculations due to the complexity of its goods. Continuing to follow, chain of supplies in development business are explicit, in addition then when associated to those in manufacturing industry, it's clear that they are additional perplexing due to the intriguing concept of the projects, the deeply dubious planning climate, as well as the respective partners of a proposed development. Henceforth, assuming the center is attracted to individual development, for example, planner structures as well as roads and passages, normalized development cycles to accomplish upper hands can't be applied. Finishing up, modern techniques for project arranging and control for this purported plan to-arrange arranging conditions would be required. Notwithstanding, specialists are as yet hesitant to handle the intricacy of individual development because of the troubles of speculation of ways to deal with be created. Overall, the suppliers of traditional assembling enterprises seem to be well managed using both descriptive and inferential methodologies. These work effectively in standardized creation processes. In this way, aimed at the most part ideas for make-to-stock, gather to-request or specially make creation were created and have been laid out up to this point.

1.2 Previous Researches Overview

Project management is a specialty that deals with several organizations and departments, including human resources management, risk management, and others in order to complete an integrated project and meet the customer’s desire, taking into account the identity of the project and commitment to time and cost considerations into account. Gathering information about the project: to identify the components of the project, the people who will benefit and the nature of the cultural and social environment of their lives. Planning and design criteria for the project. Seeing and analyzing similar projects. Determine the appropriate site and analyze it in terms of:
Built environment: determining the characteristics of the surrounding environment (public utilities/roads, movement/monitoring, and views) locating and analyzing the site.

Climatic conditions: wind / sun, heat / rain and humidity Every country's construction industry has its own set of problems, which are sometimes similar. Complex and dynamic processes are involved in the construction industry. A country's economy is heavily influenced by the construction industry. This is especially true given that construction accounts for at least half of the investments made in a variety of development policies (Henry, 1993). The main criterion of project success, according to management, is the timely completion of construction projects. Numerous construction projects, on the other hand, experience significant project delays and disruptions, causing them to exceed their initial time and cost estimates.

According to (Stumpf, 2000) a delay is an act or occurrence that extends the time required to complete a task under a contract. Disruption, on the other hand, is defined by (Kikwasi, 2012) as an event that causes the construction project's schedule to be disrupted. Construction project delays and disruptions cause dissatisfaction among all parties involved. The client considers delays and disruptions to be a loss of profits due to a lack of production and rentable space, or a reliance on existing facilities. On the other hand, due to the extended working period, increased material costs as a result of price increases, and increased labor costs, the contractor considers delay and disruption to be a higher overhead cost (Howell, 1993).

The aim of this topic is to consider the property of addition and comparison between several theories **First**: Resource Based Theory (RBT) and Constraint Theory (TOC), **Second**: The resource advantage (RAT) with an organized methodology that oversees the project, such as the project management body in knowledge(PMBOK). The benefits of a unified project management model are discussed in this paper, which explains each theory. The development of a comprehensive framework is outlined in this paper, which will be put to the test in a variety of project management scenarios.

This paper outlines the development of a comprehensive framework that will be put to the test in a variety of project management scenarios. (Techniques and their Use in Formulating Environmental 1949), in which project management can play a critical role in facilitating and enabling the necessary changes.

An appendix to the report contains a brief study on the evolution of professional bodies of knowledge (Fugate and Knapp 1998).

One important finding is that the development of a body of theory resembles the development of a well-established profession like law, medicine, architecture, accounting, or nursing. Professionals are defined by their knowledge of theory as well as their ability to apply theory in the field.

According to Fugate and Knapp, the single most important factor distinguishing a profession from a craft is the reliance on the theoretical. Surprisingly, the PMI's major report on the future of project management makes no mention of this theoretical issue (Project Management Institute 1999), despite the fact that the profession's future is a major concern.

Of course, there are many ways to express the characteristics of project management, and the real concepts of project management can be discussed; However, the PMBOK Guide provides a good summary of that principle for the purposes of this paper. Below is a breakdown of the paper's structure. The first point that was raised was what we do as practitioners and scholars with project management theory. By comparing the recipes and principles of project management with those implied by current theories of operations management, the basic theory of project management is reconstructed. Now that we have it, we will see if it is the most recent and empirically valid theoretical basis for project management. The implications of evaluating project management theory are discussed

Finally, the impact of project management's underlying theory's flaws on project management practice, profession, and evolution is investigated (Cooper, 1993).

1.3 Development of Project Management

In the last two decades, project management literature appeared and began to be widely used, and developments can be identified: an increase in the areas of work that are capable of projects, an increase in the use of project structures, an expansion of the conceptual base for project management, and a new strategic role for projects in organizations. (Cleland 1994, Fangel 1993, Hayden 1997, Kerzner 1994).

An audit of the writing uncovers one concentrate explicitly connecting with the improvements portrayed previously. The review, revealed by Chaffey (1997), considers the degree to which associations have created project group designs and frameworks to help an expanded key spotlight on project work. Despite the fact that

introducing the aftereffects of a study among British organizations, the report gives no sign of the number and attributes of the associations tested. The primary variable is the kind of association. Project the board grows speedier and simpler in customary venture centered associations. In non-project centered associations, it is probably going to flourish in a venture driven work, like Information Technology, and afterward develop out into other practical regions. This proposes that the advancement of task the board is somewhat a component of the intrinsic idea of the work embraced.

The subsequent variable is the outside trigger of downturn. Downturns are the single significant power improving development and acknowledgment of task the board, particularly in non-project centered associations. The supposition that will be that in the midst of downturn, associations are under more noteworthy strain to meet client necessities and looked by more prominent cutthroat tensions than during different periods. Kerzner investigations the impact of downturn by contrasting the US downturns of 1979-82 and 1990-94. There was little acknowledgment of an expansion in the utilization of venture the executives in 1979-82, for the most part since answers for the downturn zeroed in on momentary expense cutting exercises. Hierarchical development in the utilization of venture the board expanded during the 1990-94 downturn as the focal point of answers for the downturn was currently on longer-term drives. This difference in center makes sense of why a few associations can foster their utilization of undertaking the executives while others are not. The main and important link between project management and quality management (TQM) in engineering and non-engineering organizations includes analyzes in some literature, however, and this analysis is not related to the presentation and discussion of research data obtained regarding this problem. Rather, its goal is to understand and explain the reasons for the failure and success of a number of organizations in the (USA) since the seventies (1994) Kerzner's case for Controls, a legitimate organization in a program for total quality management (1986) and in (1987) it was recognized that the existence of Links and common factors between project management and total quality management. This is due to the contribution of project management to improving the implementation of total quality management programs. Kerzner also expresses the view that quality management contributes to

this interrelationship between project management and quality management, through a culture in which project management is accepted at an accelerating rate.

However, it did not provide specific details about the processes involved, similar conclusions were found from the experiences of some companies such as (ford motor company, hewlett, Motorola packard) (stamatis 1994) Stamatis project management describes quality management in terms of overlapping processes and complementary processes with interdisciplinary and common work.

These comparisons between the two disciplines may help identify factors that influence their development in real project (Lascelles and Dale 1993).

1.4 Importance of Project Management

The project scope is a detailed description of the tasks that must be completed or delivered in order for the project to be successful. A very well project scope strategy will help you prevent problems similar:

- Supplies that are continuously evolving.
- Altering the project's route in middle of it.
- Identifying also do in advance that the final consequence would differ from what was expected.
- Revising the economical that was deliberated.
- Disappointment to encounter scheme targets.

Successful project planning affords a clear depiction of the project's duration, industry, as well as cost. Its assistances in defining what is required in addition what isn't required to comprehensive the work. In managing projects, focus also controls the development's switch aspects, which address elements that whitethorn modifies even during the maturation of the plan.

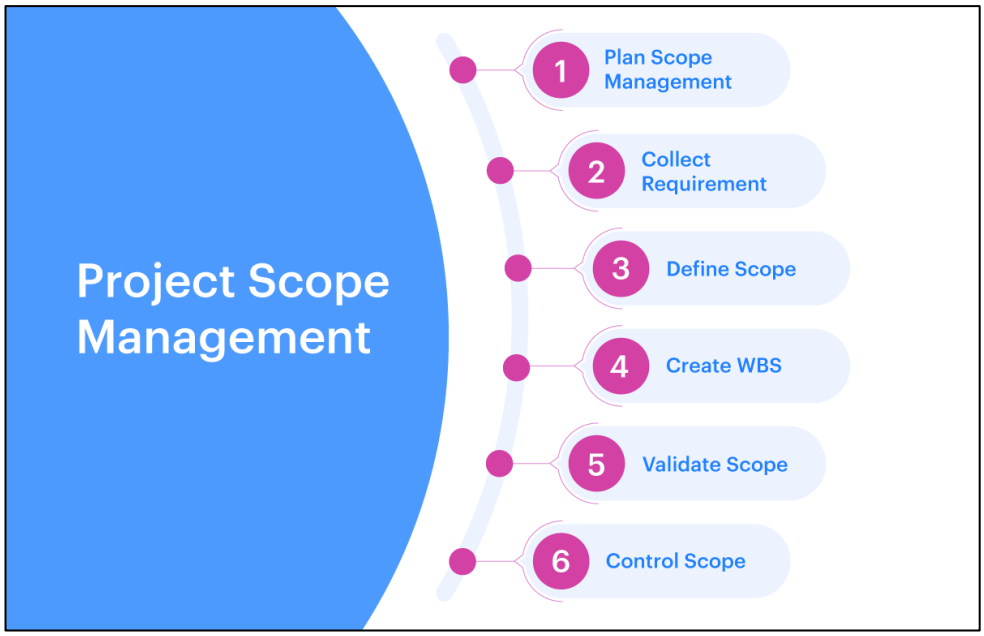


Figure 1.2: Project Scope Management

Team memberships in addition stakeholders must be as comprehensive as conceivable when documenting the scope statement to minimalize scope tiptoe, a situation in which some apparatuses of the development eventually wind up needing additional work in addition attention than initially deliberated owing to misinterpretation or else else underprivileged development.

Teams can ensure that the plan is completed on time, that a comprehensive development communication plan is in place, besides also that the end product meets the initial objectives with effective planning.

Figure 2 depicts the project planning scope: Planning ; Gathering Supplies; Defining ;WBS Scope Validating; Controlling

1. **Planning:**

It explains how the scope will be specified, verified, as well as managed. It also covers how to avoid or deal with scope creep, how to handle change requests, the escalation mechanism for any stakeholder disagreements on strategy analytics, the process for creating the statement of work, WBS, as well as how the deliverables will be approved.

2. **Gathering Supplies:**

This method entails detailing the demands of stakeholders with the specified goal of accomplishing the development's goals. The approach tries to cover all bases,

resulting in a comprehensive set of project needs. If this approach is followed carefully and accurately, it can greatly lessen the chances of nasty consequences as the project nears completion.

This is a serious phase since stakeholders frequently have irrational criteria or else expectations, in addition project managers must interfere to discovery a satisfactory resolution for all gatherings while preventing scheme delays.

You ought to consume the following matters at the completion of the collection supplies phase starts:

- Stakeholder needs .
- Business needs .
- Training and support needs .
- Project needs .
- Functional and non-functional needs.

3. Defining Scope:

This procedure entails writing a full project scope statement as well as its primary deliverables. The scope of the project outlines whatever the project is expected to accomplish as well as what it will not be able to accomplish.

4. Creating a Work Breakdown Structure (WBS):

Project Performance management relies heavily on a scheme breakdown structure. It's a file that disruptions down all efforts that remains to be improved on a development in addition afterward assigns all occupations to members of the team. It correspondingly comprises a list of deliverables that necessity be completed as well as their targets.

5. Validating Scope:

A validate scope is primarily concerned with client acceptance. It must be completed prior to the start of the project to make sure that if approximately goes incorrect, it will be straightforward to determine what went mistaken.

6. Scope Controlling:

Construction directors must guarantee that development stays within defined supplies from the starting point. This method entails evaluating extra client requirements or intentionally expanding the overall project. Uncertainty some things requirement to

be transformed; the right change administration process should be surveyed.

1.5. Research Problem

1.5.1. Lack of integration of local project management into planning design decisions

The project management is considered the main body responsible for managing the project, as well as the party responsible for the financial agreements and responsible for setting work structuring schedules, as well as setting the timetables necessary for the implementation of the project.

The management of local projects is inaccurate in its decisions and design and planning directions.

- There is no real study of the site during the planning process
- Neglecting the neighborhoods that surround the site
- Neglecting the environmental factor
- Lack of utilities (water, electricity, etc.)
- Unthoughtful planning by neglecting the logistical aspects (car parks, public parks, recreational places, and others)
- Neglecting the infrastructure in project planning (schools, nurseries, health centers, and others)
- Influencing planning by the project owner with wrong decisions
- Influencing planning by influential parties in the country
- Influence on planning by bribery and nepotism
- Neglecting the technical aspect of planning
- Neglecting the historical aspect of the design
- Lack of attention to architectural details when designing
- Designing strange facades that have nothing to do with the history of the country
- Bad tradition in design
- Not using modern technologies in design
- Lack of interest in architectural identity
- Choosing bad and unthoughtful materials
- Not paying attention to the interior aspect of buildings

- Neglecting sound insulation in buildings
- Not studying the goals correctly
- Neglecting the orientation of buildings with regard to the environmental aspect

1.5.2.There are many reasons that affect the integration of the project in general

- The project is not operationally integrated.
- The project is not integrated in terms of electricity.
- The project is not structurally integrated.
- Mechanical failure of the project.
- Lack of integration of the project in terms of plumbing.
- Lack of project integration in terms of quality.
- Lack of project integration on the part of contractors.

1.5.3. Research problem solving

1.5.3.1. Principles of project management

- Commitment to the specified time period.
- Good project planning.
- Defining tasks and goals within a specified period of time.
- Correct use of resources (money, equipment, etc.).

We must use some tools during the project management process:

- Choosing highly experienced people to take over some tasks.
- Setting the right standards to ensure that we achieve our goals.
- Managing the project budget properly.
- Distributing materials, personnel and equipment and ensuring their availability throughout the life of the project.
- The responsibility of managing the project is assigned to one person, preferably from the engineering or administrative specializations, and who has extensive experience in project management and solving the dilemmas facing the project. He must, upon completion of the project, prepare reports, calculate materials, and inform the owner The project is based on the results, and these results should be saved to benefit from them in the upcoming

projects that he supervises to help increase his experience and avoid making the same mistakes.

1.5.3.2 The main elements of project management.

- **Scope of work management.**

The management of the scope of work is considered one of the very important factors, as it puts an argument for the time that it takes to manage the project and make the goals not impossible and achievable. In project management, you must encounter errors and have to make a few modifications to complete the project creation process.

- **Defining the scope of work.**

The scope must be defined correctly and a timetable for the beginning and end of work must be established, as well as an alternative plan (work surprises), which often occurs in sites, and every project manager must go through this stage.

- **Managing the total cost of the project.**

The total cost of the project is the most important part of project management, where the project manager must work according to the specified budget and should stay away from spending in order to reduce spending and to ensure the correct functioning of the work, you must set the work budget correctly and be calculated by skilled accountants To avoid the occurrence of major financial problems that contribute to the failure of the project and help in setting the specified budget in the process of running the project in the correct manner and with high quality.

- **Quality Management.**

The quality management component is one of the important and effective elements in the construction project management, where the project manager must verify the specifications requested by the project owner and work on them. It is according to standard specifications

- **Project human resource management.**

Here it is necessary to determine the number of manpower and expertise required in the process of completing the project, and the correct use of labor paths and the strengthening of the mechanism of joint work and constructive cooperation between

different work cadres must be applied, and also the mechanism of incentives and rewards for good work must be applied, listening to different points of view, attention to innovation processes and encouraging them to ensure Continuing to work on the project properly.

- **Managing communication between project management and various work teams**.

A good communication mechanism between project management, money owners and work teams helps to ensure the proper progress of work, identify errors and problems and solve them quickly in a timely manner.

- **Risk Management.**

We must note that all projects that are being worked on are exposed to some risks, and good management must anticipate them and work to prepare any modifications required by the project in a timely manner.

- **purchase management.**

We mean the purchase of products, building materials and other materials needed by the project, as well as the services required to be provided to the various work cadres.

- **Project integration department.**

To obtain the integration of the required projects, the planning aspect must be well thought out and free from errors and defects, and the design aspect must also be ensured, and the design must be within the required standards and ensure the real contexts and also according to the opinion and approval of the project owner.

1.5.3.3. Project context

The most important ingredient for the success of any project is to think about how to implement the project according to the agreed contexts. We refer here to the internal and external environment of the project:

- **The internal environment of the project.**

Providing internal environmental conditions for work cadres, employees, engineers and contractors and ensuring that the internal environment does not create problems for project management, and also from the internal environment components to

ensure compatibility between project management and money owners in order to work smoothly.

- **External environment**

It refers to the location of the project as well as its social and political situation. If the internal and external environment are not identical, this will constitute an obstacle to the implementation of the project. Therefore, study the internal and external conditions before starting to plan the project to identify the surrounding factors and study them well.

1.5.3.4. The life role of the legislator.

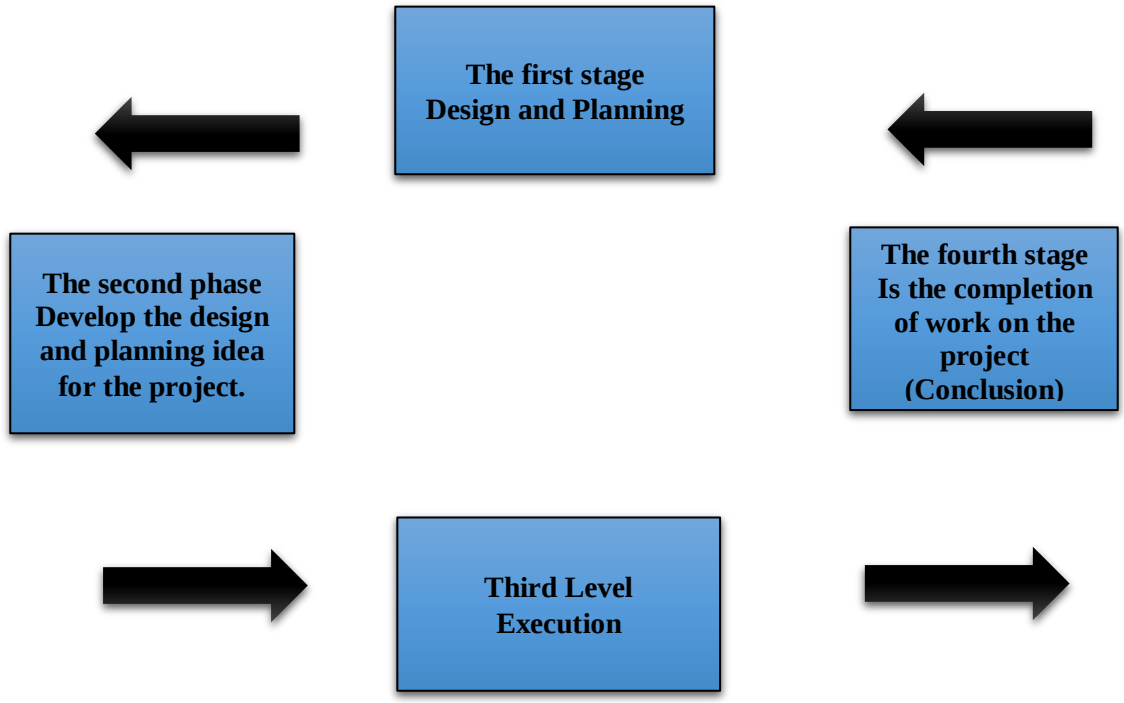


Figure 1.3: Project life cycle table

➢ To ensure the proper progress of the work, the work must be evaluated after each completion stage and an agreement to improve the next steps of the project to ensure the correct progress of the project.

This list shows the stages of work on the project:

A- Planning and design.

It is one process, but with two different parts:

1- Planning

It is considered the first and most important stage at the beginning of the project life, as planning is the main and main part of any project. The stages and requirements that must be achieved, in the planning process, the size of the project and its neighborhoods and the things that affect the site must be taken into account.

When planning large integrated projects, three main things must be taken into account in planning:

- Logistics: represented by (car parks, public parks, recreational areas, and others).
- Infrastructure: represented by (schools, health centers, nurseries, public markets, and others).
- Health facilities: represented by (water, electricity, internet, and others).
- When these three points are completed professionally, the planning will fulfill the purpose for which it was planned and be integrated in terms of planning and architecture.

2- Design.

The design is considered the second and important part of the project. It is considered the main image of the project and the future vision. The design is divided into two parts.

Interior design:

It means the design of the interior spaces, which aims to meet the physical, social and psychological needs of the community and is the main part of the safety of the building.

The interior design is divided into two main parts:

1. **Technical aspect:**

the use of modern technologies in interior design (such as lighting, water system, smart systems, etc.)

2. **The schematic aspect:**

Dividing the spaces as required and according to the service for which they were designed. There are many things that must be taken into account in the schematic aspect of the interior design:

- Ease of movement between services.
- Provide the necessary ventilation for each space equally.
- *Provide natural lighting for each space.
- Easy access to escape systems when disasters occur.
- Taking into account the psychological aspect and comfort requirements.
- When designing hospitals, the patient's health factor must be taken into account with regard to the color of the walls, the type of lighting, and others.
- Attention to sound insulation and the way to choose comfortable colors, as well as the way to choose furniture and finishing materials.

Exterior design:

The external view of the building and the most important part of the project, as it is the external facade that the community sees, and the external design must reflect the personality, identity and culture of the project owner, and it is achieved through the finishing materials that are chosen by the project owner. Under the supervision of specialized engineers.

We notice at the moment the focus is on the exterior of the building and the content of the interior is neglected.

When designing the exterior, several things must be taken into account:

- The form of the project must be of an architectural nature.
- Neighborhoods of the project from neighboring buildings must be taken into account.
- Attention to architectural details in the exterior facades.
- Accurate selection of finishing materials.
- Test colors that are visually and psychologically comfortable.
- Attention to the historical aspect of the country.
- Interest in the cultural aspect of the country.
- The design should reflect the identity and culture of the project owner.

- When designing large projects such as residential complexes, focus must be placed on delivering services and utilities (gas, water, electricity, internet, etc.) to all floors.

To achieve the correct design, the following points must be worked on:

- Gather sufficient information about the project.
- Services provided by the project to the community.
- The goals and aspirations of the project must be defined.
- Arguing financial position for the project.
- Think carefully about the risks that the project will face and develop solutions to them.
- Create alternate plans in case you get into trouble.
- Writing daily reports of workflow.
- Presenting reports to the project owner to follow the workflow process.
- Ensuring the official approvals of the municipality, electricity and other departments.
- Attention and focus on the safety and security factor in the building.

B- Project development

- Gather team members.
- Collect the necessary research on the site (examine the soil and its tolerance, test groundwater and other factors that affect the building).
- Develop the project plan to reach the final plan.
- Presenting plans and objectives to the project stakeholders.
- Participation of the work team with alternative plans in the event of a problem.
- Ensure the availability of utilities (water, electricity, etc.).

C- Implementation of the project

- Organize all tasks.
- Continuous communication with the project owner to be informed of the progress of work.
- Motivating the work team by disbursing rewards and others.

- Inform the work cadres of the project delivery date to ensure the project is completed in a timely manner.
- Work credibly in writing reports related to the progress of the project and handing them over to the employer.
- Purchase of materials and their specifications as agreed with the employer.
- Achieving the required goals by providing good services on time.
- *Keep prices as low as possible.
- Solve all problems that occur in the workplace professionally.

D- Finishing the project (Conclusion) .

- Finish all activities on the site.
- Writing final reports.
- Accurately evaluate the project and ensure the satisfaction of all parties.
- Dispose of construction waste before delivery.
- Redirect the remaining resources to other locations.
- Restructuring the work schedule.
- Pay off debts owed to suppliers.
- Receipt of the remaining funds from the owner of the project.
- Development of the implementation process.
- Verify the final project facilities (water, electricity, gas, internet services, etc.).

We now have a basic idea of the project management process in an integrated and good way to obtain the required integration in terms of planning, design and other matters related to project management.

1.6. Test and Analyze Data Quality, Sample Adequacy, Scale Validity and Reliability

This section is devoted to verifying the nature of the data distribution, the validity and reliability of the scale, and the adequacy of the sample size. The normal distribution test was carried out based on the (Kolmogorov-Smirnov) test, and to verify the adequacy of the sample size, the (KMO) scale (Kaiser-Meyer-Olkin Measure) was used. To verify the suitability of the factor analysis, the Bartlett-Test scale was used.

As for the validity of the questionnaire, the structural validity was tested, which was confirmed through the Exploratory Factor Analysis in the manner of the basic components of the scale items, and Cronbach's Alpha coefficient was used to measure the level of internal consistency of the scale variables and dimensions to ensure the scale's stability All of these tests are to verify the quality of the data and the adequacy of the sample size to make it saturated, as well as for the validity and reliability of the scale in preparation for the initiation of testing the hypotheses, as shown below:

1.6.1. Test and interpret the normality distribution of the sample response data

The objective of testing the normal distribution of the data is to determine the type of appropriate tests for the response data of the study sample, so the (Kolmogorov-Smirnov) test was adopted, and to ensure the distribution of the data through the value of (Sig) and it is required that it be greater than the level of significance of (0.05) for the data to have a normal distribution Therefore, the results of the normal distribution test for the sample response data will be explained as shown below:

Table 1.1: Test for the normal distribution of the data

One- Sample Kolmogorov – Smirnov Test				
statistics		**Integrated management of architectural projects**	**Design for architectural projects**	**Architectural project planning**
Normal Parameters	**Mean**	**2.365**	**2.432**	**2.664**
	Std.Deviation	**0.386**	**0.364**	**0.542**
Kolmogorov – Smirnov		**1.204**	**1.112**	**2.072**
Sig (2-tailed)		**0.110**	**0.168**	**0.210**

Source: Prepared by the researcher based on the outputs of the program (spss.v24)

The table (1.1) displays the (Kolmogorow-Smirnow) test for the sample response according to (Sig) values, all of which were greater than the level of significance of (0.05), so the data distribution is normal for the sample response data, and this indicates the necessity of using parametric tests.

1.6.2. To test the adequacy of the research sample size

This paragraph is concerned with conducting a (Kaiser-Meyer-Olkin (KMO) & Bartlett's Test) to test the adequacy of the research sample and measure the

correlations between the paragraphs after a requirement for exploratory factor analysis, and explain if the value of (KMO) is greater (0.50).

And the value of (Bartlett's Test of Sphericity) in terms of (Chi-Square) and with significance less than (0.05) to determine the possibility of using the exploratory factor analysis test, and the following are the tests in the table (1.2**):**

Table 1.2: To test the adequacy of the research sample size

Kaiser- Meyer- Measure of Sampling Adequacy	0.594
Bartlett Test Approx. Chi- Square	724.990
df	210
Sig.	.000

Source: Prepared by the researcher based on the outputs of the program (spss.v24).

We note from the table (1.2) that the value of the (KMO) test, which is (0.594), which is greater than (0.50), indicates that the sample size that was selected from the projects is sufficient for analysis, and that the value of (Bartlett's Test) amounted to (724.990) with a significant level (Sig). It reached (0.000) less than (0.05), and this means that there are correlations between the paragraphs of the questionnaire for the sample data, so an exploratory factor analysis can be conducted to determine the structural validity.

1.6.3 The structural validity test of the questionnaire

This paragraph is devoted to the constructive validity test to determine the suitability of the research scale for its variables (integrated management of architectural projects), (design for architectural projects) and (planning for architectural projects), and that each of them focuses on determining the consistency of the components of the scale for one variable and the consistency of relationships among them.

And that the structural validity test was tested by conducting an exploratory factor analysis in the manner of the basic components of the questions of the resolution, and in order to achieve the structural validity of the questions of the resolution, the initial values of the exploratory factor analysis must be equal to (1) to accept the paragraphs and not to delete any question. As for the values of factor saturation (Extraction) For all paragraphs of the questionnaire questions, it must be greater than (0.40), and as in the tables (1.3) shown below:

Table 1.3: Exploratory factor analysis both initial values and factor saturation values (extraction)

Initial	Extraction	Item	Variables
1.000	0.719	Q1	Integrated management of architectural projects
1.000	0.751	Q2	
1.000	0.801	Q3	
1.000	0.784	Q4	
1.000	0.736	Q5	
1.000	0.878	Q6	
1.000	0.698	Q7	
1.000	0.817	Q8	
1.000	0.812	Q9	DDesign for architectural projects
1.000	0.823	Q10	
1.000	0.782	Q11	
1.000	0.821	Q12	
1.000	0.736	Q13	
1.000	0.716	Q14	
1.000	0.675	Q15	
1.000	0.842	Q16	
1.000	0.778	Q17	Architectural,project plannin
1.000	0.856	Q18	
1.000	0.773	Q19	
1.000	0.883	Q20	
1.000	0.571	Q21	

Source: Prepared by the researcher based on the outputs of (SPSS.V24).

It is clear from the table (1.3) related to the exploratory factor analysis test for the paragraphs related to (integrated management of architectural projects), (design for architectural projects) and (planning for architectural projects) for all initial values (Initial) equal to (1) and this indicates the acceptance of all paragraphs and the absence of any deletion A question including the values of factor saturation (Extraction) for all paragraphs of the resolution is greater than (0.40),

As the value of (Extraction) for each question is explained by the proportion of each question of the subject assigned to measure it.

This is a result that shows that the data are saturated and have exploratory factor validity, for the response of the sample related to the application of the electronic platform, and this indicates the structural validity of the scale (resolution).

1.6.4. The reliability test of the research variables

This paragraph is devoted to testing the stability of the scale and it is tested through Cronbach's Alpha coefficient to measure the level of internal consistency of the variables and dimensions of the scale to ensure the stability of the scale (Reliability), that is, the possibility of obtaining similar or close results when the scale is repeated in the same research community. Greater than (0.60), knowing that its values range from (0-1), and the test of validity (vadility) is taken as the square root of the stability, and if a condition higher than (0.60) is met, then it can be said that the scale is stable and honest, and the results extracted from the sample can be generalized researched.

Table 1.4: Reliability and (vadility) test for the response of the sample

Vadility and Reliability test statistics				
	N of Items	reliability	vadility	Rating level
		Cronbach's Alpha		
Integrated management of architectural projects	8	0.832	0.907	High
Design for architectural projects	8	0.986	0.927	High
Architectural project planning	5	0.871	0.933	High
Totel	21	0.885	0.940	High

Source: Prepared by the researcher based on the outputs of (SPSS.V24).

It is clear from the table (5) and figure (2) that the scale (reliability), and (vadility) related to (integrated management of architectural projects), (design for architectural projects), (planning for architectural projects) and the total of the questionnaire questions, and they were higher than the minimum limit (0.06), and the highest value (Cronbach's Alpha) test for the design items for architectural projects, which is (0.986), and the highest value (vadility) for the planning items for architectural projects, which is (0.933).

As for the total resolution, Cronbach's Alpha has reached (0.885), and (vadility) has reached (0.940), and these results indicate the reliability and validity of the resolution at the total level and at the level (integrated management of architectural projects) and (design for architectural projects). and (architectural project planning).

2. CONSTRUCTION PROJECT MANAGEMENT

2.1 Introduction

Construction management is a mathematical science and engineering art, through which construction facilities can be managed if they are skyscrapers, dams, bridges, and others. Usually, construction management is considered complex and requires extensive experience in the field of construction and urban development, so the engineer must research a wide range of changes that occur on the project, and I tried to know, estimate, and the impact of each variable on the construction project, so the project's estimated cost reports are exported traditionally and independently of experts, and progress reports are also prepared in the implementation of the project by the staff and technicians traditionally, This traditional method has succeeded well during the previous century because the projects were small and less expensive, so this method is now outdated as the projects have become very large and more complex and need a high speed of implementation, nowadays, upon receipt of the project, integrated reports must be produced It includes the cost, time and stages of completion of the work and site management All at once.

The discipline of project management is concerned with the organization and management of resources such as human resources in order to complete a project while maintaining its defined content with considerations of quality, scheduling, and cost.

2.2. Definition of a Project

The project in this case is a time-bound process or action having a start and end date that is completed once for the purpose of providing a product or service with the intention of bringing about a positive change or adding value (Hopp, 1996).

Administrative or operational operations that take place on a regular or semi-regular basis in order to provide the same product or service over and over differ from a project, which is a one-time temporary activity. In terms of technical capabilities and

business philosophy, project management does not always have the same requirements as ongoing administrative and operational procedures and thus necessitates the development of project management skills.

Any set of actions or tasks with definite goals that must be completed within specific specifications, have a specific beginning and end finance, and use various sources of money, time, and equipment, and their people" (Howell, 1993) defined the project.

Ballard and Howell (1998) credited the definition of a project to Leach and Turner (1990), who defined it as "a new industrial investment unit with some special or unique qualities through time and cost harmony".

A project, according to Wikipedia, is a one-of-a-kind process that entails a series of coordinated and regulated activities carried out between start and finish dates in order to achieve a goal that meets the defined objectives, such as cost, time, and resource constraints.

According to the project, bringing a group of defined deliverables up to quality standards and requirements is a time and cost-constrained process (Assaf and Al-Hejji, 2006).

2.3 Project Management Definition

Strategic planning, according to the (PMI, 2013), is the submission of facts, assistances, in addition strategies to properly and efficiently implement projects. It's a planned ability for businesses, letting them to link development consequences to business points.

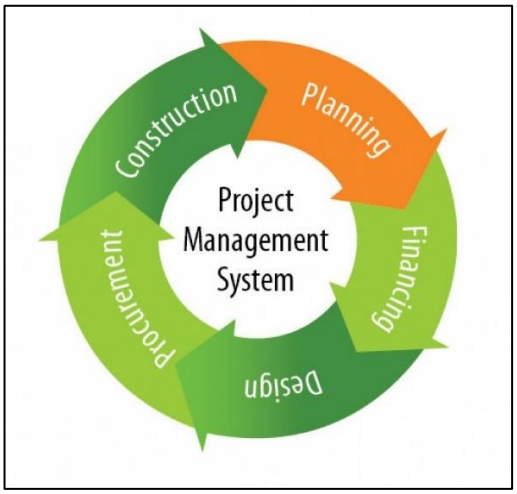


Figure 2.1: Project management system

2.3.1 This necessitates a grasp of stakeholders' requirements

- Organizing and motivating the team; determining what remains to be improved, when, from whom, and with what standards.
- Coordinating the efforts of several individuals.
- Keeping track of the work that is being done.
- Dealing with any plan modifications.
- Communicating accomplishments.

2.3.2 Other typical example definitions include

The design and implementation processes required to complete the project in record time, according to the specified cost, and a good completion of the project that meets the customer's desire.

Organizing, planning and controlling the project is required to achieve completion in a good time and according to the agreed period, as well as according to the general cost of the agreed project

The use of matching materials as agreed and of high quality and carried out by skilled craftsmen

The planning and control processes and skills required to complete a project using matching resources and optimizing time, cost, quality and safety limits at an acceptable level of risk.

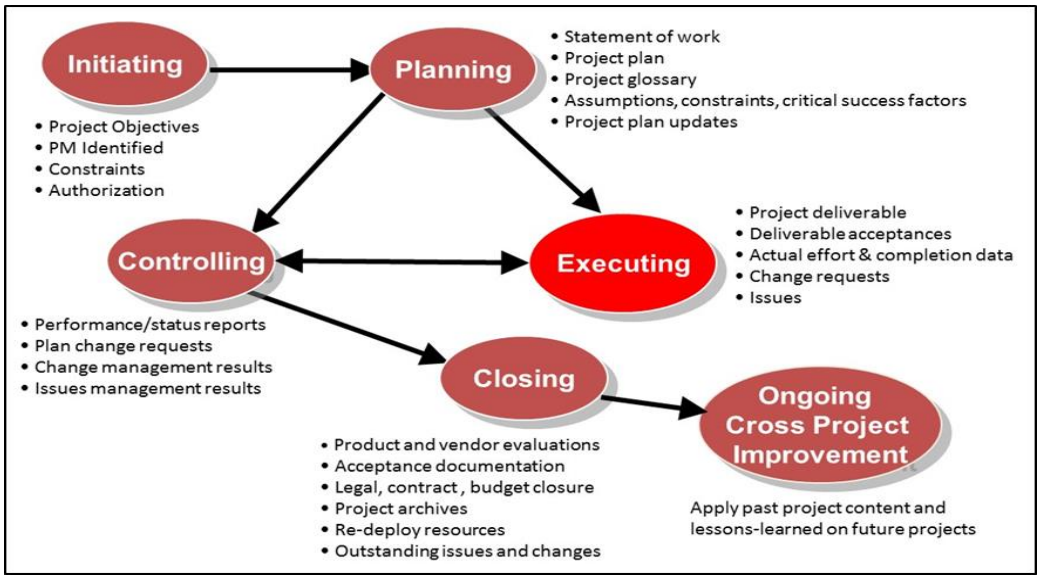


Figure 2.2: Project management process

2.3.3 Project Management Processes

- Determine the policies, methods, as well as documentation that will be utilized to plan the schedule Fig (2.3).
- Identify the tasks that the plan team members and stakeholders will need to complete in order to complete the deliverables Sequencing activities: identifying and documenting the relationships between project activities.
- Establishing as well adescribing the relationships between both the project's various activities.
- Calculate the amount of time and resources required to complete the project
- Calculate the number of worker hours required to perform each activity to estimate periods of disruption.
- Creating a project schedule by assessing activity sequences, resource estimates, in addition duration.
- Managing modifications to the development timeline to keep the schedule under control.

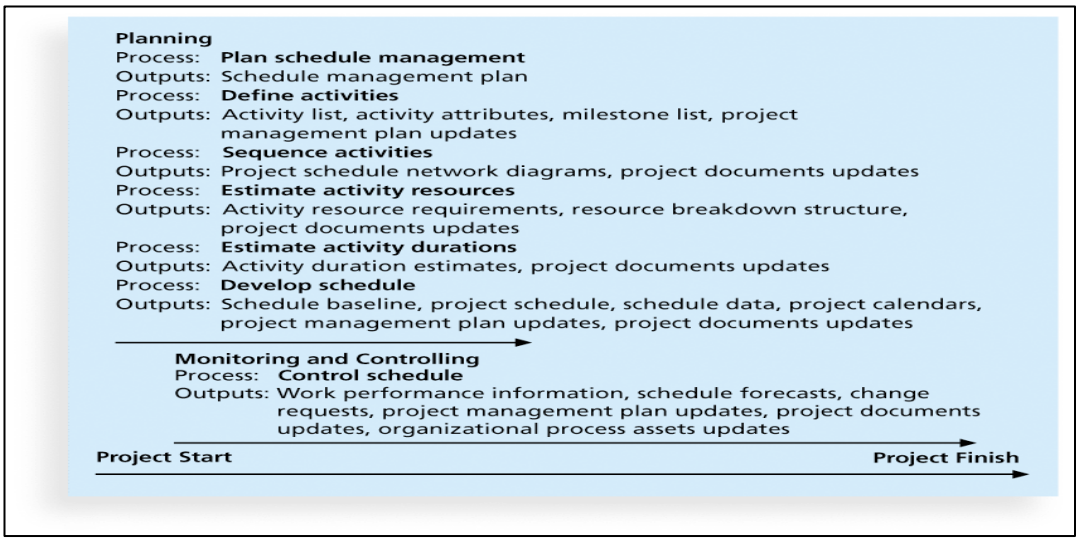


Figure 2.3: Project management summary

2.3.4 Planning schedule management

The following items are included in a schedule management plan:

- Plan schedule modeling creation
- Scheduling technique
- Level of precision as well as units of measure
- checking threshold

- Performance assessment rules
- Responsibilities formats
- Descriptions of the processes

An assignment or task is a unit of work with a defined length, cost, as well as required resources that is typically seen on a breakdown structure (WBS).

Knowing the activity includes developing a (WBC) so that we can understand the project management mechanism and what work needs to be done and also so that we can estimate the time and total cost of the project.

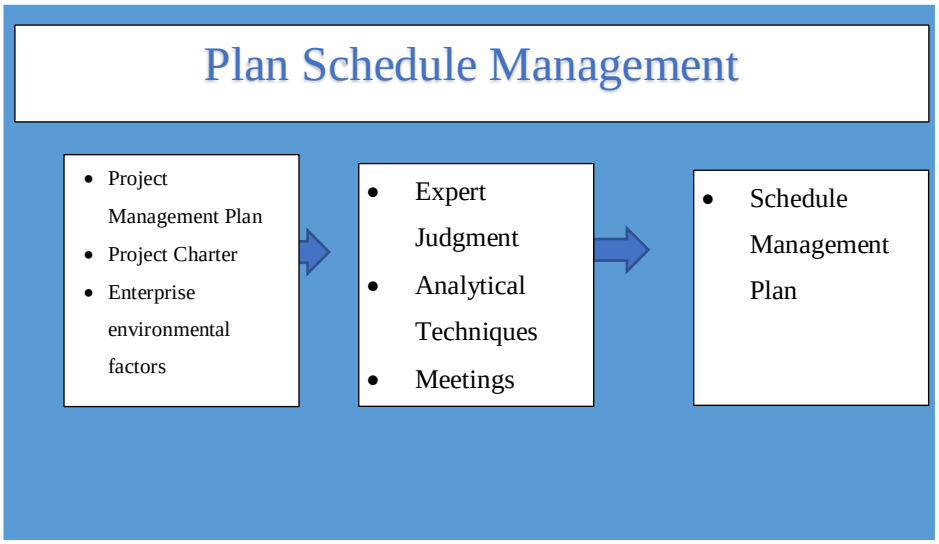


Figure 2.4: Plan schedule management

2.3.5 Activity lists and attributes

The list of activities is a detailed schedule of the activities that will be placed in the project schedule, which includes:

- Name activity.
- Knowing the activity or number.
- Briefly describe the activity

The activity provides more information such as logical relationships, past elements, resource requirements, leads, constraints, delays, imposed dates, and things related to the activity.

Milestones:

- A teacher is an important event that usually does not have a fixed duration.

- Often times it takes a lot of activities and a lot of work to complete a major milestone.
- It is useful in knowing the goals of the schedule and also monitoring the progress.
- An example of this is the completion of certain products or the customer's approval on the main documents.

Unfortunately, one reason for the loss of Trilogy's enormously expensive piece of vaporware, which would have been nearly four years in the (un)making, would have been the FBI's inability to use time constructively. The Accounting Agency reported in May 2006 that the Trilogy plan failed to meet its primary goal of strengthening the FBI's investigative capabilities and that this was beset by missed deadlines and rising expenditures.

Sentinel encountered two breakdowns during a test exercise in 2011s, prompting the FBI to conclude that the software and hardware structure constituted insufficiently. The system was still not working well in 2014s.

Activities Sequencing:

- It includes reviewing activities and setting goals.
- Relationship or dependency represents the sequence of activities or tasks in the project.
- Dependencies must be defined in order to be used in the process of determining the critical path and its goals.

2.3.6 There are 3 types of dependencies

- Compulsory dependencies: this dependency is according to the nature of the work that is being worked on in the project and is sometimes called solid logic.
- Speculative dependencies: These are defined by the project team and are sometimes called soft logic, and caution should be exercised when using them because they may reduce upcoming scheduling options.
- External Dependencies: includes the relationships between activities that occur in the project and outside the project.

Diagrams of Networks:

- Network diagrams are the best way to show activity sequences.
- A networking diagram is a graphical representation of the logical linkages between project tasks or the order in which they should be completed.
- The arrow diagram, as well as precedence diagramming, are the two basic typeface methods employed.

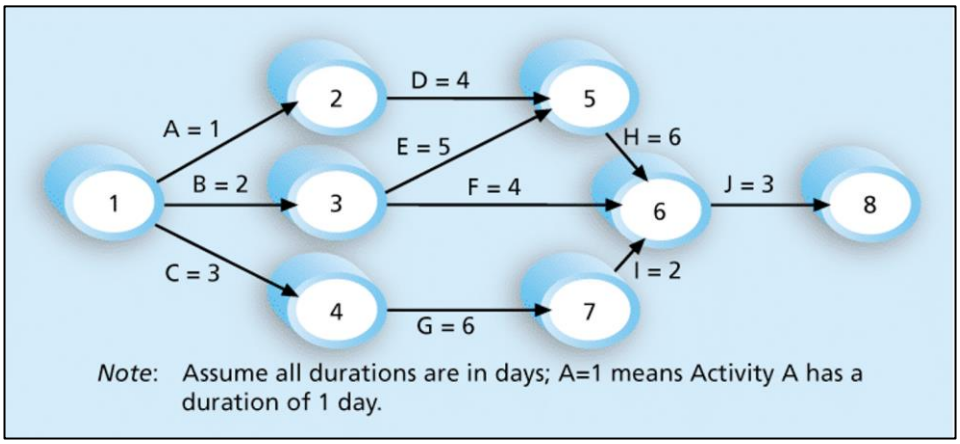


Figure 2.5: Network diagram for project X

ADM: {Arrow Diagramming Method}

- Also called activity-on-arrow (AOA) network diagrams.
- Arrows indicate activities.
- The start and finish points of activity are determined by nodes as well as circles.
- Only show as a start-to-finish outpost.

2.3.7 Creating AOA diagrams: A Step-by-step guide

- First, examine all of the activities that begin at node 1, then identify their completion nodes then draw arrows between node 1 or those that are completed, then label the relevant arrow with the activity description as well as estimated duration.
- When you continue to draw the site network diagram, all activities will be included in the diagram, which has dependencies.
- Keep drawing the chart from left to right till all the actions are shown on the diagram with dependencies. Bursts happen when two or more activities

follow a single node. Whenever two or even more nodes come before a single node, it's called a merging.

- There is a general rule, arrowheads should all point to the right, in the AoA grid diagram.

(PDM)Method of Precedence Diagramming : It's also referred to as Activity-On-Node (AON) because every activity is a node, as well as the nodes or activities, are interconnected by arrows, as seen in Figure. (2.6).

- Activity is shown as squared boxes.
- Arrows refer to the relationships between each other.
- In the project management system, the PDM technique is more prevalent than the ADM method, and it is superior since it represents different sorts of dependencies.

Task dependencies

The nature of the relationship between two linked tasks. You link tasks by defining a dependency between their finish and start dates. For example, the "Contact caterers" task must finish before the start of the "Determine menus" task. There are four kinds of task dependencies in Microsoft Project.

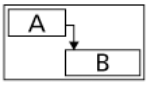
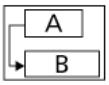
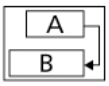
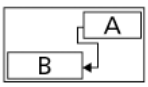
Task dependency	Example	Description
Finish-to-start (FS)		Task (B) cannot start until task (A) finishes.
Start-to-start (SS)		Task (B) cannot start until task (A) starts.
Finish-to-finish (FF)		Task (B) cannot finish until task (A) finishes.
Start-to-finish (SF)		Task (B) cannot finish until task (A) starts.

Figure 2.6: Task dependency types

Next activity: logically refers to the activity that comes after another activity

Previous activity: logically refers to the activity that comes before another activity

Estimating Activity Resources:

- Before estimating the supply of the activity, we must know about the quantity and type of resources that will be allocated to each activity, and what is meant by the resources are equipment, cadres, people, and others.
- Pay attention to the assessment of the required resources.

- Knowing the difficulties when carrying out specific activities in the project.
- What is the date when similar activities should be done.
- The required resources must be detailed in a hierarchical way, by which the resources are determined by type and category.

2.3.8 Activity resource estimation

- We should have a decent knowledge of the types in addition quantities of resources that will be allocated to each commotion before predicting commotion durations ...etc. (people, equipment, in addition materials)
- Critical matters are taken into account while ranking resources
- The number of working hours required to complete the project
- Usually the effort expended is not equal to the time spent during the work
- The persons making the assessments should be assisted and carried out under the supervision of specialized experts.
- An estimate can be created that includes three points, and this method is better than activity estimates as a separate number
- Two estimates should be made: an optimistic one for about three weeks, and a pessimistic one for about four weeks
- There is a need to use this method, which includes three points (PERT, MONTE, CARLO).

2.3.9. Creating the timetable

- The ultimate goal is to advance a truthful scheme agenda that offers a basis for monitoring the progress of a development for the time dimension of the plan.
- Uses outcomes of previous time managing plan to identify the project's start and finish dates.
- Gantt charts, critical route analytics, critical path method scheduling, as well as PERT analysis are all useful tools as well as methodologies.

2.3.10. Gantt charts

- Gantt charts are a common format for presenting project timetables in a calendar style, detailing project work and their associated beginning and conclusion dates.
- A black diamond represents a turning point in one's life.
- Instantaneous responsibilities are shown via thick-black bars.
- Duty periods are shown by lighter horizontal bars.
- Arrows denote duty dependances.

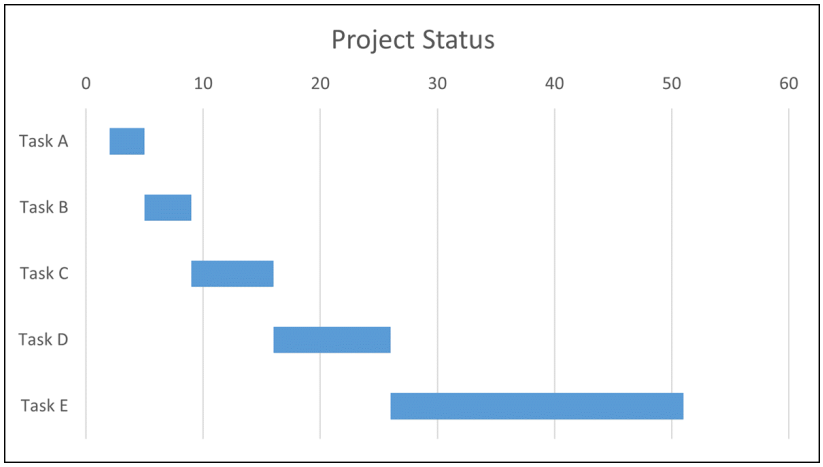


Figure 2.7: Gantt chart for project X

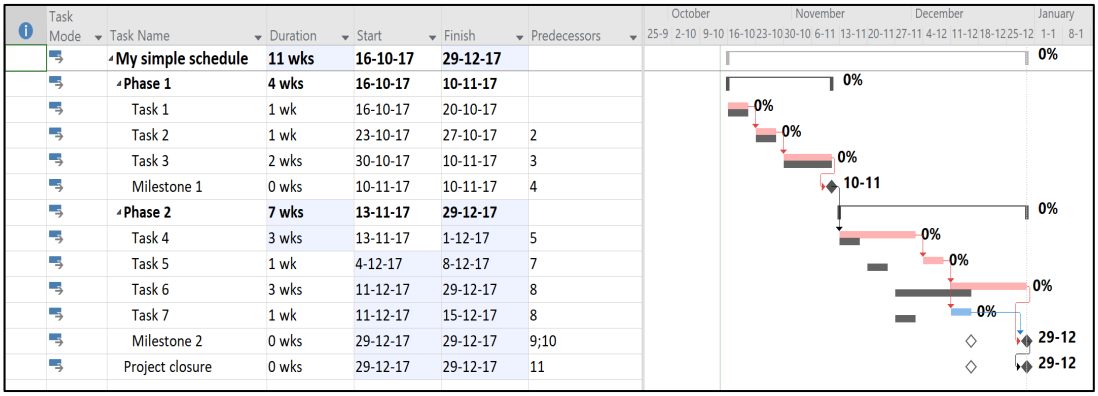
2.3.11. Adding Milestones to Gantt Charts

- Milestones on projects highlight significant events or accomplishments.
- Usually, milestones are created by inserting tasks without any duration.
- Milestones should include the following:
- Selective
- Observable
- Creating a connection
- Accurate
- Day when
- Typically done by entering tasks that have zero duration, or that can be flagged as a major event for any task.

2.3.12. Milestones should be

1. It can be specified or it can be specified
2. can be measured
3. can be customized
4. It must be realistic
5. It must be within a specific time frame

- (**Anchor)** recommends that you not be distracted by external influences such as the phone, e-mail or a website, so it should remain closed throughout the work period and only be used in emergency situations
- Save time through sincerity, speed and dedication to get the work done.



Task Mode	Task Name	Duration	Start	Finish	Predecessors
	My simple schedule	**11 wks**	**16-10-17**	**29-12-17**	
	Phase 1	**4 wks**	**16-10-17**	**10-11-17**	
	Task 1	1 wk	16-10-17	20-10-17	
	Task 2	1 wk	23-10-17	27-10-17	2
	Task 3	2 wks	30-10-17	10-11-17	3
	Milestone 1	0 wks	10-11-17	10-11-17	4
	Phase 2	**7 wks**	**13-11-17**	**29-12-17**	
	Task 4	3 wks	13-11-17	1-12-17	5
	Task 5	1 wk	4-12-17	8-12-17	7
	Task 6	3 wks	11-12-17	29-12-17	8
	Task 7	1 wk	11-12-17	15-12-17	8
	Milestone 2	0 wks	29-12-17	29-12-17	9;10
	Project closure	0 wks	29-12-17	29-12-17	11

Figure 2.8: Sample tracking Gantt chart

2.3.14. Critical path method (CPM)

- It is a technique used for plumbing planning and is also used to calculate the total duration of the project.
- The scheme's critical pathway is the categorization of goings-on that defines when the development may be finished.
- The critical chain is the extended in addition also consumes the lowest expanse of slack as well as, float on the development network.
- Slack, float refers to the length of period a commotion can be postponed without causing a subsequent action or the development's completion deadline to be postponed.
- Create a solid network diagram first.

- Estimate the period of all goings-on along respectively path in the network illustration.
- Whenever single or additional crucial route responsibilities take longer than expected, the full development timetable will be hard-pressed back.

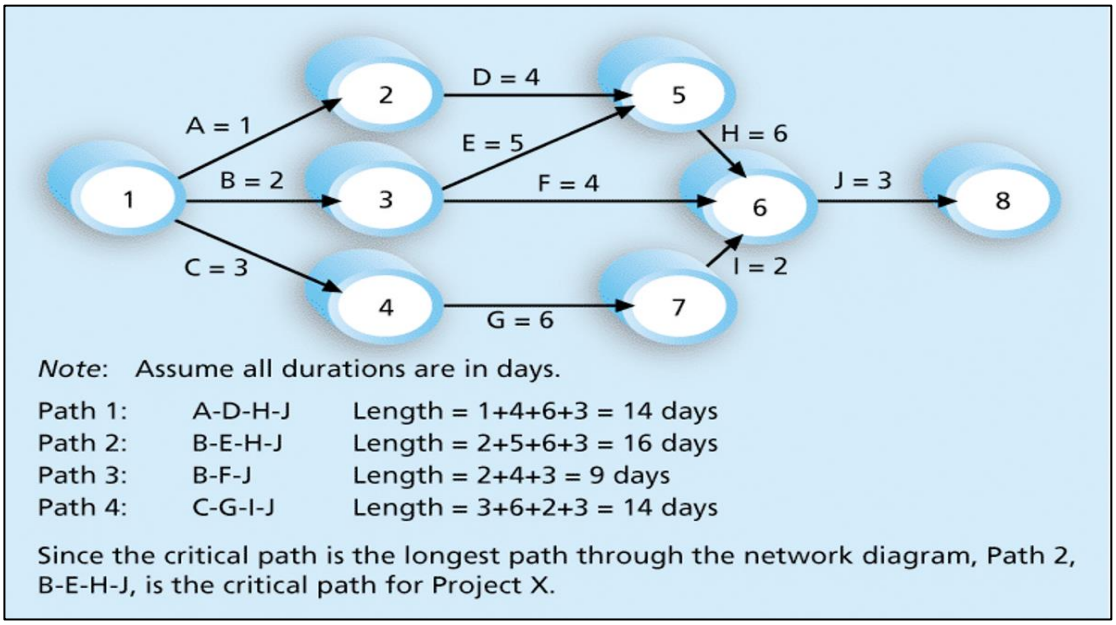


Figure 2.9: Determining the critical path for project X

- A critical chain does not include all critical actions; it just takes into consideration time.
- If the lengths of two or even more critical path methods are the same, there could be more than one planning phase.
- As the project evolves, the critical path may alter.
- Permitted slack, correspondingly known as allowed float, is the length of period a motion can be postponed without delaying the commencement of any subsequent goings-on.
- Full slack, likewise known as over-all float, is the period of period a commotion can be postponed from its original start date shorn of affecting the development's completion date.
- The initial start, as well as finish times, are strongminded through the advancing pass crossways the development network.

- The far along starting, as well as finish times, are determined through the retrograde pass.

The following fig (2.10) is a commonly used representations of a node:

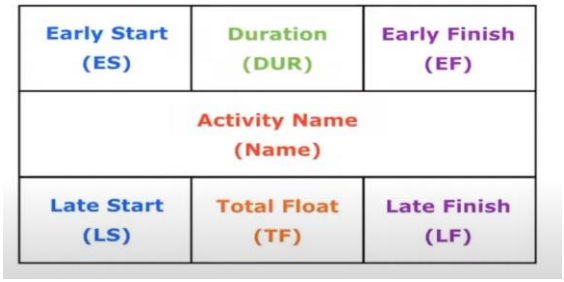


Figure 2.10: Activity attribute

- EF=ES+DUR-1.
- $ES=EF_{PRE}+1$ (If the activity has two Early finish (EF) we pick the choice with the highest value).
- The late finish (LF) will be equal to the early finish (EF).
- LF=LS+DUR-1 That's mean: LS=LF-DUR+1.
- $LF=LS_{SUC}-1$(If the activity has two Late finish (LF) we pick the choice with the Lowest value).
- TF=LS-ES.
- Zero Float means there is no flexibility in schedule, so the path with TF=0 is the Critical Path, in our example the TF in path ABCG is 0 that's mean that ABCG is the Critical Path which is mean that any delays in starting any of the tasks on this path early may cause the project's closing date to be pushed back. To put it another way, this path indicates the quickest way to accomplish the job. This means we'll have 16 days to finish the project. There are three distinct paths between the start and finish places.
- The period of motion can be postponed as of its earlier start (ES) times short of delaying its successors is referred to as free float (FF).
- FF=ESSUC-EF-1, or we can use alternative formula: FF=ESSUC-ES-DUR.
- Timelines can be shortened with three techniques.
- Activities can be shortened by adding resources or altering their scope.

- Activities can be destroyed by compressing the schedule and at a lower additional cost.
- Active tracking activities by performing them overlapping or parallel.
- Project schedule information must be updated to ensure that project timelines are met.
- The path may change when entering the start or end date
- If you know that the project delivery date and completion will be delayed, you should negotiate with the project owner, Reason: There may be financial consequences for the delay in delivering the project, and they must be paid.

2.3.15. Scheduling critical chains

- Critical path method scheduling is a type of managing projects that takes into account limited resources as well as incorporates buffers to ensure the development's completion date is met.
- The theory of constraints (POC) can be used, and this theory is a management philosophy developed by Eliyahu M. Goldratt and presented it in writing.
- There are attempts to reduce multitasking when the resource is working on more than one task at the same time

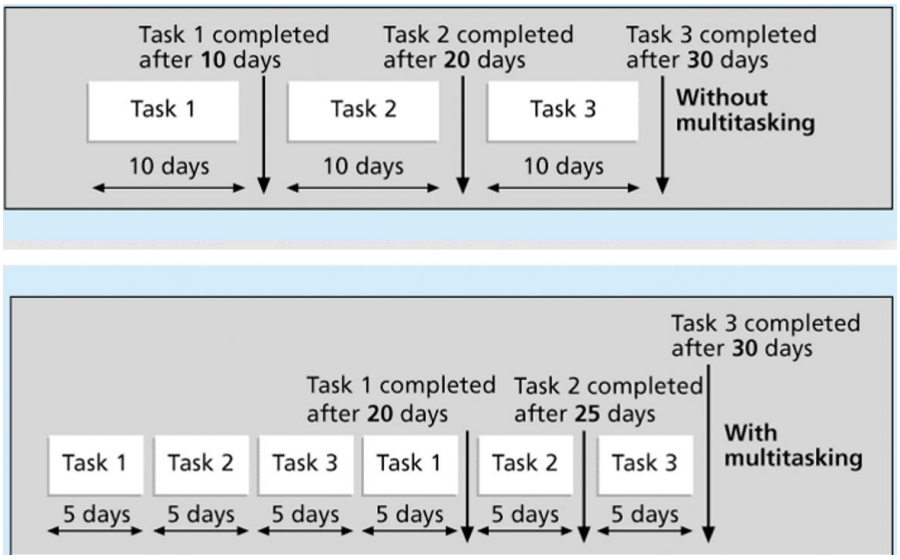


Figure 2.11: Multitasking Example

2.3.16. Critical chain besides buffers

- The buffer is extra period to finish a duty.
- According to (Murphy's Law), if it does indeed go incorrect, that it's what determination.
- According to (Parkinson's Law), labor expands to occupy the period available.
- Within conventional predictions, individuals frequently increase a buffer toward each work as well then usage it whether or not it is required.
- Instead of removing buffers from individual jobs, critical path method scheduling increases them.
- A development buffer or extra added to the program before it is due.
- Supplying buffers or adding extra time before project plan tasks.

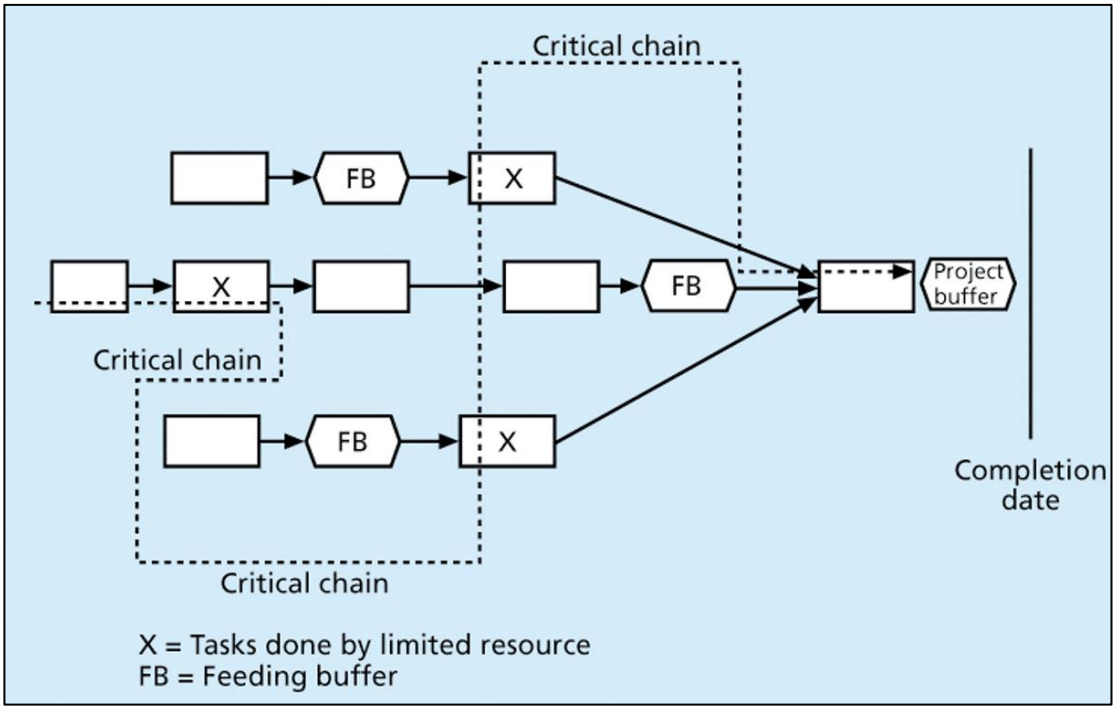


Figure 2.12: Example of critical chain scheduling

2.3.17. The pert (Program evaluation & review technique)

- PERT is the networking analytical method which is used to predict duration of the project when the individual developmental duration estimations are unknown.

- Probabilistic time estimates are used in PERT.
- Estimations of completion time based on optimistic, probably common time, as well as pessimistic estimates, or a multiple estimate.

$$PERT\ weighted\ average = \frac{Optimistic\ time + 4 * Most\ likely\ time + Pessimitic\ time}{6}$$

2.3.18. Managing the timetable

- The objectives are to understand the current condition of the schedule, to impact elements that cause scheduling problems, to identify whether or not the timetable must have changed, as well as to handle changes that may occur.
- Tools and technologies involve:
- Reports on progress
- A system for controlling schedule changes.
- Development software solution, which includes timetable comparisons charts such as the Gantt chart for tracking.
- Trend analysis, including such float as well as slack interpretation.
- Management of performance.

2.4 Project S Curve for Cumulative Costs

In managing projects, an (S-curve) is a geometrical display that depicts a development's accumulated information. For example, the cost as well as length of work hours (man-hours) consumed, or even the % (percentage) of period performed. A S-curve is a graphic that displays all of your project's pertinent appreciable quantities.

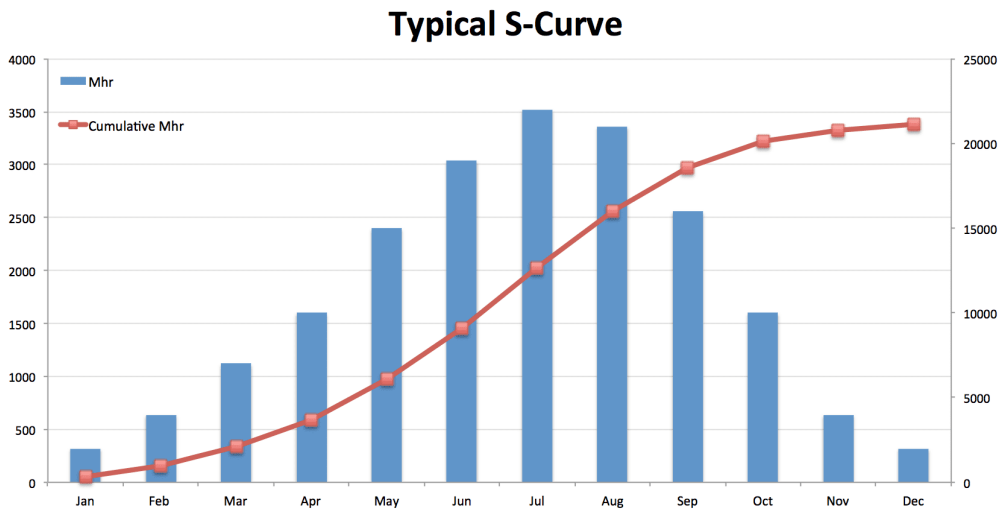


Figure 2.13: Typical S-Curve

Costs, individual, as well as other kinds of analysis can be used. The S-curve is a powerful communication tool that aids program administrators in informing project stakeholders about progress of the project. A construction project proceeds in a rather definite order.

Example:

The following table is a project which has five activities ABCDE each of the activity duration in days and cost per days:

Activity	Predecessor	Duration (days)	Cost / Day
A	-	2	300
B	A	3	400
C	B	3	400
D	B	2	200
E	D	3	100

Figure 2.14: Project activities

Tracking Gantt Chart is shown as below:

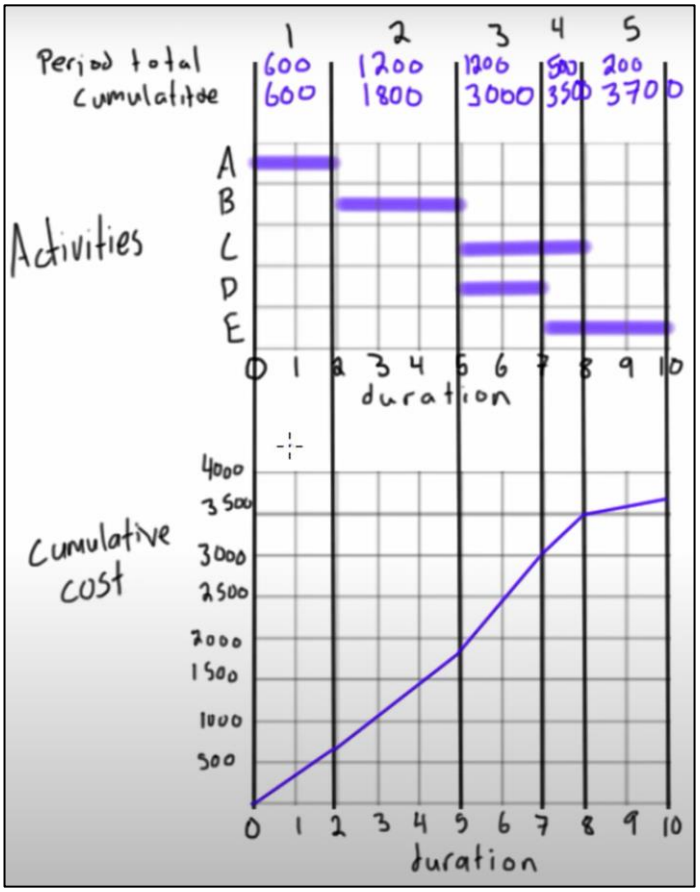


Figure 2.15: Cumulative cost

The cumulative cost curve is derived from the Tracking Gantt Chart, by drawing a vertical lines at the beginning and ending of each activity from the Gantt chart, then we define the nodes in the cumulative cost on the vertical lines based on the cost per day, for example first activity A duration is 2 days and cost is 300 per day so for A we start from 0 to 600$.

Example.1:

Let's work on a project that involves seven activities as described below:

The project starts with activity A(2days). Activity B(3days) and activity D(1 day) can start only after activity A is finished. Activity D is followed by activity E(1 day). Activity F(4 Days)succeeds Activity E. Activity C(8days) cannot start till Activity B and E are completed. Activity G(3 days) starts after the completion of Activity C and F. Completion of Activity G marks the completion of project. We can simplified the project as defined in the table below:

Table 2.1: Project activities

Activity	Predecessor	Duration
A	-	2 days
B	A	3 days
C	B, E	8 days
D	A	1 day
E	D	1 day
F	E	4 days
G	C, F	3 days

Table 2.2: Gantt chart

G						**G**						
F					**F**							
E				**E**								
D			**D**									
C						**C**						
B			**B**									
A	**A**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**

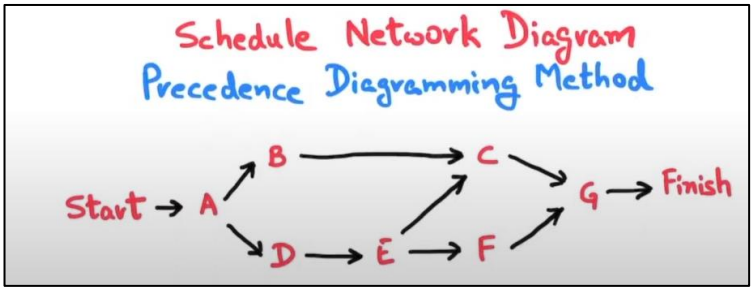


Figure 2.16: PDM diagram

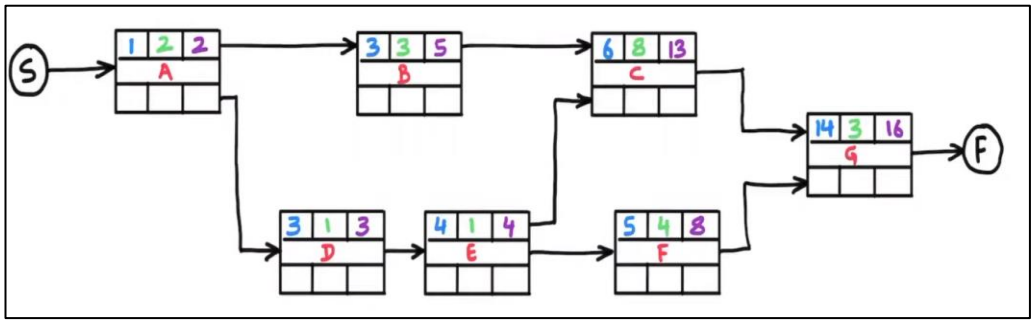


Figure 2.17: PDM Diagram

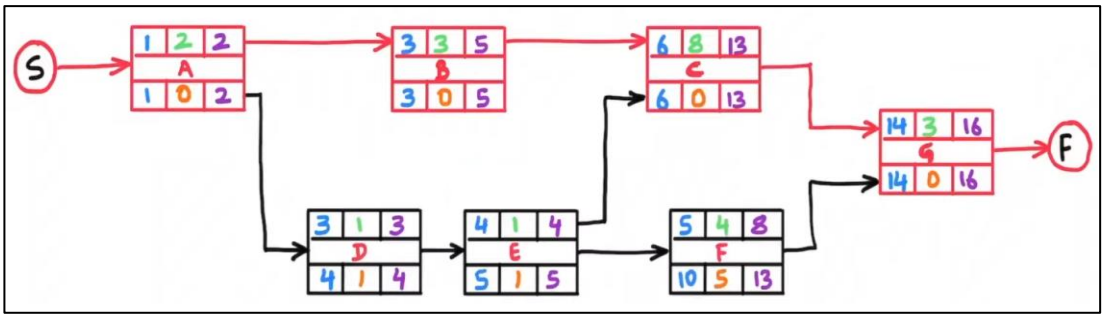


Figure 2.18: Critical path diagram (CP)

Table 2.3: Difference between the duration of critical path and the other paths

Path	**DUR**	**DUR_{CP}-DUR**
ABCG (Critical Path)	2+3+8+3=16	16-16=0
ADECG	2+1+1+8+3=15	16-15=1
ADEFG	2+1+1+4+3=11	16-11=5

Example.2:

Let's work on a project that involves nine activities as shown in the table(6) below:

Table 2.4: Date table

Activity	**Predecessor**	**Duration (Days)**
A	-	2
B	A	3
C	A	2
D	B	3
E	C	4
F	D	2
G	B	1
H	D	3
I	C	2

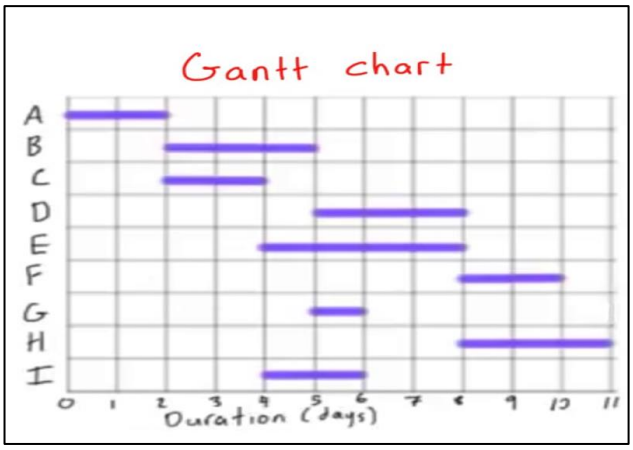


Figure 2.19: Gantt Chart

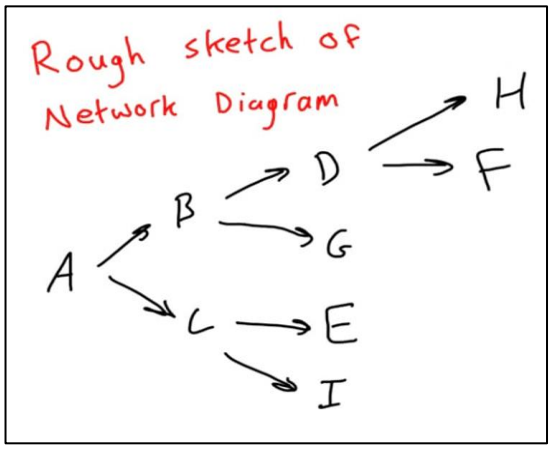


Figure 2.20: Gantt Chart & Rough Sketch of Network Diagram

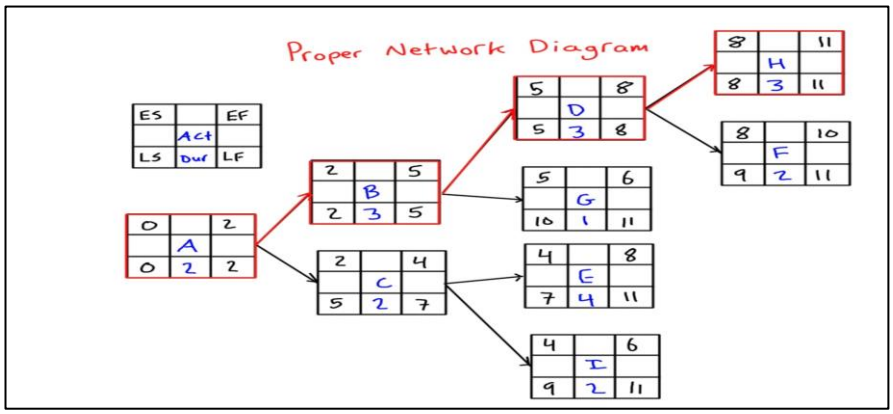


Figure 2.21: PDM Diagram

2.5 Challenges and Difficulties

The first challenge of project management is to ensure that the project is completed within specified constraints; the second, more ambitious challenge is to achieve the

best possible situation or optimization in terms of allocating the necessary inputs in order to meet the previously established goals.

Here are some of the common challenges construction project managers can expect to face in a typical construction project:

2.5.1 The goals are not well thought out

This means that the majority of project managers may suffer from not studying the well-defined goals of the projects they manage, When the goals and objectives are not well studied and defined, problems will occur in the project and the project managers and project owners will not be in complete agreement regarding the project, such as going on a trip without specifying your destination, in the end you will discover that you have wasted time and fuel, and you end up with It is a matter of loss. The goal of project management is to finish the project in the correct manner and according to what was agreed upon. However, there are projects that have unclear and non-standard goals, and the project manager must clarify them through the employer, whether these goals are related to the time factor that was agreed upon and with the final handover of the project, These objectives will be the basis for decision-making and commitment to the tasks assigned to the project manager throughout the work period. To prevent problems in the project, project managers must frequently ask questions to the employer or contractor and ensure the goals that have been agreed upon from the beginning.

2.5.2. Project budget

That the budget set for the project is exceeded. This is a natural thing while working on construction projects. The project manager must set correct and reasonable expectations so as not to increase the cost, and work on modifications to the project in order to reduce the cost, and these modifications should not be harmful. the project in terms of the materials used or others, Situations can occur in which a miscalculation of the correct judgment and insufficient experience of the project manager can lead to the collapse of the project. In the end, the total project budget must be determined through the employers, their expectations, and the requirements of the project. Therefore, the first step in managing the project cost is to correctly identify the outputs and objectives of the project. Project managers must set an emergency budget for any addition, change, or change from the employer. While

working on the project, the project manager should expect that errors or things outside his control will occur, such as the environmental factor, shortages of labor or materials, currency exchange, or other things that were not expected. The cost of work must be properly and continuously reviewed to ensure that work continues on the right track.

Figure 2.22: Top five challenges for construction project managers

2.5.3 Tim management

Lack of time is one of the most common problems facing employers, which leads to many accidents and lost revenue. Scheduling conflicts and lack of punctuality can lead to contractors inadvertently severing relationships in order to get back on track. This can lead to further delays and higher costs as they try to find or fix defects or risk contractual penalties. One of the problems and difficulties that project managers sometimes face is the difficulty of ensuring consistent communication with the Finance and Sales Department due to scheduling. Therefore, construction project managers need to focus on addressing the various emergency variables that cause delays in completing the project. Time management includes tracking subcontractors and suppliers to determine paperwork, labor, and lead times. Sudden weather variables, weather conditions and other unexpected conditions must be taken into account. All these time related issues can be managed and addressed by project scheduling and tracking.

2.5.4 Unrealistic requirements

Wrong and not properly studied dates and unreasonable things requested by project owners are among the most factors that affect the project correctly, as they kill the productive spirit and morale in the project. Sometimes the business owner, his

advisors and the board of directors have incorrect and unrealistic expectations as they want their ideas and requirements to be implemented immediately. Such cases occur when there is competition, which leads employers to set unreasonable requirements that cannot be implemented. Here comes the role of the project manager, who must work to convince the employer of well-studied engineering evidence for the project. The project manager works to defend the work team and respond to abnormal expectations by communicating the team's comments to the project owner for verification, in this way he will be able to manage the project properly and continue to work on the right track

2.5.5. Management hazard

There are many risks and more expensive in the construction and construction operations compared to other professions. Workers and engineers face real risks that may often amount to bodily injury and even loss of life. Therefore, risk management is a top priority for project managers. Therefore, they must be proactive in identifying safety issues and that the project be completed without unwanted incidents. The best way to reduce accidents in the field is to educate and involve the cadres of workers in scientific courses related to safety. There are general examples of accidents that occur during work, such as workers falling from high heights, due to the failure to fasten the seat belt, the failure or fall of building materials, fires, electrical contact and other accidents that occur during work. Project managers must be able to encourage work to report any potential hazards or accidents at the construction site. Project managers should also have site-specific safety management plans. Not all construction projects are the same; each project has its own requirements, conditions, and time. Therefore, the project manager should design plans based on the specific needs and requirements of the project. These are some of the accidents and challenges that the project manager faces throughout the construction period, project managers must be proactive in looking for solutions to any problem that occurs before it affects the success of the project.

2.6 Technique of the Critical Path

The network-based methodology for modeling project activities and their relationships to pre- and post-project activities is a critical path technique. Project

control is defined as monitoring the schedule during project implementation and updating and modifying work methods or schedules as needed. Planning can be defined as creating a workflow structure for the periodic activities of a project. Scheduling changes according to activity variables such as time, cost and number of work cadres. Project control can be defined as schedule control. The schedule is permanently on the job, and any change in the schedule or working methods mechanism can be updated or made accordingly.

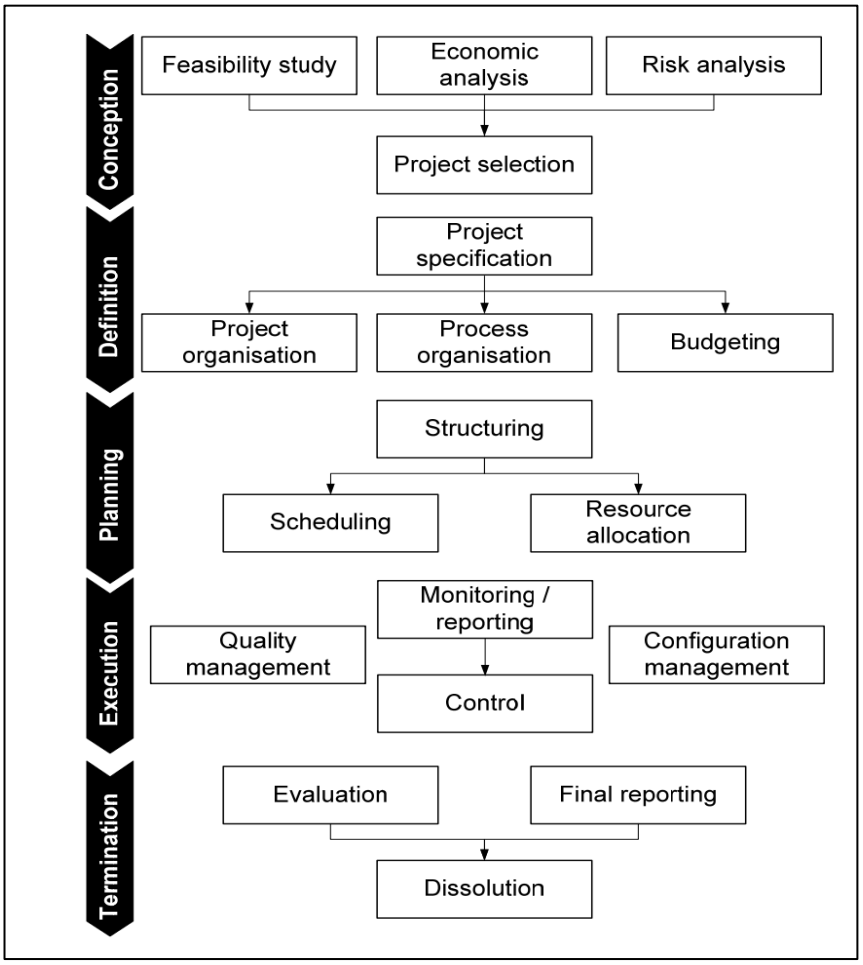


Figure 2.23: Project management life cycle

2.6.1 Planning a project

Project planning is the main topic of this article. When planning a project, you must first create a business structure, which will serve as the foundation for the project's communication model. By comparing it to standard efficiency metrics, this model can be used to evaluate the project in the future. The project's goals must be in line with the company's strategy, and key performance indicators must be established to track progress Economopoulos, 1993).

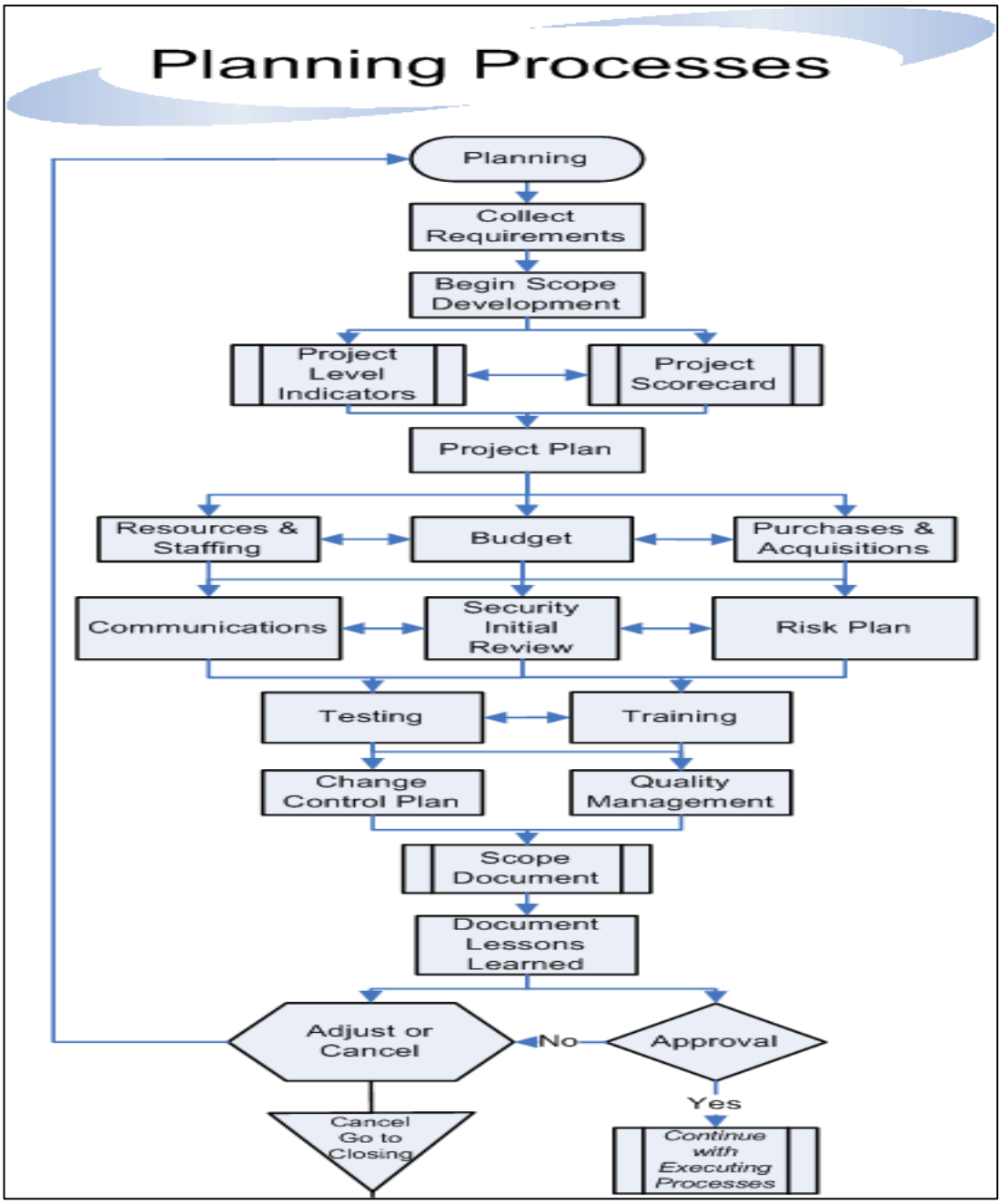


Figure 2.24: Planning processes

2.6.2. Metrics for project efficiency

Time, cost, and quality are the three measurements of a project's efficiency, and the overall goal of the project is often to complete it in the shortest time, at the lowest cost, and with the highest quality. Realistically, these objectives are incompatible, because completing a project in a shorter amount of time necessitates bigger investments and hence higher costs, as well as in the event of.

Relations between businesses:

A pair of works in the project network can have one of two relationships.

2.6.3. One work must immediately follow the other

It is assumed that the works occur simultaneously if there is no prior or subsequent relationship between them. Absolute physical and technological constraints, safety concerns, legal issues, and unforeseen circumstances such as limited resources, operating methods, or funding all play a role in the pre- and post-relationship between businesses. The project manager creates the work plan for the project based on absolute conditions, and emergency situations are added to the work plan as needed to meet the project's goal. However, in order to avoid any delays in modifying plans, the project manager must anticipate and account for emergency situations Fig (2.25).

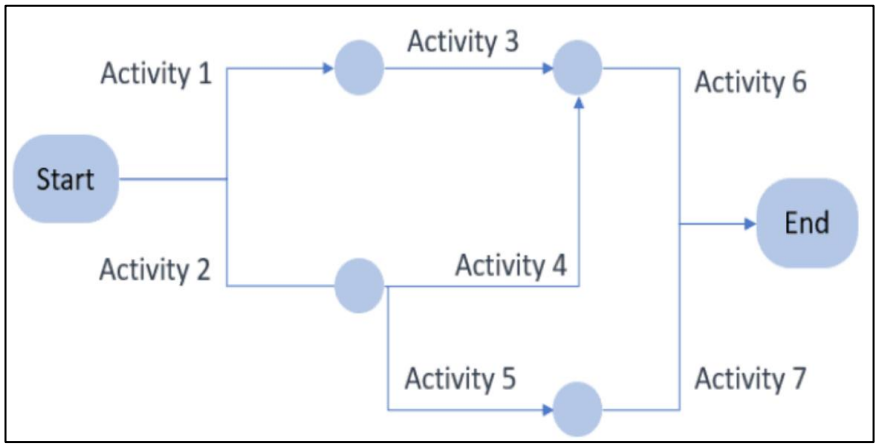


Figure 2.25: Simple project activities relationship

2.6.4. Work breakdown structure

The Work Breakdown Structure (WBS) for a project is a list of all the different activities that make up the project's plans, their durations, and their preceding and following relationships. The activities that will be used in the project should be the least expensive and least prone to issues and contingencies. As a result, the most optimal work schedule will be the one that results from the initial work breakdown structure. If the timetable isn't feasible due to time constraints or a lack of resources, the manager must adjust it to make it feasible at the lowest possible cost (Friedrich et al., 1987).

WBS requires dividing complex tasks into easier, smaller, and less complex tasks until we reach a final point where we cannot break them down into subtasks.

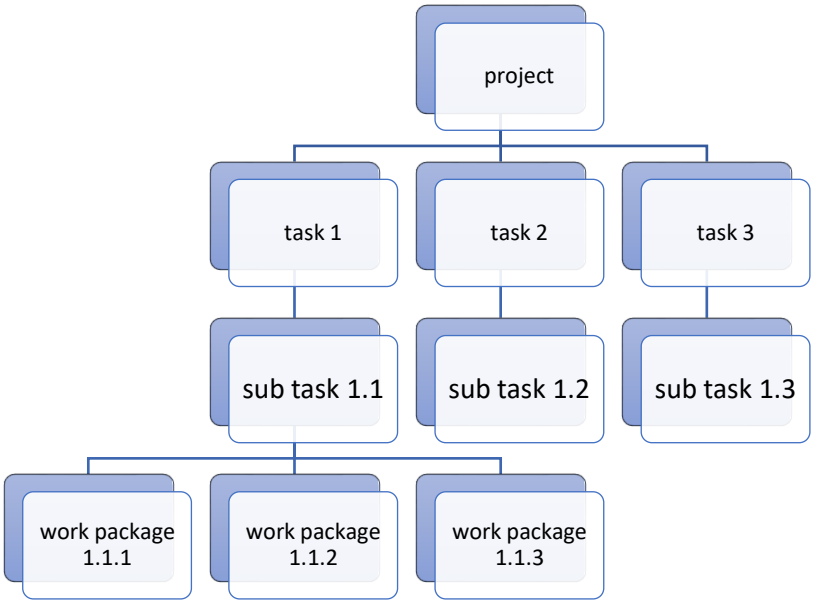


Figure 2.26: Simple work breakdown structure

The project tasks are divided into several sections and we must be able to?

- Managing various tasks
- Estimate the time required to complete the task at hand
- Estimating the estimated cost of the task assigned

We should stop breaking down when reach a low enough level to do an estimate of the desired accuracy, beside the work breakdown structure should be completed before the schedule.

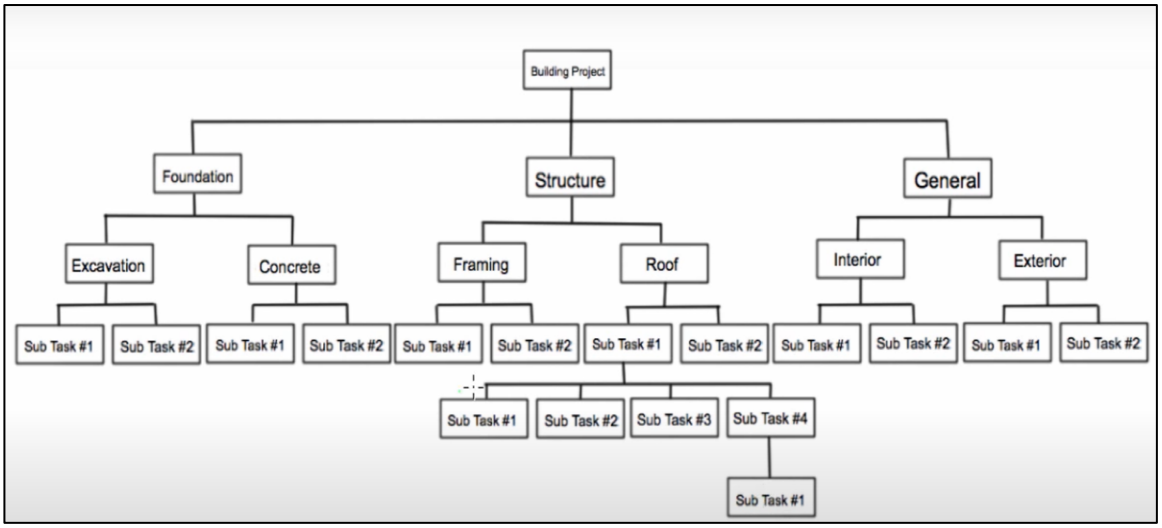


Figure 2.27: Work breakdown structure

2.6.5. Time management

The purposeful organization and management of time, a way of planning that ensures that the task completed meets the desired goals within the time frame provided. People and teams who use effective time management can work smarter and more efficiently, resulting in more work being completed in less time. However, this does not necessarily imply that they are working harder. Deciding and prioritizing tasks — choosing which chores to finish first might contribute to daily (or hourly) goals — and prioritizing them in terms of those that must be completed before others are usually included in time management. Time management is an important aspect of project management as a discipline (particularly project planning and scheduling). Time management in businesses seeks to detect, assess, and reduce the cost of missed time. Although many people think of time management as a tool for business or business activities, it can be used to efficiently regulate and organize all elements of one's personal life. Work, social and family life, as well as personal interests and commitments, can all be included. Setting goals and priorities is an important component of time management; without them, efforts would be aimless and time will be wasted (Kregel, 1996).

2.6.6. Determining responsibility for delays in project management

When the analyst identifies the activities that experienced delays, their durations, and the general nature of those delays (extended time duration, delayed start, etc.), then the analyst can assess liability for each delay (Lea, 1994).

Figure 2.28: Project delay causes

2.6.6.1. Contractual conditions

The analyst must first refer to the contract when establishing accountability for delays. In general, the analyst must examine the contract documents in detail, including the general terms and specific clauses, as well as the agreement or related material and any relevant documents, such as standard clauses, that are not included in the contract documentation (Okeola, 2013).

Change, whether directed or constructive, is the result of delays caused by the project owner. It could be due to a design modification, a contract document error or omission, a difference in site conditions, a delay in granting approval in a timely manner, a delay in responding to a request for information necessary for the progress of work, or even orders to stop or suspend work. Certain events in accordance with the contract will give the right to additional time. It is also specified in the contract if the delay is compensable or not. If it is determined that the delay was the result of a change from the project owner, then the delay is excused and compensable (Sunjka and Jacob, 2013).

2.6.6.2. FIDIC Requirements

In the FIDIC (FIDIC represents the consulting engineering Industry both globally and domestically) General Conditions 1999 (Red Book), the following prerequisites for filing and acceptability of a claim are established. Disputes, Claims, and Arbitration Claims by Contractors

If the Contractor believes he is entitled to more time to perform the work and/or further payment under any provision of these Conditions or the Contract, he must notify the Supervising Engineer and provide details about the incident or circumstances that led to the claim. The Contractor must be notified as soon as possible, but no later than 28 days prior to the occurrence or circumstances. If the contractor fails to notify the supervising engineer of the claim within 28 days, the claim will be considered abandoned, he is not permitted to extend the project's finish date, and the contractor is not entitled to any further money, and the project owner is not liable for the claim.

The Contractor shall also provide any other documentation necessary under the Contract and supporting such claim, or relating to the event or circumstances (Okeola, 2013).

If the event or circumstances that led to the claim have long-term ramifications.

- This claim qualifies as a progress claim because it is so detailed.
- The Contractor must then submit monthly progress claims to the supervising engineer that include the cumulative delay claimed and/or the cumulative financial value claimed, as well as any documentation that may be required.
- The Contractor must submit the final claim within 28 days of the end of the event or circumstances that caused the delay, or within another time period that the Contractor specifies and that is approved by the supervising engineer.

2.6.6.3. Gather the Facts

In addition to what the contract provisions state, assessing responsibility for delays necessitates a thorough examination of all project documents in order to identify reasons affecting the performance of the defined activities. Design blueprints, initial scheduling, updates and revisions, change orders, daily reports and memos, general correspondence and e-mail, requests for information, presentations, minutes of meetings, photos and videos, and data reports cost are some of the facts needed to assign responsibility before the proposal is made (Kinsiku and Akinsulire, 2012).

2.6.6.4. Assessment of responsibility

It is critical to analyze the contract and other available legislation papers while determining culpability for delays. These documents assist the analyst to figure out what's causing the delay and who's to blame. As previously stated, delay analysis calculates minor scheduling errors. This means that, even if the delay analysis shows that a particular action inside the plan is delayed by a given number of days, the issue's outcome may be unpredictable or logically tied to the schedule. A delay study, for example, may reveal that the foundations for Building A were started 10 days late. Due to ongoing work to excavate and pour the mat at the main entrance, the piling equipment could not move to that phase of the scheduled work, according to all accessible project records. The project owner had issued a change order to build an additional 500 m3 of reinforced concrete columns around the main entrance, according to a subsequent assessment of the project records. Despite the fact that these two activities are not logically scheduled and unrelated on the job site, a review of the project documentation revealed that the Contractor did not begin building A

foundations until the concrete columns were installed, allowing the fittings needed to pour Foundations to be installed (Fondahl, 1980).

2.6.6.5. Delays caused by the weather

Time is, of course, the "important" in a building deal. It's also common for the contract's "contract time" or termination date to be a condition defined inside the contract. Furthermore, given the contract's function in establishing risk-sharing, particularly with regard to severe weather-related hazards, it's only logical that the contract addresses how to detect and manage additional weather-related time (Chan, 1997). It's crucial to understand whether, how, and in what form the contract allows for weather extensions. Generally, weather-related overtime If this is the case, the contractor must factor weather projections into his bid and work schedule's clauses only give contractual extra time for extreme weather events. Knowing how many days the actual precipitation surpasses the monthly average or how many days the temperature dips below normal is only the start. The Contractor must first show that the weather conditions to which the project has been subjected have hampered his ability to complete the work on those days where the weather has been a factor. work was on the project's critical path, as only critical path delays cause the project to be delayed. In other circumstances, the contractor will have to rely on critical path scheduling to identify if weather-affected work is actually on the critical path and that extreme weather has caused the project to be delayed (Cooper, 1993).

Let's take each of the preceding concepts and present a simple point of view. The following are some important points to be aware of:

- What is it about the weather that gives for extra time?
- How is time extended for influencing weather?
- If the project is exposed to severe weather fluctuations that allow the extension of time, is this all that is required to grant the additional time?

2.6.7. Design and Build

In the construction industry, a project implementation system is used. In this type of project execution, design-build services are contracted out to a single entity known as a design-executor or design-build contractor. The following are the two types of design-build projects: Architect-led design-build (also known as designer-led design-

build) and contractor-led design-build are two different types of design-build projects. The design-build approach is based on a single stakeholder contract, unlike design and build tenders (also known as "design quotes"). By overlapping the design and construction phases of a project, this strategy reduces risks for the project owner and speeds up delivery time. A single point of contact is also included in the Design-Build method. Due to the fact that the design-build contractor is in charge of the entire project. the client demands legal reimbursement from any party who is at fault (Mukuka et al., 2013). Hiring a designer on the one hand, and a contractor on the other, is the traditional way of approaching construction projects. The procurement strategy used in the design and build system is disrupting the typical work flow. It satisfies the customer's needs by having a single point of contact, hence lowering total risks and expenses. They are now widely utilized in a variety of countries, and contract forms are readily available. The design-build construction method is sometimes compared to the "master builder" construction method. which is one of the oldest. When comparing the design-build system to the traditional method of project procurement, the authors of the Design-Build Contracting Handbook said, "From a historical standpoint, the so-called traditional approach is in fact a very contemporary notion, having only been employed for around 150 years". On the other hand, the design-build concept, also known as the 'Master Builder' concept, is said to have been around for over four millennia. Although the American Institute of Design and Building believes that design-build projects can be led by a contractor, designer, project developer, or joint venture as long as the design-build body maintains a single design-and-build contract with each other, some architects believe that a design-build system led by an architect is preferable. A one-of-a-kind construction and design method (Johnston and Brennan, 1996).

2.6.8. Contractor for design and construction

The general contractor (or contractor) is frequently the "design implementer," but the project can also be overseen by a design expert in many circumstances (architect, engineer, architecture technician or other professional designers). Professionals from both the construction and design industries are employed by some design and construction firms. The designers are usually entrusted directly by the general contractor because he is the design executor. A long-term partnership or joint venture between a design firm and a construction firm can be formed, or it can be formed for

a single project. Until 1979, members were prohibited from selling construction services under the AAA's Code of Business Ethics and Professional Conduct. Many architects in the US and around the world, on the other hand, are attempting to provide integrated design and construction services, and the design and build system is the only way to accomplish this goal. The design-build methodology has emerged as one of the most popular building methodologies, according to the organization. The Architectural Guide to Design and Build Services, created to assist its members in acting as design-build project contractors, was signed by the organization in 2003. This book covers every aspect of the process, from design services to contracts to management to insurance and financing (Hamzah et al., 2011).

2.6.9. In contract-led design projects, the architect's role is crucial

In a contractor-led design and build project, management is set up so that the owner communicates directly with the contractor, who then communicates with subcontractors (subcontractors). Architects play a variety of roles in contractor-led design and construction projects, each with varying degrees of responsibility, figure 2 showed (the A/E in each architect/engineer scheme reflects the architect/engineer scheme) (World Investments Report 2000). The architect as a contractor's employee: the architect works as a contractor's employee from the inside. On the other hand, the architect takes a professional risk and is less likely to have a say in other contractor-led design projects and construction methods.

Architect as Subcontractor (Subcontractor): In this case, the architect is one of many subcontractors on a project managed by a contractor. Architects face similar professional dangers but have limited control. The architect as a co-contractor in the execution of an integrated project headed by the contractor: In a joint venture, the architect and the contractor work together to coordinate work with subcontractors for the project's completion. This company has one contract with the building owner. Because the contractor is in charge of the partnership, the architect might be subordinate to him when it comes to monitoring the subcontractors. The architect is exposed to the same risks as in the traditional technique, but he or she has more influence over the integrative project's completion, even though it is dependent on the contractor (Richard and Park).

2.6.10. Design and implementation projects led by architects

Architect-led design and build projects involve multidisciplinary teams of architects and builders collaborating in a dynamic organizing process, where design strategy and construction expertise are tightly integrated, and the architect serves as the owner's advisor, project agent, and team leader, ensuring high performance accuracy to reconcile project objectives and results. Architect-led design and build projects involve the architect working directly with the client (owner), acting as designer and implementer, and supervising a team of consultants, subcontractors, and material suppliers throughout the project's life cycle (Salleh, 1997). Architects work on a variety of design and construction projects, each with varying degrees of responsibility (the A/E is present in every architect/engineer scheme) as showed of figure 3. Architect as Additional Service Provider: The architect extends his or her services beyond design by managing subcontractors on behalf of the owner by contracting with the owner. In traditional design and construction projects, or in projects led by contractors, the architect is exposed to similar dangers, but he has more control over his abilities. Al-Mamari as a key player in the completion of the architect's integrative project: The architect coordinates with the subcontractors to complete the project in the same way as the joint venture does. In addition, this firm has a single contract with the building owner. Because the architect is in charge of the partnership this time, the contractor can delegate subcontractor oversight to the architect. The architect can take more risks than in the traditional method, but the risk is shared with the owner and contractor in accordance with their contract terms. Another method is for the architect to directly contract with the owner to design and implement the project, and then subcontract the supply measures and implementation responsibilities to his ally, the field craftsmen are then subcontracted by the general contractor. The work and legal parameters of the agreement between the architect and the general contractor can be the same whether it's a joint venture or a subcontract, so the distinction is more of a formality than a substantive one. The contractor-led model, in which the general contractor hires an architect to design the project, is the "opposite" of this model (Wei, 2013). As Executive Director of Full-Service Design and Construction, the Architect: The Architect provides a full service to the owner by contracting with the owner, which entails overseeing subcontractors, consultants, and vendors and involving them in the project from beginning to end,

from design to completion. The architect's job title changes from designer to site supervisor throughout the project (basically taking on the role of general contractor), but he or she always keeps an eye on the big picture and can call on the expertise of construction subcontractors. The architect bears the greater risk in the traditional method or in the way that the architect leads and the contractor leads other design and build projects while having more control over the project (Sweis, 2008).

2.7. Presentation, Analysis, Description and Interpretation of the Sample Response and the Correlation between Them

This topic was devoted to describing the response of the target sample of the study, which is represented by administrative cadres, designers, and implementation officials by (5) people, and that is (10) projects in Baghdad. The answers and their orientations, the standard deviation and the coefficient of variation to determine the level of dispersion and the proportion of that dispersion to determine the extent of homogeneity of the answers and if they are in close directions or there are differences and discrepancies between the orientations of the responding sample.

The evaluation of the results of the response of the two samples to the arithmetic mean was adopted by dividing the range (which is the difference between the highest answer and the lowest answer 3-1 = 2) on the number of categories, which is (3), thus the equation (2/3 = 0.6) and adding it to the lowest value of the scale, which is (1) Which is the result (1.6), accordingly, the categories from the lowest category to the highest category can be clarified in the table (2.5).

This will explain the analysis, description and interpretation in response to the variables (integrated management of architectural projects), (design for architectural projects) and (planning for architectural projects).

Also, a correlation coefficient (pearson correlation by 2-tailed) will be measured between the integrated management of architectural projects, design for architectural projects, and planning for architectural projects to determine whether it is related based on the statistical analysis of the >>->response of the sample that represents the trends of integrated management with both design and planning of architectural projects.

The impact factor (integrated management of architectural projects) will also be tested for each of (design for architectural projects) and (planning for architectural

projects) to determine if there is an effect based on the statistical analysis of the sample response, as shown below:

Table 2.5: Standard response evaluation of the sample

Scale Descriptive	Class Boundaries	Weight Value
Low	1 ≤ Class Interval ≤ 1.6	**1**
middle	1.7 < Class Interval ≤ 2.3	**2**
High	**2.4 < Class Interval ≤ 3**	**3**

Source: Prepared by the researcher based on the calculation of the categories.

2.7.1. Integrated management of architectural projects

Table 2.6: Analysis of the response of the sample to the integrated management of architectural projects

T	vertebrae	Mean	S.D	Variance	Rating level
1	Do you think that paying financial fines when the agreed period is exceeded is a deterrent that prevents delay in delivery?	2.440	1.127	0.461	High
2	Do you think that empowering the administration by granting the authority to review government departments regarding utilities or official building approvals speeds up achievement?	2.240	0.938	0.418	middle
3	Does integration mean that the project is free from all architectural and structural **?**defects	2.400	0.880	0.366	High
4	Do you think that the project management is affected by the financial and economic **?**policies of the state	2.520	0.762	0.302	High
5	Do you think the management should be given the authority to change the master plans when there is a design contradiction **?**without referring to the investor	2.380	0.779	0.327	middle
6	Do you think that the contradiction and difference of views between the financial partners affect the work of the project management?	2.620	0.635	0.242	High
7	Do you think that emergency conditions affect the achievement of project **?**management in the future	2.440	0.836	0.342	High
8	Do you think that the project management methods and techniques used in Iraq meet **?**the required needs	1.880	0.848	0.451	middle
	Total	2.365	0.850	0.363	middle

Source: Prepared by the researcher based on the outputs of the program (spss.v24).

It is clear from the table (2.6) related to the measurement of the integrated management of architectural projects, which was measured across (8) paragraphs that the total (Mean) for it reached (2.365), i.e. at the (middle) level, while the standard deviation (S.D) reached (0.850), i.e. at a level of good homogeneity As for the variance, it reached (0.363), meaning that the percentage of dispersion was approximately (36%), while the percentage of homogeneity reached (64%), that is, at an above-average level for the total integrated management of architectural projects.

It is also clear that the highest arithmetic mean for paragraph (6) amounted to (2.620), i.e. a high level, and the standard deviation was (0.635), i.e. with a good level of homogeneity, and the variance reached (0.242), meaning that the dispersion percentage amounted to approximately (24%). The percentage of homogeneity reached (76%), which is a good level.

As for the lowest arithmetic mean for paragraph (8), it reached (1.880), i.e. at an average level, and the standard deviation was (0.848), i.e. with a good level of homogeneity, and the variance reached (0.451), meaning that the dispersion percentage reached (45%) and the homogeneity percentage was Almost (55%), an acceptable level.

2.7.2. Design for architectural projects

Table 2.7: Analysis of the design response of the sample for architectural projects

T	Paragraph	Mean	S.D	Variance	Rating level
1	Do you think that the design identity has been neglected in architectural projects?	2.560	0.786	0.307	High
2	Are designs inspired by folklore and the history of the country more attractive in the design of architectural projects?	2.400	0.903	0.376	High
3	Do you think that the modernity of the current design is less complicated, more simple, and less details from an architectural point of view?	2.500	0.707	0.282	High
4	Do you think that the programs currently used in the field of design meet the needs and ideas of engineers?	2.600	0.728	0.280	High
5	Should powers be granted to make modifications to the design by the implementing agency?	2.380	0.779	0.327	middle

Table 2.7: (Cont.) Analysis of the design response of the sample for architectural projects

T	Paragraph	Mean	S.D	Variance	Rating level
6	Do you think that the design process is inspired by the feelings and feelings of the designer and his surroundings?	2.080	0.853	0.410	middle
7	Can the design process be considered a creative process, even if it is inspired by folklore or the local culture of the country?	2.520	0.677	0.268	High
8	Do you think that the amendments imposed by the project owner on the executing authority cause confusion in the administrative and executive work?	2.420	0.810	0.334	High
	Total	2.432	0.780	0.323	High

Source: Prepared by the researcher based on the outputs of the program (spss.v24).

It is clear from the table (2.7) related to the design measurement for architectural projects, which was measured through (8) paragraphs that the total (Mean) for it reached (2.432), i.e. at the (High) level, while the standard deviation (S.D) reached (0.780), i.e. a good level of homogeneity, As for the variance, it reached (0.323), meaning that the percentage of dispersion was approximately (32%), while the percentage of homogeneity reached (68%), that is, at an above-average level for the total design of architectural projects.

It is also clear that the highest arithmetic mean for paragraph (4) amounted to (2.620), i.e. a high level, and the standard deviation was (0.728), i.e. at a good level of homogeneity, and the variance reached (0.280), meaning that the dispersion percentage amounted to approximately (28%). The percentage of homogeneity reached (72%), which is a good level.

As for the lowest arithmetic mean for paragraph (6), it reached (2.080), i.e. at an average level, while the standard deviation was (0.853), i.e. at a level of good homogeneity, and the variance amounted to (0.410), meaning that the dispersion percentage reached (41%), and the homogeneity percentage was Almost (59%), an acceptable level.

2.7.3. Planning for Architectural Projects

Table 2.8: Analysis of the response sample planning for architectural projects

T	Paragraph	Mean	S.D	Variance	Rating level
1	Is there sufficient attention to logistics (car parks, public parks, etc.) when planning the implementation of integrated architectural projects?	2.700	0.646	0.239	High
2	Do you think that there is a weakness in the infrastructure (schools, health centers, etc.) in planning integrated architectural projects?	2.702	0.614	0.227	High
3	Are the prepared resources compatible with the requirements of implementing integrated architectural plans?	2.640	0.692	0.262	High
4	Is the planning process linked to established timelines?	2.660	0.717	0.269	High
5	Do you think that the current planning is commensurate with the population increase?	2.620	0.666	0.254	High
	Total	2.664	0.664	0.260	High

Source: Prepared by the researcher based on the outputs of the program (spss.v24).

It is clear from the table (2.8) related to the measurement of planning for architectural projects, which was measured through (5) paragraphs, that its total (Mean) reached (2.664), i.e. at a (High) level, while the standard deviation (S.D) reached (0.664), i.e. a good level of homogeneity, As for the variance, it reached (0.260), meaning that the percentage of dispersion was approximately (26%), while the percentage of homogeneity reached (74%), i.e. a good level in relation to the total planning of architectural projects.

It is also clear that the highest arithmetic mean for paragraph (2) reached (2.702), i.e. at a high level, and the standard deviation was (0.614), i.e. at a good level of homogeneity, and the variance reached (0.227), meaning that the dispersion percentage amounted to approximately (22%). The percentage of homogeneity reached (78%), which is a good level.

As for the lowest arithmetic mean for paragraph (5), it reached (2.620), i.e. a high level, and the standard deviation was (0.666), i.e. with a good level of homogeneity. Almost (75%), a good level.

2.7.4. To test the correlation between integrated management and design and planning for architectural projects

Table 2.9: The relationship between integrated management, design and planning for architectural projects

		x1	x2	x3
x1	Pearson Correlation	1	.489**	.478**
	Sig. (2-tailed)		.000	.000
	N	50	50	50
x2	Pearson Correlation	.489**	1	.672**
	Sig. (2-tailed)	.000		.000
	N	50	50	50
x3	Pearson Correlation	.478**	.672**	1
	Sig. (2-tailed)	.000	.000	
	N	50	50	50

**. Correlation is significant at the 0.01 level (2-tailed).

Source: Prepared by the researcher based on the outputs of the program (spss.v24).

Table (2.9) is concerned with measuring the pearson correlation by 2-tailed between integrated management and design and planning for architectural projects, knowing that (x1) represents the integrated management of architectural projects, (x2) represents the design for architectural projects, and (x3) represents project planning Architectural.

It is clear from the table (2.9) that the correlation factor between the integrated management of architectural projects and the design of architectural projects amounted to (0.489), and it was tested at a level of significance (0.01), as (sig) reached (0.000), meaning that there is a correlation at a good level and this indicates that Integrated project management leads to good designs implementation.

It is clear from the table (2.9) that the correlation coefficient between the integrated management of architectural projects and the planning of architectural projects reached (0.478), and it was tested at the level of significance (0.01), as (sig) reached (0.000), meaning that there is a correlation at a good level and this indicates that The integrated management of architectural projects implements planning in a way that leads to the successful implementation of architectural projects in a good way.

2.7.5. To test the relationship of the impact of integrated management on the design and planning of architectural projects

Table 2.10: The relationship of the impact of integrated management on the design and planning of architectural projects

Integrated management of architectural projects	Indications	
0.239	**R^2**	Design for architectural projects
0.462	B	
0.000	sig	
0.228	**R^2**	Architectural project planning
0.672	B	
0.000	sig	

Source: Prepared by the researcher based on the outputs of the program (spss.v24)

The table (2.10) is concerned with measuring the impact factor (15) between the integrated management and design of architectural projects,

The impact factor of the integrated management of architectural projects on the design of architectural projects is (0.462), meaning that the increase in the level of application of the integrated management of architectural projects by one unit leads to the level of success of design implementation for architectural projects by (46%), while the rest is related to other topics or random variables. Or external conditions, and it was tested at a level of significance (0.01), as (sig) reached (0.000), meaning that there is an effect at a good level, and this indicates that the integrated management of architectural projects contributes to the implementation of designs leading to the completion of the project as it was designed and is avoided Mistakes and adaptation to external changes.

Table (2.11) is concerned with measuring the impact factor (16) between integrated management and planning for architectural projects.

The impact factor of the integrated management of architectural projects in the planning of architectural projects is (0.672), meaning that increasing the level of application of the integrated management of architectural projects by one unit leads to the level of success in implementing the planning of architectural projects by (67%), while the rest is related to other topics or random variables. Or external conditions, and it was tested at a level of significance (0.01), as (sig) reached (0.000), meaning that there is an effect at a good level, and this indicates that the integrated

management of architectural projects contributes to the development of plans that take into account the financial capacity and legal conditions, logistics and External and internal environmental factors from the hands of workers, engineers, designers, and others, all that can be considered determinants of the success of the architectural project.

3. METHODS AND TECHNIQUE OF PROJECT MANAGEMENT

3.1. Introduction

We demonstrate that current project management is based on an undeveloped, limited theory that requires further development, extended, and enriched. Other project management issues, such as project failures on a regular basis (Klijn and Teisman, 2000), a lack of dedication to project management techniques (Forsberg et al. 1996), a lack of current theory can explain both the lack of methodological renewal and the slow rate of methodological renewal (Mukuka et al., 2013). As a result, an explicit theory is the single most important issue for the project management profession's future.

To investigate the underlying theory of the current project management doctrine, the PMI's Guide to the Project Management Body of Knowledge (PMBOK Guide) is used. (Duncan 1996). Of course, there are other ways to express the primary characteristics of project management, and what the true project management doctrine should be is a matter of debate; however, the primary characteristics of project management can be expressed in a variety of ways, for the purposes of this paper, the PMBOK Guide provides a good summary of the doctrine. The following are a breakdown of the paper's structure.

3.2. Approach – Design – Methodology

The existing literature is used to develop a conceptual framework for an integrated model that will be field-tested extensively. The model was used to assess the strengths and weaknesses of previously published projects.

3.3. Findings

The application of TOC, RAT, and resource dependency theory to a project can have a significant impact on its success (RDT). It stresses the importance of applying strategic theories to project management in particular.

3.4. Limitations and implications of the research:

Despite the fact that TOC, RAT, and RDT are well-known in organizational theory, their use in project management is limited. In addition, the model has yet to be put to the test in the real world. To test the hypotheses identified in this study, field-based surveys are currently being used.

3.5. Consequences in Practice

Some resources, Traditional project management does not include features like innovation, tacit knowledge, or decision-making methods, are not addressed in the study. As a result, if these critical resources are identified and used to improve project performance in the future, project-based management will succeed (Investment Guide Board).

3.6. Societal ramifications

Societal impacts affect the project process, and directly influence design, planning, and planning decisions.

Iraq suffers from many societal problems, the most important of which are:

- Clan conflicts
- Personal differences
- Mismatch of opinions among the owners of money
- Doctrinal differences
- Regional differences between one governorate and another
- Royalties spread
- Bribery spread
- The prevalence of nepotism and kinship factor
- The spread of armed phenomena

3.7. Originality – Value

The iron triangle, which includes scope, quality, time, and cost, in this paper, is used to examine the components of a successful project. A project-based management

framework incorporates TOC, RAT, and RDT. On the other hand, provides new insights into resource management.

3.8. Management Theory for Projects

A theory is primarily made up of concepts and the causal relationships that link them together (Wei, 2010). In broad terms, there is a target theory of production/operations management (Kinsiku and Akinsulire, 2012).

Project management, a subset of production/management processes, this also falls under this category. Project management theory should be mandatory, showing how actions help the project achieve its objectives. There are three broad procedures through which the required production can be achieved: the process of designing the systems used in design and manufacturing, controlling those systems to achieve the required quality, and improving those systems. In project management, as in all production processes, there are three types of goals. First and foremost, there is the overall objective of producing desirable goods. Second, there are internal goals such as cost reduction and usability optimization. Finally, there are external goals, such as quality, reliability, and flexibility linked to the client's needs.

A formalized project management theory would be beneficial in a variety of ways. Previous research has identified the functions of theories (Kloppenborg, 1991):

1. By providing an explanation for observed behavior, a theory contributes to understanding. A model that predicts future behavior is known as a theory.
2. The theory can be used in the creation of analysis, design, and control tools.
3. A theory provides a common language or framework for people to collaborate on projects when it is shared, firms, and other collective endeavors.
4. The theory directs the search for new avenues for advancement.
5. It leads to learning when a theory's validity is explicitly tested in practice.
6. By deriving a theory from a novel practice and then putting it into practice in real-world scenarios. It's possible to move it to a different environment.

7. A theory is a condensed body of knowledge that allows novices to perform tasks that were previously only performed by experts. As a result, it has a positive impact in the classroom.

What is the foundation of project management theory?

As far as we can tell, there has never been an explicit project management theory in the literature (Shenhar, 1998 and Henr,y 1999). Statements from the PMBOK Guide or research from renowned project management experts, on the other hand, can be used to approximate or deduce a theory's definition.

We proceed in two steps based on these core statements. To begin, for each aspect or part of the project management process, we define project management prescriptions (action items) and explicit principles. Second, we compare the crystallization to the candidate theories' principles and prescriptions to see which one fits the best. According to the PMBOK Guide, project management processes and product-oriented processes are both important, are the two types of processes that make up a project (which defines and produces the project's final product) (Finance and Investment, 1993).

The project management process includes the steps of initiating, planning, executing, controlling, and closing a project. Start with project theory (processes that are product-oriented), then move on to management theory (planning, execution, and control processes).

3.9. Conceptualization of the Project

Crystallization (also cited in the PMBOK Guide) is used as a starting point for reconstructing the project theory in the sections that follow. (Henry, 1993). Henry claims that scope management is the raison d'être of project management. Scope management's goal is to ensure that everything stays on track, according to him, is to:

1. Work is completed to a sufficient or adequate level.
2. Tasks that aren't necessary aren't completed.
3. The completed work meets the stated business objective.

From a theoretical standpoint, what does Turner have to say about the project scope being determined by the work breakdown structure (WBS)?

a. To begin, he claims (implicitly) that project management is all about work management; this is how he conceptualizes project management.

b. Second, he asserts that work can be managed by breaking down the total work effort into smaller chunks, referred to as activities and tasks in the PMBOK Guide.

c. Finally, he asserts that this decomposition and conceptualization principle is beneficial to three critical project management functions.

(Henry 's, 1993) doesn't say so, but decomposition is based on an important but unspoken assumption: If there is any relationship between tasks, it is through sequential dependency. According to the PMBOK Guide, activities and tasks serve as the unit of analysis, time management, and cost management in project management's core processes, such as scope management, and their management and control are centralized. The classic - and still current - project management approach is as follows: first, figure out what needs to be done; second, figure out who will do what; third, figure out when actions will be performed; and fourth, figure out how much money is required in total, how much has been spent thus far, and how much remains to be spent. At the heart of this procedure is the Work Breakdown Structure (WBS) (Stumpf, 2000).

We can see that this crystallization of project management is based on the production transformation theory when we compare it to general theories of operations management (or view), which dominated production thinking for the majority of the twentieth century. Any production process, according to (Salleh, 1997) It's possible to think of it as an input-output system. Inputs, on the other hand, are a collection of resources. Before being released as outputs, this set goes through a transformation process that modifies it. The management of the transformation process is referred to as production management. From the standpoint of transformation, production is defined as the transformation of inputs into outputs. The production process is governed by a set of principles (Koskela 2000). These principles suggest that a large transformation be broken down into smaller ones in a hierarchical order.

Tasks and lowering their costs one at a time. The transformation viewpoint arose from economic thought. (Okeola, 2013) proposed the well-known value chain theory as a way to encapsulate the transformation viewpoint. Using the original economic

view of production, a group of economists led by (Sunjka and Jacob, 2013) proposed an explicit production theory The transformation perspective, on the other hand, has largely been implicit, having become ingrained in thought and practice to the point where it has become the foundation of an unseen, unspoken paradigm that shapes behavior.

3.10. Management Theory

According to the PMBOK Guide, project management processes are divided into five categories: planning, execution, control, and closure.

Let's take a closer look at the processes for planning, executing, and monitoring (Figure 3.1). The concept is that these processes form a closed loop: planning processes create a plan, which executing processes execute, and deviations from the baseline or change requests result in execution corrections or changes to future plans.

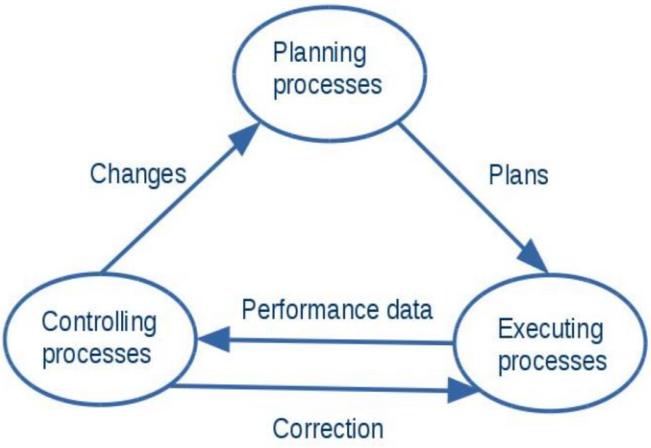


Figure 3.1: The closed loop of project management managerial processes described in the PMBOK guide

3.10.1 Planner's theory

The PMBOK Guide goes into great detail about project planning from a variety of perspectives. Core and facilitating procedures are the two types of planning procedures.This process includes ten basic processes (plan development, schedule development, total cost budget development, cost estimation, activity sequence, activity duration estimation, activist identification, speaker planning, speaker identification, resource schedule planning). The project plans created for these processes are entered into the implementation process in the pmbok guide. Planning processes take the lead in the first step: In addition to the ten planning processes,

there is one implementation process and two control processes, the focus is on planning and very little attention is paid to implementation (Kregel 1996) The perspective of management as planning when compared to theories in the field of general operations (Johnston and Brennan 1996).

In this case, the organization must have effective management, plans drawn up, reviewed and implemented centrally at the operational level in the management approach. Emphasis is placed on management actions and the results of the organization as having a strong relationship. Line production becomes synonymous with work when a plan is supposed to be put into action and is a matter of ordering (Hopp and Spearman 1996).

3.10.2. Theoretical framework

What method will be used to carry out the project's objectives? In this regard, the PMBOK Guide is unusually short. Only four sentences about the work authorization system make direct references to the actual interface between plan and work: A work authorization system is a formal procedure for sanctioning project work in order to ensure that it is completed on time and in the proper sequence.

The primary mechanism is usually a written authorization to begin working on a particular activity or work package. When designing a work authorization system, keep the value of the control and the cost of the control in mind. Verbal approvals will suffice for many smaller projects, for example:

The execution theory resembles the manufacturing concept of job dispatching, which serves as a link between the plan and the work. This concept is attributed to (Emerson, 1917).

Allocating or assigning tasks or jobs to machines or work crews, which is usually done by a central authority, is the most fundamental aspect of dispatching. By today's definition, job dispatching is the process of selecting a job for processing on a newly available machine based on logical decision rules (Bhaskaran and Pinedo, 1991).

Dispatching is clearly divided into two steps: decision (from a list of predefined tasks ready to be performed) and communication (or authorization) to the workstation. However, in project management, this decision is made in advance, and dispatching is reduced to a simple communication process. Authorization or notification to start

work in writing or orally. Shannon and Weaver's (1949) classic theory of communication appears to be the underlying theory here, which entails the sender sending a set of symbols (voice or written speech) to the receiver (Okeola, 2013).

3.10.3. Constraint theory

The two sub-processes of controlling, according to the PMBOK guide, are performance reporting and overall change control. On the basis of the former, corrections for the executing processes are prescribed, while changes for the planning processes are prescribed on the basis of the latter.

Only performance reporting against a performance baseline is considered, as well as any associated execution corrections.

They match the elements of the cybernetic management control model perfectly (thermostat model) as follows: (Hofstede 1978):

1. A certain level of performance is required.
2. The output is the yardstick by which performance is judged.
3. The difference between the measured value and the standard is used to fine-tune the process until it meets the requirement. Modern control theory defines a feedback control model that is identical to the thermostat model (Howell et al. , 1993).

The management–as–planning, dispatching, and thermostat models appear to be the foundations of project management. The first is demonstrated by the PMBOK Guide's structure and emphasis. The second comes through in the discussion of execution in the Guide Exhibit 1 shows an example of the third, which is a closed loop of planning, execution, and control. Neither theory is surprising. Management as planning has been the widely held – if largely implicit – view of intentional action in organizations until now (Johnston and Brennan, 1996). The dispatching model has been widely used in industrial engineering since the turn of the century, and it is closely related to management-as-planning. Similarly, the thermostat model was the most popular management approach in the twentieth century (Giglioni and Bedeian, 1974).

All of these concepts were popular when project management was first introduced, and when taken together, they form the theoretical foundation of current management practice.

3.10.3.1. Is project management's underlying theory sound

What have we gained from defining project management's theoretical foundations? At the very least, there are two direct benefits. We can determine whether or not a theory is the best one available and empirically valid. To begin, we can see if the theory's principles or assumptions have been proven invalid or incomplete by other theories, the validity of which we must accept. We primarily operate in the realm of theories and compare various theories.

Second, In the application of theory-based methods, We can search for scholarly anomalies or unexpected outcomes. The meeting of theory and empirical world is our source of evidence in this case. It's crucial to remember that each of these tests has its own set of benefits and drawbacks.

The existence of alternative theories is required for comparison between theories.

The empirical validity test is a strong one when the question is about a genuine scientific experiment. In the management sciences, observation from cases is often sufficient. When these tests are performed in tandem, especially if the results are similar, they can provide insight into a foundation's suitability (Johnston, 1995).

3.10.3.2. Is project management founded on the most up-to-date research

3.11. Conceptualization of the Project

We contend that the project as transformation theory is not the best available; rather, it needs to be supplemented; this is evident when we consider that competing production theories (projects are simply special cases of production) existed long before project management was invented.

In the early days of industrial engineering, another concept of production was presented. JIT and lean manufacturing are based on the Gilbreths' flow view of production, which was first proposed in scientific terms (1922). This view was first implemented in 1926 by Ford; however, In this regard, Ford's template was

misinterpreted, and from the 1940s onwards, the flow view of production was only further developed in Japan, first as part of war production and then at Toyota.

As a result, JIT and lean manufacturing both incorporate the flow perspective.

Hopp and Spearman (1996), in a groundbreaking book, show how queuing theory can be used to mathematically prove various heuristics used in the context of JIT.

The difference between the conversion and flow perspectives is that time is an important factor in the manufacturing process relative to the flow.

Since time is affected by mistrust in the production process as well as by their common factors in terms of tasks, the focus is directed towards complete mistrust and common links, which are not recognized in terms of transformation theory, the flow emphasizes the lack of action when it comes to project management objectives,The flow view's main goal is to eliminate waste from flow processes. It is recommended that concepts such as lead time reduction and variability reduction be used. As a result, the managerial prescription differs significantly from the transformation perspective; For instance, the former suggests lowering uncertainty. whereas the latter accepts the current uncertainty. Since the 1930s, there has been a third point of view on production. The value generation perspective's primary goal is to provide the best possible value to the customer (Larry, 1986) established the value generation viewpoint, which was fine-tuned in the quality movement and other circles.

Recently, (Cook, 1997) based on this point of view, He gave a presentation on a production theory that he had synthesized.. (Sweis, 2008) proposed axiomatic design, which establishes guidelines for assigning requirements to product subsystems, an important aspect of value creation.

The primary difference between transformation and value generation perspectives is that the latter considers the customer. Unlike the transformation view, which assumes that customer requirements are present at the beginning and can be decomposed along with work, the value generation view recognizes that customer requirements are not always present or well understood at the beginning, and that allocating requirements to different parts of the (project) product is a difficult problem.

The third goal of project management is to achieve the business purpose, which is explained by the value generation perspective. The principles of rigorous

requirement analysis and systematized requirement flow down, for example, are promoted. The prescription differs from the transformation viewpoint, which accepts the requirements exactly as they are. These three production concepts have been argued to be partial and complementary rather than competing production theories (Koskela, 2000). The creation of a production theory and tools that fully integrate the concepts of transformation, flow, and value is required.

We should consider production from the perspectives of transformation, flow, and value as a starting point. When the transformation model is used, the flow and value generation principles are actively violated, as well as a passive disregard.

3.12. Theory of Execution

Theoretical criticisms are dispatched by two types of project management. The assumption that all of the task's inputs and resources are available at the time of authorization is the first target of criticism. The planning theory – management as planning – underpins this criticism. Tasks pushed to execution by the plan are assumed to be completed without difficulty in this approach.

However, as previously stated, keeping an up-to-date plan is extremely difficult, As a result, the tasks in the plan do not always match reality, i.e., their prerequisites in terms of preceding tasks (or other inputs) are not always present. As a result, when pushed by the plan, a large percentage of tasks to be started are chronically lacking one or more of their inputs. According to (Johnston and Brennan, 1996) The tacit knowledge and improvisation at the operational level are critical to the success of the management-as-planning approach. The second line of attack criticizes the manner in which task authorization should be followed by action. When a task is authorized, it is assumed that it has been fully comprehended, that it has been started, and that it has been completed according to the plan. The dispatching model is akin to starting an engine that will run at a set speed and with set resources; implicit trust in those in charge is assumed. This is done by communicating the authorization, which entails issuing the necessary orders. The language/action perspective, however, has cast doubt on this viewpoint (Henry, 1993). They contend that making and keeping commitments allows organizations to coordinate their work. An offer or request initiates the commitment cycle, and then moves on to a promise, performance, and completion declaration. As a result, Rather than relying on commands from a central

authority, action is coordinated by people's commitments. (Orders are interpreted as strong requests in the language action view, and commitment is derived from the promise to follow it.) The dispatching model has two major flaws, according to the language action perspective. To begin, when dispatching, the controller and the executors should communicate in both directions.

The executor's commitment must be considered; only if the executor is committed to seeing the job through will it be started and completed.

3.13. Control Theory is the Study for How Things Work

Aside from the thermostat model, another control theory focuses on learning and improvement. The original question concerned a quality-improvement experiment in which the validity of a specific hypothesis was examined. The improvement method may then be modified based on the results of the experiment (Nkado, 199): Let's review the three steps of quality assurance: specification, quality, and production evaluation. These three steps must be completed in a circle rather than in a straight line. The steps of the scientific method are comparable to the three steps of the mass production process. Forming a hypothesis, conducting an experiment, and putting the hypothesis to the test in this way are analogous to specification, production, and inspection. A dynamic scientific method of knowledge acquisition is made up of these three steps. However, this can be generalized: all operations, rather than those designated as experiments in advance, can be considered hypothesis testing. Then, similar to the Toyota Production System, Every operation must be specified, implying that the hypothesis must be stated explicitly (Sunjka and Jacob, 2013). This allows for the identification of root causes of problems as well as performance enhancement. As this control theory of "scientific experiment" demonstrates, the thermostat model has a fatal flaw. which focuses on restoring standard performance with the available resources, but at a different intensity. Finding and eliminating the root causes of deviations is not addressed by the thermostat model.

3.14. Project Management Organization

Project management is one of the assurance systems for project management that ensures project implementation. A linear organizational structure model, a functional

organizational structure model, and a matrix organizational structure model are all examples of current project organizational structures. Each form has its own organizational characteristics and can be adapted to various organizational projects. Take, for example, the matrix organizational structure model, which has two sources of instruction and can strengthen horizontal linkages between departments with great flexibility and adaptability. Professionals' potential can also be sparked by the model. Figure 23 showed illustration for project management generally.

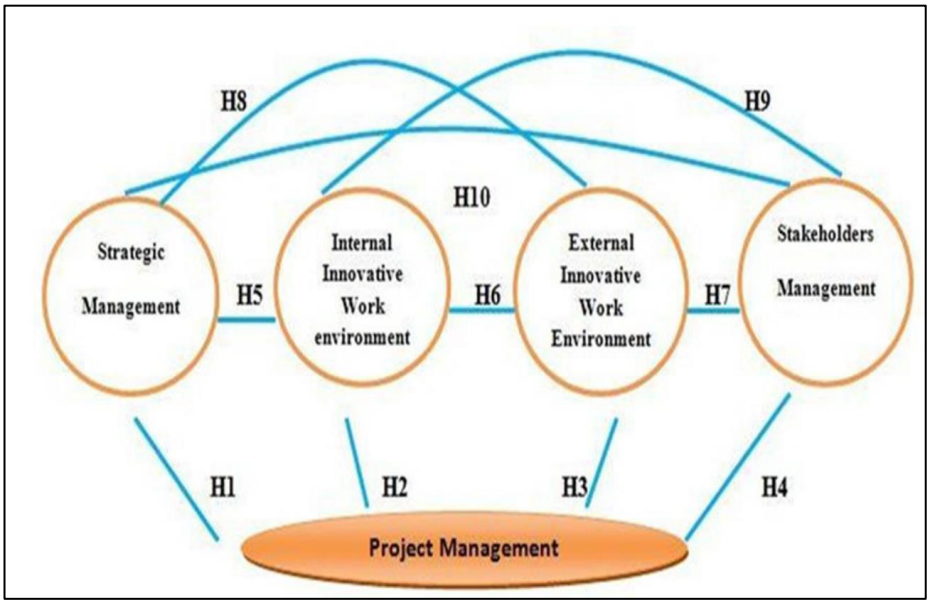


Figure 3.2: Research conceptual model

Many factors influence the organizational structure model, including the project's unique circumstances, organizational status, the number of projects being implemented simultaneously, and the project's task scope. It should employ a project management system that is both efficient and cost effective, and it should be able to communicate effectively with all stakeholders. At different stages of the project life cycle, different organizational structure models should be used, and specific evaluation criteria should be chosen with project organization forms. While the organizational structure model is straightforward and quick to adopt, the project's implementation will be seamless.

The first issue to address in the project's execution is the project's organizational structure. It's also the most important project management and control metric. For a better implementation of large-scale projects, it is necessary to start from the beginning, and it is pointless to copy an organizational structure that is commonly

used to manage large-scale projects. The introduction of BIM technology will be used to propose a new project management organizational structure in this paper. The function results of the new organizational structure model will be demonstrated in detail using the real-life example of the first middle school project in Suzhou, and it will serve as a reference for the implementation of most similar projects. Large building cluster projects have become more common in recent years. Large-scale projects have become the "typical distinctive project" due to their characteristics of large scale, novel structure, complex construction management, and requiring more technical expertise Large-scale projects can be segmented into many zones with flow construction during the relatively abundant period, it is widely acknowledged. The simple method of successively adding buildings requires fewer management resources and is relatively simple to construct. In many real-world situations, owners typically require the construction side to complete construction tasks within a certain time frame, such as the school owner's requirement that construction be completed by August 31 before school begins on September 1. Residential project owners expect projects to be completed in September and October for developer sales and other reasons.

3.15. Advanced Systems in the Management of Construction Projects

Project management is one of the most well-known disciplines in the world, and it is divided into several sections, including human resources and material resources, through which you can achieve a high success rate for many of the projects you are working on, as well as the availability of quality and capital factors. It is a collection of interconnected knowledge and tools that aid in the implementation of audit and control processes, as well as monitoring and optimal project planning. Project planning is required for the project's success and the human element's efficiency. Project deliverables must be measurable, specific, and timely. Modern construction project management trends are based on two fundamental principles at the moment:

1. Developing the innovative and creative aspects of project management
2. Expand the effective use and applications of the building information management model (BIM) in project management.

3.16. Management Organization Structure for Large Quantity Projects

The traditional method for solving project organization for large-scale projects is to divide the entire site plan into many small zones, and management resources such as manpower, materials, and machinery must be satisfied. As described at figure 24, it is showed the organization structural model for large quality projects.

3.16.1. Innovation in Construction

When defining innovation, it's important to remember that it's not the same as invention (Burmester, 2005). Some define invention as a new product, while others define innovation as a new customer benefit. The conversion of cash into ideas is known as invention, while the conversion of ideas into cash is known as innovation. Projects serve as bridges between invention and innovation (Fagerberg et al., 2004). It is critical to recognize that construction innovation is not limited to new technological inventions in order to stimulate innovation in the sector (Slaughter, 2000).

Table 3.1: History of radical innovations in the construction industry

Period	Description	Benefits
18th Century – early 19th Century	Factory construction and metalwork improvements	Handwork was required to do less of the work. Increase in the speed with which a building can be completed
19th Century	The development of a high-speed electric elevator.	A quick way to get to the top of skyscrapers Efficiency and a low cost of installation
19th – 20th Century	New materials are being developed, such as structural steel and reinforced concrete	Steel is a durable material that is required for large scale construction projects interiors. Steel and concrete work together to create a strong support system that is less expensive than brick or other materials.
21st Century	Computer – aided design (CAD) first introduced	Design all kinds of projects with lower product development costs and faster drawing time.
Future	Environmental and sustainable development issues	For the construction industry, issues of sustainability have become increasingly important

According to the Civil Engineering Research Foundation CERF (2000), "the act of introducing and using new ideas, technologies, products, and/or processes aimed at solving problems, viewing things differently, improving efficiency and effectiveness, or enhancing the standard of living" is considered innovation in construction.

Table 3.2: Theoretical practices of innovation

Strategic Management	**Stakeholder's Management**
1. There is a clear vision that cares about innovation	1- Knowing the owners of the project and listening to their opinions
2. Establishing SMART objectives	2- Examine the "needs and constraints of projects needed to operate the mechanisms" of stakeholders
3. Formulating modern concepts of strategies	3- Resolving disputes through diplomatic means between stakeholders, if any
4. Conducting an internal audit and survey on an ongoing basis with regard to the factor of strength and weakness	4- Keeping in constant contact with government agencies such as the municipality, the Electricity Department, the Water and Sanitation Department, and others.
5. Conducting an external audit and continuously surveying the factors of opportunities, threats or influences	5- Knowing the extent to which stakeholders are satisfied with the progress of work
	6- The participation of stakeholders in the continuous development of the project as well as their participation in decision-making
	7- Maintain a good and continuous relationship and nurture it with confidence with stakeholders
Indoor work environment	**External work environment**

Table 3.3: Practical practices of innovation

Management and supervision of work cadres	**Environmental factors**
1. The satisfaction of the employees and workers by motivating them	1- Meet the requirements and needs of customers
2. Providing the appropriate internal and external environmental conditions in terms of services that include ventilation, lighting and others	2- Take advantage of the continuous development and new technology.
3. Encouraging employees to be creative at work by spreading a culture of creativity	3- Dealing in an administrative and rational manner with the changes that occur in society
4. Open and friendly management	4- Dealing in an administrative way with all changes, whether political or economic
5. Providing financial and discretionary rewards for good work.	5- Communicating and working with competitors in the labor market
6. Managing workloads to ensure employees have enough time for innovation to continue	6- Communicate and work with merchants or suppliers
7. Training the staff and workers continuously during the year	7- Rapid response to any changes that occur in the labor market, and therefore the ability to compete on an ongoing basis

3.16.2. Building information system (BIM)

BIM is a 3D digital representation of a building's physical and functional characteristics, with the ability to integrate a wide range of design and construction data such as cost, schedule, materials, assembly, maintenance, and energy use.

The process and management of various construction projects is known as comprehensive modeling or building information (BIM)

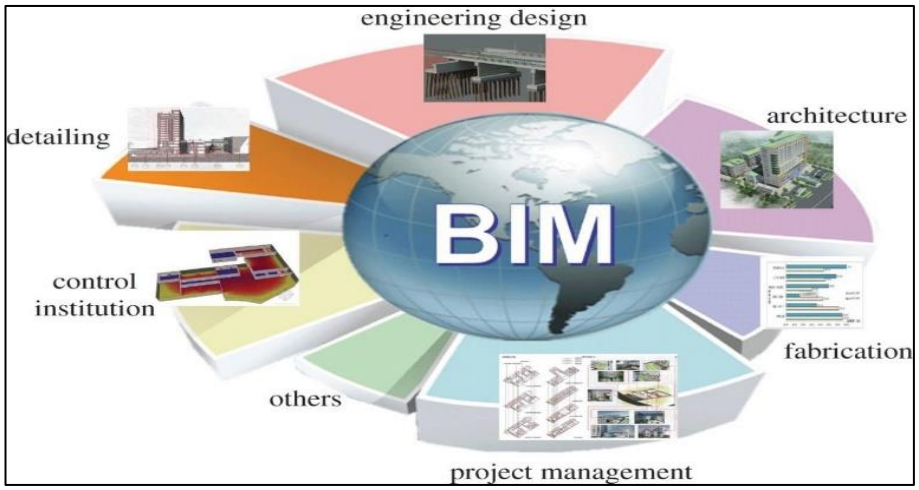


Figure 3.3: BIM system

BIM has established itself as a standard application technology. Participation professionals such as civil, steel, walls, mechanical and electrical, and others were integrated using the BIM platform. Furthermore, the model carrier integrated information from the construction process related to safety, cost, quality, schedule, contract, materials, and other factors. The BIM model can provide data support for cost control and materials management, allowing for effective fine management and a significant reduction in project costs.

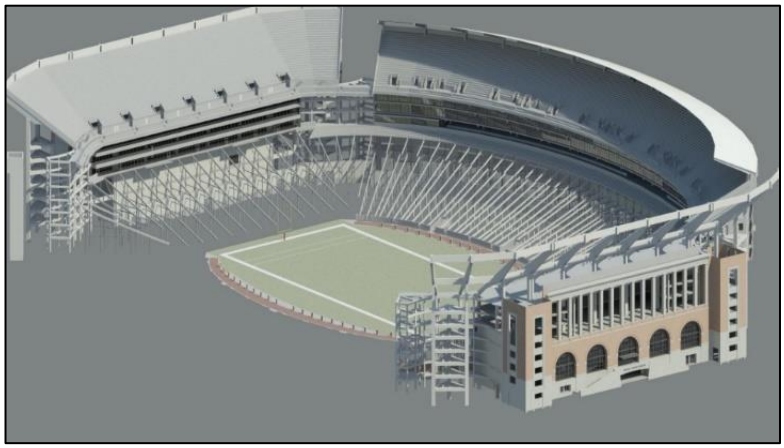


Figure 3.4: Projects by BIM/ Bryant-Denny Stadium – in development.

3.16.3. Example of structural project management

We present an overview of a structural project for a SHELBY HALL; Shelby Hall is one of the most advanced and modern research facilities in Ukraine, with an estimated area of 200,000 square feet.

Figure 3.5: Shelby Hall

The Shelby building’s architectural details and special materials were used. The university facility was built in the form of a pentagon with a dome 80 feet high above it. There are many architectural features of the building such as spiral staircases at the back of the building. What distinguishes the Shelby building is the construction The old gothic classic and how to merge it with nature

The data for each functions department came from the BIM Center, in addition to the fact that the directors of various departments were in charge of the department in question. In a nutshell, the BIM Center managed the project's data collection and shared it with the new organizational structure model. Furthermore, 3D models of the 18 single buildings were created, with the following parts of the 3D models described. The following slides are samples of B.I.M. files:

Figure 3.6: The University of Alabama

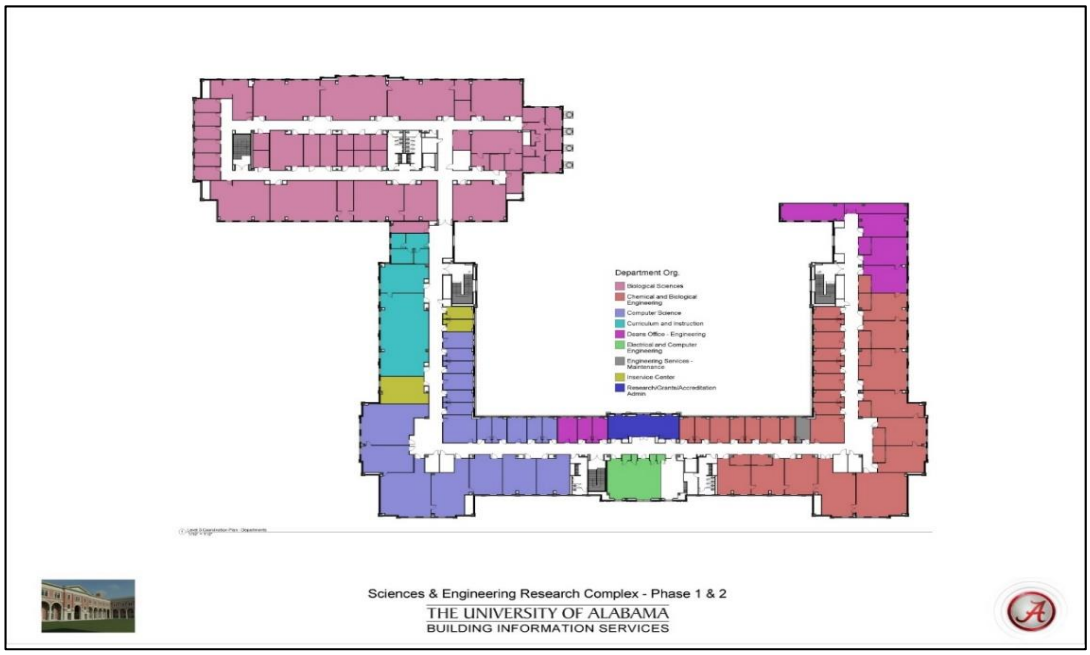


Figure 3.7: The University of Alabama

Figure 3.8: The University of Alabama

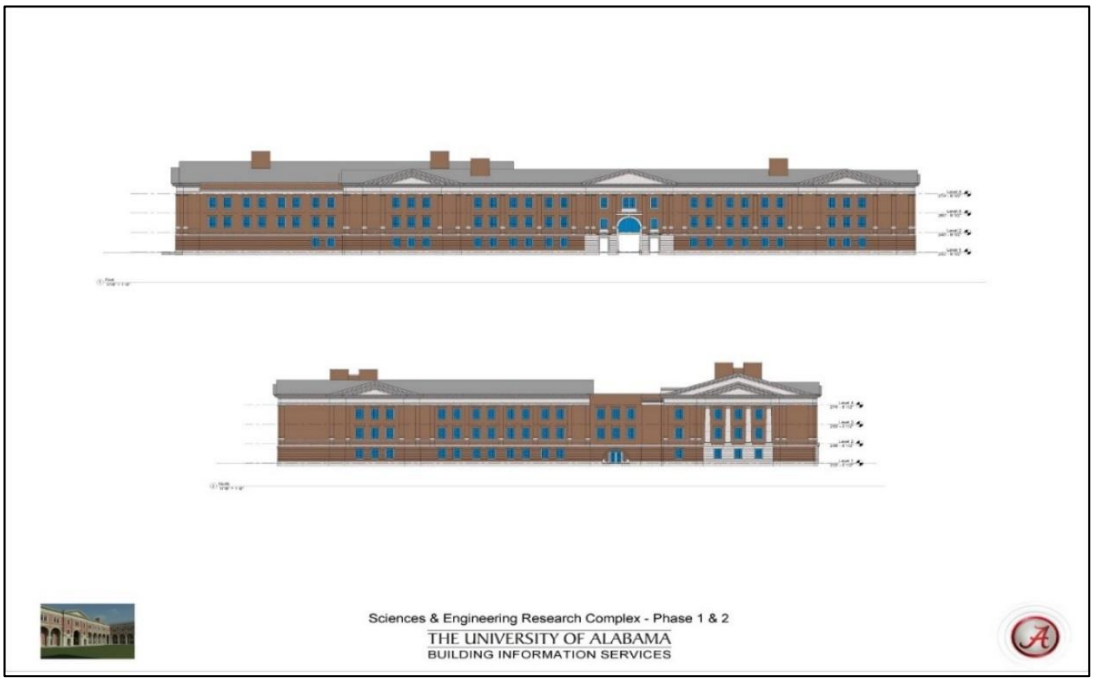


Figure 3.9: The University of Alabama

Figure 3.10: The University of Alabama – 3D view

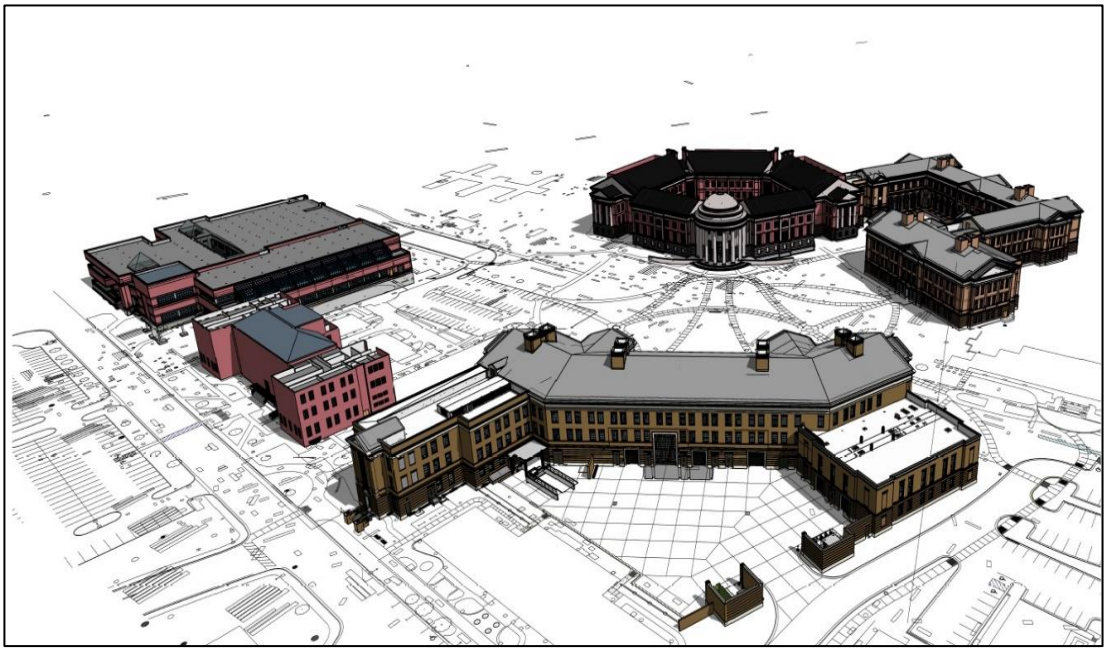


Figure 3.11: These are two aerial views of the SEC area of campus showing Shelby Hall, SEC, SERC, HM Comer and Bevill

Figure 3.12: The SEC area of campus showing Shelby Hall.

Or, here are some sample spreadsheets extracted from a BIM model. The difference between our table and the university data, and in one of the models, is directly related to our model and changes with the drawing, so the intersection between the two programs is different, some of the data we can path within our model is limitless. We may also create links within our data to link to Estus documents such as specifications, warranty information, and more.

Figure 3.13: BIM spreadsheet

Number	Name	Level	FICM	Capacity	Occupancy	Area	College	Department	Org. Name	Org. Number	Hazardous Materials
1301	Research Laboratory	Level 1	250 - Research/Non Class Lab.			597.14 SF	College of Arts and Sciences	Natural Sciences	Biological Sciences	204411	Contains Hazardous Materials
1302	Research Service	Level 1	255 - Research/Non Class Lab. Service			152.13 SF	College of Arts and Sciences	Natural Sciences	Biological Sciences	204411	
1303	Research Laboratory	Level 1	250 - Research/Non Class Lab.			899.05 SF	College of Arts and Sciences	Natural Sciences	Biological Sciences	204411	Contains Hazardous Materials
1304	Research Service	Level 1	255 - Research/Non Class Lab. Service			150.72 SF	College of Arts and Sciences	Natural Sciences	Biological Sciences	204411	
1305	Office	Level 1	310 - Office			620.20 SF	College of Arts and Sciences	Natural Sciences	Biological Sciences	204411	
1306	Research Laboratory	Level 1	250 - Research/Non Class Lab.			887.59 SF	College of Arts and Sciences	Natural Sciences	Biological Sciences	204411	Contains Hazardous Materials
1307	Research Laboratory	Level 1	250 - Research/Non Class Lab.			104.46 SF	College of Arts and Sciences	Natural Sciences	Biological Sciences	204411	
1308	Research Laboratory	Level 1	250 - Research/Non Class Lab.			97.14 SF	College of Arts and Sciences	Natural Sciences	Biological Sciences	204411	
1309	Research Laboratory	Level 1	250 - Research/Non Class Lab.			99.63 SF	College of Arts and Sciences	Natural Sciences	Biological Sciences	204411	
1310	Research Laboratory	Level 1	250 - Research/Non Class Lab.			110.33 SF	College of Arts and Sciences	Natural Sciences	Biological Sciences	204411	
1311	Research Laboratory	Level 1	250 - Research/Non Class Lab.			110.87 SF	College of Arts and Sciences	Natural Sciences	Biological Sciences	204411	
1312	Research Laboratory	Level 1	250 - Research/Non Class Lab.			117.79 SF	College of Arts and Sciences	Natural Sciences	Biological Sciences	204411	
1313	Research	Level	255 - Research/Non Class			137.72	College of Arts	Natural	Biological	204411	

	Service	1	Lab. Service			SF	and Sciences	Sciences	Sciences		
1314	Office	Level 1	310 - Office			171.54 SF	College of Arts and Sciences	Natural Sciences	Biological Sciences	204411	
1315	Office	Level 1	310 - Office			173.61 SF	College of Arts and Sciences	Natural Sciences	Biological Sciences	204411	
1316	Office	Level 1	310 - Office			169.56 SF	College of Arts and Sciences	Natural Sciences	Biological Sciences	204411	
1317	Office	Level 1	310 - Office			173.61 SF	College of Arts and Sciences	Natural Sciences	Biological Sciences	204411	
1318	Office	Level 1	310 - Office			166.57 SF	College of Arts and Sciences	Natural Sciences	Biological Sciences	204411	

4. RESULTS

The work of the architects is with the rest of the engineering departments that participate in a construction project, where the first step begins with the architects who design the spaces to meet the customer's need and also work on the design of the external appearance and the interior design of the project, then comes the role of civil engineers with all their specialties that enter In completing the project, they work to ensure that the design is safe and meets the purpose required of it

Figure 4.1: Architect and the engineers

And after the civil engineers comes the role of the rest of the engineering departments that participate in the completion of the project, where they study the final design of the project and make sure that the project is safe for people by choosing the construction materials and determining the main structural elements of the building, as well as determining the electrical, ventilation, heating and plumbing systems Air conditioning and the main factor that brings architects together with the rest of the engineering departments is the schemes that they design.

And the work of architects with the rest of the engineering departments is an overlapping work where their roles are unclear and overlap a little.

We will explain their work and their role.

4.1. Definition of engineer

He is the person who works to solve the problems facing the human being, as he makes innovations, construction and inventions that contribute to the development of human beings

Where engineers study mathematics, science, physics, and many more, and harness them for the benefit of humans.

And every engineering specialty has a role and utmost importance in society

Where architects work on design and creativity in the construction of buildings, structures, bridges, and others

And every engineering discipline is influential and important, Therefore, the jobs of engineers differ with each other, despite their similarity, differing in some details

The role of civil engineers and architects is intertwined with each other

Where civil engineers work in a variety of different projects from planning, construction, maintenance of roads and buildings, water systems, structural design of bridges and their durability, as well as the design of dams structurally and their durability and other important things in human life

While the work of architects is limited to designing homes, skyscrapers and other important projects, And both participate in the site to ensure that the work entrusted to them is completed in the correct manner and within an agreed period of time

Where the architects and civil engineers calculate the costs and create the architectural and construction plans for the project and also estimate the time period in which the project must be completed

Civil engineers choose the materials used in the construction of the project and supervise their examination

The role of the architect highlights the basic design aspect of the project, The architect must have sufficient experience in architectural design and have a very large imagination in order to create the design required of him.

And that he has great experience in cadd programs to create photographs of the project in order to facilitate work on them by the rest of the engineering departments and craftsmen

Also, the architect must have great creativity and a clear vision to ensure that the project is attractive to customers, and the architect is responsible for taking care of many parts of the project.

It must also be well integrated in aspects of architectural development, The architect must have extensive experience in the process of supervising the projects entrusted to him.

4.1.1. Job responsibilities of an architect include

- Giving organizational charts for the project structure
- Estimate the cost required for the project
- Estimated project completion time
- Drafting the required architectural designs and plans
- Presenting plans and ideas to the customer
- Work as required

The duties of the architect can be almost every stage of construction, where the work of the architect is in direct contact with the employer, in order to determine the total budget of the project, the specifications of the building that will be constructed, the building needs and goals, and the desired purpose of the building upon completion The design begins with a prototype that gradually develops at each observation or request from the project owner and comes up with a final idea. When choosing a construction site, the environmental effects and the amount of pollution that will be issued from the building are studied. Architects make plans according to the desire of the project owner, in which everything from structural systems and interior lighting, as well as plans for the types of building materials used, the architect works with interior and exterior designers to implement each stage of construction according to the agreed plans, and the plan must be reviewed The time and budget set is very necessary because construction projects rarely go according to the agreed plan, and architects and engineers from the rest of the disciplines must be flexible and adaptable when anything happens until the required project is completed.

Civil engineers are responsible for overseeing and designing roads, bridges, water systems, buildings, and dams, among other structures. Civil engineers spend the majority of their time in an office designing and planning projects, though they do visit construction sites to oversee the work being completed. Civil engineers work

with complicated designs where a background in math, as well as skills in problem-solving, can aid in finding solutions to issues that may arise with the development of projects.

4.1.2. Civil engineer responsibilities include

- View and test building materials
- Follow the instructions and beware of the risks that may occur in the project
- Continuous scanning of the site
- Periodic and continuous supervision of the maintenance of the project infrastructure
- Using modern software for project design and management

The architect works to focus mainly on the appearance of the project, while the rest of the engineering departments involved in the project focus on the safety of the project and meet the required purpose of it, as they work on selecting the materials required in building the project and working to ensure that the project is safe and does not pose a threat to People in and out. Such as:

Skyscrapers, their height and the enormity of their design

Dams must be of great strength because they bear the pressure of water and the salts that are in the water that affect the concrete pour

If you must use materials that meet the purpose required of them. Work was done on skyscrapers about 90 years ago, before the invention of concrete, the height of the buildings did not exceed 10 floors only because the material used in the structure was wood and bricks, so it could not bear higher than this height

The architects at that time had to have high-rise buildings, but modern materials and technologies did not exist, so the buildings were not high-rises. Over time, engineers began working on developing the materials used in construction (see Figure 42).

Where they started using steel beams, which is the important thing in building taller, stronger and more durable buildings, so skyscrapers began to rise

And modern cities with high buildings as a result of joint efforts between engineers in all their specialties and branches

Figure 4.2: Sturdy steel "I-beams" allow skyscrapers to be constructed

The architects wanted the buildings to be bigger, higher, and of great magnitude, and to put their creativity in them, and the rest of the engineering departments helped them, so it became clear that engineers in all their specializations are a complement to the other element. And it became clear that work in the field of construction begins with an idea from the architect that gradually develops to reach the final design according to the customer's desire, and the architect's scheme has a special name called the architectural scheme (see Figure 4.3).

The purpose of the scheme or design was explained above. The scheme is the first step in the process of starting to build the project

Figure 4.3: Architects discuss a blueprint

There are many engineering disciplines that work on different systems inside the building, such as air conditioning, ventilation, lighting, elevators, heating, plumbing, and others. This effort requires teamwork to design and equip an integrated building that meets the customer's desire for daily uses.

Furniture, window coverings, carpets, and others must be chosen in accordance with the customer’s desire and taste, as well as what reflects his personality. All these factors and goals that I mentioned when applied correctly will result in a high-accuracy project that meets the customer’s desire.

Both the architect and the engineer from other disciplines that participate in the project participate in the construction design process, whether it is a house or a commercial building. Where the architect draws master plans for buildings, skyscrapers, and other structures. The goal of designing is to meet the requirements of the customer, and to make the appearance of the project according to the customer's desire to meet the function required of him.

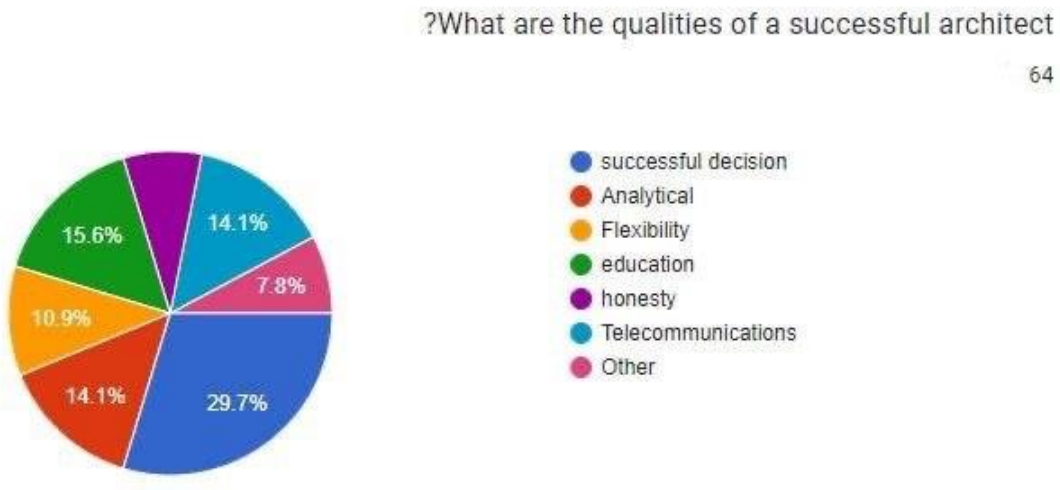


Figure 4.4: These are qualities of a successful architect, as readers of Construction Canada call them

Civil and structural engineers and other departments involved in the project are responsible for achieving the architect's design and taking it to the construction stage. The goal is to meet the requirements of the customer and make the design meet the purpose for which it was designed and also must be safe. The rest of the engineering departments who may be involved in the project construction process are electrical engineers for lighting systems, mechanical engineers for elevators, and plumbing engineers for the plumbing system, among others. The main difference between the architect and the engineer from the rest of the other departments is that the architect focuses more on art, design, creativity and getting their plans implemented on the ground, while the engineers from the rest of the departments focus more on the technical and structural aspect. While the architect is concerned with making the

building aesthetically pleasing, the architects make sure that the building is functional and safe. (There is of course a lot of overlap, but these definitions should give a general idea). Architects design a structure by keeping in mind the needs and requirements of the client. The engineers from the rest of the departments design the structure according to the architect's design, Including electrical drawings, structural planning, and plumbing, both architects and engineers use technical drawings called blueprints. Diagrams can be drawn manually or drawn on a computer using a computer-aided drawing program, such as AutoCAD or SolidWorks.

When the architect makes any design, he must analyze the design and choose the required building materials that support the structure safely before handing it over to the rest of the engineering departments, and come up with a decision whether these plans can be implemented or not and whether it is possible to build or not And he must be familiar with and aware of building materials because they have advantages and differences between them, such as the places where we need to put materials that are of high strength and the places where we need to put materials that are less strong and more flexible. For example, wood provides good strength and can be reduced in size easily. It is also oxidized and susceptible to burning and damage. Therefore, steel is stronger than wood and more practical, as it can be converted into long beams that contribute to the construction of skyscrapers and others. There are a lot of decisions and variables that interfere in every construction detail to design safe structures.

Engineers must keep pace with the development of materials as well as their properties, know their defects and their impact on design, and constantly search for new engineering technology.

For architects, they can make use of different means of communication, as this helps them express their ideas, aspirations and plans. And good design does not come out of nowhere, as many participants indicated that continuous communication with the rest of the disciplines and giving different perspectives helps the architect in the diversity and maturity of his ideas, and these ideas are reflected through the architectural design.

“An architect has to be able to describe ideas on very theoretical items to clients, but also speak technically with engineers and contractors,”

“People skills! There are a lot of personality types to manage in this business—from client to contractor—that require an even temper and the ability to smooth ruffled feathers,” said another.

At the same time, being a good talker helps with another aspect of the business—networking and the ability to pull in clients and projects.

Other qualities that came up several times included “analytical thinking,” “flexibility,” and “education/intelligence.” (On the less positive side, one person suggested the best asset is “a willingness to invest the sum total of their youth into a profession that is chronically undervalued.”)

Here are a few more responses:

“Creativity in finding esthetic, technical, and economic solutions.”

“Respect: respect for the client’s needs, respect for the relationship of the project with the physical and natural environment, respect for the budget, respect for the quality of life inside and outside the project, and respect for the properties of the materials used—all expressed without pretensions, simply, clearly.”

“Pre-tender co-ordination review between architectural floor plans and sub-consultant plans and details. With this not being done, it leads to many change orders, change directives, and site instructions that need to be tracked until the end of the project, leading to cost increases.”

“Architects need to be problem-solvers. The world is facing enormous problems that first need to be identified and analyzed before creating beautiful, economical, and simple solutions. Of course, the solutions also need to be marketed to make maximum impact.”

“The most important quality is to be reasonable. Exercise a reasonable standard of care in detailing construction drawings, specifying materials and systems, and in administering contracts between owners and contractors. Perfection is an idealized goal. Being reasonable is realistic.”

“The ability to look at a design problem holistically and keep the big-picture idea in mind through every phase of the project.”

“Finding the balance between private interests and public good in every project, and nudging clients ever closer towards the latter.”

“There are many ways an architect can be successful—I define success in architecture as making a significant contribution to at least one aspect of the profession throughout his or her career. This can take the form of marketing, client engagement, design, technical, or financial aspects of the practice. To be successful at any of these endeavours, the most important quality an architect must have is a passion that drives and sustains them in the pursuit of their goals.”

4.2. Engineers

On the engineering side, communication and the method of communication were very important and influential on the engineering level, followed by leadership and professionalism As with the architects.

Engineers from different disciplines assessed individuals' skills and information. “If we take technical excellence as a given, the ability to listen actively and understand what others are saying is the most important quality an engineer can have,” wrote one.

“Be honest, humble, respectful, and polite to employees and clients,” said another.

Practicality and flexibility are mentioned a lot, as well as the necessity of competition and lifelong learning, some qualities being honesty, calmness, constructive critical thinking and Here

4.3. Are Some Additional Reactions

“In my opinion, the most important quality of successful engineers is their emotional intelligence… the capability of individuals to recognize their own, and other people’s emotions, to discern between different feelings and label them appropriately, to use emotional information to guide thinking and behavior, and to manage or adjust emotions to adapt environments or achieve one’s goals…. By using emotional intelligence, an engineer can successfully manage the various relationships involved in a project to assist in that project’s completion. Emotional intelligence can allow an engineer to create positive relations and outcomes and ultimately create a successful business.”

“Clear, calm, methodical thinking with the ability to convey ideas and thoughts in a precise, understandable, and engaging manner. A successful engineer must be able to

both lead and mentor those around him and be committed to the success of the team. Successful projects are not the result of one engineer—they are the result of a successful engineer and his team."

"In my opinion, there is no way to call one of the qualities as the most important quality. It is a basket of qualities working together hand in hand that makes an engineer successful. This includes proper education, experience, and properly defined work responsibilities (and variations an engineer is allowed to manoeuvre on scope, time, cost, quality) … Above all, it means creating an honest and free-of-game-playing work environment for the engineer."

4.4. Reasons

4.4.1. Reasons for writing the thesis

- Poor planning.
- Not sticking to time.
- Lack of adequate coordination between engineering cadres.
- Lack of adequate coordination between engineering cadres and contractors.
- The lack of a performance measure to measure the performance of the workflow of the project.
- Failure to provide appropriate conditions for work cadres and employees.
- Failure to adhere to architectural plans.
- Technical and administrative problems.
- Work without a formal contract that guarantees the right of both parties (the owner of the money and the implementing agency).
- There are no laboratories to measure the materials used and their quality.
- Lack of good manpower.
- The effect of lack of experience in project management.
- Unrealistic requirements for money owners.
- Not calculating the total cost
- Poor judgment of time

4.4.2. The aim of the thesis

- The purpose of this thesis is to identify the close relationship between design and implementation, and it can be considered as an integrated system in general, and design is the process of creating a description of a new facility, and it is usually represented by detailed plans and specifications. The construction is the implementation of the design envisioned by architects and engineers as per their specialty.
- There must be a high coordination between engineers from the rest of the disciplines and architects to carry out many operational tasks with a variety of precedence and other relationships between different tasks.
- It is difficult to obtain an integrated project, there must be obstacles and errors within the project, so I referred in this thesis to a mechanism to solve these problems.
- Coordination between contractors and employers.
- Before starting the project, the total cost of the project and the time required to complete it, as well as the materials and specifications agreed upon according to the customer's desire, must be calculated to avoid future accidents.
- Drafting formal contracts that guarantee the rights of all parties
- Solve problems that occur when the project is late.
- Manage the work cadres in a professional manner.
- Addressing problems that occur on the site.
- Handling technical and administrative problems.
- The importance of this message stems from the planning, management and implementation of several projects at the agreed time.
- Managing time correctly, as time is an essential and important element in project management
- The architect can manage construction projects and not be a shortcut to the design and planning factor only.

- Upon receipt of the project, the total cost of the project, the time required to complete the project and the agreed materials are calculated according to the customer's desire to avoid future errors and problems.
- Advanced theories have been used to improve the workflow performance of the project.
- Calculate the number of worker hours required to perform each activity to estimate outage periods.
- Create a project schedule by evaluating the sequence of activities and resource estimates, in addition to the duration.

4.4.3. Discussion section

This study allowed the architect to manage the project professionally and not to be short on design and planning only, and also contributed to the study of time management, where time is considered one of the very important things in the project and not being bound by it, leads to many problems and losses. Delays by the Project Manager will be subject to fines or other related provisions.

Through the study conducted by the researcher in this thesis and the important issues related to project management, engineers can design, manage and implement different projects at the same time and according to the agreed dates. This study was able to address the technical problems that occur on the site from the management of labor affairs, providing the appropriate conditions for work, as well as meeting their needs and requirements, and addressing administrative problems that may be between engineering cadres or problems of validity between contractors and engineers, as well as solving problems that may occur with employers.

This study is concerned with the development of formal contracts that are between the owner of the money and the project manager, who in turn is responsible for all aspects of the work. Indicate the time required for completion, materials used in the project, and all specifications as desired by the employer to avoid any accidents or problems in the future. The plans are a future image of the facility, as for the construction (implementation), which is a process through which the plans are translated into reality, as well as identifying the activities and resources needed to implement them. The implementing engineer must comply fully with the engineering

plans and implement them in all their details and not change them except for the necessary cases or in the event of an error or problem in the plan. The projects are implemented with high accuracy if there is high coordination between the design engineer and the executing engineer, but it is very difficult to obtain an integrated project 100% and there must be minor errors and there must be implementation, design or administrative obstacles, and we have discussed the solution of these problems, if any.

This study showed that the main reason behind the delay in completing projects is poor planning, where bad project planning, poor schedule and wrong financial estimates contribute to the failure of the project.

This study focused on the real objectives of the project, which is to implement the project in the least possible time, with high quality and at a lower cost.

The study indicated that good coordination and cooperation between the parties to the construction process, including engineers, main contractors, subcontractors and suppliers, contributes greatly to the quality of the project and the duration of its implementation.

The study showed that the technical and administrative capabilities of the project and its workers facilitate the process of controlling the project completion time.

The study focused on the existence of criteria to measure the performance of the project with all its components that contribute to the success of the project.

The study focused on the motivation system for work cadres, motivating them, and cashing out financial and discretionary rewards for good work.

Providing internal and external environmental conditions in terms of services for workers.

4.4.4. Recommendations related to the results of the study

Among the reasons that contribute to the failure of the project and lack of integration in terms of planning, design and management

Some important recommendations can be suggested that help in the process of completeness of the project in terms of design, planning and management, and that contribute to the success of the project

1: The plans must be carefully studied to avoid mistakes that occur when implementing the project because the modification in the plans during the implementation of the project takes more time and increases in expenses more.

2: The presence of utilities (water, electricity, etc.) must be well checked before starting the project

3: When planning large projects, logistical matters (such as parking lots, gardens, etc.) must be accounted for.

4: When planning large projects, such as residential complexes, infrastructures (such as schools, clinics, and others) must be planned.

5: The project manager must be a professional and have good working staff

6: Correct time management and adherence to deadlines and agreements

7: Using well-tested and high-quality building materials

8: Continuous communication between the project manager and the owner of the money

9: Continuous communication between engineers and contractors

10: Contractors must be selected correctly, and the selection must be based on experience and honesty at work

11: Accurately calculate the cost before starting the project

12: Develop plans for work surprises

13: Paying attention to the exterior design of the building and emphasizing the history of the country

14: Attention to interior and exterior architectural details

4.4.5. The questionnaire and its results

We include the 50-person sample response if 10 projects are drawn, with 5 people per project

Respondents are

- Engineers with different specializations
- Project managers

- Executives
- Contractors

4.4.5.1. Integrated management of architectural projects

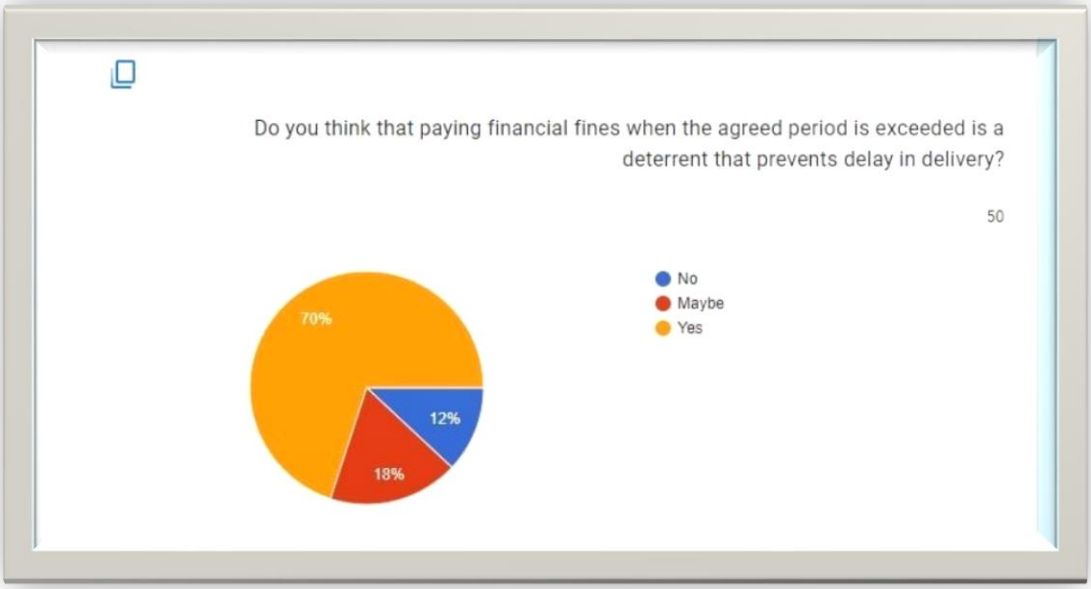


Figure 4.5: Do you think that paying financial fines when the agreed period is exceeded is a deterrent that prevents delay in delivery

Table 4.1: Distribution of answers to the question whether paying a fine when the agreed time is exceeded is a deterrent that prevents delay in delivery

The answer	The number	The ratio
No	6	%12
Maybe	9	%18
Yes	35	%70
The total	50	100

It is clear from the table that the frequency of answers in the (yes) category is high, and this indicates that most of the sample agree to impose financial penalties when the project is late.

By (70%), while the percentage of those who rejected it was (12%) and the percentage of respondents Neutrals (18%).

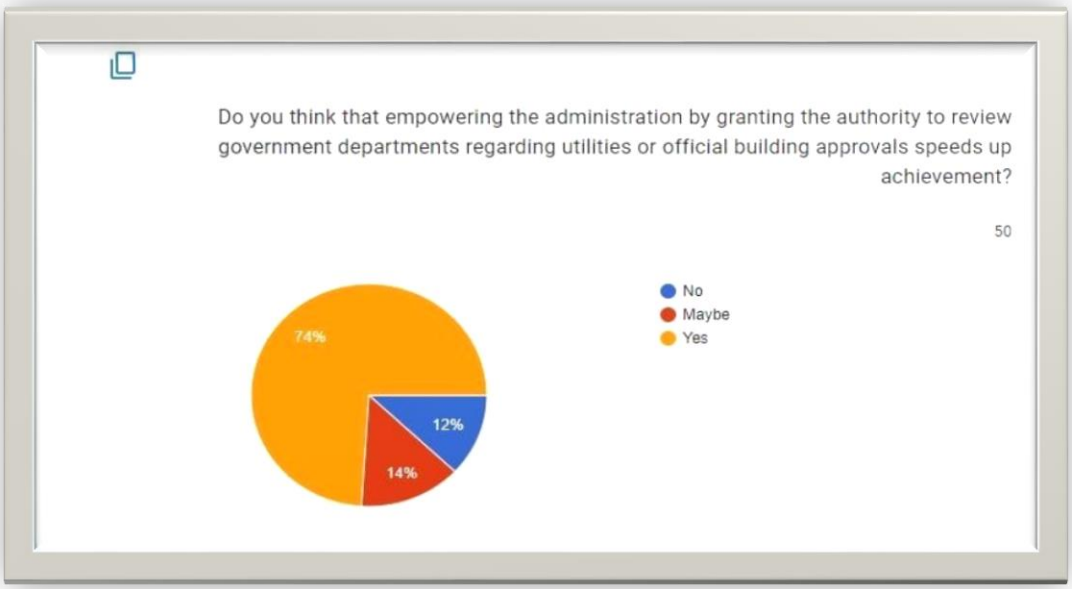


Figure 4.6: Do you think that empowering the administration by granting the authority to review government departments regarding utilities or official building approvals speeds up achievement

It is clear from the table that the frequency of answers in the category (yes) is high, and this indicates that most of the sample agrees to grant the authority or permission to the project management or the project executing agency from the review of government departments to speed up the project completion process. The percentage was (74%)

While the percentage of those who rejected (12%) was because they believed that the task of project management is limited to the implementation of the project only. The percentage of neutrals was (18%).

Table 4.2: Responses to whether strengthening administration by authorizing government departments to review utilities or official building approvals accelerates success

The answer	The number	The ratio
No	6	%12
Maybe	7	%14
Yes	37	%74
The total	50	%100

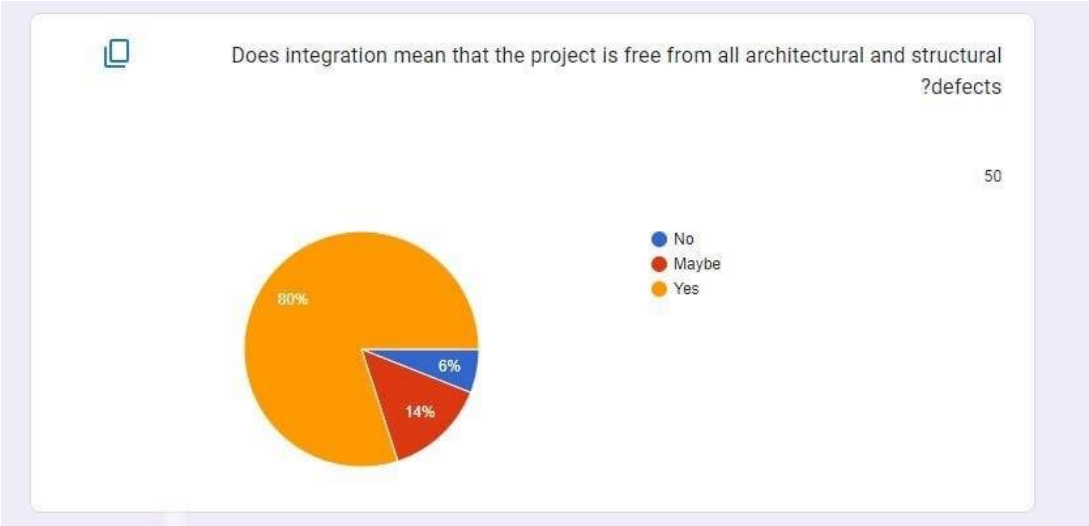


Figure 4.7: Does integration mean that the project is free from all architectural and structural defects

Table 4.3: Responses to the integration, whether the project is free from all architectural and structural flaws

The answer	The number	The ratio
No	3	%6
Maybe	7	%14
Yes	40	%80
The total	50	%100

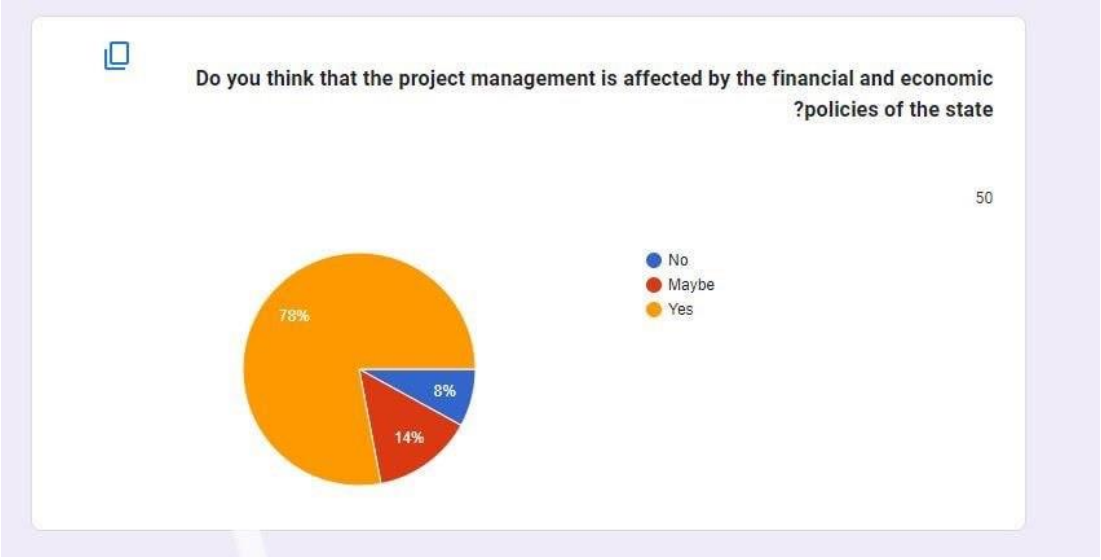


Figure 4.8: Do you think that the project management is affected by the financial and economic policies of the state

It is clear from the table that the frequency of answers in the (yes) category is high, and this indicates that most of the sample support that the state's economic downturn affects the work of projects, and the percentage reached (78%)

While the percentage of those who refused was (8%) because they believed that foreign investors are not affected by the country's economic downturn

The percentage of neutrals reached (14%), because they believe that it affects and does not affect at the same time.

Table 4.4: Answers to the question of whether the project management is affected by the financial and economic policies of the state

The answer	The number	The ratio
No	4	%8
Maybe	7	%14
Yes	39	%78
The total	50	%100

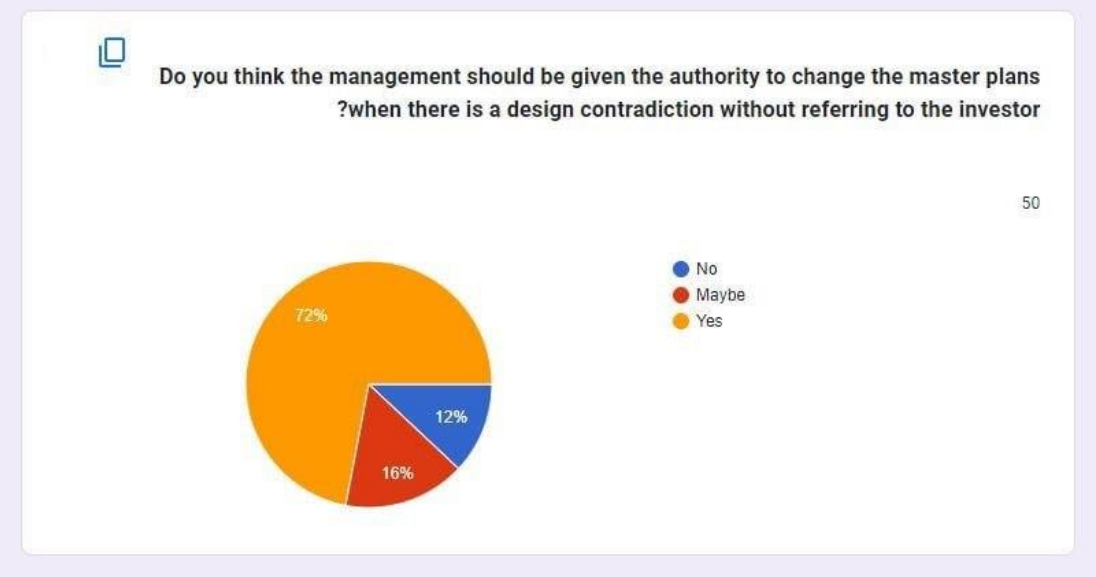


Figure 4.9: Do you think the management should be given the authority to change the master plans when there is a design contradiction without referring to the investor

It is clear from the table that the frequency of answers in the (yes) category is high, and this indicates that most of the sample agree to grant the administration the authority to change the project's basic plans when there is a problem or error in the scheme, and the percentage has reached (72%).

While the percentage of those who refused was (12%) because they believed that any change in the master plan without taking the investor's approval would cause a very

big problem between the administration responsible for implementing the project and the investor (the owner of the money).

The percentage of neutrals reached (14%), because they believe that it may or may not affect the project's work.

Table 4.5: Responses to whether the management can be authorized to change the master plans without consulting the investor in case of a design conflict

the answer	the number	The ratio
No	6	%12
Maybe	8	%14
Yes	36	%72
the total	50	%100

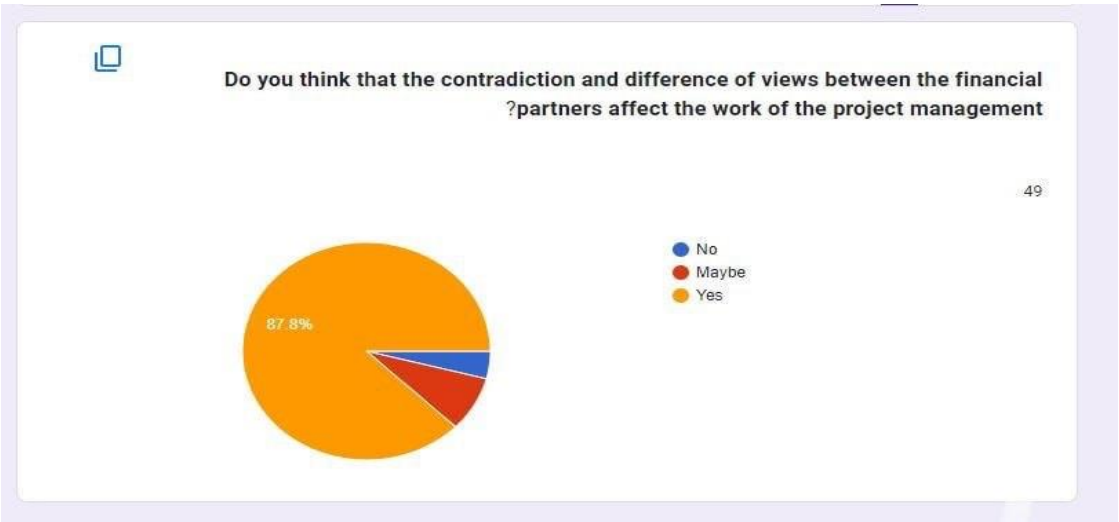


Figure 4.10: Do you think that the contradiction difference of views between the financial partners affect the work of the project management

Table 4.6: Responses on whether differences of opinion among financial partners affect the work of project management

The answer	**The number**	**The ratio**
No	**2**	**%4.2**
Maybe	4	%8
Yes	43	%87.8
The total	49	%100

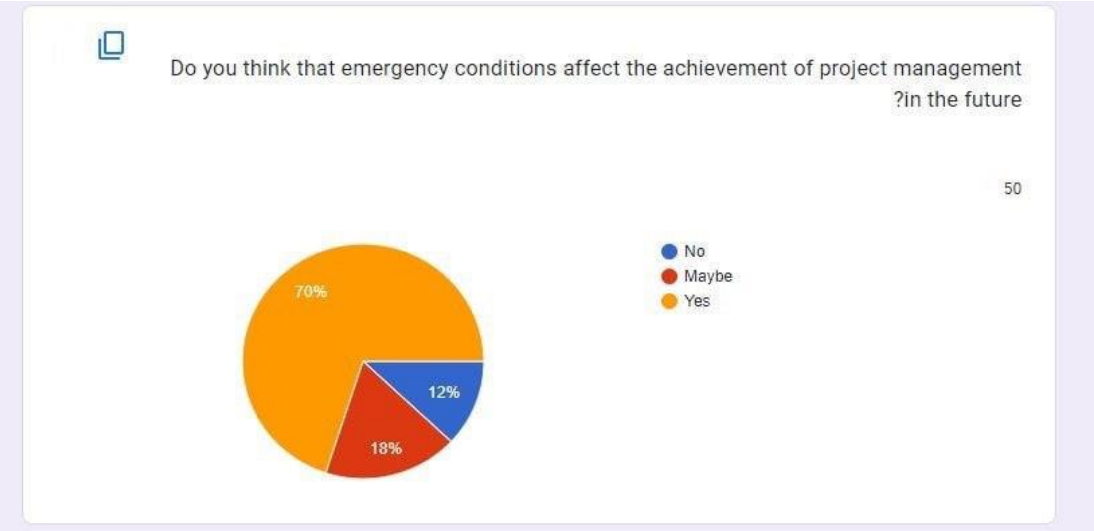


Figure 4.11: Do you think that emergency conditions affect the achievement of project management in the future

It is clear from the table that the frequency of answers in the (yes) category is high, and this indicates that most of the sample support that emergency conditions affect the project, and the percentage reached (70%).

While the percentage of rejectionists (12%)

The percentage of neutrals (18%) who believe that it may or may not affect the work of the project.

Table 4.7: Responses to the question of whether emergency conditions affect the success of project management in the future

The answer	The number	The ratio
No	6	%12
Maybe	9	%18
Yes	35	%70
The total	50	%100

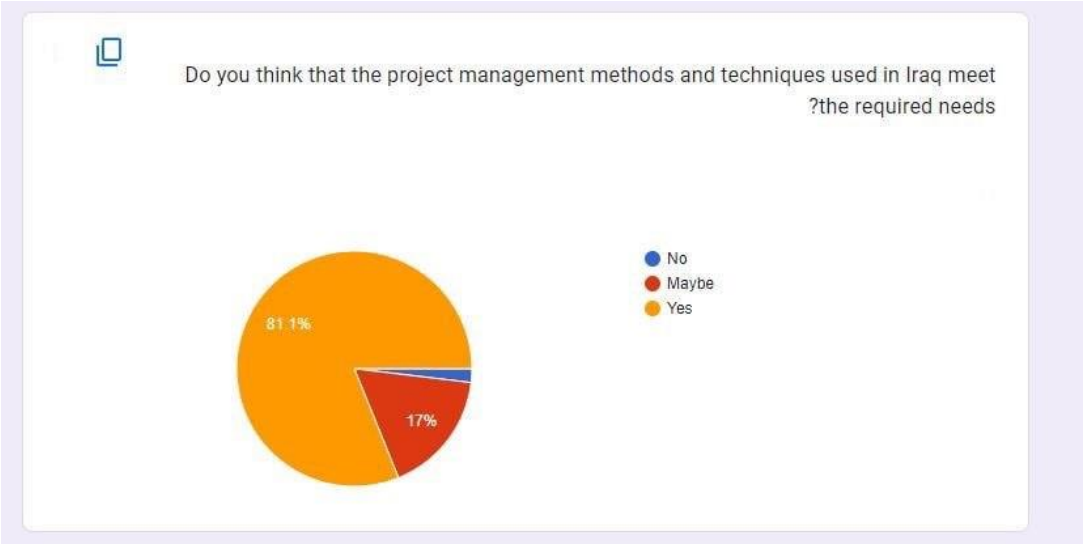


Figure 4.12: Do you think that the management methods and techniques in Iraq meet the required needs

Table 4.8: Responses about whether the methods and techniques in Iraq meet the necessary needs

The answer	The number	The ratio
No	2	%1.9
Maybe	9	%17
Yes	39	%81.1
The total	50	%100

4.4.5.2. Design for architectural projects

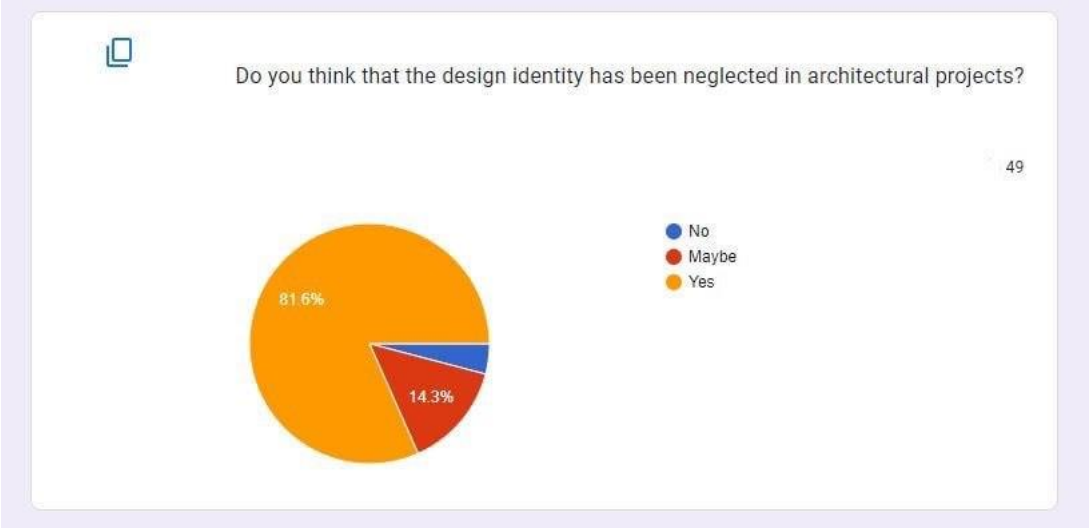


Figure 4.13: Do you think that the identify has been neglected in architectural projects

Table 4.9: Responses to whether identity is neglected in architectural projects

The answer	The number	The ratio
No	2	%4.1
Maybe	7	%14.3
Yes	41	%81.6
The total	49	%100

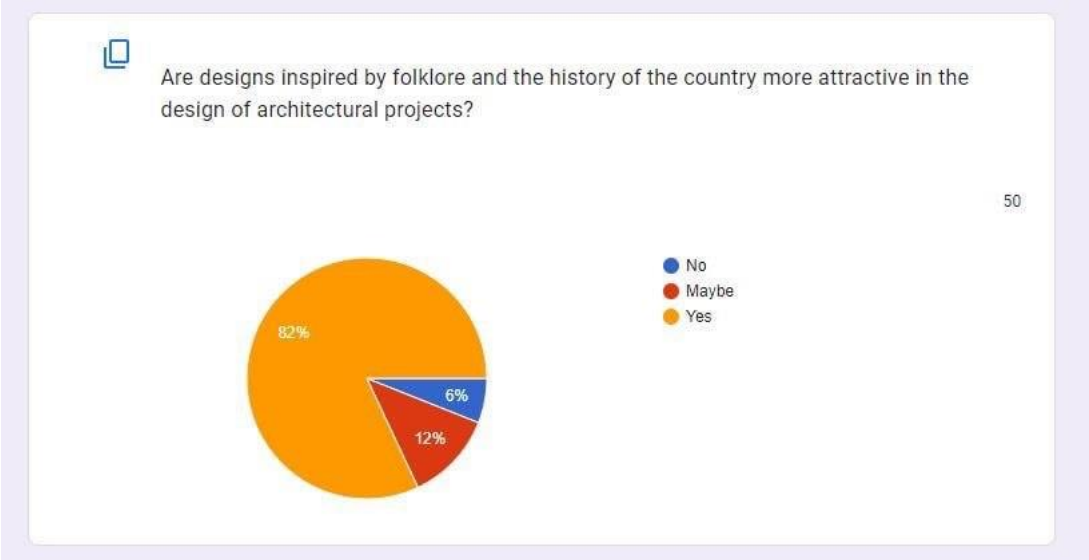


Figure 4.14: Are designs inspired by folklore and the history of the country more attractive in the design of architectural projects

It is clear from the table that the frequency of answers in the (yes) category is high, and this indicates that the majority of the sample support that designs inspired by the popular heritage of the country's history are more beautiful and better architecturally, and the percentage amounted to (82%).

While the percentage of those who rejected it was (6%). They believed that adhering to the old models of building does not contribute to the development of the construction process and does not contribute to the development of urbanization.

While the percentage of neutrals (12%) in favor of urban and structural development with its merging with the history of the country to come up with modern designs that mimic reality and give us a beautiful picture of the past.

Table 4.10: Responses on whether designs inspired by folklore and country history are attractive in the design of architectural projects

The Answer	The Number	The Ratio
No	3	%6
Maybe	6	%12
Yes	41	%82
The Total	50	%100

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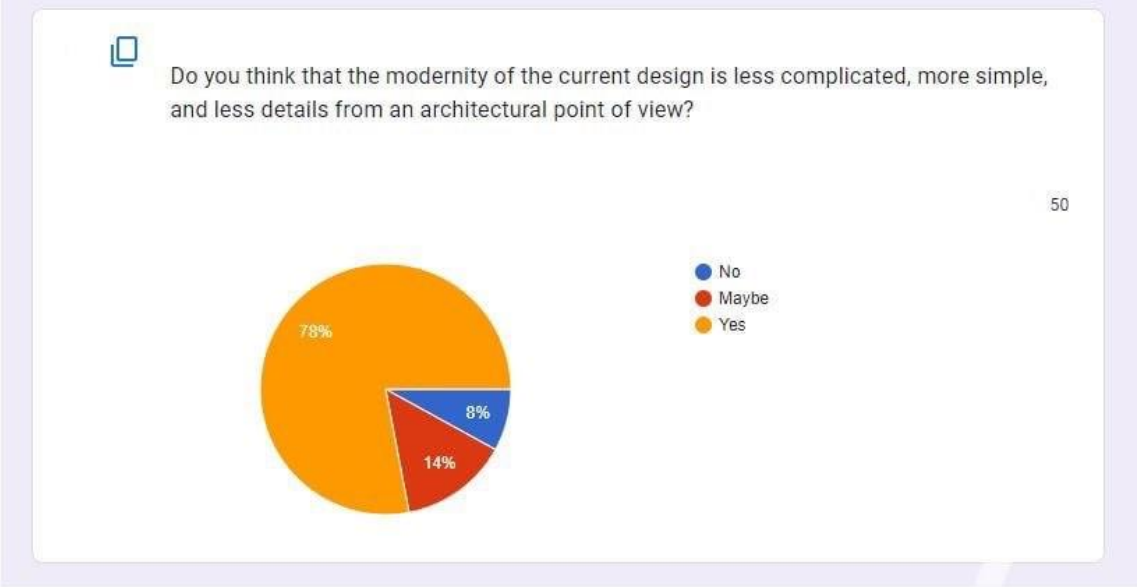

Figure 4.15: Do you think that modernity of the current design is less complicated, more simple, and less details from an architectural point of view

Table 4.11: Responses to whether the modernity of the current design is less architecturally complex, simpler, and less detailed

The answer	The number	The ratio
No	4	%8
Maybe	7	%14
Yes	39	%78
The total	50	%100

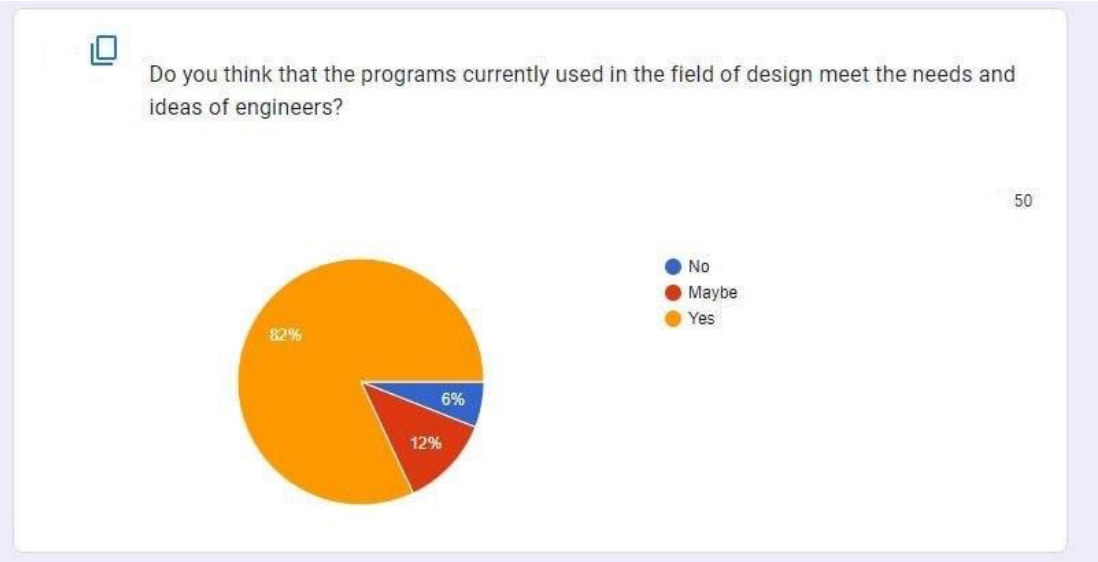

Figure 4.16: Do you think that programs currently used in the field of design meet the needs and ideas of engineers

It is clear from the table that the frequency of answers in the (yes) category is high, and this indicates that the majority of the sample support that the programs currently used in architectural design and in drawing engineering plans meet the purpose and are able to translate the ideas of architects into virtual reality, where the percentage reached (82). %).

While the percentage of those who rejected it was (6%). Where some engineers believed that there was a weakness in the programs and sometimes we encountered a problem in understanding the schematics or interfaces. While the percentage of neutrals was (12%).

Table 4.12: Responses to whether the programs used in the current design field meet the needs and ideas of engineers

The answer	The number	The ratio
No	3	%6
Maybe	6	%12
Yes	41	%82
The total	50	%100

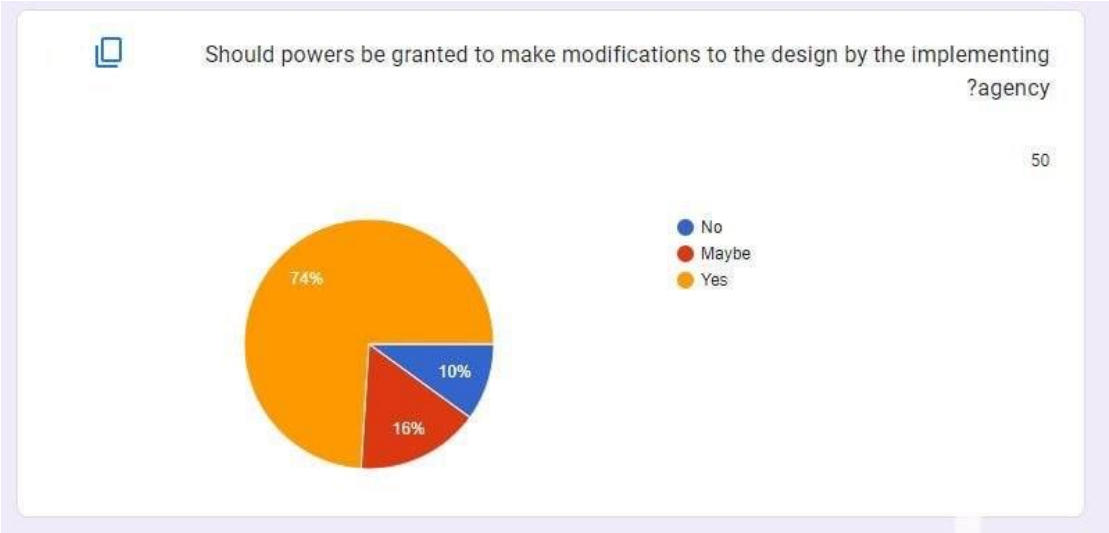

Figure 4.17: Should powers be granted to make modifications to the design by the implementing agency

Table 4.13: Responses to the case of authorizing changes in the design by the implementing agency

The answer	The number	The ratio
No	5	%10
Maybe	8	%16
Yes	37	%74
The total	50	%100

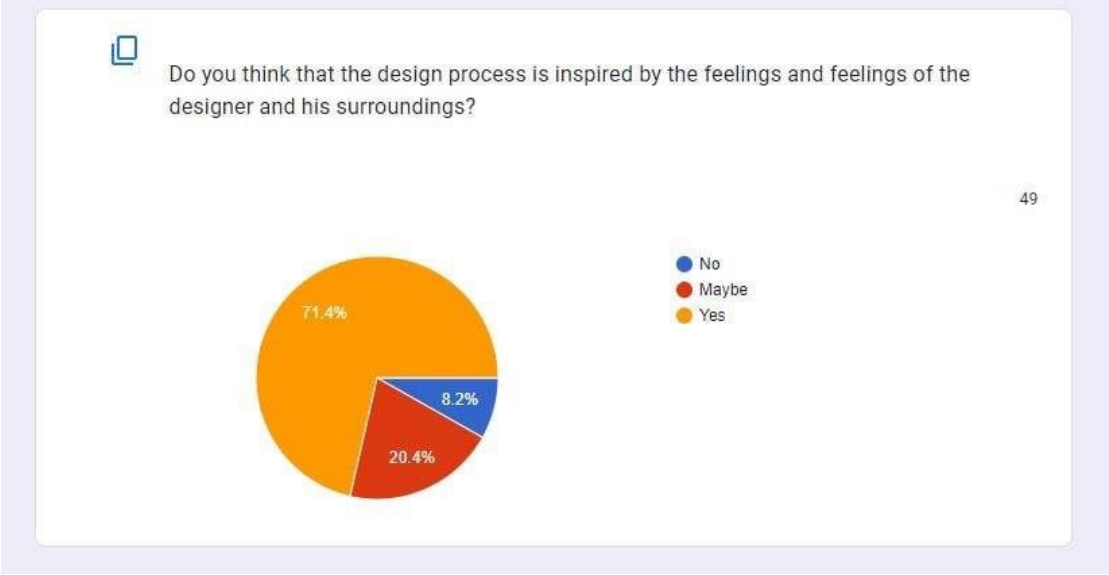

Figure 4.18: Do you think that the design process is inspired by the feelings and feelings of the designer and this surroundings

It is clear from the table that the frequency of answers in the (yes) category is high, and this indicates that the majority of the sample supports that the design process is inspired by the feelings and feelings of the engineer and his surroundings, as social. Factors affecting the design negatively or positively, amounting to (71.4%).

While the percentage of those who rejected it was (8.2%). Where some engineers and others believed that the design process is a very imaginative and natural process, as some mentioned that the design process has existed since ancient times, such as (the pyramids, the Great Wall of China, Sumela Monastery, the Gardens of Babylon and others). While the percentage of neutrals was (20.4%).

Table 4.14: Responses about whether the design process is inspired by the emotions and feelings of the designer and this environment

The answer	The number	The ratio
No	4	%8.2
Maybe	10	%20.4
Yes	36	%71.4
The total	50	%100

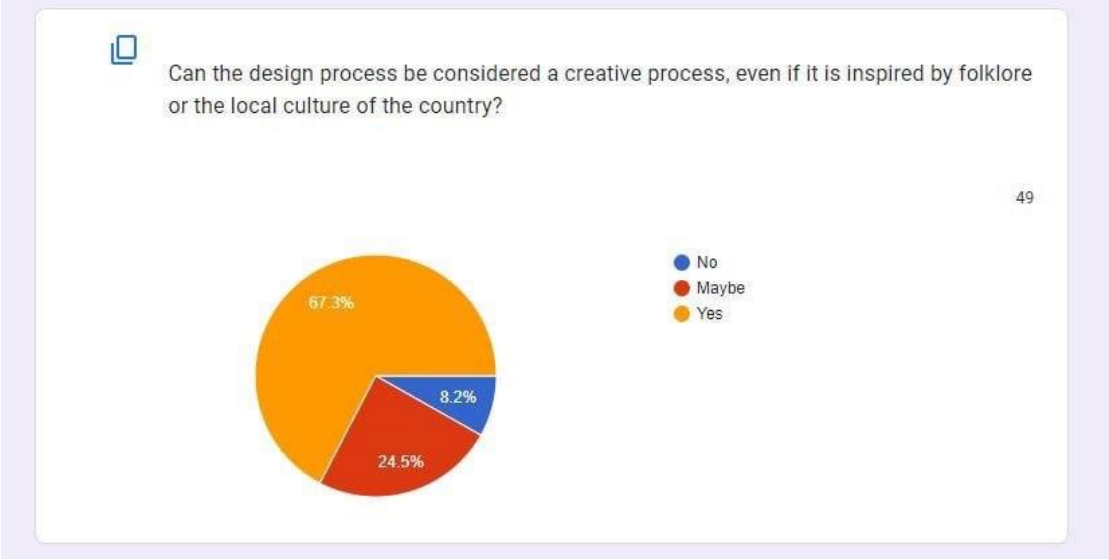

Figure 4.19: Can the design process be considered a creative process, even it if is inspired by folklore or the local culture of the country

Table 4.15: Responses to whether the design process can be considered a creative process, even if it is inspired by folklore or the local culture of the country

The Answer	The Number	The Ratio
No	4	%8.2
Maybe	12	%24.5
Yes	34	%67.3
The Total	50	%100

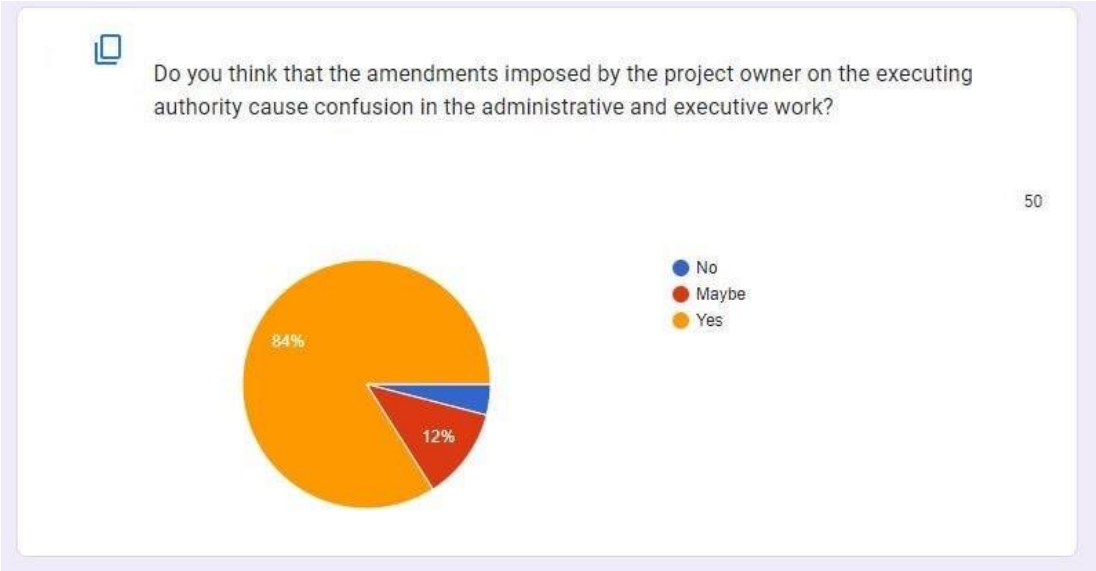

Figure 4.20: Do you think that the amendments by the project owner on the executing authority cause confusion in the administrative and executive work

It is clear from the table that the frequency of answers in the (yes) category is high, and this indicates that the majority of the sample that emergency modifications in the basic plans or in the facade scheme can create a state of confusion in the work and that there may be material losses such as the removal of walls or removal Termination materials and their replacement with others or many other obstacles, the percentage reached (84%).

While the percentage of those who reject it is (4%). They consider that the amendments imposed by the owner of the money do not affect the work of the project, as there can be an amendment and the work continues without stopping. While the percentage of neutrals (12%).

Table 4.16: Responses to whether the changes made by the project owner on the executive authority have caused confusion in administrative and executive affairs

The answer	The number	The ratio
No	2	%4
Maybe	6	%12
Yes	42	%84
The total	50	%100

4.4.5.3. Planning for architectural projects

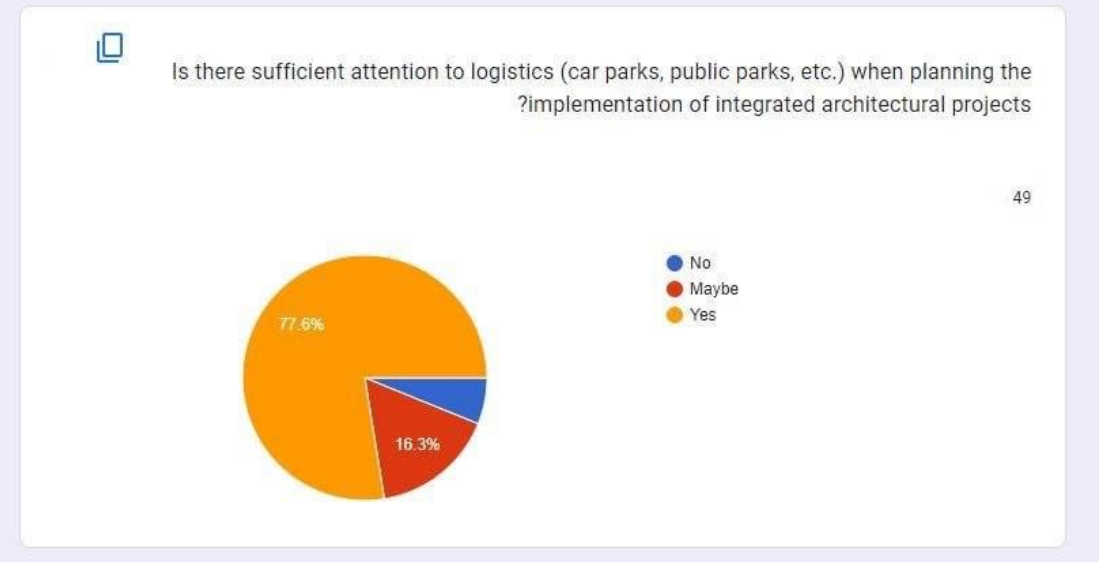

Figure 4.21: Is there sufficient attention to logistics (car parks, public parks, etc.) when planning the implementation of integrated architectural projects

It is clear from the table that the frequency of answers in the (yes) category is high, and this indicates that the majority of the sample believes that logistical matters are important and necessary in residential and non-residential projects. Where the ratio was(77.6)

While the percentage of those who rejected it was (6.1%). Some of those who gave the "No" category emphasized that there are many large and medium-sized projects that lack logistical matters such as (car parking and others). While the percentage of neutrals (12%).

Table 4.17: Responses to whether adequate attention was paid to logistics (car parks, public parks, etc.) when planning the implementation of integrated architectural projects

The answer	The number	The ratio
No	3	%6.1
Maybe	8	%12
Yes	38	%77.6
The total	49	%100

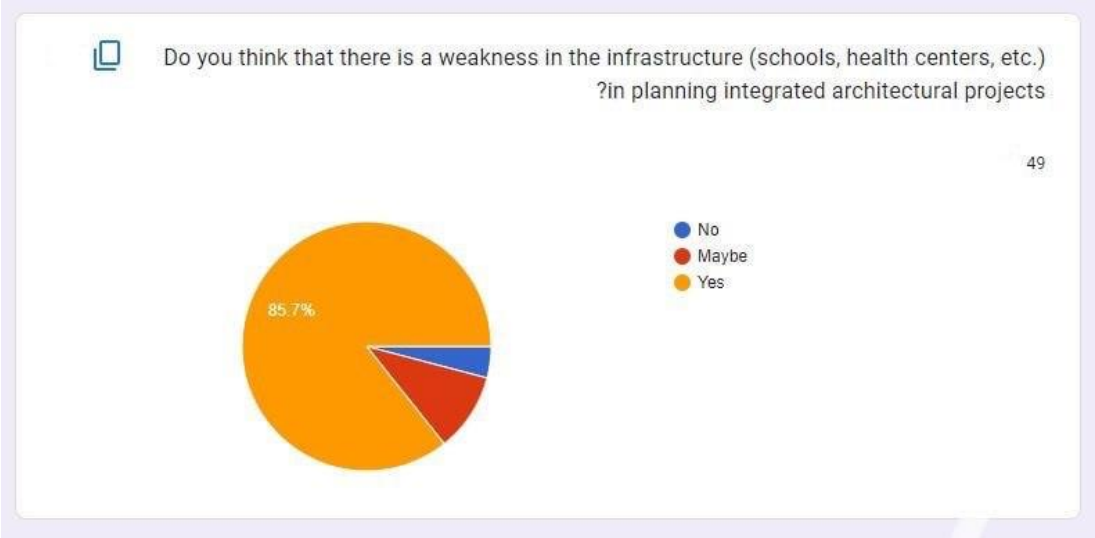

Figure 4.22: Do you think that there is a weakness in the intrastructure (schools, health centers, etc.) in planning integrated architectural projects

It is clear from the table that the frequency of answers in the (yes) category is high, and this indicates that the majority of the sample almost has weaknesses in the infrastructure of cities (schools, health centers, etc) Where the ratio was.(85.7)

While the percentage of those who rejected it was (4.3%). Some of those who voted in the category (no) confirmed that the urban infrastructure planning is integrated and does not contain planning errors. While the percentage of neutrals (10%).

Table 4.18: Answers regarding whether there is a weakness in the infrastructure (schools, health centers, etc.) in the planning of integrated architectural projects

The Answer	The Number	The Ratio
No	2	%4.3
Maybe	5	%10
Yes	42	%85.7
The Total	49	%100

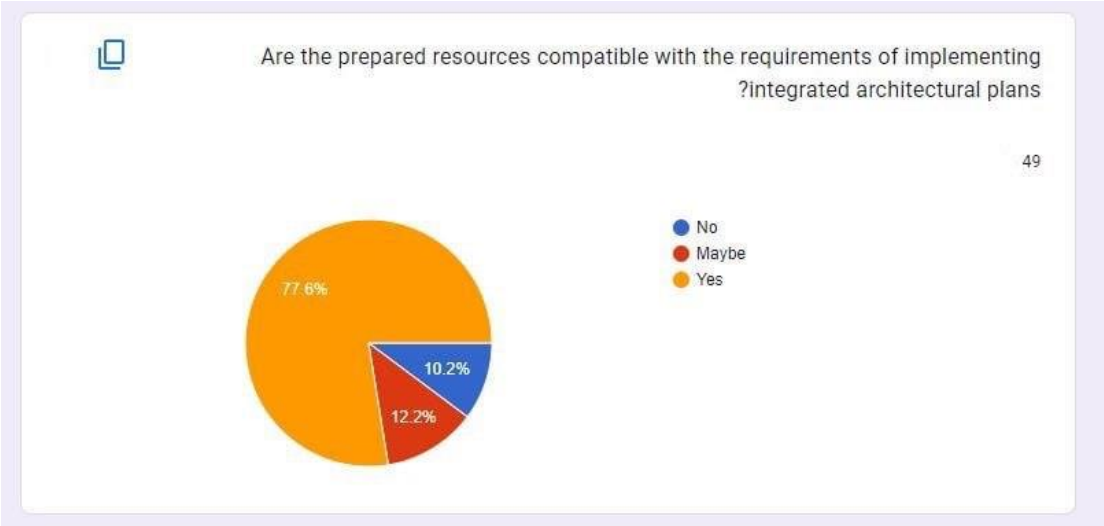

Figure 4.23: Are the prepared resources compatible with the requirements of implementing integrated architectural plants

Table 4.19: Responses on whether the prepared resources are compatible with the requirements for implementing integrated architectural facilities

The answer	The number	The ratio
No	5	%10.2
Maybe	6	%12.2
Yes	39	%77.6
The total	49	%100

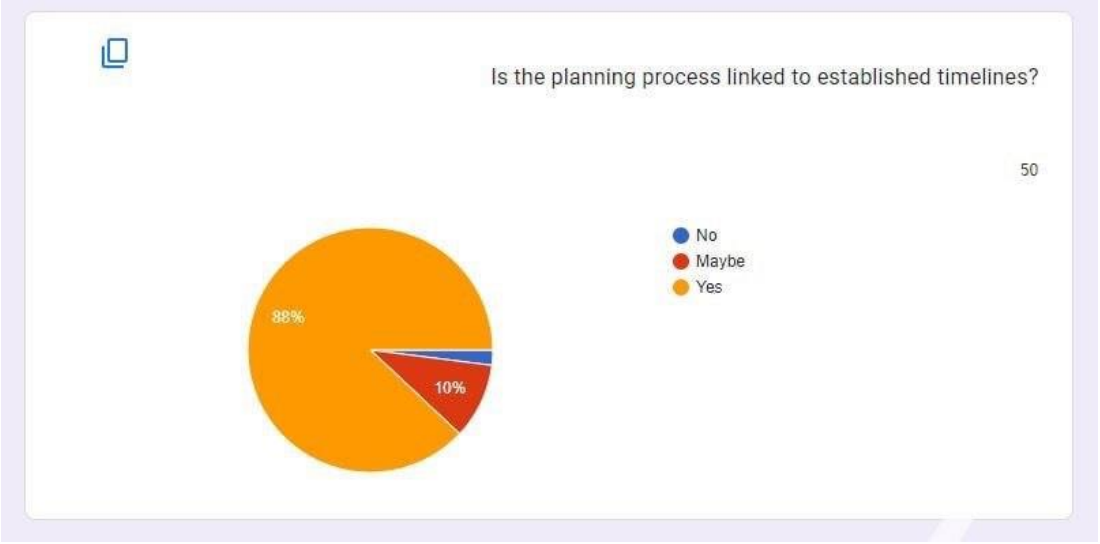

Figure 4.24: Is the planning process linked to established timelines

It is clear from the table that the frequency of answers in the (yes) category is high, and this indicates that the majority of the sample is that the planning process is

directly linked with the timetables and that any mistake in the basic planning will double the time and consequently the cost process will increase on the project or entity management executing the project.

Where the ratio was(88%)

While the percentage of rejectionists (2%).

While the percentage of neutrals (10%).

Table 4.20: Responses about whether the planning process is compatible with the determined timelines

The answer	The number	The ratio
No	1	2%
Maybe	5	10%
Yes	44	88%
The total	50	100%

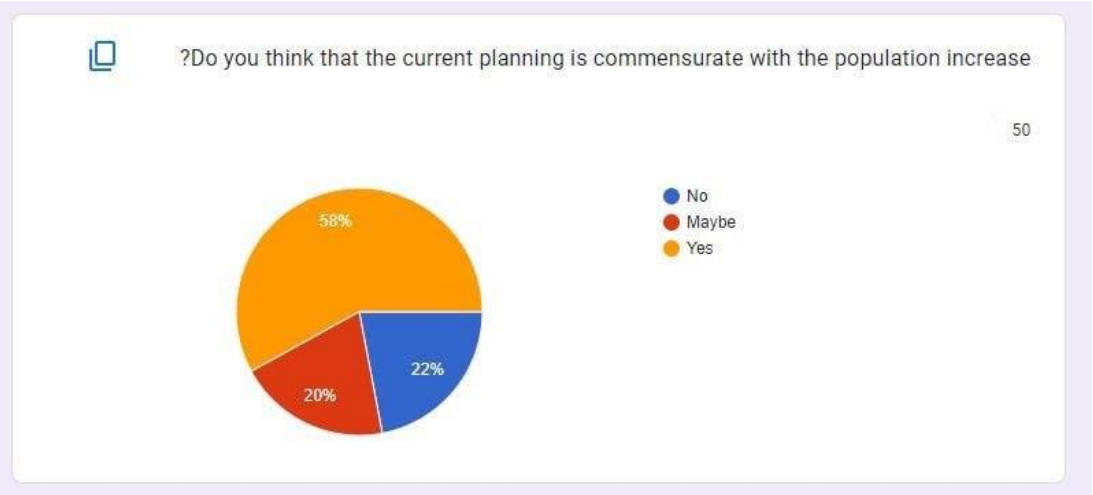

Figure 4. 25: Do you think that the current planning is commensurate with the population increase

It is clear from the table that the frequency of answers in the (yes) category is high, and this indicates that the majority of the sample believe that the current planning meets the population because Iraq does not suffer from a population crisis due to the presence of large empty spaces that are not independent by the state.

where was the ratio(58%)

While the percentage of those who reject it reached (22%.) Some engineers and some project managers believe that planning is not responsive to the population increase

and there are no future plans for the expected population increase. Some of the sample stated that Baghdad suffers from a severe housing crisis due to poor planning.

While the percentage of neutrals reached (20%). Some sample saw that there is a planning problem, but the solution exists and it can be worked on to avoid a future problem that will occur in the future.

Table 4.21: Answers on whether the current planning is proportional to population growth

The Answer	The Number	The Ratio
No	11	%22
Maybe	10	%20
Yes	29	%58
The Total	50	%100

5. CONCLUSION

5.1. Conclusion

The focus in this study is on the main reasons that contribute to the lack of project integration in terms of design, planning and implementation through the study of project management in general and knowledge of all aspects and administrative matters related to project management by setting a timetable for the project life process from its beginning (drawing plans) to its end (Completing the implementation of the project), the focus was mainly on the planning side and the design side, and knowledge of important and necessary matters is available in the design so that the design is good and effective from an architectural point of view. And also focusing on the planning aspect, where planning is considered (the cornerstone) of the project, and it also focuses on several things that must be available in projects during the planning process, such as (logistics, public utilities, and others).

A questionnaire was made in this study, and a questionnaire was taken for (10) projects, with (5) individuals for each project, and the respondents (engineers with different specializations, project managers, contractors).

Through the questionnaire results, data quality, sample adequacy, scale validity and reliability were tested and analyzed. The schedule management and planning process is also studied through the creation of schedules, cost schedules, work management schedules, assignments, and critical chain schedules.

The focus in this study was on the challenges and difficulties facing the project management during the implementation process and knowing all its details to avoid errors and accidents during work. The focus was also on studying the risks and knowing the risks that will occur on the site during the work. The study focused on drawing up official contracts between the owner of the money and the executing agency in a way that guarantees the rights of all parties. Emphasis was also placed on the most important factors, namely time management, through the creation of time

schedules that determine the start and end time of the project. The focus in this study is also on the joint work between the architect, engineering cadres and contractors, and knowledge of the duties and powers of each of them.

Through the data and results collected through the questionnaire, it was presented, analyzed, clarified and interpreted the response of the sample and the relationship between them.

This study focused on theories and their application in the workplace

The BIM information system was also studied and tested on a real project.

Through the study, the responsibilities and functions of the architect on the site and the way he works with the rest of the engineering departments on the one hand and his work with contractors on the other hand were determined to reach an integrated architectural project in terms of design, planning and implementation)

5.2. Study Results

- It is difficult to obtain a 100% integrated project, as there must be obstacles and errors within the project, so I referred in this thesis to a mechanism to solve these problems.
- The study showed that an architect can be a professional project manager.
- The study showed that the most important things that were neglected in the planning aspect are the logistical matters and public utilities.
- The study showed that most of the companies that design and implement architectural projects have neglected the architectural and historical identity in the exterior design.
- The study showed through the analysis carried out in the thesis (Chapter One, Chapter Two and Chapter Three) that the integrated management of architectural projects contributes to the development of plans that take into account the financial capacity, legal and logistical conditions, and external and internal environmental factors in the hands of workers, engineers, designers and others, all of which can be considered as determinants for the success of the architectural project.

- The study showed that there is a big problem in the field of (design, planning and implementation) of a large number of companies executing projects in Iraq, and that these companies do not have the ability to implement their plans in a real way as a result of their lack of planning culture and lack of understanding of the technical staff of the nature of the project and thus leads to Significant loss of project resources.
- The study showed that there is an administrative problem with the implementing agencies of the project in terms of neglect of planning, which landed them in a big problem and proved their inability to deal with the risks of the project.
- The study showed that there is a weakness in finding administrative coordination between the different project cadres.
- The study showed that there is a clear weakness among the companies executing projects in the field of architectural design and architectural planning.
- The study showed that most of the companies executing projects in Iraq are unable to set tight schedules for the project, and this matter contributed to wasting time and increasing the agreed period, and thus the increase in financial costs.
- The study showed that most companies or implementing agencies prefer personal financial benefit without focusing on the real objectives of the project.

5.3. The Beneficiary of This Study

- Architects in particular
- Engineers in general, each according to his specialization.
- It is used by the government sector to solve the problem of the lack of sufficient coordination between engineering disciplines and to solve the problem of lack of integration of projects in terms of design and planning.

- The private sector benefits from it due to the lack of coordination and communication between them and government agencies.
- Contractor companies.

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RESUME

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