Higher School of Commercial Studies



Final dissertation for the master's degree in Management science

Option : Management and Entrepreneurship

THEME :

An Analysis of the Project Management Process: From Project Initiation to Implementation.

Study Case : Realization of Service Stations "NAFTAL"

Submitted by :

BELKHALFA Houyam

BOUFERROUM Lina

Supervised by:

Professor MERARDA Kamel

June 2026

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Dedication

To our families,

Whose unconditional love, patience, encouragement, and constant support have formed the basis of our strength throughout the entire course of the studies. In difficult moments when we lost faith and confidence, you have supported us with your love and helped us move forward. All sacrifices that you have made for us and the words of comfort that you gave to us will always remain in our memory, as well as your prayers for our success. This achievement belongs to you at least as much as to us.

To our parents,

Who since childhood have taught us such values as perseverance, responsibility, honesty, humility, diligence. You explained to us that the result is not only important but also the way of achieving it and that each person should strive to do their best for this purpose. Thanks to your help and support throughout the years, we have achieved everything that we did during this period of time, and we would like to thank you for your education, wisdom, and moral principles that you instilled in us throughout the years and that led us through each step and page of this research.

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Who taught us many things, helped and encouraged us on our educational path, and made us think deeply about the problems and ideas we deal with. We want to thank all of you for everything and express special thanks to Professor MERARDA Kamel who, with his deep knowledge, strict attitude, patience, and desire to share knowledge with us helped us carry out this work.

To our friends and colleagues,

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Finally, and above all, we express our profound gratitude to our families, whose love, sacrifices, and continuous moral support have been the foundation of everything we have accomplished. This work belongs to them as much as it belongs to us.

Abstract

This dissertation examines the project management process at NAFTAL, a leading petroleum product distribution company and subsidiary of SONATRACH in Algeria, with a specific focus on the realization of service stations. The study covers the full project lifecycle, from the initiation phase through to implementation, and seeks to evaluate the effectiveness of the project management practices currently in place.

The research adopts a mixed methodological approach, combining quantitative analysis of internal financial documents with a structured questionnaire administered to staff involved in station realization projects. Three central hypotheses are tested: the influence of geographic location on station financial performance, the relationship between planned budget estimates and actual realization costs, and the sufficiency of the standardized project management process in guaranteeing project effectiveness.

The theoretical framework draws on established project management standards including the PMBOK Guide, PRINCE2, and ISO 21500, as well as models of process quality, organizational governance, and continuous improvement. The empirical findings reveal both strengths and limitations in NAFTAL's current approach, and practical recommendations are proposed to enhance the efficiency and effectiveness of the project management process.

Keywords: Project management, project lifecycle, process quality, project effectiveness, NAFTAL, service station, budget estimation, organizational governance.

RÉSUMÉ

Ce mémoire examine le processus de management de projet au sein de NAFTAL, principal opérateur de distribution de produits pétroliers en Algérie et filiale de SONATRACH, en se concentrant sur la réalisation des stations-service. L'étude couvre l'intégralité du cycle de vie du projet, depuis la phase d'initiation jusqu'à la mise en œuvre, et vise à évaluer l'efficacité des pratiques de gestion de projet actuellement en vigueur.

La recherche adopte une approche méthodologique mixte, combinant l'analyse quantitative de documents financiers internes et un questionnaire structuré administré auprès du personnel impliqué dans les projets de réalisation de stations. Trois hypothèses centrales sont testées : l'influence de la localisation géographique sur la performance financière des stations, la relation entre les estimations budgétaires prévisionnelles et les coûts réels de réalisation, ainsi que la capacité du processus de management de projet standardisé à garantir l'efficacité des projets.

Le cadre théorique s'appuie sur des référentiels reconnus tels que le Guide PMBOK, PRINCE2 et l'ISO 21500, ainsi que sur des modèles de qualité des processus, de gouvernance organisationnelle et d'amélioration continue. Les résultats empiriques révèlent à la fois des points forts et des limites dans l'approche actuelle de NAFTAL, et des recommandations pratiques sont proposées pour améliorer l'efficience et l'efficacité du processus de management de projet.

Mots-clés : Management de projet, cycle de vie du projet, qualité des processus, efficacité du projet, NAFTAL, station-service, estimation budgétaire, gouvernance organisationnelle.

ملخص

تتناول هذه المذكرة دراسة وتحليل عملية إدارة المشاريع في مؤسسة نفطال، المشغّل الرئيسي لتوزيع المنتجات البترولية في الجزائر والفرع التابع لمجمع سوناطراك، مع التركيز على مشاريع إنجاز محطات الخدمة. تغطي الدراسة دورة حياة المشروع الكاملة، من مرحلة الإطلاق إلى مرحلة التنفيذ، وتهدف إلى تقييم مدى فعالية ممارسات إدارة المشاريع المعتمدة حالياً.

تعتمد الدراسة منهجية بحثية مختلطة تجمع بين التحليل الكمي للوثائق المالية الداخلية واستبيان منظّم وُزّع على الموظفين المشاركين في مشاريع إنجاز المحطات. يتم اختبار ثلاث فرضيات محورية: تأثير الموقع الجغرافي على الأداء المالي للمحطة، والعلاقة بين التقديرات الميزانيات المخططة والتكاليف الفعلية للإنجاز، ومدى كفاية العملية المعيارية لإدارة المشاريع في ضمان فعاليتها.

يستند الإطار النظري إلى المعايير الدولية المعتمدة في إدارة المشاريع كدليل PMBOK و2PRINCE وISO 21500، فضلاً عن نماذج جودة العمليات والحوكمة التنظيمية والتحسين المستمر. كشفت النتائج الميدانية عن نقاط قوة وحدود في النهج الحالي لمؤسسة نفطال، وتم اقتراح توصيات عملية لتعزيز كفاءة وفعالية عملية إدارة المشاريع.

الكلمات المفتاحية : إدارة المشاريع، دورة حياة المشروع، جودة العمليات، فعالية المشروع، نفطال، محطة الخدمة، التقدير الميزانيات، الحوكمة التنظيمية.

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ABBREVIATIONS LIST

Abbreviation	Full Meaning / Definition
General Introduction	
H1 / H2 / H3	Research Hypotheses 1, 2 and 3 as defined in the dissertation's introduction
ISO	International Organization for Standardization : international body issuing quality and management standards
NAFTAL	Société Nationale Algérienne de Pétrole et Lubrifiants : Algeria's national petroleum product distribution company, subsidiary of SONATRACH
PMBOK	Project Management Body of Knowledge :PMI's reference guide to project management best practices
PRINCE2	Projects IN Controlled Environments (version 2) : UK-originated structured project management methodology
RACI	Responsible – Accountable – Consulted – Informed : matrix for defining team roles and responsibilities
SONATRACH	Société Nationale pour la Recherche, la Production, le Transport, la Transformation et la Commercialisation des Hydrocarbures :Algeria's national hydrocarbon company and NAFTAL's parent company
Chapter 1 — Foundations of Project Management and Project Processes	
CPI	Cost Performance Index:EVM metric measuring cost efficiency (Earned Value / Actual Cost)
CV	Cost Variance — deviation between earned value and actual cost (EV − AC)
EVM	Earned Value Management :performance measurement technique integrating scope, schedule, and cost
PMI	Project Management Institute: international professional association and publisher of the PMBOK Guide

SPI	**Schedule Performance Index :EVM metric measuring schedule efficiency (Earned Value / Planned Value)**
SV	**Schedule Variance :deviation between earned value and planned value (EV − PV)**
WBS	**Work Breakdown Structure : hierarchical decomposition of all project work into manageable components**
Chapter 2 — Theoretical Models of Process Quality, Governance, and Maturity	
CMM	**Capability Maturity Model : original maturity framework developed by SEI for software engineering processes**
CMMI	**Capability Maturity Model Integration : process-improvement framework developed by SEI**
CMMI-DEV	**Capability Maturity Model Integration for Development : adaptation of CMMI for development and engineering environments**
DMAIC	**Define – Measure – Analyze – Improve – Control : core Six Sigma methodology for process improvement**
KPI	**Key Performance Indicator :measurable metric used to evaluate the success of a project or process**
OPM3	**Organizational Project Management Maturity Model :PMI framework for assessing maturity across project, program, and portfolio management**
P3M3	**Portfolio, Programme and Project Management Maturity Model :OGC model evaluating maturity across seven management perspectives**
PDCA	**Plan – Do – Check – Act : Deming's continuous improvement cycle (also called the Deming Cycle)**
PMO	**Project Management Office :organizational unit providing governance, standards, and support for project management**
SEI	**Software Engineering Institute: Carnegie Mellon research center that developed the original CMM/CMMI models**
Chapter 3 — Empirical Study of the Project Management Process at NAFTAL	
AGREGAT	**Aggregate Revenue Forecast Model: NAFTAL's internal spreadsheet projecting annual income per product category over five years**

BAOSSEM	**NAFTAL's internal procurement register used to track tenders, offers, and all procurement processes for service station realization projects**
DA	**Dinar Algérien :Algerian Dinar, national currency of Algeria**
EBE	**Excédent Brut d'Exploitation : Gross Operating Surplus; measures cash-generating capacity before financial expenses, depreciation, and taxes**
FT-AMORT	**Fiche Technique d'Amortissement :NAFTAL's depreciation schedule tracking infrastructure and equipment assets at statutory rates**
GPLc	**Gaz Pétrole Liquéfié carburant : Liquefied Petroleum Gas for vehicles; NAFTAL's highest-revenue product line**
KDA	**Kilo Dinars Algériens : thousands of Algerian Dinars; the unit used for all financial figures in this study**
LPG	**Liquefied Petroleum Gas :English equivalent of GPLc**
NPV	**Net Present Value : discounted cash-flow metric for investment appraisal (see also VAN)**
PMIS	**Project Management Information System: digital platform for monitoring project schedule, budget, and risk in real time**
ROI	**Return on Investment :financial ratio measuring the profitability of an investment**
SPSS	**Statistical Package for the Social Sciences :IBM software used in this study for quantitative data analysis**
TCR	**Tableau des Comptes de Résultats :NAFTAL's projected income statement assessing station financial feasibility over five years**
TTC	**Toutes Taxes Comprises:all taxes included (VAT-inclusive price)**
VA	**Valeur Ajoutée : Value Added; economic value generated by station operations after deducting input costs**
VAN	**Valeur Actuelle Nette : Net Present Value; used in this study to evaluate the 20-year financial return on service station investments at a 6 % discount rate**
VAT	**Value Added Tax**

Summary

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Introduction

General introduction

In a world where the economy is getting more complicated and competitive, organizations need always to find ways to improve their performance and optimize the use of their resources. In industries where there are big investments and technical limits, like energy and distribution, project management has become a strategic role that has a direct impact on how well an organization works and how competitive it is. Projects are no longer seen as routine tasks, they are now seen as important ways to create value, come up with new ideas, and promote long term growth.

In this situation, organizations face a lot of problems, such as delays, cost overruns, coordination difficulties, and limits on their ability to make decisions. These challenges often come up because of both technical and also the weakness of the project management process itself. So the success of a project depends a lot on how the management process is done, how well it is set up, and how well it is followed through all stages of the project lifecycle, from planning to completion.

Structured and process-based project management depends on a set of phases including initiation, planning, execution, monitoring and control. Theoretical models stress the need for well-defined goals, realistic planning, effective monitoring systems, and quick decision-making processes. These elements are thought to be necessary for projects to be successful and useful. However, in real life, many organizations find that there are gaps between these theoretical standards and how they are actually put into practice, which causes problems with performance and efficiency.

In this context, the current study examines NAFTAL, a significant subsidiary of SONATRACH engaged in the distribution of petroleum products in Algeria. NAFTAL is in charge of carrying out strategic infrastructure projects, especially building and improving service stations all over the country. These projects require significant financial investment, multiple stakeholders, and strict regulatory and technical requirements. This makes project management a key factor in their success.

Even though there are formal procedures and organizational structures in place, NAFTAL still has many problems that make it hard to carry out projects. Delays in finishing projects, going over budget, problems with working together with other stakeholders,

And slow decision-making processes all point to possible problems with the project management process. These observations prompt significant inquiries concerning the efficacy of current practices and their alignment with established theoretical frameworks.

In this context, the title of this research is:

“An Analysis of the Project Management Process at NAFTAL: From Project Initiation to Implementation”.

To achieve this, the realization of a service station at NAFTAL was selected as the case study of this research. This choice is justified by NAFTAL's strategic position as the national leader in petroleum product distribution in Algeria, its active program of service station construction projects, and the direct access granted to us during our internship within its Executive Directorate of Strategy, Planning and Economy and Executive Directorate of Finance. The service station realization project thus serves as both the operational unit of analysis and the practical framework through which the three research hypotheses are empirically tested.

The primary research question directing this study is as follows:

How does the project management process for service station realization at NAFTAL, from initiation to implementation, influence project effectiveness?

From this main question, several sub-questions arise:

- To what extent does the geographic positioning of a service station influence its financial performance?
- How significant is the gap between planned budget estimates and actual realization costs in NAFTAL service station projects?
- Does the application of standardized project management process guarantee project effectiveness at NAFTAL?"

In order to provide answers to these questions, the following hypotheses have been formulated:

- **H1:** Service stations established in geographically advantageous locations demonstrate superior financial performance compared to those situated in locations with limited commercial potential.

- **H2:** The planned budget estimates for NAFTAL service station projects are consistently lower than the actual realization costs.
- **H3:** “Following the standard project management process at NAFTAL is not sufficient to ensure the profitability of service station projects."

The primary aim of this research is to scrutinize the project management process at NAFTAL and assess its influence on project efficacy. More specifically, the study seeks to pinpoint the strengths and weaknesses of existing practices, evaluate the congruence between theoretical models and practical application, and offer managerial suggestions to enhance the efficiency of project management processes.

This research topic was chosen for a number of reasons. First and foremost, project management is essential to the accomplishment of major infrastructure projects, especially those in the energy industry. Second, increasing the efficiency of project procedures can result in notable improvements in time management, cost control, and output quality. Lastly, the NAFTAL case offers a pertinent and useful framework for examining problems in the real.

In conducting this research, a quantitative research methodology was used in light of a case Study of NAFTAL. This is through two methods, which include a structured questionnaire, which was conducted among 37 professionals in two executive directorates. The second method involved analyzing four internal financial reports, such as AGREGAT, TCR, VAN, and FT-AMORT. This will allow the testing of each hypothesis by providing relevant and analytically justified findings.

This research is structured into two main parts. The first part is dedicated to the theoretical framework of project management. The first part includes two chapters:

Chapter 01: FOUNDATIONS OF PROJECT MANAGEMENT AND PROJECT PROCESSES

The primary ideas of project management were presented in this chapter, along with a definition of the project and its essential features. It highlighted the process based approach as an organized method of project management and described the project lifecycle. To demonstrate how projects are set up and run, the various stages:” initiation, planning, implementation, and control” were shown.

The theoretical foundation for examining project management procedures in action is given in this chapter.

CHAPTER 2: THEORETICAL MODELS OF PROCESS QUALITY, GOVERNANCE, AND MATURITY

This chapter examined the factors that influence the quality and effectiveness of project management processes. It emphasized how crucial organizational structure, governance, and process quality are to project success. In connection with process performance, the idea of project effectiveness was also covered. This chapter provides the analytical framework for evaluating project management in the empirical study.

The second part includes one chapter:

Chapter 3: EMPIRICAL STUDY OF THE PROJECT MANAGEMENT PROCESS AT NAFTAL

The empirical study that was carried out at NAFTAL to examine the project management procedure is presented in this chapter. It outlines the approach taken and emphasizes the key finding about the efficacy of the project. Additionally, it makes suggestions for better project management techniques.

Through this work, we aim to contribute to a better understanding of the relationship between project management processes and project effectiveness. While providing practical insights that can support decision-making and performance improvement within NAFTAL and similar organizations.

Chapter 01:
Foundation of project management and project processes

Chapter 01: Foundation of project management and project processes

Introduction:

In the contemporary, dynamic, and competitive business environment, organizations in various industries are increasingly using projects as the main vehicle for achieving their objectives and executing their strategies. Regardless of whether it is in the public or private sector, projects have emerged as the main vehicle for executing change, building infrastructure, and meeting stakeholder demands in organizations. Especially in industries where there are high investments and high operational complexities, such as in the energy and distribution sectors, project management has emerged as a strategic necessity that affects business performance and competitiveness.

However, it is impossible to engage in project management without first establishing a solid theoretical background for it. Before delving into the various approaches to project management, it is vital to understand what constitutes a project, how it is different from regular organizational activity, and which frameworks have been developed to manage it effectively. This calls for an in-depth examination of the fundamental concepts that define project management, from the vital characteristics of a project and the roles of key actors involved in it to the structured process frameworks and management phases of project execution.

Through an examination of the basic concepts of project management, the process-based frameworks in which project management is conducted, and the linear phases of project initiation, planning, execution, and conclusion, this chapter develops the conceptual underpinning for the rest of the thesis. Clearly understanding the basics of project management is an essential pre-requisite for any in-depth analysis of project management practices, theoretical or empirical. The chapter is structured in the following three sections:

Section 01: Fundamental Concepts of Projects and Project Management

Section 02: The Project Life Cycle and Process Approach

Section 03: Project Management Phases: Theoretical Description

Section 01: Fundamental Concepts of Projects and Project Management

1.1 What are the definitions and characteristics of a project?

1.1.1 The definition of “Project”:

Is it possible to affirm that project management is as old as history itself? The construction of the Great Wall of China and the Pyramids of Giza testify to the fact that, before the development of project management as a discipline, there were already goal-oriented undertakings, especially in the construction of monumental works. The permanence of these works is an indicator of the fact that the very essence of a project, as defined as a "temporary undertaking to produce a unique product," was present before the development of project management as a discipline.

The definition of "project" is found to be difficult, and its conceptualization is addressed on three distinct levels: Etymological, normative and practical perspectives.

- **Etymological perspective:**

The word "project" has its etymology rooted in the Latin word projectum," which is further related to the verb "projicere," meaning "to throw forward." This etymology embodies the essence of anticipation and forward-thinking, which is an inherent part of any project. Hence, a project may be defined as an attempt to influence the future by designing the present towards an intended goal.

The concept of project, which is rooted in the French and Latin cultures, focuses on intentionality, vision, and conceptual thinking. It is often related to strategic thinking, planning, and intellectual preparation before taking action. Under this perspective, a project is closely related to a plan that influences the future.

On the other hand, the concept of "project" rooted in the Anglo-Saxon culture emphasizes action, execution, and performance outcomes. This perspective is more operational and performance-oriented. Hence, this etymology of the word "project" reveals the two faces of the project concept: one related to vision and planning, and the other related to action and performance.

Thus, from the etymological and cultural perspectives discussed above, a project may be defined as an attempt to influence the future by designing the present towards an intended goal by developing a forward-thinking vision and an action plan towards desired outcomes.

- **Normative perspective:**

- PMBOK Definition (7th Edition): "*A project is a temporary effort to create a unique product, service, or result."* .[1]
- "An ensemble of coordinated and controlled activities with start and end dates undertaken to achieve an objective conforming to specific requirements, including constraints of time, cost and resources." ISO 21500:2021[2]
- "A management environment structured to plan, monitor and control the delivery of a specific set of products to a defined quality, within a defined time and cost".[3]

- **Practical perspective:**

From the practical viewpoint, the definition of the term "project" can be given in the following ways:

- A project is a series of coordinated activities designed to accomplish a particular goal while adhering to the constraints of time, cost, and resources.
- A project is a temporary organizational structure designed to accomplish a particular goal.
- A project is a process of solving problems with the ultimate goal of transforming the need or idea into a tangible product.
- A project is a series of planned operations and tasks that require the allocation of human, financial, and material resources.
- A project is a management tool used by organizations to execute management decisions and effect change.
- A project is the process of transformation, which converts inputs into outputs.
- A project is an effort involving multiple stakeholders who are brought together through the application of the mechanisms of planning, communication, and supervision.
- A project is the response of an organization to a particular opportunity or challenge, which requires the application of the process of decision-making.
- { A project can be considered to be any series of activities and tasks that:

[1] Project Management Institute (PMI), A Guide to the Project Management Body of Knowledge (PMBOK Guide), 7th ed., 2021.

[2] International Organization for Standardization. (2021). ISO 21500:2021 Management of projects, programmes and portfolios – Context and concepts.

[3] AXELOS. (2020). Applying PRINCE2: A guide to the PRINCE2 methodology (2020 edition).

- Have a specific objective to be completed within certain specifications
- Have defined start and end dates
- Have funding limits (if applicable)
- Consume human and nonhuman resources (i.e., money, people, equipment)
- Are multifunctional (i.e., cut across several functional lines) } [4]

- {projects are engines of progress. They are responsible for the vast majority of the forward progress and positive change we see in the world. Projects remain the best mechanism we have to turn our visions, goals, and hopes for the future into reality. And the men and women who lead them are the unsung superheroes of our time}[5].

1.1.2 Key characteristics of a project:

Apart from the numerous definitions that have been given to describe a project, there are certain fundamental characteristics that make a project unique from other activities or operations. These characteristics help in understanding the nature of a project and why it requires certain management practices. According to Amos Haniff & Mohamed Salama , the essential characteristics of a project are[6]:

- **Defined objective:**

Each project begins with an objective, which must be accomplished within specific constraints. This objective guides all activities in the project and offers a framework within which project management decisions are made. By having an objective, the various stakeholders are able to align themselves towards the achievement of the expected results.

- **Temporary nature:**

Projects are temporary in nature, having a specific starting point and ending point. Projects are not continuous activities like those found in organizations. Projects are undertaken on a temporary basis with the aim of attaining the desired objective. Once the objective is attained, the project comes to an end.

- **Uniqueness:**

Each project is unique in terms of context, objective, and results. Projects, however similar they are, are unique in terms of the environment, stakeholders, and resources. Each project is unique, and this uniqueness at times gives rise to some uncertainties.

- **Organized resources:**

Each project requires the organization of various resources, including human, financial, materials, and technological resources. Each project requires careful planning and management of these resources in order to attain the desired objective. Project management plays an essential role in the organization of resources with the aim of attaining the objective.

---

[4] Kerzner Harold,"Project Management: A systems Approach to Planning,Scheduling and Controlling Ed11", John Wiley & Sons, 2013, page 02.

[5] Schmidt Terry, " Strategic Project Management Made Simple ,Ed2",John & Sons, 2021, Introduction.

[6] Amos Haniff & Salama Mohamed," Project Management",Goodfellow Publishers, 2016, page 04

1.1.3 The triple Constraint of a project:

In addition to these characteristics, a project is defined further by a set of constraints that determine its realization. These constraints are normally represented diagrammatically by what is known as **the triple constraint triangle**[7]:

- **Scope:** it refers to the total amount of work that is required to be done in order to achieve the expected outcomes of the project. It clearly defines the project objectives, work to be done, and the project outcomes. Defining the scope ensures that the project produces the desired outcome.
- **Time:** it refers to the time required to complete the project. It includes the scheduling of activities, deadlines, and the order in which activities are to be performed in the project. Adhering to the time constraint is important to ensure that the project is completed within the stipulated time period.
- **Cost:** it refers to the funds required to run the project. It includes all the expenses that are incurred in the project, whether in terms of labor, materials, equipment, and other needs of the project. Controlling the cost is very important to ensure that the project is done within its stipulated budget.

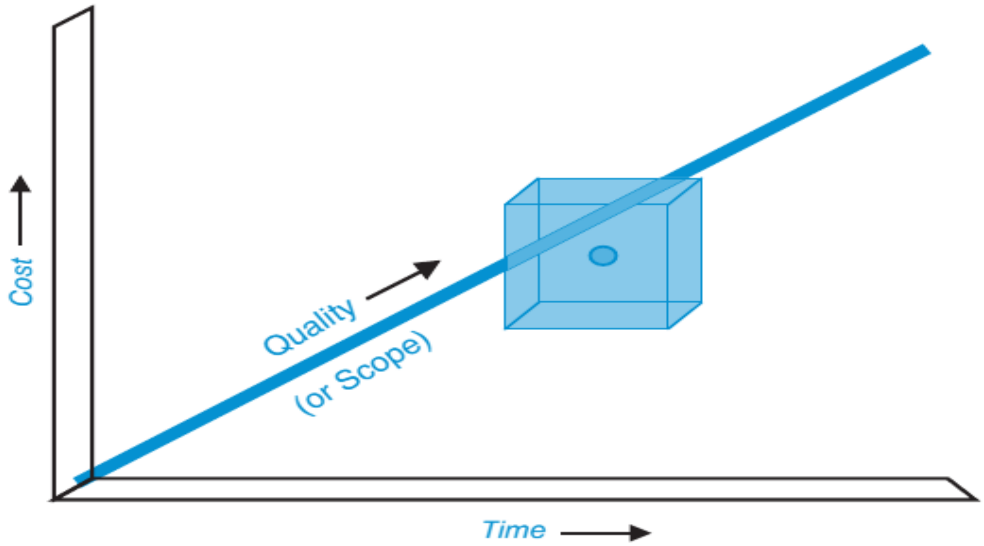


Figure N°01: the triple constraint triangle

Source: Heckscher Eli F. The continental system: An Economic Interpretation

1.2 Project Management and Its Objectives :

Management is considered one of the key elements of organizational operation and progress. In a constantly changing and increasingly complex environment, organizations need structured managerial practices for optimizing resource utilization and ensuring the achievement of strategic objectives. Regardless of the sector, whether industrial, commercial, or service-based, management is considered a key element for directing actions and ensuring

[7] Kerzner, Harold.. Project Management: A Systems Approach to Planning, Scheduling, and Controlling. 11th ed. Hoboken, NJ: John Wiley & Sons,2013.pages 71-73

organizational progress. In this general framework, project management is considered a specific form of management applicable to temporary and goal-oriented projects.

1.2.1 Definition of Project management:

The most comprehensive definition of project management is given by the International Organization for Standardization, ISO 10006, the 2003 edition, : "a particular approach, methodically and progressively structuring an emerging reality... a project is defined and implemented to develop a response to the needs of a user, client, or clientele, with a determined objective and actions to be undertaken with given resources."

Project management is the application of knowledge, skills, tools, and methods to the project's activities in order to respond to the project's requirements.

Project management covers the whole spectrum, from the mastery of planning and control techniques to the motivation of the team and the quality of the product or service.

1.2.2 The Evolution of Project Management:

Management has manifested itself in various ways throughout history. Its formal development can be traced back to the early twentieth century, when scholars like Frederick Winslow Taylor, in the USA, and Henri Fayol, in France, founded separate management schools whose ideas are still followed today. The development of project management is closely related to the overall development of economic science, industry, and management.

- **From Projects to Project Management across History:**

The formalization of project management as a discipline is said to have started in the mid-twentieth century. However, it is worth mentioning that before this formal conceptualization of project management as a discipline, monumental constructions such as ancient temples, defensive constructions, and even important expeditions existed.

The historical developments of economic change and management innovation eventually led to the formal conceptualization of project management as a discipline.

- **From the Anticipation Methodology to the Emergence of Engineers:**

During the Renaissance, architectural projects became more and more complex and required a certain level of planning. This move from a more improvised approach to construction to a more carefully thought-out plan represented a major step in development. Architects were no longer merely constructors, but rather designers who had to anticipate and organize the execution of a project. The emergence of engineers was another step in this process. In the seventeenth century, engineering schools were created in France under the direction of Jean-Baptiste Colbert to support development projects initiated by the state. Engineers, who were initially seen as servants of the king, used their scientific and technical expertise to undertake broad public works, particularly in the domains of transportation and infrastructure development.

- **Colbertism and the Introduction of Quality Logic:**

Colbertism, as propounded by Jean-Baptiste Colbert, represents one of the earliest rational economic ideologies. It emphasized the role of the state, regulation of production techniques,

and quality standards. Colbert was keen on ensuring quality in production and thus introduced the concept of quality logic[8].

This early emphasis on quality, regulation, and standardization can be seen as an early precursor of modern project management principles, especially with respect to quality.

- **Division of Labor: Adam Smith:**

Adam Smith proposed the concept of the division of labor in the eighteenth century. According to this concept, the efficiency of labor can be enhanced significantly.

This concept has influenced the formation of various organizational structures. In addition, it influenced the decomposition of projects. In decomposition, projects are broken down into smaller tasks that can be handled by different actors with different expertise[9].

- **Taylorism and the Scientific Organization of Work:**

Frederick Winslow Taylor developed the idea of scientific management at the end of the nineteenth century. The main ideas of Taylorism include: Vertical division of labor (separation of planning and execution), Horizontal division of tasks (specialization of tasks), and Performance-based compensation[10].

This idea directly influenced the project management techniques used today, including project planning, time management, and cost control.

- **Fayolism and Administrative Doctrine:**

While Taylor focused on efficiency in operations, Henri Fayol developed a theory of management as an administrative science. He recognized key functions of management as planning, organizing, commanding, coordinating, and controlling.

These are key principles in project management and supervision. Fayol's contribution shifted focus from operations efficiency to organizational coordination and hence set the stage for project management.

- **Fordism and Mass Production:**

Henry Ford developed the concept of mass production and assembly line systems. Fordism focused on productivity and minimizing costs and sought standardization of processes.

Fordism is based on continuous flow and task sequencing.

Although Fordism is based on industrial systems, it also promoted some of the key project management and supervision principles such as discipline in scheduling and workflow optimization.

- **Toyotism and Flexibility:**

[8] Eli F. Heckscher, The Continental System: An Economic Interpretation (Online Library of Liberty, 1922), 162-170.

[9] Adam Smith, Recherches sur la nature et les causes de la Richesse des nations, coll. « Classiques favoris » ,Paris: Les Belles Lettres, 2025, chap. 1.

[10] Hugh G.J Aitken, " Scientific Management in action: taylorism at Watertown Arsenal 1908-1915", Princeton University Press, 2014 , pages: 14-24

Unlike Fordism, Taiichi Ohno created the Toyota Production System, often called Toyotism. Toyotism focused on flexibility, eliminating waste, improving quality, and implementing just-in-time production.

The five zeros principle, often referred to as zero defects, zero delay, zero stock, zero breakdown, and zero paperwork, created a culture of constant improvement and resource utilization efficiency. These principles have greatly influenced modern adaptive and lean project management methodologies.

- **From Project Management to Project-Based Management:**

In the mid-twentieth century, the formalization of project management techniques occurred within the context of large engineering projects. However, by the end of the 1970s, the economic crisis, the pace of technological development, and the rise of market competition forced organizations to look for more innovative management techniques.

Thus, the traditional technical management techniques were replaced by the incorporation of planning techniques "hard" and management techniques "soft" such as leadership, communication, and organizational culture.

The dynamics of environmental changes, such as the pace of technological innovation, globalization, and the complexity of the market, required the organization to adopt more flexible forms of projects as a management strategy.

Consequently, the evolution of project management techniques from traditional technical management techniques to a more comprehensive management system can be noted.

1.2.3 The main objectives of Project Management:

The major goals of project management include ensuring that a project is completed successfully while meeting the requirements that are set. The main goals of a project management project normally focus on performance, efficiency, and the generation of value:

- **Achieving the Project Objectives:** The main goal of project management is to ensure that the project achieves the expected outcome. This is done by ensuring that the project is completed in accordance with the expected specifications and that the requirements for which the project is initiated are met.
- **Respecting the Triple Constraint (Time, Cost, and Scope)**: One of the main objectives of project management is to ensure the maintenance of equilibrium among the three main project constraints. These include the time constraint, in which the project is to be completed; the cost constraint, in which the project is to be executed within the allocated budget; and the scope constraint, in which all the components of the project are to be included. Effective management of the above project constraints is the basis of the success of the project.
- **Ensuring Quality of Deliverables**: Project management is aimed at ensuring that the product or service delivered is of the expected quality and that the requirements of the client or user of the product or service are met.
- **Optimizing the Use of Resources:** The efficient use of the available resources : human, financial, and physical; is another main goal of project management. This is to prevent wastage of resources.
- **Managing Risks and Uncertainties:** There is always uncertainty in every project. Project management is aimed at ensuring that all the possible risks in the project are anticipated in advance so that the impact of the possible risks is minimized.
- **Satisfying Stakeholders:** A project is always carried out in the presence of various stakeholders. These include the client, the project members, the project managers, and

the partners. One of the main objectives of project management is to keep all the stakeholders satisfied.

1.3 Actors and Stakeholders in Projects :

This process involves the integration of different actors with varying interests that contribute to the planning and successful completion of the projects. These actors or stakeholders play unique roles and influence the projects to varying degrees, making their identification and management critical to ensuring effective integration and informed decision-making during the entire duration of the projects.

Stakeholders are those individuals or groups that can influence or be influenced by the successful completion or implementation of a project. They are very important in determining the success or failure of a project.[11]

According to the PMBOK Guide provided by the Project Management Institute (2021), stakeholders are individuals or groups or organizations that may impact or may be impacted by or may perceive that they may be impacted by the decisions made or the outcomes of a project or activity.

This process involves their participation during multiple phases of the projects, which may impact the objectives, resources, or performance indicators used to measure their success or completion. Thus, the identification and analysis of stakeholders form a critical process during the initiation of projects to align with the strategic objectives while meeting the expectations that may be required.

1.3.1 Internal Stakeholders:

- **Project Sponsor:** Senior management has traditionally played the role of a sponsor within an organizational setting over the past two-plus decades. The sponsor tends to be a member of the executive tier and serves to facilitate communication between the contractor and client executives, ensuring that information is relayed without filter and that client funds are being properly managed. While the sponsor relays information with respect to costs and performance, the project manager provides information with respect to schedules and performance. In addition to their liaison role, the sponsor provides information with respect to the setting of objectives and priorities, organizational structure, policies and procedures, master planning, initial resource allocations, critical staffing needs, monitoring of execution, and conflict resolution. This responsibility varies throughout the life cycle of the project[12].
- **Project Managers:** In many cases, the project managers lack direct control over the resources of the projects they manage. This has made them engage in negotiations with the line managers with the aim of acquiring the resources necessary to undertake the project activities. When the role of the project managers is mentioned as involving control over the resources of the projects, the resources under their control are often considered indirect since they remain under the control of the line managers.
  In the past, the project managers were mostly engineers with high technical expertise. This high expertise over technology enabled them to manage the technical staff and

[11] Kristoffer Bellen,"Understanding Different Types of Stakeholders and Their Roles",Project-management.com , 06 May 2025, https://project-management.com/types-of-stakeholders/.

[12] Kerzner Harold,"Project Management: A systems Approach to Planning,Scheduling and Controlling Ed11", John Wiley & Sons, 2013, page 464

provide detailed guidance to the functional managers. In these cases, the line managers were more likely to allow the project managers to control the resources of their staff working on the projects. In these cases, the project managers were expected to not only coordinate the project tasks but also to manage the people working on the projects.

However, today the role of the project managers has changed significantly compared to what was expected of them in the past. Today, the project managers only have a general understanding of technology and not high expertise over technology as was the case with their predecessors. This has made the role of the project managers today shared with that of the line managers whose staff work on the projects under their supervision. This has made the line managers develop a better understanding of the practice of project management, which is the reason behind the majority of them seeking to acquire professional qualifications from the Project Management Institute. In this regard, today the project managers are only expected to manage the outcomes of the projects while leaving the task of managing the resources to the line managers. Another significant development is that project managers are increasingly being seen as being in charge of managing a part of the business of the organization rather than just managing a technical project. This implies that the project managers must be able to make appropriate business decisions in addition to making appropriate decisions for the project. This requires them to have a good understanding of the business principles. Project managers in the future may need to achieve appropriate external certification from professional bodies such as the Project Management Institute. Moreover, they may need to achieve appropriate internal certification in the business processes of the organizations.

Further, the rapid changes in technology have reinforced the need for project managers to have a business-oriented approach. According to Hans J. Thamhain[13]Today's project managers must be able to handle a wide range of complex issues. These issues include the increasing technological complexity of projects, the increasing global competition in the marketplace, the increasing resource constraints in the organizations, the need for high-performance requirements of the projects, the increasing changes in the marketplace, and the need for innovation. Project managers must be able to handle the increasing complexity of the organizations. Moreover, the increasing need for innovation in the organizations is another significant development. Project managers must have the ability to handle conflicts. Moreover, the increasing need for the use of information technologies is another development.

- **Project Team Members :** The project team consists of the members who are responsible for carrying out the activities that will help achieve the goals of the project. Members of the team are usually appointed based on their expertise, technical competencies, and experience relevant to the requirements of the project. With the guidance of the project manager, the project team contributes to the achievement of

[13] H. J. Thamhain," Management of Technology " ,Hoboken, NJ: Wiley, 2005, page 28 .

the outcomes of the project. The main goal of the project team is to execute the activities identified in the project plan while ensuring that the outcomes of the project are produced to the requirements, quality standards, and time set for the project. Members of the team will be involved in technical, operational, and administrative activities relevant to their specialization. Their activities could include design, analysis, construction, testing, documentation, or any other activities necessary to achieve the goals of the project.

Besides the accomplishment of the given task, the team members play a vital role in problem-solving and decision support. They are able to leverage their knowledge and experience to solve potential problems and improve the efficiency and effectiveness of the project processes. This helps the project team to easily cope with the challenges and unforeseen changes during the project lifecycle.
Good communication and collaboration among the project team are crucial elements to ensure the coordination of all the activities and team members involved. It requires the team members to cooperate and exchange information to avoid any delays and misconceptions among the team members. Besides, the team environment helps to improve the team members' motivation and commitment to the project goals.
Finally, the team performance is considered a key success factor for the project. When the team members are well-coordinated and motivated and the project manager provides the team with the necessary support, the team members are able to make a great contribution to the accomplishment of the project goals and the achievement of high-quality results.

1.3.2 External stakeholders :

- **The clients or the customers :** represent the primary external stakeholders, whose task is to initiate the project. They are responsible for commissioning the projects, which involves establishing the scope, objectives, and criteria for the projects. In most cases, the clients are the ones who provide the financial resources for the implementation of the projects.
  The primary responsibility of the clients is to ensure that the results of the projects are consistent with the needs and objectives that were initially established. To achieve this, the clients play a critical role in the decision-making process. They review the projects to ascertain that the work done is consistent with the contractual agreements. They also review the results of the projects to ascertain that the product or service delivered meets the standards required for the business.
  In addition, the clients are the ones with the mandate to request modifications to the projects where necessary. They are the ones with the mandate to approve major changes that may occur during the implementation of the projects. By monitoring the projects, the clients play a critical role in ensuring that the projects are consistent with the objectives.
- **Regulatory bodies:** refer to external project stakeholders who are responsible for ensuring that the project is implemented in compliance with existing laws and regulations. They may include government agencies or environmental authorities or other official organizations.

The major objective of regulatory bodies is to protect the interests of the public by ensuring that the activities carried out during the project implementation phase are compliant with existing laws and environmental concerns. In order to achieve their objective, regulatory bodies may involve themselves in reviewing project plans and authorizing or permitting project activities at different stages during project implementation. In the process, they ensure that the project is implemented in compliance with existing laws and regulations.

Additionally, regulatory bodies may involve themselves in auditing or evaluating project activities with the aim of ascertaining compliance with regulatory requirements during project implementation. In case they find that the project is not in compliance with regulatory requirements, they may require the project to be adjusted or suspended until compliance is achieved. In summary, regulatory compliance is important in project implementation, and regulatory bodies should be communicated with effectively in order to achieve project success.

- **Suppliers and contractors :** are the external business entities that provide the necessary materials, tools, service, or expertise required for the successful completion of the projects. They are usually appointed through contractual agreements that define the type of resources required for the projects, the level of quality, and the time required for the completion of the projects.

  The main responsibility of the suppliers and contractors is to provide the required resources, such as goods or service, as per the specifications and time limit agreed upon during the signing of the contract. This includes ensuring the timely delivery of the required materials with the required technical specifications, as well as the efficient completion of the assigned task within the stipulated time limit.

  In addition, the suppliers and contractors are responsible for organizing their own business processes to deliver the required resources for the successful completion of the projects. It is important for the suppliers, contractors, and the project team to work together efficiently, as this helps to prevent delays, operational risks, and ensures the successful completion of the projects.
- **End users** : represent the individuals or parties that finally use or benefit from the product, service, or output produced by the project. Although they may not directly contribute to the day-to-day implementation of the project, they remain key stakeholders because the success of the project depends on their satisfaction with the output.

  End users' major task is to express their needs, expectations, and preferences during the early stages of the project, particularly during planning and designing. This helps the team to understand how the output or product developed by the project team will finally be used or applied. Through their experience and insights, the end users can influence the designing process to make the output more effective and relevant.

  Additionally, the end users can take part in assessment or evaluation processes once the output or product developed by the project team is ready. This gives the team an opportunity to understand how to improve the output or product to make sure that the output or product developed meets the needs of the end users. In conclusion, the views and expectations of the end users should always be taken into consideration to ensure that the output or product developed meets the purpose of the project.

Figure 1 : Stakeholders in a Project



Source: Bellen Kristoffer;"Understanding different type of stakeholders and their role".

1.3.3 Stakeholder analysis and management :

It is a basic concept in project management. It involves identifying people, groups, or companies that may impact the project in some way or may be impacted by it in some way. It is through understanding the stakeholders and their expectations that a project manager is able to anticipate any challenges in the project and ensure a smooth flow of processes in the project.

The first step in stakeholder analysis and management involves identifying the stakeholders in a project. It involves listing all stakeholders, both internal and external, in a project and those who are interested in it. After identifying the stakeholders in a project, they are then analyzed using various factors, such as their level of influence, their interests, and their expectations.

After identifying the stakeholders in a project, a project manager carries out a stakeholder analysis to determine their level of power and their interests in a project. One tool that a project manager uses in this case is a power-interest grid. Using this tool, a project manager is in a position to determine the stakeholders in a project and their level of concern in a project.

Another key concept in stakeholder analysis and management is keeping a stakeholder register. It involves keeping a record of key stakeholders in a project, their expectations, their level of influence in a project, and their communication needs. Keeping a stakeholder register ensures that a project manager is in a position to manage stakeholders in a project.

Finally, stakeholder analysis and management involve communicating with stakeholders in a project. It involves ensuring that stakeholders in a project are kept abreast of any developments in a project. It involves keeping stakeholders in a project satisfied through communication in order to ensure a smooth flow of processes in a project.

Section 02: The Project Life Cycle and Process Approach

Having now established what a project is and who the actors in a project are, the next question is to consider how a project develops and changes over time. Every project, regardless of its size and/or complexity, moves through a series of stages from conception to completion. This is known as the project life cycle. The project life cycle and the process perspective that underpins the organization of project management activities within it are both critical to any approach to project management. This section discusses both concepts and concludes with an overview of the major international standards and reference models that have been developed to support their use.

2.1 The Project Life Cycle:

One of the most important concepts in project management is that of the project life cycle. The project life cycle is the framework within which all project activities are carried out and enables project managers and their teams to know where they are in a project at any given time and what to do next.

2.1.1 Definition of the Project Life Cycle:

The project life cycle refers to a set of phases that a project travels through from its initiation to its closure. According to the PMBOK Guide 7th Edition, "The project life cycle is a set of phases that a project travels through from initiation to closure. Each phase has a definite start and finish, specific objectives to accomplish, and specific deliverables to generate. The phases are usually linear or sequential, meaning that one phase is completed before starting the next phase. At times, however, phases can overlap or run concurrently."

The life cycle gives structure to the project and makes it easier to manage. It also gives points at which it is possible to review the progress of the project and determine whether to stop it, change it, or continue it. This is particularly important when it comes to big projects that involve a lot of investment. It is critical to be able to recognize when something is going wrong and change it before it is too costly to change.

2.1.2 General Phases of the Project Life Cycle:

While the specific phases of the project life cycle may vary depending on the industry, type of project, and methodology, there is a universal consensus on the existence of a set of phases that represent the natural progression of every project. The universal phases of the project life cycle are:

- **Initiation:** This is the beginning of the project life cycle. In this phase, the problem or opportunity to be addressed by the project is identified, the project is deemed feasible, and the necessary approval to start the project is obtained. The only output of the initiation phase is the project charter.

- **Planning:** In the project life cycle, the goals of the project are elaborated on in detail, and a comprehensive plan to guide the execution of the project is developed. This includes the project scope statement, project schedule, cost estimates, identification of potential project risks, and communication plans.

- **Execution:** This is the phase of the project life cycle where the actual work of the project is done. The project team implements the plans developed in the previous phase of the project life cycle.

- **Monitoring and Control:** This phase takes place simultaneously with the execution phase. During this phase, the progress of the project is monitored against the baseline plan, and if there are deviations, corrective action is taken to bring the project back under control.

- **Closing:** This is the last phase of the project, where all the activities are closed, the deliverables are handed over to the clients/users, contracts are closed, and the lessons learned are documented. As a matter of fact, it should be noted that these phases do not always occur sequentially, one after the other, especially in complex projects, where the project schedule is such that the phases overlap or are revisited, depending on the information obtained during the project. The underlying principle, however, remains the same: the project is divided into phases, making it easier to manage, monitor, and control the project.

2.1.3 Types of Project Life Cycles:

Not all projects are managed the same way. Different types of life cycles are used, depending on the type of project being undertaken, the level of uncertainty, etc. According to the literature, the following are the major types of life cycles used[14]:

[14] Project Management Institute. 2021. A guide to the project management body of knowledge (PMBOK guide). 7th ed. Newtown Square, PA: Project Management Institute.

- **Predictive Life Cycle:** This is also called the waterfall model. This type of life cycle is used when the scope, schedule, and budget of the project can be clearly identified at the beginning of the project. The project is completed through a series of phases, where the scope of the project can be changed through a formal process. This type of life cycle is used for projects where the requirements are clearly known, i.e., there is less uncertainty involved, like building and infrastructure projects.

- **Adaptive life cycle:** This life cycle is referred to as the agile life cycle. This life cycle is applied to projects whose requirements are expected to change over time. The projects are divided into smaller periods called iterations or sprints, each of which results in a working version of the project. This life cycle is applied to complex projects with requirements that are difficult to define, such as software development projects.

- **Hybrid life cycle:** The hybrid life cycle is a combination of the predictive life cycle and the adaptive life cycle. In the hybrid life cycle, some aspects of the project are planned, while other aspects are managed on an iterative basis. The hybrid life cycle is becoming popular with organizations that wish to take advantage of the predictive life cycle and the adaptive life cycle.

The table below summarizes the main characteristics of each type of project life cycle:

Table 1 : Comparison of Project Life Cycle Types

Criterion	Predictive (Waterfall)	Adaptive (Agile)	Hybrid
Planning approach	Fully planned upfront	Iterative, evolves over time	Partial upfront + iterative
Flexibility to change	Low	High	Moderate
Deliverables	Single final deliverable	Incremental deliverables	Mix of both
Best suited for	Well-defined, stable projects	Complex, evolving projects	Projects with some uncertainty
Risk management	Managed upfront	Managed throughout each cycle	Blended approach

2.2 The Process-Based Approach to Project Management:

Besides the life cycle, which gives an overall framework for the progress of a project over time, the process-based approach gives an operational framework for the organization and operation of the work of managing a project. An understanding of the process-based approach is vital to an understanding of the structure of current project management standards such as the PMBOK Guide.

2.2.1 What Is a Process in Project Management?

A process in project management is a series of related actions and activities that are carried out to produce a pre-specified product, result, or service. Each process in project management is said to have a series of inputs that are required to carry out the process, a series of tools and techniques that are used to carry out the process, and a series of outputs that are generated as a result of carrying out the process. This is known as the ITTO framework and is the basis of the process-based approach to project management.

The process-based approach is based on the recognition of the fact that the process of managing a project is not an action but rather a series of structured activities to be performed. By organizing the activities of the project into processes, the project managers can ensure that nothing is left out. All aspects of the project are addressed.

2.2.2 The Five Process Groups:

The PMBOK Guide divides the project management processes into five process groups. The five process groups of the PMBOK Guide are similar to the phases of the project life cycle. The process groups are, however, different from the life cycle phases. The process groups represent the type of process being performed rather than the phase of the project life cycle. The five process groups of the PMBOK Guide are as follows:

Table 2 : The Five PMBOK Process Groups and Their Main Purpose

Process	Purpose
Initiating	Formally authorizes the project and defines its high-level objectives and stakeholders.
Planning	Establishes the detailed roadmap for how the project will be executed, including scope, schedule, budget, risks, and resources.
Executing	Carries out the work defined in the project management plan and coordinates people and resources to produce the deliverables.
Monitoring & Controlling	Tracks, reviews, and regulates the progress and performance of the project, and manages changes to the plan.
Closing	Formally completes or closes the project, ensuring all activities are finalized and lessons learned are documented.

Another important aspect of the process groups is their iterative nature. In other words, the outputs of one process group may serve as the inputs to another. For instance, the outputs of the project planning process group include the project management plan, which becomes the primary input to the executing process group. On the other hand, the outputs of the project monitoring and controlling process group include the project change requests, which become the inputs to the project planning and executing process groups. This iterative nature of the

project management processes is what allows project management to remain adaptive to changes and updates throughout the project life cycle.

2.2.3 The Ten Knowledge Areas:

In addition to the five project management process groups, the PMBOK Guide divides project management processes into ten knowledge areas. Each knowledge area represents a specific area of project management knowledge, which groups the processes related to the specific area. The ten knowledge areas are:

- **Project Integration Management:** It involves all other knowledge areas and ensures that all elements of a project integrate to form a whole.
- **Project Scope Management:** It involves planning and controlling the scope of a project to ensure that a project delivers exactly what is required.
- **Project Schedule Management:** It involves planning and controlling a project's schedule to ensure that a project is completed on time.
- **Project Cost Management:** It involves planning and controlling costs to ensure that a project is completed within a budget.
- **Project Quality Management:** It ensures that a project and its products meet the required standards of quality.
- **Project Resource Management:** It involves planning and controlling human and physical resources to ensure that a project is completed successfully.
- **Project Communications Management:** It involves planning and controlling how information is collected, created, and disseminated to all stakeholders.
- **Project Risk Management:** It involves identifying, analyzing, and responding to risks to ensure that a project is successful.
- **Project Procurement Management:** It involves procuring goods and services outside a project team.
- **Project Stakeholder Management:** It involves identifying stakeholders and their expectations and managing them throughout a project.

Together, the five process groups and the ten knowledge areas comprise a matrix of 49 individual processes that cover all aspects of project management. This matrix represents the heart of the PMBOK system and offers the project manager a comprehensive resource for managing any project.

2.3 The Relationship Between the Life Cycle and the Process Groups:

After the project life cycle and the project management process have been introduced individually, it is important to understand the relationship between the two. While the life cycle shows the various stages a project goes through over the course of its life, the project management process groups show the nature of the project management work done throughout the life cycle. It is important to understand the relationship between the life cycle and the project management process groups to understand the project management system.

2.3.1 Life Cycle Phases vs. Process Groups:

One of the major difficulties project management students face is the difference between life cycle phases and project management process groups. While the two may seem similar, they have different applications. The life cycle phases, which include the project initiation phase, project planning phase, project execution phase, project monitoring and controlling phase, and project closure phase, show the chronological nature of the project. It shows where we are in the project.

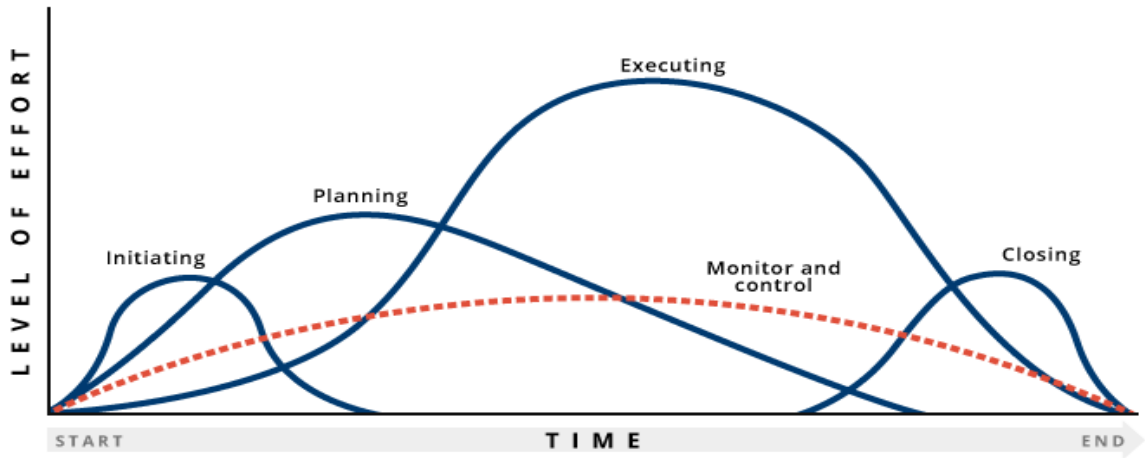
The project management process groups, on the other hand, show the nature of the project management work done.These questions address the following query: what type of management activities are we currently performing? For example, planning activities are not only performed during the planning phase, but also at the beginning of every new phase of a project, when the need to update plans arises. In addition, controlling activities are performed on an ongoing basis, not just during a specific point.

2.3.2 How the Process Groups Apply Across the Life Cycle:

One of the most important characteristics of the process groups is the fact that they do not have to be applied at a single phase of the life cycle. Instead, the process groups can be reapplied several times throughout the life cycle of the project, whenever the need arises. It is the ability to apply the process-based approach several times throughout the project life cycle that has given it the advantage of being the most flexible and adaptive to the needs of different types of projects.

To exemplify the application of the process groups several times throughout the life cycle, consider a project to build a large building. In such a project, the entire project planning may have to be done at the start of each major phase of the project. For instance, the entire project planning may have to be done at the start of the design phase, at the start of the construction phase, and once again at the start of the commissioning phase.

Figure 2 : Interaction Between Process Groups and the Project Life Cycle



Source: Project Management Institute (PMI)

2.3.3 Process Interactions and Information Flow:

Another critical aspect of the relationship between the life cycle and the process groups is the interaction and flow of information between processes. As noted above, it is critical to note that the outputs of one process group are usually inputs to another. This creates a flow of information that ties all management activities together in a logical and integrated manner.

For example, the project charter that is created in the initiating process group is a critical input to the planning process group. The project management plan that is created in planning is used to direct all activities in the executing process group. The performance information that is collected in the monitoring and controlling process group is used to update and change plans in planning. All of these documents are used in closing to review and archive them and to document lessons learned.

It is the flow of information between the different elements of the process that makes the process-based approach more than just a list of activities. It is a dynamic integrated system of management that keeps the project on track with the goals of the project, no matter what the changes or challenges may be.

Section 03: Project Management Phases: Theoretical Description

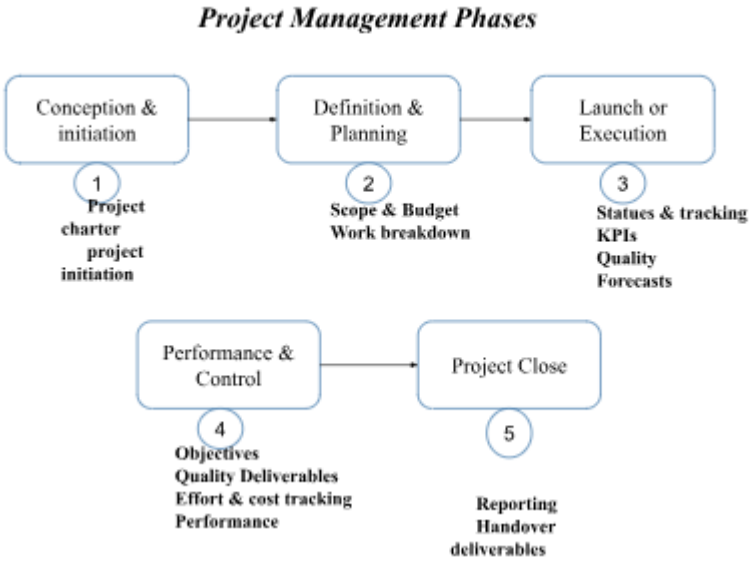
Projects are often structured in terms of a series of stages, which are sequential in nature, although at times they may be overlapping in their approach. These stages are often referred to as the phases of project management and are the basis for the operational approach by which the objectives of the projects are defined, planned, and implemented in the end. Dividing the projects into phases is often the basis for the management of the complexity of the projects by the organization.

According to the PMI, the life cycle of a project is composed of various steps that are linked together. Every step has its own objectives, main activities, results, and decision points. All these help in the smooth flow of the project from the beginning to the end. This division of the project into steps makes it easier for the project manager to monitor the progress of the project, compare the results achieved at each step, and make proper decisions at each stage before moving into the next step.

From the theory perspective, the majority of the project management standards and guidelines, including the PMBOK guide, indicate that there are five major stages that need to be managed in the course of the project, including the initiation, planning, execution, monitoring and control, and closing stages. The stages are sequential in order to ensure that the goals are well articulated, the resources are well arranged, and the risks are well managed. Each phase has an individual responsibility to ensure the success of the project. For instance, the initiation phase is responsible for defining the project. It is in this phase that the project is officially approved to commence. The planning phase is responsible for planning the project. The execution phase is responsible for executing the plans. Lastly, the monitoring and control phase is responsible for evaluating the execution of the plans against the objectives. The closing phase is responsible for closing the project.

The objective of this section is to provide an easy understanding of the various phases in project management. This section will cover the various phases in project management, their objectives, activities, and outputs. This simple framework will help in the later analysis in the research, especially regarding the application of the processes in the projects.

Figure 3 : Project Management Phases



Source: Developed by us

3.1 Initiation phase:

3.1.1 Definition and Objectives of the Initiation Phase:

The initiation phase represents the first stage in the project life cycle. The main goal of the initiation phase is to define the methodology that will be adopted for the implementation of the project. During the initiation phase, the newly appointed project manager clearly defines the overall strategy that will be adopted to guide the project towards the achievement of the desired results.[15]

According to the Project Management Institute, the initiation phase includes the formal authorization of a project and the establishment of its initial scope, objectives, and stakeholders. This phase ensures that the project is in alignment with the organization's strategic objectives before the commitment of significant resources.

In this phase, the decision-makers evaluate the potential value of the project. They also evaluate its feasibility. By establishing an initial understanding of the objectives and constraints of the project, the initiation phase establishes a foundation for all subsequent project management activities.

The main objectives of this phase include:

[15] Muller Jean-Louis G, " Les fondamentaux du management de projet ", AFNOR,2016, page 91

- Establishing the purpose and objectives of the project
- Evaluating the feasibility and relevance of the project
- Identifying the key stakeholders involved
- Establishing a preliminary scope of the project
- Obtaining formal authorization to commence the project

These aspects of the initiation phase ensure that the project begins with a sense of direction and a mutual understanding among the parties involved.

3.1.2 Main Activities of the Initiation Phase:

The initiation phase involves various critical activities that are geared towards laying the foundation for the project. The activities are geared towards ensuring that the decision-maker is able to assess the relevance of the project, at the same time ensuring that the objectives and framework of the project are well articulated.

Some of the activities that are conducted at the initiation phase include the development of the business case, which acts as the reason for the project. The business case involves an assessment of the problem or the opportunity that the project aims at addressing, including the benefits that are expected from the project relative to the investments made. The business case helps the decision-maker in determining whether the project is aligned to the strategic objectives of the organization.

The other activity that takes place at the initiation phase is the feasibility study, which involves an assessment of whether the proposed project is feasible from the technical, economic, and operational perspectives. The feasibility study helps the organization in identifying the potential problems that might arise from the project.

The identification of stakeholders is another critical activity that takes place at the initiation phase. The stakeholders are the individuals, groups, or organizations that might influence the project or might be impacted by the results of the project. The stakeholders are identified at the initiation phase so that the project manager is able to understand the stakeholders and their level of influence.

Finally, the initiation phase is concluded by the creation of the project charter. The project charter is the document that authorizes the start of the project. According to the PMBOK Guide, which is a publication of the Project Management Institute, the project charter is a critical document that provides the objectives of the project, the scope of the project, the stakeholders of the project, and the authority vested in the project manager. After approval, the document is the formal reference for the start of the project and the transition to the project planning phase.

3.1.3 Outputs of the Initiation Phase :

- **The project charter :** The project charter formally begins the project and authorizes the use of the organization's resources. The PMBOK Guide defines the project charter as the official document that proves the existence of the project and its goals.

" The project charter is a basic document that is developed during the initiation of the project. Its main function is to ensure that the goals of the project are properly identified and that the project manager has the authority to start the project and begin the procurement of the necessary project resources. It provides a basic structure that allows everyone involved in the project to have a common understanding of the project and the expected outcome.
In other words, the project charter allows the project sponsor to officially sanction the project based on the project goals that have been identified and defined. It outlines the project details such as the project scope, milestones, project budget, and other aspects that help in the establishment of the basic structure of the project.
It is, however, worth noting that the project charter does not sanction the project. Instead, the sanctioning of the project occurs during the project selection process. Additionally, the project charter does not outline the project activities. Such details occur during the project planning phase. It is during this phase that the project planning activities occur. It is mainly a record of the project initiation and the first outline of the project development.
The project charter development is recommended for use in the development of medium and large-sized projects that are complex and fairly complex. Such projects have many aspects that have to be monitored and controlled. They have high risks and involve significant investments in money and human resources. They involve significant changes in the existing processes of the business and the coordination of many departments in the organization"[16].

- **The stakeholder register :** is an essential document that provides information about various stakeholders who are more likely to impact or be affected by the project. The information includes the level of influence and interest that every stakeholder has in the project. The stakeholder register is an essential tool used in project management and is an essential document used in project management. The development of the stakeholder register is initiated at the early stages of the project. The information used to develop the stakeholder register is obtained from the project sponsor, management, business case, subject matter experts, and other stakeholders. The development of the stakeholder register is usually undertaken by the project manager. The development is then subject to approval by the project team and the project sponsor. After the identification of the key stakeholders and approval of the project charter during the initiation phase, the project kickoff is undertaken. The development of the stakeholder register is an ongoing process and is subject to significant emphasis during the project execution and planning phases.
- **The kickoff meeting:** is an important event that marks the official beginning of the activities of the project. It is an event that gives the project manager an opportunity to present the objectives, main results, and important scheduling milestones of the project to the project team. It is an event that brings together the project sponsor, stakeholders, and the project team in an attempt to create an understanding of the objectives of the project.

[16] University of Waterloo, " Project Charter" , VPAF Project Management Office , https://uwaterloo.ca/vpaf-project-management-office/methodologies/project-management/initiation/project-charter

The event is usually conducted by the project manager. It is characterized by an official atmosphere that is preparatory in nature. It is meant to create commitment among the participants. At the event, there is usually a presentation that is intended to create an understanding of the high-level overview of the project. However, the details of the implementation of the project are addressed during the planning phase. After the official launch of the project by the kickoff meeting, it is then time to move to the planning phase[17].

3.2 Planning Phase :

The planning phase takes the results of the initiation phase and develops these into a detailed roadmap for action, establishing the baselines for scope, schedule, cost, quality, resources, risks, and procurement that will guide the execution and control phases. The iterative approach ensures that all knowledge areas are addressed in detail, thereby providing for the management of the uncertainties in an anticipatory manner.

3.2.1 Objectives and Key Activities:

The main objective is to provide enough information to enable measurable execution while allowing flexibility in progressive elaboration. Some of the activities include:

- **Scope Planning:** This activity involves the preparation of the Work Breakdown Structure (WBS), which is used to break down the work into manageable packages. It is achieved by the preparation of the scope statement.
- **Time Management:** This activity involves sequencing activities, estimating time, and scheduling activities based on dependencies.
- **Cost and Resource Planning:** This activity involves cost estimation, budgeting, and the allocation of resources using the Organizational Breakdown Structure (OBS).
- **Risk management planning:** it includes the identification of threats and opportunities, the conduct of qualitative and quantitative analysis, and the formulation of responses.
- **Quality, procurement and communication planning :** include the establishment of metrics, the formulation of a sourcing strategy, and the design of information distribution matrices.

These activities are integrated within the project management plan through iterative refinement to balance the triple constraint.

3.2.2 Tools and Techniques:

- **Work Breakdown Structure (WBS):**

The Work Breakdown Structure is a systematic tool for dividing the scope of the whole project into smaller and more manageable parts. The Work Breakdown Structure organizes the work of the project in a hierarchical fashion, with each level being a more detailed specification of the work of the project. By using the 100% rule, the Work Breakdown Structure ensures that all the necessary work required for the completion of the whole project

[17] OpCit, " Kick-off Meeting"

is thoroughly included. This tool helps in the clear specification of the deliverables of the project and the estimation of the time required for the management of the project.

- **Critical Path Method (CPM):**

The Critical Path Method is a scheduling tool used for the management of the sequence of the project activities that have the most significant impact on the completion of the whole project. The Critical Path Method is usually represented by a diagram showing the dependency of the various tasks of the project. The critical path is the sequence of the dependent tasks of the project that is longest in duration; any delay in these tasks will result in the corresponding delay of the whole project.

- **Gantt Charts:**

Gantt charts represent a visual tool for project scheduling that is frequently employed to illustrate the different activities involved in a given project along a time axis in the form of horizontal bars. Each horizontal bar represents the commencement and completion time for a given activity within the project. This tool enables the project manager to identify the project schedule with ease. Moreover, it can be employed to illustrate the different dependencies for the various tasks involved in the project. It is also instrumental in tracking the progress of the project to identify whether the different tasks involved in the project have been completed within the stipulated time.

- **Monte Carlo Simulation:**

Monte Carlo simulation represents a quantitative tool for project risk analysis that is frequently employed to identify the potential impact that different uncertainties could have on the project schedule or costs. This tool operates on the basis of probabilistic simulation to generate different scenarios for the various possibilities that could arise for the different variables involved in the project.

- **Parametric Estimating:**

Parametric estimating is a method used to forecast project costs, durations, or resource requirements based on statistical relationships between historical data and project variables. For example, the cost of constructing a building can be estimated using a cost-per-square-meter formula derived from previous projects. This technique is efficient when reliable data is available and helps produce quick and reasonably accurate estimates during the planning phase.

- **Three-Point Estimating:**

Three-point estimating is used to improve the accuracy of activity duration or cost estimates by considering uncertainty. Instead of relying on a single estimate, it uses three values: the optimistic estimate (best-case scenario), the most likely estimate, and the pessimistic estimate (worst-case scenario). A common formula used is the average of these three values. This method helps project managers obtain more realistic estimates and better account for possible variations in project activities.

3.2.3 Outputs and Baselines:

- **Project Management Plan:**

The primary output of the planning phase is the development of the Project Management Plan, which acts as the guiding document for the entire project. The Project Management Plan is the integration of various subsidiary plans, including the scope, schedule, cost, quality, resource, communication, risk, procurement, and stakeholder management plans. The combination of these plans defines the way the project will be executed, monitored, and controlled.

- **Project Baselines:**

As a result of the planning phase, project baselines are developed to include the approved version of the basic project parameters used for measuring the project's performance. The baselines include the scope baseline, the schedule baseline, and the cost baseline. The schedule baseline can be represented using an S-curve, while the cost baseline organizes the financial resources of the project into control accounts for monitoring the expenditures.

- **Risk Register:**

Another important outcome of the planning phase is the development of a risk register. The register identifies the risks that may occur in a project. The register includes information about the risks, such as the likelihood of the risks and their impacts. The people involved in managing the risks and the ways of mitigating the risks are also documented in the register.

- **Resource and Procurement Documents**

As a result of the planning phase, resource calendars and procurement documents are developed. Resource calendars include the availability of human, equipment, and material resources. The procurement documents, such as the request for proposal (RFP), are prepared where external sources of supply are necessary.

- **Communication Plan:**

Another important outcome of the planning phase is the communication plan. The plan identifies the ways of communicating various pieces of information to the various stakeholders of the project. The communication plan includes the type of information to be communicated, the communication methods to be used, and the people involved.

3.3 Execution phase :

The execution phase is the time frame in which the plans laid down in the planning stage of the project are executed. In this phase, the project team executes the project plan, mobilizes resources, and produces project deliverables. Good coordination and leadership skills play a vital role in ensuring that the execution of the project is done in a manner that meets the quality expectations laid down in the project plan.

3.3.1 Objectives and Key Activities:

The major goal of the execution phase is the execution of the project management plan and the realization of the project goals. This involves the management and coordination of the project team's activities, the efficient management of project resources, and the execution of project activities in line with the established processes and quality standards.

There are several critical activities that take place during the execution phase. First, the project manager directs and motivates the project team in executing the project activities outlined in the Work Breakdown Structure (WBS). Additionally, the project manager procures the necessary human resources to ensure that the project team has the necessary skills and expertise. This is done through the procurement of contracts and the coordination of external stakeholders when the need arises.

Finally, the project manager carries out the quality assurance processes that ensure the project activities conform to the mandated standards and processes. Communication activities are carried out during this phase, which involves the dissemination of information to the stakeholders in line with the project communication management plan. Moreover, the project manager engages the stakeholders in the project and carries out the approved changes and actions in line with the project goals.

3.3.2 Team and Resource Management:

Effective management of teams and resources is critical in the execution phase. The project manager works towards the development of an efficient and cooperating team through the establishment of individual roles, cooperation, and the management of any emerging conflicts. This can be achieved through training, performance evaluation, and recognition.

Resource management involves the management of physical resources such as equipment, materials, and facilities. The timely availability of these resources is critical and must be aligned with the project schedule and resource calendar. Procurement management is critical when external sources are used; it involves the monitoring and evaluation of the performance of the vendors.

At the same time, stakeholder management is another critical aspect that is significant in the execution phase. This is achieved through effective communication with the stakeholders and the timely management of any emerging issues; this way, the required support is achieved.

Table 3 :Example of The RACI MATRIX

Task /Activities	Project Manager	Team Lead	Developer	Tester	Stakeholder
Task 01	A	R	C	I	A
Task 02	A	R	C	R	A
Task 03	C	R	C	A	A

Task 04	A	A	I	I	C
Task 05	A	R	I	R	C

To clearly establish the boundaries of individual responsibilities within the project management team, management tools such as the RACI matrix can be used. The RACI matrix is an instrument that clearly establishes the individuals identified as Responsible, Accountable, Consulted, and Informed in the course of the project. This tool is essential in eliminating role ambiguity and promoting coordination among the project management team.

3.3.3 Deliverables and Performance Delivery:

The primary result of the execution phase is the creation of the project deliverables that are consistent with the established scope and quality measures. The deliverables are usually validated through inspection, testing, and acceptance.

Project activities are carried out in the execution phase in conformity with the approved schedule and processes. Quality management practices are implemented in the execution phase to prevent errors and ensure the accuracy of the work done. Documentation of the project experience and knowledge is also carried out in the execution phase in the form of lessons learned documents.

Project performance is tracked through the use of performance metrics and status reports. The reports provide valuable information regarding the work done and the performance. It has also been found that the execution phase is the longest phase in the project lifecycle and accounts for 50%-70% of the total budget allocation in the projects.

3.4 Monitoring & Controlling phase :

The monitoring and controlling phase is aimed at ensuring that the project is progressing as planned and according to the objectives. In the course of the monitoring and controlling phase, the performance of the project is measured and compared with the baseline established during the planning phase.

Monitoring and controlling is not a one-time step but rather a continuous iterative process. In most cases, the monitoring and controlling phase is implemented concurrently with the execution phase. Through the evaluation of the project and analysis of the data collected, the project managers are able to have control over the project and ensure that the objectives of the project are met.

3.4.1 Objectives and Key Activities:

The monitoring and controlling phase is concerned with the validation of the progress of the projects and the identification of any changes in the projects in order to ensure alignment with the objectives of the projects. The main activities in this phase are:

- Monitoring the performance of the projects through the use of Earned Value Management (EVM) in order to measure the progress in relation to the scope, schedule, and cost.
- Conducting variance analysis in order to identify any differences in the performance in relation to time, cost, scope, and quality.
- Forecasting the performance of the projects through the use of Estimate at Completion (EAC) and To-Complete Performance Index (TCPI) in order to predict the results at the end of the projects.
- Managing changes through the use of an integrated change control process in order to ensure the approval of changes through the change control board.
- Executing the quality control activities in order to ensure the quality of the projects.
- Monitoring the project's risks and implementing the necessary strategies in order to respond to the identified risks.
- Generating performance reports in order to ensure the stakeholders are aware of the performance in the projects.

These activities are essential in order for the project managers to be able to identify any problems in the projects and take proactive measures in order to prevent small problems from turning into major problems and risks in the projects.

3.4.2 Tools and Techniques for Monitoring and Control:

The monitoring and controlling phase utilizes different tools and techniques for project performance evaluation and decision-making, as follows:

- **Earned Value Management (EVM):**

EVM is a technique used for the management of projects based on the integration of scope, schedule, and cost measures. It measures the efficiency of the projects by comparing the actual performance with the planned performance. The main measures are the Schedule Performance Index (SPI) and the Cost Performance Index (CPI), which measure the schedule and cost efficiency, respectively. Schedule Variance (SV) and Cost Variance (CV) are the measures of the deviation in the projects.

- **Trend Analysis:**

Trend analysis involves the study of project data over a period of time to identify trends in the project's performance. This helps project managers to identify any possible delays or cost overruns at early stages of the project, based on the study of the trends in the project's performance. Visual aids, such as S-curves, are used to represent the trends in project performance, as well as the planned performance of the project.

- **Variance Analysis:**

Variance analysis is a method for measuring the variance between the planned and actual results. It helps in determining the threshold value for the variances in the schedule, cost, and other aspects. Threshold-based alerts are generally used for this purpose.

- **Change Control System:**

A change control system (CCS) is used to manage changes to the project plan in a structured and controlled manner. Before making any change to the project, its impact on the project in terms of scope, cost, and time is analyzed. Changes are also approved by a Change Control Board (CCB) to ensure that changes are made in line with project objectives.

- **Performance Reviews:**

Performance reviews are defined as the evaluation of the progress of the projects. In this regard, the evaluations are conducted by comparing the tasks completed with the milestones planned to assess whether the projects are progressing in the expected manner or not. In this context, checklists are often used to ensure that the milestones are completed successfully.

- **Forecasting:**

Methods used in the forecasting technique involve the prediction of the project's performance based on the information that is readily available. The metrics that can be used in the forecasting technique include Budget at Completion (BAC), Estimate at Completion (EAC), and Variance at Completion (VAC).

3.4.3 Outputs and Corrective Actions:

The monitoring and control process has several outputs, which are crucial in the evaluation process, and can be listed as follows:

- **Variance reports:** Reports that illustrate the differences between the planned and actual results in relation to scope, schedule, costs, or quality.
- **Performance dashboards:** Devices that use visual aids to illustrate the key performance indicators in a concise and easy-to-understand manner.
- **Updated forecasts:** Predicted results that are revised according to the current results in the project.
- **Change requests:** Requests to alter the plans in the project based on considerable variances or newly identified needs in the process.
- **Corrective actions:** Actions that are implemented in the process to ensure proper alignment with the baseline plans.
- **Preventive actions:** Actions that are implemented in the process to reduce the likelihood of possible issues or risks in the future.
- **Decisions regarding integrated change control:** Decisions that are made regarding the changes in the process after analyzing their effects on scope, schedule, and costs.
- **Audit records and lessons learned:** Records that are used in the process to ensure transparency in the decision-making process.

These outputs are crucial in ensuring the stability of the projects, thereby ensuring proper alignment with the defined objectives.

3.5 Closing phase:

The closing phase is the final phase of the project lifecycle. In the closing phase, the completion of all the activities is ensured, and the project is formally concluded. The main purpose of the closing phase is to ensure that the completion of the project has been fully recognized by the concerned stakeholders.

Besides that, the closing phase allows the organization to leverage the knowledge gained during the project execution. In the closing phase, the lessons learned and the performance evaluations are documented. This will help the organization in the management of future projects. Once the activities in the closing phase have been completed, the project team is released, and the results obtained from the project execution are transferred to the environment or the concerned stakeholders who will utilize the final results obtained from the project execution.

3.5.1 Objectives and Key Activities:

The closing phase of a project includes activities related to administrative closure, contractual closure, stakeholder acceptance, and knowledge transfer. The activities performed during this phase are as follows:

- Obtaining formal acceptance of the project results from the stakeholders or clients.
- Completion of procurement activities, including the closure of contracts and completion of all payments related to the project.
- Releasing the project team and resources for further assignment to different projects and organizational activities.
- Archiving project-related documentation to ensure proper documentation of project-related information for easy retrieval in the future.
- Preparing final performance reports to provide a summary of project results, achievements, and performance.
- Capturing lessons learned through project experience evaluations and reviews.
- Updating organizational process assets, including guidelines and best practices from the project experience.
- Recognizing and celebrating team achievements to appreciate the efforts of the project team.

These activities are performed to ensure the project is fully closed, all requirements are met, and valuable knowledge is gained, which can be used in the future.

3.5.2 Tools and Administrative Processes:

In the closing phase, several tools and administrative processes are utilized to ensure that the project has been completed in conformity with the agreed requirements. The tools are instrumental in ensuring the completion of the project and the documentation of the project performance and the transfer of knowledge and skills within the organization.

- **Acceptance Management:**

The acceptance management process is instrumental in ensuring that the project has been completed in conformity with the requirements set at the beginning. It involves verifying the results and obtaining approval from the client. It is documented through the use of acceptance sign-off documents, which are instrumental in confirming the completion of the project.

- **Contract Closeout:**

The contract closeout involves the completion of all the financial and legal aspects of the procurement process. It includes verifying the completion of the obligations by the supplier and the completion of all payments. The reconciliation and documentation of the payments ensure that there are no outstanding obligations between the organization and the supplier.

- **Lessons Learned Repository:**

This tool is used to capture and store the knowledge gained during the project. The project teams are able to document their experiences in terms of the challenges encountered, best practices, and recommendations for improvements. These are then stored in a repository in structured formats.

- **Project Audit:**

Project audit is defined as an independent review of the project to assess its performance. It is performed to ensure that the project was completed in accordance with its approved scope, budget, and schedule.

- **Resource Transition Plan:**

At the end of the project, it is expected that the resources involved in the project will be transitioned to new projects or tasks. The resource transition plan is used to ensure that this transition is effectively managed by outlining how these resources will be transitioned to other areas of the organization.

- **Final Report:**

The final project report is used to provide a summary of the performance of the entire project. It includes details such as the executive summary, key performance indicators, and evaluation of whether the expected benefits were achieved by the project.

The last phase produces several key outputs that validate the official conclusion of the project and ensure the successful transition of its results to the relevant stakeholders or operational units.

3.5.3 Outputs and Transition:

One of the key outputs of this phase is the production of the final project report, which briefly describes the entire project performance in terms of objectives, results, key performance indicators, and significant accomplishments achieved in the project lifecycle. The report

provides management and relevant stakeholders with a clear evaluation of the entire project execution and the level of achievement of expected objectives.

The closing phase also produces another key output, which is the closure of contracts with relevant suppliers or partners involved in the project lifecycle. The phase ensures that all contracts are checked for any pending obligations, and any outstanding issues are cleared by executing any pending payments or closing all contracts.

The closing phase also produces acceptance documentation that confirms that all project outputs were reviewed and formally accepted by the client or relevant stakeholders involved in the project lifecycle.

Furthermore, the closing phase also ensures that organizational process assets are updated to reflect all experiences gained in the entire project lifecycle. This includes all changes to organizational procedures, templates, and best practices.

Finally, after all operations are completed in the closing phase, project results are handed over to operations, maintenance, or benefits delivery, depending on the nature of the project.

Overall, the closing phase of the project lifecycle ensures that all project results are successfully concluded, all obligations are cleared, and valuable experiences are preserved for continuous organizational improvement.

Chapter 02: Theoretical models of process quality, governance, and maturity

Chapter 02: Theoretical models of process quality, governance, and maturity

Introduction:

Having identified the fundamental concepts of project management in the previous chapter, it is imperative to progress towards the theoretical models that can be used to evaluate the concepts rather than simply describe them. Although it is important to understand how projects are defined, structured, and phased, it is also essential to evaluate the effectiveness with which an organization is able to manage its projects by using specific sets of tools that can be used to evaluate the quality of the process, the governance and organizational structure, and the management process itself. These sets of tools and concepts form the basis of the theoretical foundation that is to be developed in this chapter.

The importance and relevance of these sets of tools and concepts have already been identified and justified in the literature on project management. A number of studies have already identified that organizations that follow these sets of concepts and tools have consistently delivered superior project management results in terms of cost, schedule, and satisfaction compared to organizations that do not follow these concepts and tools. In many industries that have complex operational activities and accountability constraints, the lack of these concepts and tools has led to the development of patterns and trends that can be described as process inconsistency, delay, and cost overruns. Therefore, these concepts and tools are theoretically justified and pragmatically essential, and it is imperative that these concepts and tools be evaluated and identified prior to the commencement of the empirical study.

The chapter is divided into three sections that can be related to each other as follows:

Section 01: Process Quality and Conformity in Project Management

Section 02 : Governance and Organizational Factors Influencing Project Processes

Section 03: Project Effectiveness, Process Outcomes, and Improvement Models

Section 01: Process Quality and Conformity in Project Management

In order to measure the effectiveness of an organization's project management process, it is critical first to identify process quality and determine how it can be measured. This section will introduce the concept of process quality in project management, identify the main international standards organizations use as a yardstick of best practice, and present the maturity models used to measure and improve the quality of project management in an organization.

1.1 The Concept of Process Quality in Project Management:

Quality is a term commonly used in the field of management, though not necessarily defined clearly. In the context of project management, quality refers not only to the product but also to the process used in the creation of the product. This is a critical factor because a good project plan may not be effective if the processes used in its management are not effective.

1.1.1 Definition of Process Quality:

According to the ISO 9000:2015 standard, "quality is the degree to which a set of inherent characteristics of an object fulfills requirements."[18] In the context of project management, the above definition of quality means that a process is said to be of high quality when it is able to achieve the intended objectives, when it is able to deliver on time, within budget, and according to the defined scope.

Henceforth, the concept of quality in the context of process management in projects may be conceptualized as the extent to which the management processes employed during the entire project lifecycle are well defined and are able to achieve the desired outcomes. Having a process in place is not enough; the process needs to be implemented and monitored.

Some researchers and institutions have also emphasized process quality as a significant factor in the success of projects. Project Management Institute has stated, "Organizations that use structured and well-defined project management processes have a significantly greater likelihood of successfully completing projects on time and within budgets, compared to those using ad hoc approaches"[19].

To sum up , Process quality refers to the effectiveness and efficiency of organizational processes in achieving desired results while meeting quality standards. Process quality is a fundamental concept of quality management that aims at ensuring that organizational processes are running smoothly to attain a high level of quality products and services.

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[18] ISO, ISO 9000:2015, Quality management systems; Fundamentals and vocabulary (Geneva: International Organization for Standardization, 2015)

[19] Project management institute, Pulse of the profession, 2020

1.1.2 Dimensions of Process quality :

Process quality in project management has various dimensions that contribute to the overall quality of project management processes. The major process quality dimensions are as follows:

- **Efficiency:** This refers to the ability of a process to maximize the available resources such as time, budget, and human resources to attain project objectives. For a process to be efficient, it should avoid waste and duplication of efforts wherever possible.
- **Effectiveness:** This is a dimension that measures how well a process attains its set objectives. A process can be efficient but not effective in attaining its objectives. For a process to be effective, it should be able to attain its objectives irrespective of its efficiency in resource utilization.
- **Reliability:** This refers to the ability of a process to deliver consistent quality output every time it is used, irrespective of who is using it or in which situation it is being applied.
- **Adaptability:** This is a dimension that measures the ability of a process to change in response to changes in project management situations such as project risk, project stakeholders' needs, or project delays. Adaptability is critical in project management because no two projects are similar.

1.1.3 Quality VS Grade in project management :

In the realm of project management, there is a significant conceptual differentiation between quality and grade, though both are sometimes used interchangeably in real-life application. Quality, as defined in the PMBOK Guide, is the degree to which a project's deliverable meets specified requirements and satisfies stakeholder expectations. Grade, on the other hand, refers to the level of features, functionality, and characteristics that are incorporated into a given product and/or service.

This distinction shows that a deliverable can be classified as being of low grade and high quality if it meets all the requirements set out in its project scope statement, even if only basic features are involved. For example, a product that has been engineered to be functional in only a limited sense can be said to be high quality if it meets its needs. On the other hand, a deliverable that has been classified as high grade, with advanced features or high-tech attributes, can be said to be of low quality if it does not meet its requirements or has been defective due to poor project management practices.

This distinction assumes particular importance in project management since the goal of the project is not always to attain the most complex and technologically advanced output. Instead, the goal is to attain an output that meets the requirements and expectations of the project while ensuring that the project is well managed and controlled. Excessive preoccupation of project teams in improving the grade of the output without adequate attention to the quality management processes will increase the risk of defects, rework, and cost overruns.

Therefore, effective project management emphasizes the need to maintain an effective balance between the grade and the quality of the output. The establishment of effective

process control, requirements, and quality management practices is essential to attaining effective project outcomes. On most occasions, poor process quality-despite the grade of the output-remains one of the main factors that lead to project inefficiencies and failures.

1.2 Conformity to standards and best practises:

Organizations are increasingly ensuring and improving the quality of their project management processes by benchmarking them against internationally recognized standards and frameworks. These standards provide a common language, a set of best practices in processes, and a reference framework against which an organization's processes may be judged.

1.2.1 The Main Project Management Standards:

Significant advancements have been made in project management over the past decades, and this has led to the development of a number of internationally accepted standards and methodological frameworks to help organizations and project management professionals manage projects successfully. These standards and frameworks are aimed at ensuring project success while fulfilling various project management objectives in terms of scope, time, cost, and quality. Out of the many project management standards and frameworks available today, three such standards are PMBOK Guide, PRINCE2, and ISO 21500, which are commonly used in project management research and practice. These standards are based on a structured approach to project management and focus on various aspects such as processes, governance, and international standardization.

- **The PMBOK Guide (Project Management Body of Knowledge)**, which was developed and published by the Project Management Institute (PMI), is considered one of the most powerful and widely accepted project management guides around the world. Instead of being an inflexible project management methodology, the PMBOK Guide provides an extensive collection of the best practices, concepts, and tools that are generally used in project management. Traditionally, the project management activities are divided into ten knowledge areas that define the scope management, schedule management, cost management, and risk management of projects. On the other hand, the project management activities are grouped into five different process groups that include the integrating activities of the projects. Additionally, the PMBOK Guide provides the project manager with an understanding of the project management activities and their interrelation by dividing them into inputs, tools and techniques, and outputs (ITTOs) for each of the processes. The latest version of the PMBOK Guide, which was published in 2021 and is the seventh version of the guide, provides a more flexible and principle-based approach that includes the concepts of value delivery, flexibility, and performance domains.
- **PRINCE2 (Projects in Controlled Environments):** is another project management methodology that is widely employed. PRINCE2 was also developed in the United Kingdom and is presently maintained by Axelos. Unlike the PMBOK Guide, the PRINCE2 project management methodology is prescriptive and provides a structured and stepwise approach to project management. The project management methodology

consists of seven principles, seven themes, and seven processes. The combination of these seven principles, seven themes, and seven processes provides an extensive project management framework. One of the major advantages of the PRINCE2 project management methodology is its strong focus on business justification. This ensures that the project is always in line and that the delivery of the project's value is maintained throughout the project lifecycle. Additionally, the project management methodology provides a strong focus on the identification of roles and responsibilities. This ensures that all the parties involved in the project are aware of their roles and responsibilities within the project. Finally, the project management methodology provides the management of projects by stages. This ensures that the project is divided into various stages that can be easily managed and the project's performance monitored before the project proceeds to the next stage. Due to its structured project management approach and governance structure, the PRINCE2 project management methodology is mostly employed in government and public sector organizations within the United Kingdom and Europe.

- **The ISO 21500:2012 standard**, published by the International Organization for Standardization (ISO), represents another important reference in project management. Unlike PMBOK or PRINCE2, ISO 21500 is designed primarily as a high-level international guideline rather than a detailed methodology. Its objective is to provide a common framework and shared terminology that can be used by organizations across different industries and countries. The standard organizes project management activities into 39 processes, which are grouped into 10 subject groups and five process groups, similar to the structure used in the PMBOK framework. One of the major advantages of ISO 21500 is its compatibility with other ISO management standards, particularly ISO 9001, which focuses on quality management systems. This compatibility allows organizations that already operate within an ISO-certified environment to integrate project management practices more easily into their existing management systems. As a result, ISO 21500 is particularly valuable for organizations seeking international standardization and alignment with broader quality management frameworks.

All three approaches: PMBOK, PRINCE2, and ISO 21500, when taken together, provide a comprehensive way of handling projects. While the PMBOK approach is mainly focused on best practices and knowledge areas, the PRINCE2 approach is mainly focused on governance and methodology. The ISO 21500 approach provides a standardized way of handling projects. The widespread acceptance of all these approaches in both academic and professional circles speaks volumes about the importance of these approaches in ensuring the success of projects.

The table below provides a comparative overview of these three frameworks:

Table 4 : Comparison of the three Project Management Standards

Criterion	PMBOK (7th Ed.)	PRINCE2	ISO 21500
Origin	USA (PMI)	UK (Axelos)	International
Number of Processes	49 processes	7 principles / themes	39 processes
Approach	Knowledge areas	Governance-based	Subject groups
Certification	PMP, CAPM	PRINCE2 Foundation / Practitioner	No direct certification
Best suited for	General / all sectors	Government & IT projects	ISO-certified environments

Source: Adapted from PMI (2021), Axelos (2017), and ISO (2012)

1.2.2 Benefits of Conformity to Standards:

The benefits of project management standards are evident in project success and organizational effectiveness. The major benefits of project management standards can be stated as follows:

- **Greater consistency in project management:**
- The adoption of project management standards ensures that projects are executed through uniform and structured processes and methodologies.
- There is greater use of common project management tools and techniques to avoid confusion and inconsistency in project management.

- This increases the certainty associated with project management outcomes.

- **Greater monitoring and control over project management:**
- The adoption of project management standards provides benchmarks and measures to assess project management performance.
- Project management standards enable project managers to assess actual project management performance against planned project management objectives covering scope, schedule, cost, and quality.
- This helps project managers to identify any divergence from project management plans at an earlier stage.

- **Greater decision-making:**
- Project management standards provide structured approaches to project management activities such as project management planning, risk management, and project management reporting.
- Project management standards enable project management teams to obtain reliable information regarding project management performance.
- This increases the quality and speed of strategic and operational decision-making.

- **Enhanced stakeholder confidence and credibility:**
- Implementation of universally accepted standards is a hallmark of professionalism and transparency.
- Stakeholders, clients, and regulatory bodies are more likely to place their confidence in organizations that follow well-established best practices.
- Such confidence is likely to promote partnerships and enhance the organization's reputation.

- **Efficient utilization of resources:**
- Implementation of standardized project management techniques promotes efficient utilization of resources such as time, budget, and personnel.
- Such practices help to avoid resource waste due to inadequate planning, duplication of tasks, or communication barriers.

- **Enhanced project success rates:**
- The PMI Pulse of the Profession Report (2020) revealed that organizations with well-developed project management techniques experience less resource waste.
- Such organizations are likely to achieve higher project success rates compared to organizations without well-defined project management techniques or those with informal management techniques.

- **High correlation between standards and project success:**
- Implementation of project management standards is likely to result in improved project management techniques such as project planning, execution, and monitoring.
- As a result, projects are likely to achieve project objectives such as scope, time, cost, and quality.

1.2.3 Process Conformance and Audit Mechanisms:

The adoption of a project management standard by an organization is a significant move toward the improvement and control of projects. However, the mere adoption of a standard does not automatically translate to the effective application and implementation of its principles and processes. In a number of projects and organizations, a significant gap is often noted between the processes and practices recommended in the standard and the actual processes and practices applied by the projects. As a result, it becomes necessary for an organization to establish specific measures and tools to ensure effective and full observance and application of the processes and practices in project management. These measures and tools are often referred to as process conformance and audit mechanisms, and they help in verifying and checking for conformity, detecting deviations, and promoting improvements in the application and implementation of project management processes.

The first and most significant tool applied for the purpose of ensuring the observance and application of project management standards is the process conformance checklist. This is a specific and significant tool for verifying and checking for conformity and ensuring that all the processes and steps required for the proper management and administration of a project have been properly and thoroughly carried out. This is particularly significant in projects, and the checklists are often categorized and applied in line with specific phases in the project management process, such as the initiation phase, the planning phase, the execution phase, the monitoring and control phase, and the closing phase. As a result, the process conformance checklist ensures that all the specific and required steps and processes, such as the project charter, the project schedule, the risk management plan, and the progress reports, are properly and thoroughly carried out. This ensures greater transparency and accountability in the management and administration of projects, and the application and observance of the standards and processes in managing projects are well documented.

Another prominent mechanism for evaluating the observance of standards in project management is the internal audit. Internal audits are a series of assessments carried out by qualified personnel in an organization with the aim of evaluating the observance of established standards in the management of projects. However, the purpose of carrying out internal audits is not limited to evaluating the observance of standards in the management of projects. Rather, these audits also focus on identifying areas where inefficiencies and deviations in the management of projects may be occurring. While conducting internal audits, the auditors may scrutinize the projects, interview the managers and team members, and gain a comprehensive understanding of the management processes in the projects. As a result, the outcome of internal audits is documented in a report, where areas of conformity and areas requiring improvement are identified. Therefore, internal audits are a crucial mechanism for developing effective control systems in an organization and for promoting improvements in the management of projects.

Besides the use of various tools for verifying the observance of standards in the management of projects, internal audits, and other forms of evaluating the observance of standards, organizations also carry out maturity assessments with the aim of evaluating the capability of the project management processes in the organization. Maturity assessments are

a comprehensive form of evaluating the management of projects, where the extent to which the management processes are structured, standardized, and integrated in the organization is analyzed. Maturity assessments are based on maturity models, where the processes in an organization are divided into various levels, ranging from low levels characterized by informal processes to high levels where processes are highly optimized, with continuous improvement and performance measurement. As a result, these assessments help in evaluating the level at which the project management processes in an organization are, and areas where improvements are required. Therefore, the outcome of maturity assessments is highly beneficial for developing strategies for improving the governance and management of projects in an organization.

In general terms, the role of process conformance tools, internal audits, and maturity assessments is that they act as supportive tools that allow an organization to ascertain that project management standards are not just formally accepted and acknowledged by the organization but also practically implemented. This way, the tools contribute significantly to improving the efficiency of projects and the general success rate of projects.

1.3 Process Maturity in Project Management:

Standards of conformity show that the organization has the right processes in place. However, maturity models take it a step further by showing the extent of usage of the processes and how they can be improved over a period of time. The concept of maturity in project management is based on the fact that organizations can take their processes from a very basic and informal level to a more structured and measurable level.

1.3.1 The Origin of Maturity Models:

The concept of organizational maturity was first proposed in the field of software engineering in the context of the Capability Maturity Model (CMM), developed by the Software Engineering Institute (SEI) at Carnegie Mellon University in the late 1980s. The basic idea of the CMM is that any organization goes through a sequence of five levels of maturity in terms of the capability of its processes. These levels range from ad hoc and chaotic practices at Level 1 to highly disciplined and improving practices at Level 5. Later on, the concept of the CMM was extended to a number of other fields, including project management[20].
The fundamental idea behind maturity models is quite simple: as the processes of an organization get more mature, the results of the project get better. Organizations that manage their projects in an ad-hoc fashion have very unpredictable results, whereas organizations that have a good and measured process are able to deliver better results.

1.3.2 The main maturity models in project management:

In order to assess and improve their project management practices, organizations use project management maturity models that are developed for that purpose. These models are designed

[20] *Paulk, M. et al., Capability Maturity Model for Software, Version 1.1, Carnegie Mellon University / SEI, 1993*

to provide a framework that enables organizations to assess their project management practices at different levels of maturity. Using project management maturity models, organizations are able to compare their project management practices at different levels of maturity and thus assess the level at which project management is conducted within their organizations. Project management maturity models also provide a means through which organizations can develop a continuous improvement path that enables them to advance from a low level of project management practices to a more standardized project management system.

Over time, various project management maturity models have been developed by various professional bodies and research institutions. However, some of the most common project management maturity models that are widely cited by various authors are OPM3, P3M3, and CMMI-DEV. These models are developed as a means of enabling organizations to use a structured approach to assess their project management practices.

- **The Organizational Project Management Maturity Model (OPM3)**

It was created by the Project Management Institute (PMI) as a comprehensive model for improving project management maturity in organizations. Unlike models that focus only on projects, OPM3 adopters take a more holistic view of the organization in assessing project management maturity through three domains: project management, program management, and portfolio management. This approach recognizes the fact that project management is inextricably related to the manner in which an organization handles groups of projects. OPM3 is based on a substantial database of over 600 best practices with associated capabilities and results. It provides organizations with a means of assessing the extent of implementation of these best practices in their processes and structures. Perhaps the greatest strength of the Organizational Project Management Maturity Model is its comprehensive and detailed framework. It provides organizations with a means of pinpointing areas of improvement and developing action plans. As a comprehensive model, the Organizational Project Management Maturity Model is considered one of the most advanced project management tools in assessing project management maturity in organizations.

- **the Portfolio, Programme and Project Management Maturity Model (P3M3):**

which was developed and is maintained by Axelos. It is intended to help organizations measure and improve their ability to manage projects, programs, and portfolios in a controlled and structured manner. It measures the organization's ability in terms of five different maturity levels.

The first advantage of using the P3M3 model is its ability to measure the organization's maturity through seven process perspectives. These perspectives include risk management, stakeholder management, financial management, organization governance, and resource management. By assessing these areas separately, an organization can easily identify its weaknesses in a particular domain of management. The second advantage of using the P3M3 model is its modular nature. It provides flexibility and adaptability in terms of assessing the

organization's maturity in a single domain of management or assessing its overall maturity in project management, program management, or portfolio management.

- **The Capability Maturity Model Integration for Development:**

Abbreviated as CMMI-DEV, is a prominent maturity model, and it has been adapted for application in the context of project management. This model was initially developed by the Software Engineering Institute for the purpose of evaluating and improving processes related to software development and systems engineering. However, the model has been applied in a variety of domains, including construction, infrastructure, and complex engineering projects. This model primarily focuses on the improvement of processes in an organization by developing a maturity model with five levels, namely initial, managed, defined, quantitatively managed, and optimizing.

The processes in an organization, at the initial maturity levels, are often informal, reactive, and dependent on individual performances. However, at higher maturity levels, processes tend to be more standardized, documented, and measured. A significant benefit of the CMMI-DEV model is its focus on process discipline and measurement, enabling the organization to achieve greater efficiency, quality, and predictability in the projects. Although the model was initially developed for application in a technical development environment, its application has been significant in a variety of domains.

Overall, these maturity models provide organizations with frameworks that can be used in assessing and improving project management practices. OPM3 is based on aligning project management practices with organizational strategies, P3M3 focuses on governance and structured management, while CMMI-DEV emphasizes systematic improvement and measurement. Though these models have some differences, they all have one thing in common: they all aim at supporting organizations in moving towards achieving high maturity levels in order to improve project results.

1.3.3 The Five Levels of Process Maturity:

In all of the models mentioned above, a standard five-level system is utilized to ascertain the level of maturity of an organization’s project management processes. The following table offers a brief summary of the five levels of process maturity while distinguishing between their characteristics:

Table 5 : The Five Levels of Process Maturity in Project Management

Level	Name	Key Characteristics	Typical Behavior
Level 1	Initial	No defined processes. Results depend entirely on individual effort and cannot be predicted.	Projects are managed informally with no standard procedures in place.
Level 2	Repeatable	Basic project management processes are established. Some consistency begins to appear across projects.	Teams use checklists and track basic schedule and budget information.
Level 3	Defined	Standardized processes are documented and applied organization-wide. Lessons learned are systematically collected.	A central PM office defines templates and guidelines followed by all teams.
Level 4	Managed	Performance is measured quantitatively. Process capability is evaluated using specific metrics.	KPIs such as SPI and CPI are tracked and deviations trigger corrective actions.
Level 5	Optimizing	Continuous improvement is fully embedded in the organization's culture and operations.	Post-project reviews feed into structured improvement cycles for future projects.

It is important to note that the transition from one level to the next is not automatic. To move from one level to the next, effort and investment are necessary. There is a need for training, documentation, and measurement instruments. There is a need for a genuine commitment to improvement. In reality, most organizations are operating at Level 2 or Level 3. To move beyond these levels is a resource-intensive and cultural shift.

In the context of the present study, the concept of maturity models is utilized as a significant analytical tool. Through the evaluation of the maturity level of an organization in the context of project management practices, it is possible to enlighten the reasons why particular issues are encountered by the organization and propose the necessary improvements that are feasible in terms of the actual maturity level of the organization. Instead of proposing ideal solutions that may not be feasible by the organization, the evaluation of the maturity level provides suggestions that are feasible by the organization.

Section 02: Governance and Organizational Factors Influencing Project Processes

The quality of the processes of project management is not entirely defined by the tools or methodologies adopted by an organization. Rather, it is also largely defined by the governance structures or organizational aspects in which the processes are executed. Two different organizations may choose to adopt the same methodology for managing their projects but achieve vastly different results depending on the mechanisms of decision-making, authority delegation, and communication between individuals. This section seeks to analyze the governance or organizational aspects of project management processes, which is an extremely important but often underappreciated facet.

2.1 Project Governance: Definition and Frameworks:

Project governance is a term that is largely utilized in the context of management. However, it has a particular connotation in the context of project management. The clarification of the nature of project governance is essential to the evaluation of the level of organization in the project management of an organization.

2.1.1 Definition of Project Governance:

The project governance provides a framework under the authority of the organization's top management and the corporate governance. The fundamental purpose of project governance is to ensure the organization's portfolio of programs and projects is aligned to the overall organization's strategy. This ensures the necessary actions are taken to maintain the progress[21].

The term project governance is defined as a system of rules or procedures that guides the process of decision-making while ensuring accountability for the decisions made during the duration of the project. It also outlines who is responsible for making decisions, who is accountable for the decisions made, and how the decisions made are related to the strategic intent of the organization.

Project governance, as defined by the Project Management Institute, is the framework by which the objectives of a project are defined, the means by which these objectives are achieved are determined, and the results are supervised. In a nutshell, governance is concerned not with the execution of the tasks involved in the project, but rather that the correct decisions are taken by the correct people at the correct time.

In addition, the effectiveness of governance in a project is particularly important in a large or complex project that involves a number of stakeholders. In a project that lacks a clear

[21] Dinsmore Paul C, Rocha Luiz, "Entreprise Project Management",Amacom,2012,Page 03

governance framework, a number of problems may occur, which may affect the quality of the process or the performance of the project. These problems include unclear responsibilities, decision-making that is too slow, or a lack of accountability.

2.1.2 The Main Elements of a Project Governance Framework:

A project governance framework consists of the following key components:

- **Decision-making authority:** This refers to the people authorized to take decisions at each hierarchical level of the project. A well-defined decision-making authority helps eliminate confusion and prevents any delay that may occur due to unclear roles and responsibilities.
- **Accountability and oversight:** This refers to all those mechanisms that ensure all the parties are held accountable for their contribution to the project. The role of the oversight committee or the project board is critical in monitoring the project's progress to ensure it is aligned to the defined objectives.
- **Transparency and reporting:** A well-established project governance framework requires the disclosure of all relevant information regarding the project's progress to all concerned parties. This helps in the timely identification of problems to take corrective measures before the situation gets out of hand.
- **Strategic alignment:** The project governance framework helps ensure that the project remains aligned to the strategic objectives of the organization. A project may be successfully completed within the defined time frame and budget but not aligned to the strategic objectives of the organization. Such a project cannot be considered successful.

2.1.3 Project Management Office (PMO)

Of all the structures of governance in project management, Project Management Office (PMO), in particular, is of utmost importance. Project Management Office, as described in the PMBOK guide, is "an organizational unit that defines and maintains project management standards, provides support to project managers, and oversees the project portfolio within an organization." Depending on the level of control exerted, Project Management Office may exist in different forms, as described in the literature, which states that Project Management Office may exist in three different forms[22]:

- **Supportive PMO:** The first PMO is an advisory role that offers support to project managers. This PMO is best suited for an organization whose project managers have a great deal of autonomy.
- **Controlling PMO:** The second PMO is one that requires projects to conform to certain frameworks or methodologies. The controlling PMO has some degree of control over the way project management is done. The controlling PMO also conducts periodic audits to ensure that projects are conforming to the methodologies. This PMO

[22] Project Management Institute (PMI), A Guide to the Project Management Body of Knowledge (PMBOK Guide), 7th Ed., 2021, p. 154.

is best suited for an organization that seeks to standardize project management practices.

- **Directive PMO:** The third PMO is one that has full control of projects. The project manager is appointed by the PMO. This PMO is best suited for an organization that is fully committed to centralized project management.

2.2 Organizational Structure and Its Impact on Project Management:

Apart from the organizational governance structure, the organizational structure itself has a significant impact on the process of project management. The organizational structure dictates how an organization is structured in terms of the flow of information and the ability of the project manager to effectively coordinate the organization. Therefore, it is important to understand the basic organizational structures that have an impact on project management.

2.2.1 The Main Types of Organizational Structures:

According to the literature on project management, there are three principal types of organizational structures: functional, matrix, and projectized. Each type of organizational structure has a different effect on the management of projects, particularly with regard to the power vested in the project manager as well as the resources available for the projects.

In the case of a functional organizational structure, the organization is divided into departments according to specialization, e.g., the engineering department, finance department, human resources, procurement, etc. Each department is headed by a functional manager who is responsible for the resources within the department. When a project involves more than one department, the project manager has limited power and must rely on the cooperation of the functional managers to successfully execute the projects. This often results in delays, which may cause difficulties in the management of projects due to conflicting priorities between departments and projects.

In the case of a projectized organizational structure, the organization is completely focused on projects. The project managers have complete power over the resources within the projects, with the resources within the projects being dedicated to the projects for the entire duration of the projects. This type of organizational structure is highly effective for the management of projects, particularly large complex projects which demand good coordination as well as the ability to take rapid decisions. However, the structure may result in inefficiencies after the projects are completed.

The matrix organizational structure represents a combination of the functional organizational structure and the projectized organizational structure. This type of organizational structure combines the advantages of the functional organizational structure with the advantages of the projectized organizational structure. The matrix organizational structure unites the advantages of the functional organizational structure with the advantages of the projectized organizational structure. The matrix organizational structure can be weak matrix (leaning toward functional), balanced matrix, or strong matrix (leaning toward projectized) according to the power vested in the project manager. The table below summarizes the principal characteristics of the organizational structures:

Table 6 :Comparison of Organizational Structures and Their Impact on Project Management

Criterion	Functional Structure	Matrix Structure	Projectized Structure
Authority of PM	Little or none	Shared with functional managers	Full authority
Resource control	Functional manager	Shared	Project manager
Team dedication	Part-time	Part-time or full-time	Full-time
Communication	Within departments	Cross-functional	Within project team
Best suited for	Routine operations	Complex, multi-dept. Projects	Large, dedicated projects

Source: Adapted from PMI (2021) and Kerzner (2022)

2.2.2 Decision-Making in Project Management:

Decision-making is one of the most important aspects of governance within the context of project management. The quality, speed, and clarity of decisions taken during the different phases of the project lifecycle can have a direct bearing on the ability of the project to deliver within the stipulated time, within the stipulated budget, and within the stipulated objectives. Lack of clear and speedy decision-making is one of the most common reasons for delays in projects[23].

There are generally two forms of decision-making: centralized and decentralized. In the former, the majority of the decisions are taken by the top management or the central authority. This form of decision-making, although beneficial, can create problems if the concerned authority is not always available. In the latter, the majority of the decisions are left to the discretion of the project manager and the members of the project management team, who are

[23] Project Management Institute (PMI), Pulse of the Profession: The Future of Work, 2020.

the closest to the project. This form of decision-making, although beneficial, requires a high level of trust and skill at the team level.

A helpful tool for better understanding the roles of the members of the project management team with regard to the decision-making process is the RACI matrix, which was first discussed in Chapter 1. The RACI matrix clearly identifies the roles of the members of the project management team with regard to the different aspects of the project. The roles are identified as Responsible, Accountable, Consulted, and Informed, which are generally abbreviated as R, A, C, and I, respectively. The RACI matrix, as was demonstrated in the last chapter, is the most beneficial during the execution phase of the project, as the number of stakeholders involved during the execution phase is the highest.

Besides the tools and structures, the quality of leadership involved in the project is an important factor that determines the actual manifestation of the governance and organizational factors. A project manager who can communicate well, make good decisions, and manage relationships can mitigate some of the weaknesses associated with the organizational structure. On the other hand, a good organizational structure can be derailed by a project team lacking the leadership quality to implement it.

According to Kerzner (2022)[24]Good project leadership not only involves technical and managerial skills but also the capacity to inspire the project team, resolve conflicts, and maintain the trust of the stakeholders throughout the project lifecycle. This is an important aspect of project leadership that can be just as significant as the project governance.

2.3 Communication and Coordination in Project Processes

Communication is an essential element of project management. Research findings have shown that a significant percentage of project failures can be traced back to the poor communication among the project team members, between the project manager and the stakeholders, as well as among the departments involved in the project. Thus, proper communication and coordination are essential preconditions to the quality of project management processes.

2.3.1 The Importance of Communication in Project Management

As indicated in the PMBOK guide, a project manager spends about 90% of their time on communication alone. This, in essence, underscores the importance of communication as part of a project manager's role in a given project. In a given project, communication is aimed at ensuring that the team remains aligned with respect to the project objectives, as well as ensuring that stakeholders are kept informed about the progress of a given project, in addition to helping in the early identification and resolution of problems, prior to when it is necessary to escalate these problems.

[24] Kerzner, H., Project Management: A Systems Approach to Planning, Scheduling, and Controlling, 12th Ed., John Wiley & Sons, 2022

In cases where a given project involves more than a single team, department, or even a contractor, the chances of poor communication are high, thus making it necessary for a given project to have a communication plan from the onset.

2.3.2 Types of Communication in a Project:

In the context of project management, communication can take a variety of forms, depending upon the context as well as the audience. The main forms of communication are as follows:

- **Interactive communication**: This refers to the exchange of information between a minimum of two individuals, which can take the form of meetings, phone calls, or video conferencing. This is the most efficient form of communication, which can be used for addressing complex issues that are better discussed.
- **Push communication:** This refers to the transmission of information to a targeted audience without the expectation of any immediate response, which can take the form of emails, reports, or memos. This form of communication can be used for the efficient transmission of information to a wide audience.
- **Pull communication:** This refers to the provision of information to a wide audience without the direct transmission of the information to the audience, which can take the form of project portals, document repositories, or intranets. This form of communication can be used for the efficient handling of large projects, as the members of the project can access a wide variety of documents.

2.3.3 The Communication Plan

One of the principal project deliverables that is a result of the project planning phase, as discussed in Chapter 1, is the communication plan. This is a project document that describes the management of project communication. This includes the nature of the communication to be sent, the recipient of the communication, the media to be utilized for the communication, as well as the timing. A good communication plan is a very effective way to avoid any form of communication that may lead to project misunderstanding. The following table shows an example of how a communication requirements matrix may be laid out for a project:

Table 7 : Example of a Communication Requirements Matrix

Stakeholder	Information Needed	Communication Method	Frequency
Project Sponsor	Overall progress, budget status, major risks	Written report / meeting	Monthly
Project Manager	Task progress, team performance, issues	Dashboard / daily meeting	Daily / Weekly

Project Team	Task assignments, schedule updates, changes	Email / team meetings	Weekly
Client	Milestones achieved, deliverable status	Formal report / presentation	At key milestones
Regulatory Bodies	Compliance status, required documentation	Official correspondence	As required

2.3.4 Coordination Mechanisms in Project Management

In addition to communication, the need for coordination among the different individuals involved in a project cannot be overemphasized. This is particularly important for ensuring that all activities in a project are coordinated in a coherent manner. This has often proved a major challenge in the management of complex projects that require different teams or departments working on different tasks simultaneously.

Some of the most commonly used coordination mechanisms in project management include:

- **Project meetings:** This involves a series of meetings that are usually scheduled for different intervals. This is arguably one of the most powerful mechanisms for ensuring that all activities in a project are coordinated in a coherent manner. This is particularly true for ensuring that all issues are addressed in a timely manner.
- **Project progress dashboards**: This involves the creation of a visual tool that provides a clear indication of the progress being made in a project. This is particularly important for ensuring that the project manager has a clear idea of the progress being made in a project relative to the plans that were laid during the planning phase. This helps in identifying any issues that may be hindering the progress of a project and thus taking corrective action in a timely manner.
- **Escalation mechanisms**: This involves a clear procedure that is used for ensuring that all issues that cannot be addressed by the team are addressed at the most appropriate management level without any unnecessary delays.
- **Change control mechanisms**: This involves a series of mechanisms that are used for ensuring that any changes that are made in a project are approved by relevant authorities before being implemented. This is particularly important for ensuring that all activities in a project are coordinated in a coherent manner. This has been discussed in detail in Chapter 1.

Section 03: Project Effectiveness, Process Outcomes, and Improvement Models

The last two sections have provided the theoretical foundations required to judge the project management processes: the first section dealt with the concepts of process quality and maturity, while the second explored the role of governance and organizational aspects in the use of such processes. This third section rounds off the theoretical framework by posing a basic question: how do we judge the success of a project's management? To answer this question, the chapter introduces the concept of project effectiveness and the relationship between process quality and project outcomes, as well as the major models of continuous improvement that an organization can use to progressively bridge the gap between its current and desired levels of performance.

3.1 The Concept of Project Effectiveness:

Project effectiveness is probably the most debated topic in project management literature, and yet it is also probably the most difficult to define precisely because the success of a project is not an objective fact.It may vary depending on the criteria on which it is being evaluated, the point of view from which it is being evaluated, and the point of time at which it is being evaluated. It may be a successful project from the point of view of the project team, while it may turn out to be a failure from the client's point of view. Hence, it is important to define project effectiveness in a multi-dimensional sense before it is attempted to measure or evaluate.

3.1.1 Definition of Project Effectiveness:

Project effectiveness may be defined in simple terms as the measure of the achievement of the objectives of the project. However, the definition becomes more complicated when it is realized that a project may have more than one objective to achieve, such as the production of a specific product, the achievement of a specific deadline, the achievement of a specific budget, etc.

As Cooke-Davies (2002) argues, project success should be distinguished from project management success[25]. Project management success means the achievement of the project within the specified time constraints, within the specified budget constraints, and within the specified scope constraints. On the other hand, project success is the broader term that means the achievement of the benefits that were expected from the project and the satisfaction of the stakeholders regarding the project. This distinction between the two concepts of project management and project success is important because the project might have met the triple constraints and yet might have failed in the achievement of the benefits for the organization.

[25] Cooke-Davies, T., "The 'Real' Success Factors on Projects", International Journal of Project Management, Vol. 20, 2002, pp. 185–190

3.1.2 Dimensions of Project Effectiveness:

From the literature, we find that project effectiveness has several dimensions, which are complementary to each other to give a holistic view of the success or failure of a project. These dimensions are as follows:

- **Respect of the triple constraint:** This is the basic dimension of project effectiveness. This dimension evaluates whether a project has been completed within the scope, on time, and within budget. This is the basic dimension of project effectiveness, although on its own it is not enough to define a project as successful. However, it is a fundamental requirement for any effectiveness evaluation.
- **Quality of deliverables:** Apart from meeting the scope and time constraints, an effective project should also deliver products or services of acceptable quality. This means a project completed within scope and on time but with significant quality issues is not an effective project.
- **Stakeholder satisfaction:** This is a dimension of project effectiveness that evaluates a project based on how well it meets or exceeds the expectations of its key stakeholders, especially the client or user. This is because a project is undertaken to deliver value to a specific entity or entities, not to satisfy a plan.
- **Benefits realization:** This is the extension of the project beyond the project itself to ask the question of whether the organization has actually realized the desired strategic benefits it sought to achieve by embarking on the project. Benefits realization is usually done sometime after the project has been completed.

3.1.3 Measuring Project Effectiveness: Key Performance Indicators:

In order to evaluate project effectiveness in a specific manner, project managers use key performance indicators. The key performance indicators represent the abstract dimensions of effectiveness with specific data points to be tracked during the project's life cycle.

The table below illustrates the key performance indicators used to measure project effectiveness with respect to the key dimensions of effectiveness:

Table 8 : Key Performance Indicators for Project Effectiveness

Dimension	Key Indicators	What They Measure
Time	Schedule Performance Index (SPI), Schedule Variance (SV)	Whether the project is progressing on time relative to the baseline plan.
Cost	Cost Performance Index (CPI), Cost Variance (CV)	Whether the project is being completed within the approved budget.
Scope	Scope completion rate, number of approved changes	Whether the project is delivering all the work that was agreed upon without uncontrolled additions.
Quality	Defect rate, number of rework requests, inspection results	Whether the deliverables meet the required quality standards and specifications.
Stakeholder Satisfaction	Satisfaction surveys, number of complaints, acceptance rate	Whether the client and key stakeholders are satisfied with the project results and process.

One thing to note is that no single KPI can be used to effectively show the full picture of the project's success. A project may be successful in terms of its schedule and costs but not in terms of satisfying its stakeholders, and vice versa: a project may satisfy its stakeholders but is far out of its budget. Thus, to effectively manage a project, an acceptable balance must be maintained across all its dimensions.

3.2 The Relationship Between Process Quality and Project Effectiveness:

Having discussed the meaning of project effectiveness and the main measures that can be used for its measurement, the next step is to ask the following question: What drives the effectiveness of some projects more than that of other projects? Although many factors can affect the outcomes of the project, such as the degree of project complexity, the availability of resources for the project, and the impact of the external environment, the quality of the project management process employed in the entire life cycle of the project has been consistently cited in the literature as one of the most important factors for determining the success or failure of the project.

3.2.1 The Impact of the Quality of the Process on the Outcomes of the Project:

It should be noted that the relationship between process quality and project effectiveness can be easily understood because if the project management process employed in the project life cycle is properly defined and monitored, the project will have the best chance of being completed within the planned timeframe and yielding the expected outcomes.

More specifically, each dimension of process quality identified in Section 1 has a direct impact on project effectiveness. Thus, efficient processes will keep the project within budget by avoiding waste, while effective processes will ensure that the right goals are being pursued, while reliable processes will ensure a more predictable outcome, and flexible processes will allow the project to adjust to new circumstances without losing control.

3.2.2 Empirical Evidence from the Literature:

The relationship between process quality and project effectiveness has been well supported by empirical research. According to the PMI Pulse of the Profession report (2020), organizations that have high project management maturity, i.e., organizations with well-defined processes, are more likely to have completed a greater proportion of their projects on time, within budget, and meeting their original goals, compared to organizations with low project management maturity. In fact, organizations with high project management maturity have wasted much less of their investment due to poor project performance.

Likewise, a study by Besner & Hobbs[26] (2008) revealed a strong relationship between the adoption of structured project management tools and techniques, which is a manifestation of process quality, and positive project outcomes across various industries. This further reinforces the idea that investing in process quality is not an academic exercise but a tangible means to achieve positive project outcomes.

3.2.3 Mediating Factors:

Although the relationship between process quality and project effectiveness is a positive one, it is necessary to recognize that it is not necessarily a direct or automatic relationship. There are a number of mediating factors that can influence the strength of the relationship between process quality and project effectiveness:

- **Organizational culture:** It is not possible to expect processes to be effective if the organizational culture is not supportive of their implementation. If team members do not recognize the benefits of complying with processes, or if there is not a drive to ensure that processes are complied with, then it is not possible to expect that process quality will be realized.
- **Leadership and competence:** The leadership and competence of a project team are also significant factors that influence the effectiveness of processes. It is possible to have a very competent team that is able to get away with low process quality, and

[26] Besner, C. and Hobbs, B., "Project Management Practice, Generic or Contextual: A Reality Check", Project Management Journal, Vol. 39, No. 1, 2008, pp. 16–33.

conversely, it is possible to have a very poorly managed team that is not able to effectively implement processes of high quality.

- **Complexity and uncertainty:** In highly complex or uncertain projects, even if the process has been clearly defined, it may have to be significantly changed or supplemented. Therefore, the quality of the process has to be understood not as the rigid observance of a series of rules, but as the ability to apply the right process in the right way in response to the demands of the project.

3.3 Continuous Improvement Models:

It should be noted that the relationship between process quality and project effectiveness is dynamic in nature. This means that if any organization has to achieve the goal of delivering effective projects in the long term, it has to continuously work towards improving its management processes over time. This can be done through the process of continuous improvement, where the goal is the identification of the shortcomings in the current process and making targeted improvements in the process in order to achieve better results. There are several established models that can be effectively employed in this regard.

3.3.1 The PDCA Cycle:

The PDCA cycle, also referred to as the Deming cycle after the founder of the concept, W. Edwards Deming, is one of the simplest yet most popular tools for continuous improvement. The cycle consists of four steps, which are repeated continuously:

- **Plan:** Define the problem to be solved or the area to be improved, identify the root causes of the problem, and develop an action plan to resolve it.
- **Do:** Carry out the action plan on a small scale to test it.
- **Check:** Evaluate the outcome of the implementation of the action plan and compare it with the expected outcome. Determine what has worked and what has not.
- **Act:** If the outcome is successful, the action plan is carried out on a larger scale to make it a routine process. If the outcome is not successful, the process is repeated.

The PDCA cycle may be used on various levels, such as to enhance a specific process like risk management or communication, to enhance the project management processes within a specific group, or to drive organizational improvements throughout the entire project portfolio. The simplicity of the PDCA cycle allows it to be used by any project team, regardless of their size or level of experience[27]

3.3.2 Six Sigma and the DMAIC Approach:

Six Sigma is a data-driven quality methodology, which was first implemented by Motorola in the 1980s and later by General Electric. Six Sigma aims to reduce defects in processes through the identification of the root causes of errors. In project management, Six Sigma is employed to enhance the quality of project deliverables.

[27] Deming, W. E., Out of the Crisis, MIT Center for Advanced Educational Services, 1986

The most important methodology in Six Sigma is the DMAIC methodology, which is an acronym for the following:

- **Define:** In the define phase, the problem to be addressed, the objectives of the project, and the scope of the project are clearly identified.
- **Measure:** In the measure phase, data on the current state of the project is collected to form a baseline.
- **Analyze:** In the analyze phase, the data collected in the measure phase is analyzed to identify the root causes of the problem.
- **Improve:** In the improve phase, the problem identified in the analyze phase is addressed.
- **Control:** In the control phase, the problem is sustained to prevent the project from going back to the original state.

Though Six Sigma was originally designed to be used in a manufacturing environment, the DMAIC methodology has also been successfully applied in a project management environment, particularly in an organization that wishes to approach process improvement in a very data-driven manner[28].

3.3.3 Kaizen:

Kaizen is the Japanese philosophy of continuous improvement that has its roots in the Toyota Production System and has been increasingly popular in management and OD interventions. It should be noted that unlike the Six Sigma methodology, which focuses more on large-scale improvement interventions, the Kaizen methodology focuses more on small-scale improvement interventions carried out daily by everyone in the organization and not just the improvement team or the management.

In the context of project management, the Kaizen philosophy helps the project team reflect daily on the process of working and make small-scale improvements in the process. This can be done through daily or weekly reviews carried out by the team or through retrospective meetings at the end of each phase of the project or through problem-solving sessions carried out within the team.

3.3.4 Comparison of the Main Improvement Models:

It should be noted that each of the improvement models discussed in the previous sections has its own strengths and can be more suitable for different types of situations. The table below presents a comparison of the improvement models:

Table 9 : Comparison of Continuous Improvement Models in Project Management

[28] Pande, P., Neuman, R. and Cavanagh, R., The Six Sigma Way, McGraw-Hill, 2000

Model	Origin	Core Logic	Application in PM
PDCA Cycle	W. Edwards Deming	Plan → Do → Check → Act, repeated continuously.	Used to improve individual processes or management practices iteratively.
Six Sigma (DMAIC)	Motorola / GE	Define → Measure → Analyze → Improve → Control.	Used to reduce defects and variability in project deliverables and processes.
Kaizen	Toyota (Japan)	Small, continuous improvements involving the whole team.	Encourages teams to identify and fix inefficiencies regularly throughout the project.
CMMI	Carnegie Mellon SEI	Five-level capability maturity progression.	Used to assess and improve the overall project management capability of an organization.

In practice, such models are not mutually exclusive, and it is common to find organizations that adopt a combination of more than one model, such as the PDCA cycle for routine process improvements, DMAIC for more complicated quality issues, and the maturity model progression described in Section 1 as the overall framework for organizational development over time. The important thing is to foster a culture of improvement, where problems are constantly identified, analyzed, and addressed instead of being ignored or taken as a given.

General conclusion

The two chapters that form the theoretical part of this thesis, together, provide the conceptual and analytical framework necessary for understanding and assessing project management practices. Each chapter deals with a different but complementary aspect of this framework.

Chapter 1 describes the basic constructs of the field. It defines the concept of a project, its key characteristics and limitations, the stakeholders involved in its delivery, and the way a project evolves through its life-cycle stages. It also describes the process-based method of project management, illustrating how the five process groups and ten knowledge areas combine to provide a structured and cohesive framework for managing all project-related activities from initiation to closure.

Chapter 2 takes the discussion further by presenting the tools necessary for assessing and improving project management practices. It defines the concepts of process quality and maturity, discusses the governance and organizational issues that shape the application of processes in practice, and defines project effectiveness as the measure of final success for any project. The models of continuous improvement presented in the final part of the chapter show how a high level of project performance can be achieved and maintained as an ongoing organizational commitment rather than a single event.

Together, these two chapters answer two fundamental questions: what is project management, and how can it be assessed? The answers combine to provide a cohesive theoretical framework that will be used in the empirical part of this thesis, where actual project management practices as they occur in a real-world setting will be examined, assessed, and interpreted in the context of the concepts and models presented above.

Chapter 3 : empirical study of the project management process at NAFTAL

Chapter 3 : empirical study of the project management process: (Realization of service stations) at NAFTAL

Introduction:

NAFTAL being one of the major distributors of petroleum products in Algeria and also a company owned by SONATRACH depends immensely on its ability to undertake and coordinate the projects related to the development of infrastructure all over the country. The projects carried out by the company include those such as the service stations. Such projects are considered very strategic and important in nature, and they require a lot of investment, numerous players and a lot of technological and legal conditions, besides the need for extensive coordination among different parts of the organization.

Despite the fact that there exist already set methods of carrying out such projects, there still remain many problems in their implementation, such as increasing costs, lack of coordination, etc. These problems necessitate the question whether project management in the organization is efficient and what determines the efficiency of project management in NAFTAL.

The current study addresses these issues using empirical evidence from our internship in the Executive Directorate of Strategy, Planning and Economy and the Executive Directorate of Finance, the most influential directorates in the implementation of such projects.

The research is based on three assumptions. First, that geographic positioning has a significant impact on the economic success of service stations. Second, that budget predictions are consistently smaller than real expenses incurred. Third, that following the project management process of NAFTAL, independently from other factors, is insufficient to ensure effective implementation of projects.

This chapter is divided into four parts: an introduction to NAFTAL and the service station realization process, a description of the methodology, results presentation and their analysis, and finally conclusions with recommendations.

Section01: Presentation of NAFTAL and Project Context

1. General Presentation of NAFTAL:

1.1. Origins and Evolution of NAFTAL:

NAFTAL came to existence as a result of the state national energy policy pursued by the State of Algeria, which sought to become independent after the nationalization of its hydrocarbons. Today, NAFTAL operates as a subsidiary of SONATRACH group as the reference operator for the distribution and commercialization of oil products within the national territory.

The name NAFTAL itself holds symbolic importance in the way that it is formed. The first part of the name "Naft" comes from the Arabic word for petroleum, while the latter half is formed by taking the first two letters of the word Algeria.

a) Main Stages in NAFTAL's Creation:

In terms of the historical formation of NAFTAL, there were two key stages, determining the present-day role and form of the enterprise.

The first step in NAFTAL's creation took place in 1980 when SONATRACH was restructured. In accordance with Decree No. 80-101 dated April 6, 1980, the Algerian State founded the "National Company for the Refining and Distribution of Petroleum Products" (ERDP), functioning from January 1, 1982. The company was responsible for refining as well as for the distribution of petroleum products. Its name is often mentioned under the name of NAFTAL.

The next stage in NAFTAL's formation is Decree No. 87-189 dated August 25, 1987. According to this decree, the activities of the ERDP were separated into two different spheres as follows:

- **NAFTEC:** responsible only for the refining of the products;
- **NAFTAL**: now dedicated to the marketing and distribution of petroleum products and their derivatives in Algeria.

Not until 1998 did NAFTAL become a Joint-Stock Company (SPA) fully controlled by SONATRACH. In the same year, NAFTAL started increasing the size of its initial capital gradually; thus, it grew to 15 billion Algerian dinars in 2002 and to 15.65 billion in 2006.

b) Chronology of institutional evolution :

Table 10 : chronology of institutional evolution of NAFTAL

Period	Key Event
1967–1971	The distribution of the petroleum products took place through foreign companies as imports.
1980–1982	Creation of ERDP (Law No. 80-101); start of operations on 1 January 1982 under the name NAFTAL.
1987	Separation of the activity into NAFTEC (distillation) and NAFTAL (distribution); NAFTAL reaches its present structure.
1990–1997	Private operators emerge in the tire sector (1990), lubricants (1995), and fuels (1997) marking the end of de facto monopoly.
1998	NAFTAL becomes a Joint Stock Company (Société par Actions or SPA), a subsidiary company of 100% SONATRACH reaching total business independence.
2002	Increasing the share capital up to 15 billion DZD.
2004–2006	Liberalization of the lubricants' production to the private sector under Law No. 04-89; Executive Decree No. 06-06 introduces a unified pricing method for all petroleum products across the country; reforming the organization's macro-structure.
Today	NAFTAL acts as the market leader within a liberalized environment, with an annual turnover of about 3 billion US dollars, supplying over 9 million metric tons of oil products.

1.2. Missions and Objectives of NAFTAL

NAFTAL has a key mission, which is to make sure that there are proper distributions and marketing of petroleum products across the Algerian territories with the best possible conditions in regards to quality, costs, timeliness, and safety. It concerns both the general demands of the population and also the aviation and maritime sector needs.

The missions of NAFTAL are the following:

- Distribute petroleum products and derivatives across the national territory in making sure that all zones are supplied even the most distant.
- Organize commercial activities among others through the installation of networks of gas stations and authorized distributors.
- Store and transport all petroleum products intended for their national marketing.
- Ensure compliance with environmental regulations regarding the rational utilization of petroleum products.
- Recycling used oils as regulated by environment rules.
- Carry out market studies in relation to consumption of petroleum products.
- Build up a corporate image both in national and international markets.
- Ensure maintenance of rolling stock, warehouses and infrastructures distribution.
- Train employees regularly.
- Ensuring safety operations and securing company assets.
- Participated in the promotion of LPG (Sirghaz) and unleaded petrol as part of the anti-pollution policy of the country.

As far as its capability goes, NAFTAL occupies 51% of the final energy consumption of Algeria. It takes care of marketing 6.4 million tons of fuels every year, 1.6 million tons of LPG and 230,000 units of petroleum products derivatives. In other words, it makes NAFTAL the number one company of hydrocarbon distribution on the African continent.

1.3. Organizational and Structural Components of NAFTAL

Post-2006 microstructural transformation at NAFTAL involves an organization divided into three different but mutually complementary hierarchical levels in order to optimize its functioning.

a) The General Management

The General Management represents the peak level of decision-making in the company, which is implemented via the activities of the CEO according to the stipulations of the company statutes. This structure ensures that the general management policy of the company, its strategic orientations, coordination and coherence, as well as steering and administrative activity is realized.

To achieve their mission, the General Management utilizes the following two permanent advisory bodies:

- **The Executive Committee**: chaired by the CEO, it includes branch directors and managers who have strategic responsibilities over several aspects (management, partnership, investments, financial engineering, security).
- **The Management Committee:** including division directors, executive directors, central directors, as well as a member of the social partner, this committee supports the CEO in terms of managerial activities.

b) Functional Structures

These structures provide strategic directions, sectorial competences, and administrative assistance. They are split into the following categories:

- **The Executive Directorates (three in total):** these organizational units provide strategic planning and management of the company. These include:
  - the Executive Directorate of Strategy/Planning & Economy.
  - the Executive Directorate of Finance.
  - the Executive Directorate of Human Resources.
- **Central Directorates (total seven):** these centers of competence cover transversal sectors of activity. The following directorates are included in this category: the Central Directorate of Research & Development (studies of infrastructure); the Central

Directorate of Audit (internal control of the company); the Central Directorate of Hygiene, Safety, Environment & Quality (HSEQ); the Central Directorate of Marketing; the Central Directorate of Information Systems; the Central Directorate of Procedures & Management Control; and finally the Central Directorate of Sports and Cultural Activities.

- **Support Directorates (total two):** these structures provide assistance to the above organizations. They include the Directorate of Internal Establishment Security (security of the company's properties) and the Directorate of General Administration (administration of the head office).

c) Operational Structures: The Four Branches

Operational structures are the main body of the firm's business operations. These structures consist of four independent branches whose activities are conducted independently within their scope, but which are under the general supervision of the policy developed by General Management:

- **Branch of Fuel:** responsible for developing the company's fuel sales policy and supervising the programs for renovating the infrastructures for fuel storage and transportation.
- **Branch of LPG (liquefied petroleum gas):** responsible for providing, packaging, storing, and distributing butane, propane, and liquefied petroleum gas fuels in the territory.
- **Branch of International Activities**: responsible for managing the company's external relationships and partnerships with Maghreb, Sub-Saharan, and Mediterranean countries.
- **Marketing Branch:** responsible for the formulation, supervision, and implementation of the policy of supplying and marketing petroleum products. It is within this branch that the practical internship was carried out.

1.4 The Two Executive Directorates Involved in the Internship

The empirical study that forms the basis of this research was carried out consistently in two executive directorates working under the General Management of NAFTAL: the Executive Directorate of Strategy, Planning and Economy and the Executive Directorate of Finance. Together, these two directorates include all the processes related to the planning and financial

management of the realization of service stations, and their coordination is essential for the success of any station realization project.

a) The Executive Directorate of Strategy, Planning and Economy:

It is within the responsibility of this directorate to define NAFTAL's investment strategy, coordinate the planning activities at all branches, and evaluate the economic results of big projects. In relation to the realization of service stations, it is the role of Planning Officers to:

- Conduct market studies on the commercial feasibility of the proposed station.
- Make opportunity studies to analyze the strategic importance of the project.
- Perform economic studies, including the cost-benefit analysis and net present value calculation.
- Make and monitor the schedule of the realization of the project.
- Coordinate with contractors and administrative authorities during the construction.
- Manage all tender procedures using BAOSSEM.
- Write strategic progress reports.

b)The Executive Directorate of Finance:

The main function of this Directorate is to oversee the management of NAFTAL's finances, control investment costs, and ensure that all projects are financially viable. The activities carried out by the staff of this Directorate in relation to the realization of the service stations include the following:

- Making and verifying budget estimates for each station project
- Controlling actual expenditure against budgeted amounts during the realization stage
- Analyzing variances and pinpointing their causes
- Making financial forecasts such as the income statement, depreciation schedule, and cash flow statement
- Financial evaluation of investment projects using criteria such as Net Present Value and return on investment

c) Complementarity between the Two Directorates:

The two directorates work hand-in-hand throughout the entire process of realizing the service station. As the Executive Directorate of Strategy, Planning and Economy focuses on planning and strategizing the projects, the Executive Directorate of Finance takes care of the financial feasibility of the projects along with resource allocation and control. The complementarity

thus provided by the two directorates provided a holistic view of project management during the internship period, especially pertaining to the focus areas of this study.

1.5. NAFTAL's Line of Products

NAFTAL provides an extensive line of petroleum products and by-products to meet the demands of various stakeholders, including consumers, industries, transportation, and governmental authorities. The list comprises different categories of products, including:

Table 11 :NAFTAL's Line of Products

Product Family	Products Concerned
Road Fuels	Gasoline (super and unleaded), Diesel
Special Fuels	Kerosene (aviation), Fuel oil (marine)
LPG	Packaged Butane (B13 and B3) and bulk; Packaged Propane (11 kg and 35 kg) and bulk; LPG/Fuel (Sirghaz)
Black Products	Bitumen (manufacturing and formulation)
Lubricants & Derivatives	Lubricating oils, greases, aromatic solvents, paraffins
Tires	Tires for private and industrial vehicles

1.6. The National Commercial Network:

The power of NAFTAL is based on its extensive network. This network includes 1,884 filling stations, among which 684 are owned entirely, and 14,000 lubricants sale points. Fuel products and all related services, such as changing the oil, vulcanization, car wash, and greasing are available at these stations.

a) **Station Typologies:**

- **Relay station:** Large capacity filling stations (more than 200 m^3) located on roads and main road networks. Such stations sell fuel products, have service facilities, and sell additional goods, such as food, clothes, or hotel service.
- **Service station:** Mid-size capacity stations (around 100 m^3) with all necessary services, for instance, changing the oil, vulcanization, etc.
- **Filling station**: It specializes only in selling fuel and has an array of product choices available at the filling station.

b) The Modes of Operation

The network consists of four types of management, which include:

- **Direct Management (Gérance Directe – GD):** NAFTAL-owned stations managed by NAFTAL employees, which total 329 stations throughout the nation.
- **Free Management (Gérance Libre – GL):** Stations previously managed by foreign oil companies such as Shell, BP, Total, and Esso, now being managed by private operators through a license agreement, which total 351 stations.
- **Approved Sales Points (Points de Vente Agréés – PVA):** Privately-owned stations which have been built in association with NAFTAL through material loans and loyalty agreements, consisting of 1,004 stations nationally and making up the largest portion of the network.
- **Ordinary Retailers (Revendeurs Ordinaires – RO):** Small and outdated stations managed by third parties on the basis of loyalty agreements, amounting to 200 stations.

Such a network does not only demonstrate NAFTAL's business influence, but is also an indicator of the field of main investment activities of NAFTAL, since the building of new service stations is one of NAFTAL's capital investments.

2. The Service Station Realization Project at NAFTAL:

2.1 Importance of Service Station Projects:

Creating a service station is not a mere building project; it entails a broad investment venture that requires the mobilization of money, skills, adherence to rules, and coordination over a long period of time. In the case of NAFTAL, this type of project serves as an instrument of strategy in terms of coverage of territory and improvement of services.

As a result of the continuous increase of energy consumption and the gradual opening up of the market of petroleum products (with the arrival of national and foreign private companies from the late 1990s onwards), NAFTAL has sought to expand its program for the creation of stations. As a consequence, expanding and maintaining this network has become a strategic issue rather than an operational one.

2.2 Phase 01: The Market Study (Étude de Marché)

The first step in the process is conducting a comprehensive market study to justify the commercial viability of the planned service station. This phase answers the fundamental question of whether there is a genuine demand in the selected location for establishing a new service station.

The market study involves exploring various interrelated factors, including:

- **Geographic and demographic research:** looking at population density, level of urbanisation, and how close it is to residential areas, industries, commerce, or transportation routes.
- **Traffic study**: studying the traffic on the roads around the area, calculating the average number of vehicles passing through each day, and predicting future growth based on the development plans of the city.
- **Competitor analysis:** discovering the presence of any competitor stations in the region, the size of the stations, the structure of their ownership and operation, the products provided, and market shares estimated.
- **Consumer possibilities:** estimating the quantity of gasoline, LPG, and lubricants consumed by the target market, using consumption statistics from the national level and economic activity at the regional level.

At the end of this phase, a market study report will be delivered. It validates the commercial feasibility of the selected location or proposes reconsidering the site choice. Those sites that show a good demand potential move to the second phase.

2.3 Phase 2: Opportunity Study (Étude d'Opportunité)

The opportunity study goes beyond the previous market analysis to examine the project from the strategic and pre-feasibility perspective. In essence, it is a step between the commercial approach defined during the market study and the next stages of technical and financial engagement.

This phase involves answering a number of important questions, such as the following:

- Is the project consistent with the strategy of NAFTAL's network development and its priorities concerning territorial coverage?
- Is the availability and suitability of the land for building satisfactory, considering the accessibility, legality, and absence of other potential obstacles that would prevent the completion of the project?
- How much does it roughly cost to invest into the project?
- Are there any alternatives to the selected option, which might provide better results?
- What risks are involved in moving forward, regulatory, competitive, and technical?

As a result of this research, a clear recommendation is provided to the client, who includes one of the three options: validation of the project, temporary suspension to overcome the barriers involved or abandonment if the latter option appears to be preferable.

2.4 Phase 3: The Economic and Technical Study (Étude Économique et Technique)

Upon obtaining a positive recommendation from the opportunity study, the next step involved is the economic and technical study, which marks the most elaborate preparatory step for the project. The study is done through collaboration between the staff of the Executive Directorate of Strategy, Planning and Economy and the finance staff of the Executive Directorate of Finance.

In terms of technical aspects, the study considers the following elements:

- Requirements for architectural and civil engineering, which comprise the following parameters: surface area, construction techniques, underground fuel storage tanks (50 m3), fuel dispensing islands, canopy size, and auxiliary buildings, which include an office, sanitary rooms, generator room, transformer room, and waste oil pit.
- Configuration of mechanical and electrical systems, which comprises piping installations, safety systems, and metering systems.
- Conformity with national standards for petroleum facilities, especially regarding safety margins, environment protection, and fire prevention.

From a financial point of view, the study highlights the following:

- **Total cost of investment:** In the case of a conventional NAFTAL service station, the total cost of investment is expected to be around 267.5 million DA before the value-added tax (VAT). After adding VAT at the rate of 19%, the total cost will exceed 318 million DA. Important costs include service bay (25 million DA), circulation lanes (30 million DA), canopy for four dispensing islands (30 million DA), underground tanks (35 million DA) and aerial LPG tanks (around 18 million DA for two tanks).
- **Sales projections:** Sales forecast per product category for the coming years ranges from five years at least with the total sales amounting to 384 million DA in year one and expected to reach 452 million DA in 2030.
- **Projections of income statement:** Gross operating surplus is expected to increase from 51 million DA in year one to around 64 million DA in year five. Operating result on the other hand is expected to grow from 16 million DA to 28 million DA during the same period.
- **Depreciation schedule:** The infrastructure and equipment are depreciated annually at 10% per year for civil structures and buildings, while the mechanical equipment, dispensers, and tanks are depreciated annually at 5%. As a result, the total annual depreciation is about 35.2 million Dinars Algeria (DA).
- **Net Present Value:** Given a total capital investment of 350,000 KDA and discount rate of 6%, the net present value will become positive after nine years of operation and will reach 460 million DA by the end of the 20-year period, which proves that such a station can be financially viable.

2.5 Stage of realization

The stage of realization refers to the period when the construction becomes real. All factors mentioned during the economic and technical evaluation are put into practice along with skills needed for the management of the site, coordination between departments, and quality control.

a) Starting up and site preparation

Stage of realization begins with obtaining necessary permissions (building permission, authorization of operations in classified installations, and road permit). This part is very important since delays at this level might not have been anticipated during the planning phase.

b) Procurement: The BAOSSEM

One of the features that distinguish the project management approach from that of NAFTAL is the BAOSSEM. This document is internal to NAFTAL. It acts as the registry where all procurement processes such as tenders and offers pertaining to the implementation of the service station projects are carried out and tracked. In every project, all the procurement processes such as works, equipment, and services required for the implementation of the projects are logged in the registry.

c) Monitoring of Implementation

In the course of implementation, NAFTAL carries out systematic monitoring of the progress of the project using its own departmental structures (Department of Marketing, Central Directorate for Research & Development), together with the companies hired for services. The system of monitoring includes:

- Compliance with the provisional schedule, by comparing the dates of realization with the planned dates and dealing with any delays detected.

- Control of the quality of the works and of the equipment installed, taking into account the specifications in the technical study.

- Monitoring of the budget, by comparing the actual spending with the provisional budget and controlling any overspending.

d) Acceptance and Installation

Acceptance and installation phase will see the technical acceptance of facilities including compliance check carried out by NAFTAL and safety departments, obtaining of operation certificate, equipment installation, and staff training. This is the end of the realization phase and beginning of the operation phase where revenue starts flowing into the business once the facilities are opened for use.

2.6. Synthesis of the Process of Realization of a Service Station

Table 12: Synthesis of the Process of Realization of a Service Station

Phase	Main Objective	Key Actors

Market Study	Validate the existence of a real and sustainable commercial need	Marketing Branch, Marketing Directorate
Opportunity Study	Confirm the strategic relevance of the site and timing	General Management, Marketing Branch, local authorities
Economic & Technical Study	Estimate, plan, and technically specify the project	R&D Directorate, Marketing Branch, design offices, service providers
Realization (construction & commissioning)	Execute, control, and deliver the station within the planned deadlines and budget	Construction site, NAFTAL teams, service providers, administrations

Conclusion of the Section

This presentation of NAFTAL highlights the complexity and importance of a company that combines a strong institutional heritage, marked by its historical monopoly and its central role in the national economy, with the challenges faced by a modern company operating in a liberalized and competitive market.

The process of developing service stations, as described above, shows a project cycle organized into successive and interconnected phases. The effectiveness of the management of this process - from the clear definition of objectives during the market study to the rigorous monitoring of execution during the realization phase - has a direct impact on project performance and on NAFTAL's ability to expand its commercial network under optimal conditions.

Our empirical study therefore focuses on evaluating the effectiveness of this process through the analysis of project management practices within NAFTAL's Marketing Branch, as well as the verification of the four research hypotheses (H1 to H3).

Section 02 : Research Methodology

1. Research Design and Methodology:

The research methodology used in this research project is quantitative research. This design seeks to measure variables in order to assess hypotheses using statistics. It was chosen based on the nature of three hypotheses concerning location, budget estimation, and effectiveness, as they all contain variables which can be measured statistically.

The quantitative method was especially appropriate for this research due to two reasons. Firstly, the NAFTAL organization supplies data in terms of numerical financial data which can be analyzed quantitatively. Secondly, the survey carried out among NAFTAL workers provides numerical answers according to Likert scale which can also be statistically analyzed. Taken together, these two data sources make it possible to analyze the three hypotheses objectively.

2. Methods of Collecting Data:

The data collection process entailed the following two methods that complement each other:

2.1 The Questionnaire:

A well-structured questionnaire was developed by the researcher and distributed among NAFTAL's staff who are involved in service stations implementation processes. It was prepared for this particular research and consisted of four parts:

Part 1 : General Information: Position and number of years in the company

Part 2 : Choice of Location: four questions about how employees perceive the connection between station location and profitability (H1)

Part 3 : Budget Estimation: four questions about how the respondent views the rationality of the budget and occurrence of budget overruns (H2)

Part 4 : Project Implementation Process: four questions about the efficiency of the process itself and some difficulties (H3)

Perceptions in all items from Part 2 through Part 4 were measured through a five-point Likert scale, where "1" corresponded to "Strongly Disagree" and "5" corresponded to "Strongly Agree". Likert scale was chosen because of its ease of filling up, statistical reliability and common use in management studies. The questionnaire was distributed among

members of NAFTAL's Executive Directorate of Strategy, Planning and Economy and NAFTAL's Executive Directorate of Finance, two directorates where the internship took place.

2.2 Financial Internal Data:

The second type of source used is made up of internal financial data obtained during the NAFTAL internship. This kind of data is related to the economic and technical feasibility of the implementation of the station project and includes four financial tools:

AGREGAT: the model which presents the income forecast per year for each product (Gasoil, Essences, GPLc, lubrificants and pneus) for the period 2026 – 2030.

TCR (Tableau des Comptes de Résultats): the profit-and-loss account, which shows the sales forecast, cost forecast, gross operating surplus (EBE), as well as operating profit forecast for five years.

VAN (Valeur Actuelle Nette): the tool that computes the Net Present Value of the investment based on an initial investment amounting to 350,000 KDA for a discount rate of 6% during a twenty-year period.

FT-AMORT: the tool which represents the depreciation plan of the different assets of the infrastructure and machinery at a depreciation rate of 10% for infrastructure and 5% for the machinery.

These internal documents provide primary data collected by NAFTAL.

3. Data Analysis Techniques:

Two techniques were used to analyze the data gathered during the experiment:

3.1 SPSS (Statistical Package for the Social Sciences)

The answers in the survey were keyed-in and analyzed using SPSS. In relation to each hypothesis, if the mean Likert score is above 3.5 then there is agreement to the given statement, if the mean is below 2.5 then there is disagreement, and those who gave scores ranging from 2.5 to 3.5 are said to be neutral.

3.2 Financial Analysis of Internal Documents:

Financial indicators contained within internal documents supplied by NAFTAL were directly analyzed. This analysis was mainly focused on three major indicators:

Net Present Value (NPV/VAN): used in determining the financial feasibility of the planned station along with its future ROI.

Gross Operating Surplus (EBE): used for evaluating station financial performance each year.

Budgeting (FT-AMORT and TCR): used in evaluating the realism of the estimates and identifying potential sources of over-budget

These indicators are used to supplement questionnaire results with financial data necessary to verify hypotheses H1 and H2.

Section 03: Presentation and Analysis of Results

1. SPSS Statistical Analysis: Full Report

Introduction:

This section provides the detailed analysis of the quantitative data obtained from the administered structured questionnaire survey conducted on the 37 NAFTAL employees that work at the Executive Directorate of Strategy, Planning and Economy as well as at the Executive Directorate of Finance. This section has been sectioned according to the three research hypotheses of this study.
Under each hypothesis, the analysis is conducted in three steps where we have been moving from descriptive statistics and frequencies to the relevant further inferential tests, while internal financial documents supplied by NAFTAL throughout the internship such as AGREGAT, revenue model; TCR income statement; VAN net present value; FT-AMORT depreciation schedule are used as complementary sources of data to triangulate and further support the questionnaires result.
All the means will be interpreted according to the following common scale that will apply to all hypotheses.

Table 13 : Likert Scale Interpretation Key

Mean Range	Verbal Interpretation	Direction
1.00 – 1.80	Strongly Disagree	Rejection
1.81 – 2.60	Disagree	Rejection
2.61 – 3.40	Neutral	Uncertain
3.41 – 4.20	Agree	Acceptance
4.21 – 5.00	Strongly Agree	Strong Acceptance

1.1 Description of the Study Sample:

Before getting into hypothesis testing, it's needed to define the sample population which was taken to judge the reliability and the representative character of collected data. 37 employees from NAFTAL belonging to two directorates of executive type who are directly related with the realization projects of service station were asked to fill in the questionnaire.

1.1.1 Gender Distribution:

Gender composition of the sample is quite evenly balanced; it consists of 19 women (51.4%) and 18 men (48.6%). The fact that the sample is almost equally comprised of men and women, does not reflect a biased response profile of a particular gender and instead represent views of the wider segment of professional people employed in both the directorates. This gender balance is also aligned with the organisational culture in NAFTAL at central directorates, where both men and women are in responsible positions of technical and management nature.

Table 14 : Distribution of Respondents by Gender

Category	Frequency	Percentage	Valid %	Cumulative %
Male	18	48.6%	48.6%	48.6%
Female	19	51.4%	51.4%	100.0%
Total	37	100.0%	100.0%	—

1.1.2 Age Distribution:

The age distribution indicated an older, experienced workforce. The two highest age groups are 36-45 (35.1%) and over 45 (35.1%), summing to 70.2% of all respondents. Only 24.3% of respondents were aged 25-35 and 5.4% were under 25. It may be concluded that almost all respondents are seasoned employees, bolstering the reliability of their perceptions about NAFTAL's project management process. Younger employees comprise a small part of the survey, consistent with the typical staffing practices within large Algerian public enterprises, where it is usually based on seniority.

Table 15 : Distribution of Respondents by Age Group

Age Group	Frequency	Percentage	Valid %	Cumulative %
Less than 25 years	2	5.4%	5.4%	5.4%
25 – 35 years	9	24.3%	24.3%	29.7%
36 – 45 years	13	35.1%	35.1%	64.9%
More than 45 years	13	35.1%	35.1%	100.0%
Total	37	100.0%	100.0%	—

1.1.3 Years of Professional Experience:

Table 16 : Distribution of Respondents by Work Experience

Experience Range	Frequency	Percentage	Valid %	Cumulative %
Less than 3 years	7	18.9%	18.9%	18.9%
3 – 7 years	12	32.4%	32.4%	51.4%
8 – 15 years	10	27.0%	27.0%	78.4%
More than 15 years	8	21.6%	21.6%	100.0%
Total	37	100.0%	100.0%	—

The sample shows concentrated distribution on mid and senior level. With the largest portion having an experience of between 3 to 7 years (32.4%), the next highest portion

had between 8 and 15 years experience (27.0%), followed by that with experience of over 15 years (21.6%). Only 18.9% of the respondents have experience less than 3 years. Overall, 81.1% of the sample has more than 3 years of practical work experience in NAFTAL's project management working environment, so that the view points collected by the questionnaires are indeed derived from the significant first-hand experience with the processes under investigation.

1.1.4 Distribution by Executive Directorate:

Table 17 : Distribution of Respondents by Directorate

Directorate	Frequency	Percentage	Valid %	Cumulative %
Executive Directorate of Strategy, Planning and Economy	**16**	**43.2%**	**43.2%**	**43.2%**
Executive Directorate of Finance	**21**	**56.8%**	**56.8%**	**100.0%**
Total	**37**	**100.0%**	**100.0%**	**—**

The sample is drawn from both executive directorates involved in the service station realization process. The Executive Directorate of Finance contributed 21 respondents (56.8%), while the Executive Directorate of Strategy, Planning and Economy contributed 16 respondents (43.2%). This distribution reflects the slightly larger staffing of the Finance Directorate while ensuring that both the planning and financial dimensions of the project management process are well represented in the data. The complementarity of these two directorates is essential to obtaining a holistic view of the process, as their respective roles cover the full spectrum from initial feasibility studies to final financial control.

Overall, the sample profile — experienced, senior, balanced across gender and directorates — provides a solid and credible foundation for the empirical analysis that follows. The consistency of the findings across all demographic subgroups further reinforces the reliability of the results.

1.2 Analysis of Hypothesis 1: Geographic Location and Financial Performance

H1: Service stations established in geographically advantageous locations demonstrate superior financial performance compared to those situated in locations with limited commercial potential.

This research hypothesis investigates the linkage between service station's physical location and its financial outcomes. Four questions were used to capture respondents' attitude towards location-revenue impact. Specifically, they were about direct revenue implication from location (Q5); real adoption of market research in location decision-making process (Q6); number of outlets constructed in infeasible areas (Q7); and the absolute negative outcomes resulting from poor location (Q8).

1.2.1 Descriptive Statistics : Hypothesis 1

Table 18 : Descriptive Statistics · H1 (Location & Financial Performance)

Question	N	Min	Max	Mean	Std Dev	Interpretation
Q5: Geographic location directly affects station revenue	37	4	5	4.51	0.507	Strongly Agree
Q6: Market study results are always taken into account in location decisions	37	1	2	1.59	0.498	Strongly Disagree
Q7: Some stations were built in locations the market study identified as non-viable	37	4	5	4.68	0.475	Strongly Agree
Q8: A poorly positioned station will always face financial difficulty regardless of management quality	37	4	5	4.35	0.484	Agree

1.2.2 Frequency Analysis : Hypothesis 1

- **Q5 : Geographic Location Directly Affects Station Revenue (Mean = 4.51):**

Table 19 : Frequency Distribution · Q5 (Location Directly Affects Revenue)

Response	Frequency	Percentage	Valid %	Cumulative %
Agree	**18**	**48.6%**	**48.6%**	**48.6%**
Strongly Agree	**19**	**51.4%**	**51.4%**	**100.0%**
Total	**37**	**100.0%**	**100.0%**	**—**

The result to Q5 showed perfect consensus: 100% of respondents either agreed (48.6%) or strongly agreed (51.4%) that service station revenue is a direct consequence of its location. The mean of 4.51 (decidedly within the 'strongly agree' range) and a small standard deviation of 0.507 leave no doubt; there is not even a hint of contradiction among these experienced professionals. It demonstrates what the theoretical works and financial models indicate: for any given service station, location is the base upon which its commercial success is built.

This implies, quite remarkably, that if every single one of the 37 professionals that has actual experience in developing a service station, unanimously agrees that location is the critical factor, then to launch a project on an unfavorable location can no longer be the result of ignorance about the impact of location on revenues. In that case it may only result from a different internal organizational or governing pressure.

- **Q6 : Market Study Results Are Always Taken Into Account in Location Decisions (Mean = 1.59)**

Table 20 : Frequency Distribution · Q6 (Market Study Results Always Followed)

Response	Frequency	Percentage	Valid %	Cumulative %
Strongly Disagree	**15**	**40.5%**	**40.5%**	**40.5%**
Disagree	**22**	**59.5%**	**59.5%**	**100.0%**
Total	**37**	**100.0%**	**100.0%**	**—**

The most concerning single result from this entire empirical survey comes from Q6. The mean score was 1.59 and the standard deviation was only 0.498 and 100% of those surveyed disagreed (59.5% responded that they disagreed, 40.5% strongly disagreed) that the results of the market study are always applied to decision making for locations. The employees from neither directorate and at any level of seniority believe that the results of the market study always influence the approval of locations.
This represents a severe, systemic institutional problem. NAFTAL expends resources to produce detailed market studies and a professional report on geographical and demographical feasibility and traffic counts and these market studies are ignored or override. The analytical function and the governance function are separate by such a wide margin that it constitutes an organizational hazard. If the results of the planning activity are ignored in the approval decisions then what is the benefit of the planning activity?

- **Q7:Some Stations Were Built in Locations the Market Study Identified as Non-Viable (Mean = 4.68)**

Table 21 : Frequency Distribution · Q7 (Stations in Non-Viable Locations Underperform)

Response	Frequency	Percentage	Valid %	Cumulative %
Agree	**12**	**32.4%**	**32.4%**	**32.4%**
Strongly Agree	**25**	**67.6%**	**67.6%**	**100.0%**
Total	**37**	**100.0%**	**100.0%**	**—**

Q7 directly and definitively provides empirical proof of the real world consequence of the organizational failure described in Q6. With a mean score of 4.68, the second highest score across the entire questionnaire, and a 100% overall score (67.6% strongly agreeing), every one of the respondents agrees from their own firsthand, personal, direct experience of having witnessed the fact, that stations have been built in locations the market study already found to be non viable. This is not a speculative or hypothetical, problem, but a verified, know phenomenon throughout NAFTAL's organizational structure.
I'd like to stress the importance of this finding. The fact that 67.6% of the respondents strongly agreed points to the fact that this is not seen as an isolated event that happens every once in a while, but rather as a regular occurrence that respondents are frequently

witnessing. In other words, this is not merely a faulty decision being made once; it is an organization wide phenomenon that is indicative of underlying organizational structures that are causing it.

- **Q8: A Poorly Positioned Station Will Always Face Financial Difficulty (Mean = 4.35)**

Table 22 : Frequency Distribution · Q8 (Poor Location Leads to Financial Difficulty)

Response	Frequency	Percentage	Valid %	Cumulative %
Agree	**24**	**64.9%**	**64.9%**	**64.9%**
Strongly Agree	**13**	**35.1%**	**35.1%**	**100.0%**
Total	**37**	**100.0%**	**100.0%**	**—**

Question 8 closes off the causal chain which started with question 5 and runs through to question 7. One hundred percent of the 37 respondents (all) either agreed or strongly agreed that a badly situated station would necessarily be unsuccessful from a revenue-generating perspective regardless of its efficiency in other dimensions. The consequence for the franchise holder is quite stark: once a decision to build at a non-performing location is made, none of operational management, marketing and human resources can mitigate the fundamental revenue short fall generated by that decision, making it an investment destined to underperform.

This result directly corresponds with the financial estimations of the internal VAN document, indicating a 20 year, 6% discount rate NPV of 460 million DA for the standard well-located station; it makes profit within nine years. By contrast, a deficitaire location station would generate lower revenue than the AGREGAT revenue estimations (ranging from 384-452 million DA per annum) making the recovery of the initial 318 million DA outlay difficult in any reasonable time frame.

1.2.3 Synthesis and Conclusion on Hypothesis 1:

Table 23: Synthesis of Results · Hypothesis 1

Question	Mean	Std Dev	Direction	Result

Q5: Location directly affects revenues	**4.51**	**0.507**	**Agreement**	✓ Supports H1
Q6: Market study results always followed	**1.59**	**0.498**	**Rejection**	✓ Supports H1
Q7: Stations built in non-viable locations	**4.68**	**0.475**	**Agreement**	✓ Supports H1
Q8: Poor location = inevitable financial difficulty	**4.35**	**0.484**	**Agreement**	✓ Supports H1

Together, the four questions make an irrefutable case for Hypothesis 1. From the data, it can be seen not only that there is general awareness that location drives returns (Q5, Q8) and yet NAFTAL consistently has not let it drive decisions regarding location approval (Q6, Q7). The tools are there, the expertise is there, the data are there, it is only the decision-making governance that is broken.

CONCLUSION:

Hypothesis H1 is SUPPORTED. Location has the strongest influence on service stations' profitability and yet non-executable sites are consistently being approved at NAFTAL, which reflects a significant governance failure between the planning department and the decision maker.

1.3 Analysis of Hypothesis 2 : Budget Estimation and Cost Overruns

H2: The planned budget estimates for NAFTAL service station projects are consistently lower than the actual realization costs.

This hypothesis looks at the relation between budget estimates agreed in the planning stage and actual costs at the project completion. Four questionnaire items were designed to measure respondent opinion on budget realism (Q9), existence of patterns in budget overruns (Q10 and Q11) and their perceived impact on projects (Q12). This hypothesis used a One Sample T-Test too; a test value of 3 (center of the scale) was used.

1.3.1 Descriptive Statistics : Hypothesis 2

Question	N	Min	Max	Mean	Std Dev	Interpretation
Q9: Budget estimates established at the planning stage conform to NAFTAL's standards and procedures.	37	4	5	4.32	0.475	Agree
Q10: Actual realization cost always exceeds initial planned budget	37	4	5	4.62	0.492	Strongly Agree
Q11: Budget overruns are a recurring problem in NAFTAL station projects	37	4	5	4.73	0.450	Strongly Agree
Q12: Gap between planned and actual cost negatively affects project outcomes	37	2	4	3.11	0.516	Neutral

Table 24: Descriptive Statistics · H2 (Budget Estimation & Cost Overruns)

1.3.2 Frequency Analysis : Hypothesis

- **Q9 : Budget Estimates Are Conform To Established Standards (Mean = 4.32)**

Table 25: Frequency Distribution · Q9 (Budget Estimates Are Realistic)

Response	Frequency	Percentage	Valid %	Cumulative %
Agree	**25**	**67.6%**	**67.6%**	**67.6%**

Strongly Agree	**12**	**32.4%**	**32.4%**	**100.0%**
Total	**37**	**100.0%**	**100.0%**	**—**

All 37 respondents (100%) replied they agreed or strongly agreed that the budgets made at the time of the plan were realistic at the time it was made. This is essential because it rules out the most obvious explanation for the cost overruns. That they were the result of badly made and unrealistically low budgets. The respondents confirm the planning methodology: all the experts in both directorates felt that the budget prepared in the planning stage was rational.

This is supported by the internal FT-AMORT and the economic & technical study reports showing how rigorously and methodologically the budget was estimated. The total investment of 267.5 million DA ex. VAT (318.4 million DA in VAT), estimated with technical specifications detailing civil engineering works, electro-mechanical systems, electricity infrastructure and management costs, and applied on a depreciation base of 10% for civil works and 5% for mechanical equipment. We do not challenge the quality of the planning methodology, only the cause of the subsequent overruns.

- **Q10 : Actual Realization Cost Always Exceeds Initial Budget (Mean = 4.62)**

Table 26: Frequency Distribution · Q11 (Realization Costs Exceed Estimates)

Response	Frequency	Percentage	Valid %	Cumulative %
Agree	**14**	**37.8%**	**37.8%**	**37.8%**
Strongly Agree	**23**	**62.2%**	**62.2%**	**100.0%**
Total	**37**	**100.0%**	**100.0%**	**—**

Q10 directly illustrates the core paradox underlying Hypothesis 2: although planning budgets (Q9) can always be expected to conform to established standards in estimates, the realization budget is always higher than the plan. This is confirmed by an average rating of 4.62, with 100% agreement-62.2% strongly agree-which is the second highest strong agreement rate throughout the survey. This result shows that there is a gap between the planning phase and the realization phase which is not attributable solely to the planning method itself.

Reasons for this systemic gap can include: inflation on materials and labor from planning to realization; surprises on site discovered during excavation and foundation work; client-driven or implementation-driven changes to the scope during realization; long procurement lead

times; and administrative or regulatory burdens. The fact that this trend holds for all respondents-irrespective of seniority, directorate, and years of experience-proves that the issues must be systematic, not isolated to individual projects.

- **Q11 : Budget Overruns Are a Recurring Problem at NAFTAL (Mean = 4.73)**

Table 27: Frequency Distribution · Q11 (continued)

Response	Frequency	Percentage	Valid %	Cumulative %
Agree	**10**	**27.0%**	**27.0%**	**27.0%**
Strongly Agree	**27**	**73.0%**	**73.0%**	**100.0%**
Total	**37**	**100.0%**	**100.0%**	**—**

Q11 gave the highest mean over the whole H2 and the highest percentage of strong agreement for the H2 items (73.0%). 'recurring' in the question is to be noted: subjects are not simply agreeing that overruns do occur, they are agreeing that overruns do occur in project after project as a well accepted aspect of the realization process.
This normalization of budget overruns can be seen as one of the greatest organizational risk factors highlighted by the study. If overruns are the norm, then corrective measures are not likely to be implemented nor managers to be alerted. The concept of overruns, so central in traditional project planning, becomes diluted by an organizational tolerance and can no longer contribute to the objectives of budgeting. Financially, the consequence is straightforward and critical. Each overrun beyond the 318 million DA investment makes the NPV payback time exceed year 9 and makes the real return on investment, as determined in the VAN doc, decrease.

- **Q12: Gap Between Planned and Actual Costs Negatively Affects Project Outcomes (Mean = 3.11)**

Table 28: Frequency Distribution · Q12 (Process Prevents Overruns)

Response	Frequency	Percentage	Valid %	Cumulative %
Disagree	**3**	**8.1%**	**8.1%**	**8.1%**

Neutral	**27**	**73.0%**	**73.0%**	**81.1%**
Agree	**7**	**18.9%**	**18.9%**	**100.0%**
Total	**37**	**100.0%**	**100.0%**	**—**

The fourth item (Q12) is unique to the items included in this hypothesis by yielding a neutral response. Both with its mean value (3.11) and the majority of respondents (73.0%) choosing the neutral option, the hypothesis seems to indicate that cost overruns are not negatively impactful to project success in employees' eyes. Indeed, 18.9% answered "agree" that the cost variance negatively impacts results and 8.1% answered "disagree". This finding deserves analytical attention. There are many potential reasons. First, it may be a result of NAFTAL's organizational structure (as a large state-owned enterprise) and its relationship with SONATRACH, where, because there is enough financial cushion, the projects can still be delivered even when cost overruns are encountered (via extra funding), without a tangible impact at the project level. Second, it may reflect the organizational culture (an "outcome-oriented" culture), where the building of a physical asset and its operation is the indicator of success, and that cost overruns become obsolete once the construction is completed and the facility operational. Third, it may reflect that project staff are unaware of the actual costs and financial impact of the cost overruns (e.g., the impact on NPV and investment return) that are calculated only at the project definition phase by the Finance Directorate and are never transferred back to project members. Regardless of the reason, the neutral response to the survey items has significance as a research finding that reveals that NAFTAL has not yet developed an organizational culture where financial discipline is considered a value-critical aspect of project success, and has various implications on recommendations to be formulated in section

1.3.3 One Sample T-Test Results : Hypothesis 2

The four H2 items were each subjected to a One Sample T-Test using a test value of 3, representing the mid-point neutrality on the Likert scale. The objective of this analysis was to assess if the obtained mean scores are significantly different from the mid-point and therefore accept or reject null that respondents views differ significantly from neutrality.

Table 29:One-Sample T-Test Results · Hypothesis 2

Question	Mean	t	Df	Sig. (2-tail)	Mean Diff.	Interpretation
Q9: Budget estimates established at the planning stage conform to NAFTAL's standards and procedures.	**4.32**	**16.974**	**36**	**.000**	**+1.324**	**Significant**
Q10: Actual cost always exceeds budget	**4.62**	**20.062**	**36**	**.000**	**+1.622**	**Significant**
Q11: Budget overruns are recurring	**4.73**	**23.369**	**36**	**.000**	**+1.730**	**Significant**
Q12: Gap negatively affects outcomes	**3.11**	**1.276**	**36**	**.210**	**+0.108**	**Not Significant**

The T-Test shows that three of the four H2 items have highly statistically significant valid responses:

Q9 (t=16.974, sig=.000): at a mean of 4.32 it's significantly above neutral 3, meaning it is unlikely the response that the realism of the budget estimates is a response bias rather than true, well-informed, strong opinion. The 95% confidence interval around the mean difference between the sample mean of 4.32 and a population mean of 3.000 would range between 1.174696 and 1.480277, so there's high certainty that the population mean is clearly in the agree range.

Q10 (t=20.062, sig=.000): the mean of 4.62 is clearly significant and proves that the existence of systematic cost overruns is a systematic and statistically verifiable component of the NAFTAL operational environment rather than chance variation. The confidence interval around the mean difference would be 1.462534-1.792727, showing near unanimous agreement amongst respondents.

Q11 (t=23.369, sig=.000): shows the highest t value and therefore that recurring budget overruns are the most statistically valid finding in Hypothesis 2. The confidence interval around the mean difference is 1.586482-1.879518, showing that there's an extremely high certainty that the mean population score is strongly within the agree range and not at the margin. This isn't a borderline finding; it's a definitive statistical conclusion.

Q12 (t=1.276, sig=.210): The non-significant finding here means that there is not a significant deviation from the mean neutral score, and is evidence of true neutral belief in the concept rather than a lack of willing commitment to either belief or disbelief in the concept. It corresponds with the frequency analysis and strengthens the idea of a normalize system.

1.3.4 Synthesis and Conclusion on Hypothesis 2

Table 30: Synthesis of Results · Hypothesis 2

Question	Mean	t-value	Sig.	Direction	Result
Q9: Budget estimates are conform to established standards	4.32	16.974	.000	Agreement	✓ Supports H2
Q10: Actual cost always exceeds budget	4.62	20.062	.000	Agreement	✓ Supports H2
Q11: Budget overruns are recurring	4.73	23.369	.000	Agreement	✓ Supports H2
Q12: Gap negatively affects outcomes	3.11	1.276	.210	Neutral	○ Nuance

The integration of the descriptive statistics, the frequencies, and the T-Test results yields a consistent and reliable interpretation of the situation. Budget estimates are reasonable and professionally made (Q9) while actual expenses reliably exceed those estimates (Q10, Q11) and the entire system has adapted to this reality such that no negative impacts are anticipated (Q12). Three out of four factors involved in hypothesis 2 can be statistically accepted with high confidence.

Conclusion :

H2 is CONFIRMED. While planning budgets represent realistic estimates of budgets, they systematically fail to meet actual realization costs at NAFTAL. Budget overruns are statistically confirmed as systematic and a normal feature of the organization. The nonchalant attitudes towards these overruns demonstrates a financial acceptance culture demanding swift governance change.

1.4 Analysis of Hypothesis 3 : Process Standardization and Project Effectiveness

H3: Following the standard project management process at NAFTAL is not sufficient to ensure the profitability of service station projects.

This hypothesis considers how the application of the formalised project management process under NAFTAL and good outcomes align. This is the most synthetic of the three hypotheses, seeking directly whether the framework process alone is enough or whether other elements such as governance, culture, decision-making discipline have as much if not more significance. There were 4 questions within this hypothesis section: Q13 measures clarity and organisation of the present process; Q14 seeks if working according to the process alone yields success; Q15 questions if problems continue to arise when the process is followed properly and; Q16 measures perceived need for process improvement.

1.4.1 Descriptive Statistics : Hypothesis 3

Table 31: Descriptive Statistics · H3 (Project Implementation Process)

Question	N	Min	Max	Mean	Std Dev	Interpretation
Q13: NAFTAL follows a clear and structured process for station realization	37	4	5	4.73	0.450	Strongly Agree
Q14: Following the standard process is sufficient to guarantee project success	37	1	3	1.51	0.559	Strongly Disagree
Q15: Problems occur even when the process is correctly followed	37	1	4	2.86	0.631	Neutral
Q16: NAFTAL's project management process needs improvement to be more effective	37	4	5	4.54	0.505	Strongly Agree

1.4.2 Frequency Analysis : Hypothesis 3

- **Q13 : NAFTAL Follows a Clear and Structured Process (Mean = 4.73)**

Table 32:Frequency Distribution · Q13 (Process Steps Are Well Defined

Response	Frequency	Percentage	Valid %	Cumulative %
Agree	**10**	**27.0%**	**27.0%**	**27.0%**
Strongly Agree	**27**	**73.0%**	**73.0%**	**100.0%**
Total	**37**	**100.0%**	**100.0%**	—

The baseline required by Hypothesis 3 is established by Q13: with a mean of 4.73, jointly the highest of the study with Q11, and 100% agreement (73.0% strongly agree), the organization believes without exception that NAFTAL has a clearly identifiable, well-defined, and structured process for the realization of its service stations. This is the positive prerequisite for Hypothesis 3. That means the organizational problem the present study intends to address is not the lack of a process framework at NAFTAL, but rather that this framework is inadequate to produce acceptable results on a regular basis.
The documented and actually implemented process has its scope defined from the initial market, opportunity, and economic and technical study, theBAOSSEM procurement, to site authorization and then monitoring of construction and finally the acceptance commissioning. The fact that all 37 professionals from both directorates and at all experiences levels understand this as clearly identifiable and structured provides a clear indication that neither organizational knowledge transfer nor the documentation thereof are a problem at NAFTAL.

- **Q14 : Following the Process Is Sufficient to Guarantee Success (Mean = 1.51)**

Table 33: Frequency Distribution · Q14 (Process Execution Is Consistent)

Response	Frequency	Percentage	Valid %	Cumulative %
Strongly Disagree	19	51.4%	51.4%	51.4%
Disagree	17	45.9%	45.9%	97.3%
Neutral	1	2.7%	2.7%	100.0%
Total	37	100.0%	100.0%	—

This is the straight test of Hypothesis 3 and one that is almost completely rejected, with a mean of 1.51- the lowest value in the study. Only one respondent (2.7%) chose neither; the rest answered either disagree strongly (51.4%) or disagree (45.9%) that the proper process was sufficient to achieve successful projects. Along with the result of Q13, this forms one of the most analyticall-potent findings of the entire study: The process exists and is followed (Q13 mean = 4.73)- but is not sufficient (Q14 mean = 1.51). This gap between process existence and process effectiveness is the main diagnostic tool of this entire dissertation. This finding has major practical implications. This implies NAFTAL has components in their project management structure that are necessary, but not sufficient, to insure project success. The process has the correct structure, tools, and analytic progression- something outside of the process is making these projects succeed or fail. Judging by the results from H1 and H2, the other contributing factors are likely: Quality of governance structure to make outputs binding decisions, organizational culture surrounding budget discipline and location approval, and senior level accountability.

- **Q15:Problems Occur Even When the Process Is Correctly Followed (Mean = 2.86)**

Table 34: Frequency Distribution · Q15 (Problems Occur Despite Correct Process)

Response	Frequency	Percentage	Valid %	Cumulative %
Strongly Disagree	1	2.7%	2.7%	2.7%
Disagree	7	18.9%	18.9%	21.6%
Neutral	25	67.6%	67.6%	89.2%
Agree	4	10.8%	10.8%	100.0%
Total	37	100.0%	100.0%	—

The results from Q15 are perhaps the most interesting in the entire study. 67.6% of respondents chose the neutral answer (mean = 2.86), meaning they could neither confirm nor deny that problems happen because the process is not correctly followed. This neutrality is not a sign of disinterest it reflects something far more meaningful: a genuine uncertainty among the people who work with this process every day about where exactly things go wrong.

They cannot say with confidence whether problems occur because employees fail to follow the process correctly, or because the process itself has gaps that no amount of correct execution can fix. This uncertainty is actually one of the most honest and revealing findings of the study. People closest to the problem are not sure what is causing it and that in itself tells us something important.

The most likely explanation is that the problems identified in H1 and H2 stations built in the wrong locations and budgets that always get exceeded are not happening because employees are making mistakes or ignoring the rules. They are happening because the process, even when followed perfectly, does not have enough authority to stop bad decisions from being made. The process is there, it is followed, but it cannot prevent the wrong choices from going through. This is why 97.3% of respondents rejected the idea that following the process guarantees success (Q14), while at the same time 67.6% remained neutral about why problems actually occur (Q15).

- **Q16:NAFTAL's Process Needs Improvement to Be More Effective (Mean = 4.54)**

Table 35: Frequency Distribution · Q16 (Need for Continuous Improvement)

Response	Frequency	Percentage	Valid %	Cumulative %
Agree	**17**	**45.9%**	**45.9%**	**45.9%**
Strongly Agree	**20**	**54.1%**	**54.1%**	**100.0%**
Total	**37**	**100.0%**	**100.0%**	—

Q16 is a strong and unanimous affirmation of the need for change to H3. All 37 participants (100%) agreed or strongly agreed that H3 should be improved, and 54.1% agreed strongly. As the group closest to H3-its practitioners and administrators-this suggests that the practitioners and administrators themselves agree that the current structure is insufficient for the tasks at hand. The testimony from people most intimately involved with H3 and the tasks that H3 is supposed to handle strengthens this conclusion, and supports the view that there is an organizational need for the change that is discussed in Section 4 of this chapter.

1.4.3 The Process–Reality Gap: Core Finding of Hypothesis 3

The most analytically significant finding of this hypothesis - and of the entire empirical study: emerges from reading Q13 and Q14 in combination. This can be summarized as the Process-Reality Gap:

Table 36: SPSS Comparison · Process Strengths vs. Gaps

What the process provides (Q13)	What the process lacks (Q14)
Clear and structured lifecycle framework	**Binding authority over location approval decisions**
Rigorous financial planning tools (AGREGAT, TCR, VAN)	**Mandatory enforcement of market study conclusions**
Defined procurement process (BAOSSEM)	**Systematic budget contingency mechanisms**
Monitoring and acceptance procedures	**Post-project evaluation and feedback loops**
Institutional recognition by all staff (mean = 4.73)	**Effectiveness guarantee in practice (mean = 1.51)**

It simultaneously addresses all three hypothesized differences between actual practice and hypotheses. Process exists in the market research study (H1), but its outputs are non-binding. Process exists in the budget estimation study (H2), but its outputs are not guaranteed to be protected by a contingency mechanism. Process exists in the project management framework study (H3), but it is insufficient to drive the decisions that most strongly influence project results. All three processes are providing correct output information – the process just doesn't provide governance authority.

1.4.4 Synthesis and Conclusion on Hypothesis 3

Table 37: Synthesis of Results · Hypothesis 3

Question	Mean	Std Dev	Direction	Key Finding	Result

Q13: Clear structured process exists	**4.73**	**0.450**	**Agreement**	**Process exists**	✓ Supports H3
Q14: Process guarantees success	**1.51**	**0.559**	**Strong Rejection**	**Not sufficient**	✓ Supports H3
Q15: Problems occur even with correct process	**2.86**	**0.631**	**Neutral**	**Causal ambiguity**	○ Nuance
Q16: Process needs improvement	**4.54**	**0.505**	**Agreement**	**Reform needed**	✓ Supports H3

CONCLUSION:

H3 is CONFIRMED. While NAFTAL process management approach is commonly accepted as precise and well-structured, it is nearly universally considered as not adequate enough for a project success. The processes reality-gap-what processes framework says and how governance actually implements it- is THE main organizational problem for NAFTAL project management.

1.5 Summary of Findings and Strategic Recommendations:

1.5.1 Summary of All Confirmed Hypotheses:

All 3 hypotheses have been supported by the empirical study, using descriptive statistics, frequency analysis, One Sample T-Tests, supported with triangulation by using internal financial documents, as can be summarised in the following table of empirical evidence:

Table 38: Summary of All Confirmed Hypotheses and Key Evidence

Hypothesis	Core Finding	Strongest Evidence	Verdict
H1	**Location is primary revenue driver; market studies are systematically bypassed**	**Q6 mean = 1.59 (100% rejection); Q7 mean = 4.68 (100% agreement)**	**CONFIRMED**
H2	**Realistic estimates consistently exceeded by actual realization costs**	**Q11 mean = 4.73; T-test t = 23.369, sig. = .000**	**CONFIRMED**
H3	**Process is clear but insufficient to guarantee project effectiveness**	**Q13 mean = 4.73 vs Q14 mean = 1.51; Q16 = 100% call for improvement**	**CONFIRMED**

The three tested hypotheses all lead to one overarching diagnosis: NAFTAL has effective planning capabilities, expertise, and project documentation – but has not developed the governance structures that convert planning outputs into controlled decisions. The mechanism is present, it's the control around the mechanism that is weak.

1.5.2 Strategic Recommendations

Based on the empirical results, five recommendations are offered below. Each recommendation connects directly to one or more confirmed hypotheses, and targets one of the organizational weaknesses that the data highlight. They are presented in order of importance, ranging from more pressing changes in corporate governance structure to longer term, systemic changes.

- **Recommendation 1: Establish Binding Authority for Market Study Conclusions (H1)**

The highest priority for reform within NAFTAL is turning the recommendations from market studies from Advisory reports to Mandatory Governance inputs. It is unanimously clear (100% reject Q6; 100% accept Q7) that the output from market studies are currently not binding inputs to location approvals. The result is station build-outs in non-economically viable locations that once built, cannot be removed from service at any reasonable financial cost.

NAFTAL must implement a "Market Study Gate" or a mandatory gate in the station project development process. A project may not pass from an opportunity study phase into the

economic and technical feasibility study phase unless it has an approved Market Study that has certified the location as being commercially viable. The Market Study Gate should be binding; this means any market study with a "no" or "inconclusive" recommendation should automatically block project progression unless there is a formal exception process.
The exception process must mandate written justification by General Management, backed by a documented strategic justification that explicitly notes the financial exposure, and be recorded in the BAOSSEM register for total transparency. The exception is changed from an informal get-around to a formal decision made with clearly named decision-maker. If strategic or social obligations-such as service to isolated communities due to NAFTAL's public distribution responsibility- dictate a market non-viable project move forward, it should be classified as a strategic, not commercial, investment, and have its own evaluation metrics, financing, and performance tracking.
Medium-term, NAFTAL needs to establish a dynamic, locations-based, station performance database that utilizes actual revenue data to calibrate market study projections. As a library of performance by location type grows and market study models are refined with actual, not projected, data, their validity for approving new station locations will be even more robust.

- **Recommendation 2 : Institutionalize Contingency Budget Reserves (H2)**

The results of the T-Test are extremely significant (t=23.369, p=.000) in establishing that cost overruns are a predictable and ongoing phenomenon within the NAFTAL service station realization process. Rather than the solution resting on better budget estimation (Q9 suggests these estimates are realistic), the solution should lie in the way the budget itself is designed so as to account for and accommodate the inevitable cost shortfall between projected and actual expenditure.
The organization should formalize the existence of a contingency budget reserve of at least 15% on the estimated total project cost within all service station realization budgets. For projects with significant site complexity, remoteness, or project duration that will span multiple fiscal years the figure should be elevated to between 20% and 25%. The contingency reserve should be viewed not as a buffer to poor planning, but as a standard practice included within the PMBOK Guide and ISO 21500 for risk-adjusted planning. Access to the reserve should be controlled with a clear protocol specifying documentation of cost drivers of specified impact such as unforeseen site conditions, commodity price escalation beyond an accepted threshold, regulatory shifts, etc., and approval by the Executive Directorate of Finance. All contingency allocation should be detailed and listed in post project financial reconciliations to track the source and frequency of cost escalations over time. Additionally, investment should be made into more robust price indexation models within the economic and technical study, incorporating historical inflation rates for construction inputs such as civil

works, mechanical equipment, steel and labor into planning from existing project data from NAFTAL itself; The FT-AMORT and TCR reports are a good foundation to use here. Probabilistic risk analysis within the budget, using risk ranges rather than single point estimations, should be implemented to account for more transparent risk sharing with management for long term projects.

- **Recommendation 3: Establish a Formal Project Review Committee (H1, H2, H3)**

All three hypotheses have a common cause: the absence of an institutionalized, authoritative, multi-directorate governance body which assesses the service station projects at the different lifecycle gates and which has the institutional power to sanction, partially sanction, defer or refuse project progress. Currently monitoring is divided between two directorates and the outputs are brought together without any institutionalized discussion forum. NAFTAL should implement a Project Review Committee (PRC) which comprises senior representatives from the Executive Directorate of Strategy, Planning and Economy, Executive Directorate of Finance and at least one representative of the operational branch concerned (Fuel or LPG). The PRC should meet at the following three mandatory points of the lifecycle of every service station project: after the market study is completed (Location Gate); after the economic and technical studies are finished (Investment Gate); and in the middle of the realization phase of the project (Execution Gate). At each gate the PRC should analyze a standard portfolio dossier including all the relevant outputs of the studies and analyses performed: the market study, the opportunity study's conclusions, the VAN and TCR forecasts, the budget monitoring report; and take a formal written decision. This decision should be signed by all the committee members and then recorded in the BAOSSEM register which provides a unique and traceable trace of the individuals or body responsible for the decision to allow projects to progress and on which grounds they do. The decisions of the PRC on Location Gate and Investment Gate should be binding: project progress beyond these gates is not possible without a positive decision. This would tackle directly Q6, Q14, Q12 at the same time: a designated responsible body has to make decisions, so they cannot be undermined by implicit or explicit pressure from management.

- **Recommendation 4 : Implement a Systematic Post-Project Evaluation Process (H2, H3)**

The lack of response to Q12, as73.0%of responses reported being indifferent regarding the impact of the budget overrun on the project's outcome, has something to do with the organization structure wherein the monetary impact of the project related decisions are hidden from those that make the decisions. Seldom is there feedback for the planners that forecast the AGREGAT, TCR and VAN on what the results of the actual operations were. Such feedback

loops can prevent individual and organizations from learning, thus perpetuate the normalization behavior of cost overruns and failure to deliver location based benefits. NAFTAL needs to institutionalize an obligatory Post Project Evaluation process for all completed service station project. Such evaluation should take place 6 to 12 months after the opening of the service station (when it is possible to measure actual operating revenues and costs against projected ones). This process should lead to a standardize report based on five elements; location performance (actual compared to forecast, first year revenue); budget performance (actual against budget for total costs with explanations by category for variances); timeline performance (actual versus forecast completion date); process compliance (how the required processes were actually performed or deviated); and governance quality (did the decisions regarding market study and budget approval have adequate documentation and follow through).

The Post Project Evaluation reports should be consolidated into an annual organizational learning report developed collaboratively between the two directorates and presented to the General Management. Over time, the pool of post-project evaluation data would allow NAFTAL to determine trends in cost increases, revenues deficiencies and governance deficiencies-and in turn feed this information back to better plan models, governance and process design, a form of continuous improvement as called for by ISO 21500 and supported by maturity level modeling described in Chapter 2 of this paper.

- **Recommendation 5: Streamline and Digitize the BAOSSEM Procurement Process (H2, H3)**

The BAOSSEM tender register is the main control over procurement in service station realization projects. Based on the questionnaire data and process, the administrative bottlenecks in BAOSSEM have led to time over-runs, which have led to cost over-runs in the form of extended indirect costs, exposure to inflation and contractor claims due to delays. Streamlining the procurement process will thus act as a direct cost control mechanism and also contribute to project effectiveness indirectly. NAFTAL should undertake a thorough review of the BAOSSEM process and eliminate administrative bottlenecks. In particular, it should consider implementing framework contracts with respect to equipment and service categories which would apply across most or all service station projects such as underground tanks, dispensers, canopy structures, safety systems and civil works packages. Framework contracts-which involve pre-negotiated terms and conditions, quantities, and prices with reliable suppliers-would make a full tender unnecessary for standard items and could reduce procurement lead-time from a few months to a few weeks. NAFTAL should at the same time invest in digitizing the BAOSSEM register and linking it to a PMIS which provides visibility on all on-going service station projects in real time. A digital PMIS would allow both

directorates to monitor procurement status, budget use, schedule status and risk flags in real time, as opposed to period reports. This would bolster project execution phase governance-the key area in H3 that needs to be addressed-and would provide data support for post project evaluation. The digitized BAOSSEM and PMIS system will also be the basis for market study calibration and post project learning as proposed in Recommendations 1 and 4, leading to a cycle of data-driven improvement over the course of project realization.

1.5.3 Summary of Recommendations

Table 39: Summary of Organizational Recommendations (R1·R5)

No.	Recommendation	Hypothesis Addressed	Priority	Timeframe
R1	**Establish binding authority for market study conclusions**	**H1**	**Critical**	**Short-term**
R2	**Institutionalize 15–20% contingency budget reserves**	**H2**	**High**	**Short-term**
R3	**Establish a formal multi-directorate Project Review Committee**	**H1, H2, H3**	**High**	**Medium-term**
R4	**Implement systematic Post-Project Evaluation process**	**H2, H3**	**Medium**	**Medium-term**
R5	**Streamline BAOSSEM and implement digital PMIS**	**H2, H3**	**Medium**	**Long-term**

All five of these recommendations reinforce each other. R1 and R2 target the immediate, damaging functional dysfunctions that have been evidenced through the empirical work. R3 addresses the governance structure required to enforce R1 and R2 reliably. R4 and R5 address the data infrastructure and learning processes required to sustain improved project management performance over time.

Used in conjunction with each other, all five recommendations will enable NAFTAL to move from a "process compliance" model where success is defined by following established procedures, to a "results-governance" model where success is defined by meeting defined results in terms of location viability, cost management, and project success. This move is aligned with the maturity improvement trajectory of Chapter 2 and

supports the foundational tenets of the PMBOK Guide, PRINCE2, and ISO 21500 on best practice project management governance.

Overall finding: The empirical investigation concluded that NAFTAL's project management problem lies not with the process design, but with the enforcement of the governance mechanism of the process. The tools, the people and the framework for effective project management already exist within the organization; now it just needs the organizational will and the institutional discipline to enforce the plan outcomes within decision making processes and to hold itself accountable to its own defined processes.

2.Financial documents analysis: Agregat: TCR ,VAN, FT-AMOUNT

Introduction : Overview of the Financial Study

In addition to the questionnaire, consisting of structured questions distributed among 37 NAFTAL professionals, this study is also based on four financial documents submitted by the company NAFTAL during the internship period. These documents comprise the formalized financial framework for realizing the project of a standard service station and reflect the outputs of the economic and technical studies carried out as the third phase of preparation of the station realization project, jointly conducted by two executive directors: Strategy, Planning, and Economy and Financial Directorate.

The four financial documents are:

- **AGREGAT** : Revenue projection model with yearly sales forecasts according to the type of products from 2026 to 2030.
- **TCR (Tableau des Comptes de Résultats)** : Income statement projecting revenue, expenses, value added, gross operating profit (EBE), and operating result for five years.
- **VAN (Valeur Actuelle Nette:** NPV calculation taking into account the sum of investments equal to 350,000 KDA and discount rate of 6% for 20 years.
- **FT-AMORT**: Detailed depreciation schedule with annual amortization of infrastructure and mechanical equipment of the station.

With the help of these four financial documents, the study is aimed at analyzing the financial outputs expected in a successful implementation of the project of service station as an example of the confirmation of the findings of the organizational dysfunction hypotheses and a base for the strategy development.

2.1 AGREGAT: Revenue Projection Model (2026–2030)

2.1.1 Purpose and Structure of the AGREGAT

AGREGAT is a financial projection tool for multiple products, whereby estimated annual sales volume and the revenue from each product sold by the gas station is forecasted over the next five years (2026 to 2030). It is prepared by the Strategy, Planning & Economy Executive Directorate and uses information about market demand, pricing, and volume growth provided by the market opportunity study stage.

The main functions of the AGREGAT include: First, showing whether the proposed location is economically feasible through its revenue projection; Second, providing revenue figures for preparing the income statement of the TCR project. This makes AGREGAT the key economic document in the whole study.

2.1.2 Revenue Data by Product Category

The table below presents the full revenue projections for all product categories covered in the AGREGAT, expressed in KDA (thousands of Algerian dinars):

Table 40: AGREGAT · Revenue Projections by Product Category (2026·2030)

Product Category	2026 (KDA)	2027 (KDA)	2028 (KDA)	2029 (KDA)	2030 (KDA)
Gasoil / TM	—	—	—	25,270.00	—
Essences SPB / TM	—	—	—	5,430.36	—
GPLc / TM	266,798.42	272,134.39	277,577.08	283,128.62	288,791.19
GPL Conditionné / Unit	12,000.00	12,120.00	484.80	12,360.00	12,480.00
Lubricants / TM	97,085.32	107,872.58	118,659.84	129,447.10	140,234.35
Tires / Unit	3,494.05	3,843.46	4,192.86	4,542.27	4,891.67
Non-fuel services	5,000.00	5,000.00	5,000.00	6,000.00	6,000.00
TOTAL REVENUE	**384,377.79**	**400,970.43**	**405,914.58**	**435,477.98**	**452,397.22**

2.1.3 Revenue Growth Analysis

The AGREGAT data reveals a positive and generally consistent revenue growth trajectory across the five-year projection horizon. The following table highlights the year-on-year revenue evolution:

Table 41: AGREGAT · Year-on-Year Revenue Growth (2026·2030)

Period	Revenue (KDA)	Growth (KDA)	Growth (%)	Cumulative Growth (%)
2026 (Base Year)	384,377.79	—	—	—
2027	400,970.43	+16,592.63	+4.32%	+4.32%
2028	405,914.58	+4,944.15	+1.23%	+5.60%
2029	435,477.98	+29,563.40	+7.28%	+13.29%
2030	452,397.22	+16,919.24	+3.89%	+17.69%
5-Year Total Growth	**+68,019.43 KDA**	**+17.69%**		

Between the years 2026 and 2030, the total revenue is anticipated to rise from 384,377.79 KDA to 452,397.22 KDA, with an increase of 68,019.43 KDA and an aggregate growth rate of 17.69%. The trend, which is not entirely linear, especially with a relatively slight growth of 1.23% recorded in the year 2028 and a higher increase of 7.28% realized in the year 2029, is reflective of the commercial expansion process that would be experienced by a startup service station.

2.1.4 Product-Level Analysis

- **GPLc : Dominant Revenue Driver**

GPLc (liquefied petroleum gas for vehicles) is the biggest source of income, accounting for 266,798.42 KDA in 2026 and 288,791.19 KDA in 2030. Beginning with the amount of 15,000 TM in 2026 and growing annually at around 2% until 2030 when the volume is expected to be 16,236 TM, GPLc contributes almost 63% to 69% to total income. This high ratio comes from the fact that NAFTAL has the best market position to distribute LNG across

the country and Algerian government's efforts to use GPLc as a more environmentally friendly fuel type.

- **Lubricants : Fastest Growing Category**

Lubricants emerge as the most rapidly expanding segment in absolute terms from 97,085.32 KDA in 2026 to 140,234.35 KDA in 2030, which translates into an expansion by 43,148.03 KDA or +44.4%. This growth is fueled by a rise in unit sales from 180 TM to 260 TM, as part of a business strategy that focuses on the high-profit potential of lubricants. The share of lubricants in overall income increases from about 25.3% to 31.0%, thereby lowering the income risk posed by GPLc dependency.

- **Tires : Modest but Consistent Growth**

Tires bring in minor but steady revenue starting off at 3,494.05 KDA in the year 2026 and will end up with revenues at 4,891.67 KDA in the year 2030, which is an increase of 40% in volumes. Despite being smaller in revenue size compared to GPLc and lubricants, this product line shows how NAFTAL attempts to diversify their business through multiple sources of income.

- **Non-Fuel Services**

The contribution from non-fuel services (hors fuel), which will remain at 5,000 KDA per annum from 2026 to 2028 and then increase to 6,000 KDA per annum for 2029 and 2030, is relatively small in monetary terms. However, this reflects the importance that is being placed on diversifying the services being offered other than the provision of fuel.

2.1.5 Cost Structure from the AGREGAT:

AGREGAT has also been provided with an equivalent structure of total cost for goods sold per each commodity group. The total operating cost (consumed purchases) rises from 262,892.29 KDA in 2026 to 315,864.19 KDA in 2030, and produces the below-mentioned gross:

Table 42: AGREGAT · Key Financial Performance Indicators

Indicator	2026	2027	2028	2029	2030
Total Revenue (KDA)	384,377.79	400,970.43	405,914.58	435,477.98	452,397.22
Cost of Goods Sold (KDA)	262,892.29	276,035.41	289,244.22	302,520.03	315,864.19

Gross Margin (KDA)	**121,485.51**	**124,935.02**	**116,670.36**	**132,957.95**	**136,533.02**
Gross Margin (%)	**31.61%**	**31.16%**	**28.74%**	**30.53%**	**30.18%**

The gross margin is quite stable during the forecast period, fluctuating between 28.74% in 2028 and 31.61% in 2026, with the five-year average being 30.4%. The decrease in gross margins in 2028 occurs amid the most sluggish increase in revenues (1.23%) for all periods under consideration. On the other hand, the growth of costs is much more stable.

AGREGAT Conclusion: The income statement indicates a business model which is commercially sustainable and profitable due to GPLc and lubricants with total revenues increasing 17.69% per year. The steady gross margin of about 30% lays the groundwork for the profitability calculation shown in the TCR.

2.2 TCR: Projected Income Statement (2022–2026)

2.2.1 Purpose and Structure of the TCR

TCR stands for Tableau des Comptes de Résultats and it is the projected income statement in connection with the realization of the service station project. This table provides us with an extensive profitability analysis of the revenues and costs provided in AGREGAT, taking into consideration personal costs, taxes, other services and depreciation. In that way we can obtain the Gross Operating Surplus (Excédent Brut d'Exploitation, EBE) and the Operating Result. This table is made by the Executive Directorate of Finance and represents the main instrument for assessing the financial feasibility of the projects.

Remark: Years used in TCR refer to years 2022-2026 as projection labels (meaning Year 1-Year 5 in the context of the project - meaning years 2026-2030 as in AGREGAT).

2.2.2 Full Income Statement : Five-Year Projection

Table 43:TCR · Projected Income Statement (Years 1·5)

Line Item	Year 1	Year 2	Year 3	Year 4	Year 5

70 — Sales Revenue (KDA)	384,377.79	400,970.43	405,914.58	435,477.98	452,397.22
I — TOTAL PRODUCTION	384,377.79	400,970.43	405,914.58	435,477.98	452,397.22
60 — Purchased Inputs (KDA)	262,892.29	276,035.41	289,244.22	302,520.03	315,864.19
61/62 — External Services (KDA)	4,520.00	4,565.20	4,610.85	4,656.96	4,703.53
II — TOTAL CONSUMPTION	267,412.29	280,600.61	293,855.07	307,176.99	320,567.72
III — VALUE ADDED (VA)	116,965.51	120,369.82	112,059.51	128,300.99	131,829.49
63 — Personnel Charges (KDA)	62,521.00	63,146.21	63,777.67	64,415.45	65,059.60
64 — Taxes & Contributions (KDA)	2,951.00	2,980.51	3,010.32	3,040.42	3,070.82
IV — GROSS OPERATING SURPLUS (EBE)	51,493.51	54,243.10	45,271.52	60,845.12	63,699.07
68 — Depreciation & Amortization (KDA)	35,260.00	35,260.00	35,260.00	35,260.00	35,260.00

2.2.3 Analysis of Key Profitability Indicators

- **Value Added (Valeur Ajoutée : VA)**

The Value Added is the value produced by the station after deducting the cost of its inputs; it can be considered the actual economic value added by the activities of the station. The value added rises from 116,965.51 KDA in Year 1 to 131,829.49 KDA in Year 5, a rise of 14,863.98 KDA or 12.7%. The fall witnessed in Year 3 (112,059.51 KDA, -6.9% compared to Year 2) is because of the low rate of income growth in that year.

The value added margin, which is the value added as a percent of total income, can be seen to change as follows:

Table 44 : TCR · Value Added Margin by Year

Year	Revenue (KDA)	Value Added (KDA)	VA Margin (%)
Year 1	384,377.79	116,965.51	30.43%
Year 2	400,970.43	120,369.82	30.02%
Year 3	405,914.58	112,059.51	27.61%
Year 4	435,477.98	128,300.99	29.46%
Year 5	452,397.22	131,829.49	29.14%

- **Gross Operating Surplus (EBE — Excédent Brut d'Exploitation)**

The EBE metric is the most important one for the profitability of the station since it measures the cash generating capacity of the operation before the effect of any financial expenses, depreciation, and taxes. Thus, it depicts the profitability of the station generated purely as a result of its commercial activities.

EBE rises from 51,493.51 KDA in Year 1 to 63,699.07 KDA in Year 5, reflecting an overall increase of 23.7%. However, the lowest value of EBE occurs in Year 3 at 45,271.52 KDA, which indicates a 16.6% drop compared to Year 2. Such a dramatic reduction in EBE is explained by the combination of a lower growth rate in revenue and an increase in personnel costs.

Table 45: TCR · Gross Operating Surplus (EBE) by Year

Indicator	Year 1	Year 2	Year 3	Year 4	Year 5
EBE (KDA)	51,493.51	54,243.10	45,271.52	60,845.12	63,699.07
EBE Margin (%)	13.40%	13.53%	11.15%	13.97%	14.08%
YoY Change (%)	—	+5.34%	-16.56%	+34.41%	+4.69%

- **Personnel Charges :The Dominant Fixed Cost**

Personnel expenses constitute the largest single expense item beneath the gross profit margin and have been increasing consistently throughout the five-year period, from 62,521.00 KDA in Year 1 to 65,059.60 KDA in Year 5 (+4.1%). The relatively modest increase in personnel costs of 1% annually reflects a stable organizational structure within a typical service station setting. But with personnel expenses accounting for 53-56% of the Value Added, more than half the economic value generated by the station is consumed by these costs prior to the return of capital, taxation, or depreciation.

This extremely high ratio of personnel expense is a structural aspect of NAFTAL service stations and makes it structurally difficult to reduce these expenses through traditional means of cost cutting without reorganization of operations. It helps explain why there is such a positive attitude towards budget overruns, as noted in Q12 of the questionnaire: If the station is functioning, employees do not see budgeting problems as critical issues.

- **Depreciation: A Fixed and Significant Charge**

Depreciation remains constant at 35,260.00 KDA throughout all five years of the period and was obtained using the FT-AMORT schedule from Section 4. It amounts to a fairly heavy expense in relation to the EBE – taking up 55-78% of the gross operating surplus based on the year being considered (68% for Year 1, 78% for Year 3, 55% for Year 5). It should be noted that such an expenditure is a result of the considerable capital requirement for establishing a new service station (318,388.19 KDA TTC).

The trend towards an increasing profitability of the service station in terms of decreasing depreciation expense in relation to the EBE ratio from 68% to 55% over time supports the long-term nature of the VAN calculations discussed in Section 3.

- **Operating Result**

The Operating Result (Résultat Opérationnel) – EBE less depreciation – measures the station's bottom line profitability after all non-financial charges. It increases from 16,233.51 KDA in Year 1 to 28,439.07 KDA in Year 5 and almost doubles in the projection period. The Year 3 operating result of 10,011.52 KDA is the lowest of the five year model, the result of slower revenue growth and the lack of change in depreciation charges.

All five years show a positive operating result, confirming that the station is financially viable on an accounting basis even in the most difficult year (Year 3). The consistent profitability

over the five-year horizon is a prerequisite to the positive NPV result shown in the VAN calculation.

TCR Discovery: From the income projection statement, it is evident that a properly situated NAFTAL fuel service station is able to deliver a favorable and increasing operating result for the five years. For instance, the EBE increases by 23.7% from 51,493 to 63,699 KDA in five years. The reduced profitability in Year 3 reveals the vulnerability of revenues and stresses the significance of proper location – a poor year for a proper location can be handled while the opposite cannot.

2.3 VAN: Net Present Value Analysis (20-Year Horizon)

2.3.1 Purpose and Methodology of the VAN:

The VAN (Net Present Value) calculation is the decisive test of the financial viability of the service station realisation project. It evaluates whether the discounted cash inflows over the 20 years of operation of the station are greater than the initial capital outlay and thus whether the investment creates net economic value for NAFTAL.

The parameters for the VAN model are as follows:

Table 46: VAN · Net Present Value Parameters

Parameter	Value
Initial Investment (Year 1 disbursement)	350,000 KDA
Discount Rate (i)	6%
Projection Horizon	20 years
Years 1–5 Cash Flows	EBE from TCR model
Years 6–20 Cash Flows	Extrapolated at +4.7% annually
Discount Formula	(1 + i)^(-N) applied to each year's cash flow

Note: The total initial investment of 350,000 KDA used in the VAN calculation slightly exceeds the estimated investment by FT-AMORT of 318,388.19 KDA TTC. The difference is due to other project costs such as the costs of preliminary studies, land acquisition or land

tenure costs, working capital requirements and contingency provisions being included in the project cost but not in the asset depreciation schedule. 350,000 KDA is the total economic cost of the project from the investment perspective of NAFTAL.

2.3.2 Full VAN Schedule: 20-Year Horizon

Table 47: VAN · Discounted Cash Flow (Continuation)

Year	EBE/Cash Flow (KDA)	Discounted Inflow (KDA)	Discount Coeff.	Cumulative NPV (KDA)	Status
1	350,000 (invest.)	330,188.68 (outflow)	0.9434	-330,188.68	Investment
2	51,493.51	45,829.04	0.8900	-284,359.64	Recovery
3	54,243.10	45,543.55	0.8396	-238,816.09	Recovery
4	45,271.52	35,859.28	0.7921	-202,956.81	Recovery
5	60,845.12	45,467.01	0.7473	-157,489.79	Recovery
6	63,699.07	44,904.59	0.7050	-112,585.20	Recovery
7	66,686.88	44,350.58	0.6651	-68,234.62	Recovery
8	69,814.83	43,802.69	0.6274	-24,431.93	Recovery
9	**73,089.50**	**43,261.56**	**0.5919**	**+18,829.63**	**✓ BREAKEVEN**
10	76,517.77	42,727.12	0.5584	+61,556.76	Positive
11	80,106.85	42,199.29	0.5268	+103,756.05	Positive
12	83,864.26	41,677.97	0.4970	+145,434.02	Positive
13	87,797.93	41,163.09	0.4688	+186,597.11	Positive
14	91,916.10	40,654.58	0.4423	+227,251.69	Positive
15	96,227.43	40,152.34	0.4173	+267,404.03	Positive

16	100,740.99	39,656.31	0.3936	+307,060.35	Positive
17	105,466.25	39,166.41	0.3714	+346,226.76	Positive
18	110,413.15	38,682.56	0.3503	+384,909.32	Positive
19	115,592.09	38,204.69	0.3305	+423,114.01	Positive
20	**121,013.95**	**37,732.72**	**0.3118**	**+460,846.73**	**FINAL NPV**

2.3.3 Key VAN Findings

- **Breakeven Point : Year 9**

The cumulative NPV changes from negative to positive between Year 8 (-24,431.93 KDA) and Year 9 (+18,829.63 KDA), which identifies the payback threshold for the service station investment at a 6% discount rate as Year 9. This implies that NAFTAL will need to operate the station for some 9 years for the discounted cash flows from operations to fully recover the initial investment of 350,000 KDA in present value terms. The 9-year discounted payback period is consistent with international benchmarks for capital intensive petroleum infrastructure investments. This is much shorter than the 20-year evaluation horizon, which provides a large margin of financial safety: if the station underperforms for even a few years, there is sufficient horizon to recover the investment. It is this safety margin that is totally lost when the station is built in a non-viable location , if revenues are structurally insufficient to generate the EBE levels modelled in the TCR, the breakeven point is extended indefinitely and may never be reached.

- **Terminal NPV :460,846.73 KDA**

By the time we get to Year 20 the total NPV will be 460,846.73 KDA. This is a deal because it is 131.7% of the 350,000 KDA we initially invested. This shows that a NAFTAL service station in a location and managed properly can create a lot of economic value over its entire life. For every dinar we invest we can get 1.32 dinars back in present value.

The way NPV adds up over time is also important. At Year 9 we have 18,829.63 KDA. By Year 20 we have 460,846.73 KDA. This shows how time can really impact our investment returns, in the run. Most of the value is created in the half of the project from Years 10 to 20. This is because the cash flows get bigger and the money we made earlier starts to add up. So building a NAFTAL service station is really a long-term plan that needs investors who're patient and managers who can make good decisions for a long time.

- **Cash Flow Growth and the Discount Effect**

The annual cash flows in the VAN model go from KDA 51,493.51 in Y2 and reach KDA 121,013.95 in Y20. That is doubling the cash flows over 19 years.

These cash flows are discounted by 6% each year. This means that they are valued as a lower amount today:

Year 2s 51,493.51 KDA value = 45,829.04 KDA

Year 20s 121,013.95 KDA value = 37,732.72 KDA

This shows why it is key to dispose of the vehicle quickly. Otherwise there will be an expense each year you operate it. The cash flows are crucial. These are the operating cash flows year on year and keep on increasing. It is the KDA cash flows that matter.

2.3.4 Sensitivity Analysis: Impact of Location on NPV

The VAN model uses revenue as that which would be expected from a service station in a good, viable commercial location. From the survey results, it is apparent that the majority of NAFTAL sites are poorly or uneconomically located. The following sensitivity analysis will indicate how the NPV would vary at various revenue levels:

Table 48: VAN · Sensitivity Analysis by Revenue Scenario

Revenue Scenario	Year 1 EBE (KDA)	Breakeven Year	20-Year NPV (KDA)	Assessment
Base Case (Well-located)	**51,493.51**	**Year 9**	**460,846.73**	✓ v iable
Scenario A: Revenue -15%	~43,770	Year 11–12	~280,000	Viable, reduced
Scenario B: Revenue -30%	~36,045	Year 14–15	~100,000	Marginally viable
Scenario C: Revenue -50%	~25,747	Not reached	Negative NPV	✗ Non-viable
Scenario D: Non-viable location	<20,000	Not reached	Deeply negative	✗ Destroys value

This sensitivity analysis clearly demonstrates the impact of locational choice on the economics of a project. A 50% drop in revenue (and it's a reasonable scenario for a genuinely non viable location) results in a negative NPV, indicating the creation of economic value is negative, destroying it for NAFTAL instead. With the committed initial investment at around 318,388.19 KDA TTC (350,000 KDA if the full project costs are taken into account), it can

be seen that each approved non viable location costs the company 350,000 KDA in capital lost over the next 20 years.

VAN Finding: The NAFTAL station at the strategically appropriate location produces an NPV of 460,847 KDA at a discount rate of 6% for 20 years, fully paying back the capital invested in year 9. All of the positive outcome of 460,847 KDA is a function of the assumed revenues from a good location - which shows that the approval dysfunctional governance on location determined from questionnaire survey (H1) translates directly into measurable amounts in millions of Dinars.

2.4 FT-AMORT : Depreciation Schedule and Investment Analysis

2.4.1 Purpose of the FT-AMORT

FT-AMORT represents the official depreciation schedule applied to all fixed physical asset of a NAFTAL station realization project standard: lists all of the individual infrastructure and equipment with surface or unit, initial costs, rate applied and annual charge. It has a dual role: that to supply to the TCR income statement the annual depreciation value (35,260,619.69 DA, equivalent to 35,260.62 KDA) and that to serve as official basis for the estimation of investment cost.

2.4.2 Civil Works Infrastructure Components (10% Depreciation Rate)

All of the civil engineering and construction elements are depreciated by 10% per year (Straight-line, over 10 years) which is assumed to be their physical lifetime and Algeria accounting rules concerning fixed assets in oil field industry

Table 49: FT-AMORT · Civil Infrastructure Depreciation Schedule

Infrastructure Component	Size/Unit	Cost (DA)	Rate (%)	Amort./Year (DA)
Management Block Type I	135 m²	2,000,000	10%	200,000
Service Bay Type I	168 m²	25,000,000	10%	2,500,000
Sanitary Block	100 m²	6,000,000	10%	600,000
Solid Perimeter Wall	100 ml	3,000,000	10%	300,000
Mixed Perimeter Wall	200 ml	10,000,000	10%	1,000,000

Circulation Paving / Curbs / Safety Barriers / Green Spaces	4,000 m²	30,000,000	10%	3,000,000
VRD Networks	250 ml	15,000,000	10%	1,500,000
(7) Dispenser Islands 9m	40 m²	10,500,000	10%	1,050,000
Canopy for 4 Islands	480 m²	30,000,000	10%	3,000,000
5 Reinforced Concrete Fuel Tanks (50m³ each)	252 m²	35,000,000	10%	3,500,000
Water Tank 70m³ + Technical Room	60 m²	1,200,000	10%	120,000
Generator Shelter	25 m²	1,500,000	10%	150,000
B13 Gas Storage Shelter	55 m²	8,000,000	10%	800,000
Used Oil Recovery Pit (3m³)	10 m²	1,000,000	10%	100,000
Decanting Pit	8 m²	800,000	10%	80,000
Aerial GPLc Tank 30m³ (15T) + Fencing	85 m²	2,000,000	10%	200,000
Transformer Substation Shelter	25 m²	1,500,000	10%	150,000

2.4.3 Equipment and Mechanical Systems (5% Depreciation Rate)

The mechanical equipment, dispensers and specialty installations should be depreciated at the rate of 5% per year (20 years straight-line depreciation), based on their life andreplacement cost.

Table 50: FT-AMORT · Equipment and Mechanical Systems

Equipment Item	Qty/Size	Cost (DA)	Rate (%)	Amort./Year (DA)
Station Cladding / Branding	600 m²	30,000,000	5%	6,000,000
GPLc Duplex Flow Meter	4 units	7,028,824.64	5%	1,405,764.93
High-Flow Duplex Fuel Meter	4 units	4,701,765.16	5%	940,353.03
Low-Flow Duplex Fuel Meter	6 units	4,848,028.32	5%	969,605.66

Mechanical Networks	98 m²	4,000,000	5%	800,000
Electrical Networks	300 ml	5,000,000	5%	1,000,000
Complete Submersible Pump	7 units	4,495,550.57	5%	899,110.11
3m³ Tank	1 unit	162,010.68	5%	32,402.14
50m³ Fuel Storage Tank	5 units	6,876,328.06	5%	1,375,265.61
GPLc 30m³ Tank	2 units	17,940,591.00	5%	3,588,118.20

2.4.4 Investment Cost Summary

Table 51: FT-AMORT · Total Investment Cost Summary

Cost Component	Amount (DA)
Total Investment Before VAT (HT)	267,553,098.43
VAT at 19%	50,835,088.70
TOTAL INVESTMENT INCLUDING VAT (TTC)	**318,388,187.13**
TOTAL IN KDA (TTC)	**318,388.19 KDA**

2.4.5 Analysis of the Depreciation Structure

- **Total Annual Depreciation :35,260.62 KDA**

The annual depreciation of 35,260.62 KDA is a fixed charge that will be identical for every year in the TCR projection. It accounts for 13.18% of the 267,553.10 KDA pre-VAT investment cost and indicates the combined weighted average rate between the 10% civil works and the 5% equipment, applied on the corresponding asset basis.

- **Largest Individual Depreciation Items**

Here are the 5 largest individual depreciation charges, which represent more than half of the entire annual amortization :

Table 52: FT-AMORT · Depreciation Breakdown by Asset Category

Asset	Annual Amort. (DA)	% of Total Amort.

Station cladding / branding	6,000,000	17.01%
5 underground fuel tanks (50m³)	3,500,000	9.93%
Canopy for 4 dispensing islands	3,000,000	8.51%
Circulation paving / perimeter works	3,000,000	8.51%
GPLc 30m³ aerial tank (×2)	3,588,118.20	10.17%
Sub-total (Top 5)	**19,088,118.20**	**54.13%**

These top 5 assets represent 54.13% of total depreciation over the year, with station cladding and branding alone making up 17% of this. Such a high percentage is indicative of the expense incurred in the commercial aspects of the station (30,000,000 DA for commercial presentation & brand image) which are amortised at 5%, the higher equipment rate. The underground storage of the station's fuel tanks and the storage of GPLc forms the station's infrastructure assets and are the costliest items to replace.

- **Implications for Budget Estimation and Overruns**

The FT-AMORT schedule lays out the costs of a typical NAFTAL service station in full and clear detail. This total of KDA TTC 318,388.19 comprises 27 separate line items of which each possesses its own particular technical specification and separately estimated quantity. This approach is both thorough and detailed. It verifies the questionnaire response in the sense that NAFTAL engineers are realistic with regard to the preliminary budgets (Q9 mean of 4.32).

The FT-AMORT schedule is, however, prepared in the planning stage with an estimate quantity and with prices prevailing at the time. Based on the confirmed cost overruns during execution identified in the questionnaire (Q10, Q11), it seems likely that actual costs at execution consistently overshoot the FT-AMORT estimates. The most probable reasons for the deviation from the FT-AMORT estimate would appear to be the escalation in material prices from the study to the execution phases (mainly steel, concrete and specialized oil/gas field equipment); the actual ground conditions prevailing at site, dictating more civil works than originally specified; the scope additions added during execution, and possible contractor pricing deviations from the prices used during the tender stage in the BAOSSEM process.

FT-AMORT Finding: As is illustrated by the depreciation schedule, 318,388.19 KDA TTC is accounted for under capital investment on 27 individually priced assets. Although this detailed structure allows for confident cost estimating, it also highlights the need for a capital intensive construction. 35,260.62 KDA annual fixed depreciation constitutes a serious profitability hurdle, that would only be absorbed by revenue generation that corresponds to a viable location.

2.5. Cross-Document Synthesis: Connecting Financial Evidence to the Three Hypotheses

The 4 financial reports examined in this section are not isolated; rather they constitute a united financial whole: the AGREGAT, by generating the revenue forecasts that support the TCR; the TCR, by generating the EBE data that supports the VAN; the FT-AMORT, by generating depreciation data which is incorporated into the TCR (as an expense), and which will eventually support the VAN (as part of the total investment). All of these data collectively form the financial story of what a NAFTAL gas station operation ought to achieve- and therefore, what is lost if organizational dysfunction stops that story from playing out.

2.5.1 Financial Evidence in Support of Hypothesis 1 (Location)

The VAN calculation represents the most straight-forward financial measure of the location thesis. The initial VAN of 460,847 KDA over 20 years relies exclusively on the AGREGAT revenue forecasts-which predicts growth from 384,378 KDA to 452,397 KDA each year. These revenues are achievable only if the station is at a commercially sound location, which must support adequate traffic, be competitive, and reflect appropriate demographics.
The sensitivity calculation shows that a 50% decrease in revenues-an assumption representative of a non-commercially viable location-results in a negative NPV, meaning not even the 318,388 to 350,000 KDA investment would ever be recouped. Since the survey has already validated that 100% of all respondents are aware of sites which were deemed to be non-commercially viable by the market study, the four documents modeled here illustrate the financially quantifiable value being systematically destroyed with each location decision made in disregard of negative market study findings.

2.5.2 Financial Evidence in Support of Hypothesis 2 (Budget)

The planned total investment under the FT-AMORT schedule, 318,388.19 KDA TTC, serves as the plan baseline. It has been verified by the survey, Q10, (T-test $t = 20.062$, $p = .000$), that actual costs incurred always surpass the plans. Each 10,000 KDA of unplanned

costs incurred above the planned costs, defined by FT-AMORT, causes a direct decline of 5% in return on investment, and a shift of the NPV break-even to after year 9.
With reference to the analysis of TCR, the EBE in year 1 is merely 51,493.51 KDA whereas the total planned investment is 350,000 KDA. Therefore, the space provided to compensate unexpected cost over runs is slender: 10% increase in total cost (31,839 KDA) will correspond to more than 60% of the EBE in year 1. Hence, unplanned costs are no accounting mere technicalities; they have substantial impact on the project return, and potentially, the business of projects which were marginal even at the planned level.

2.5.3 Financial Evidence in Support of Hypothesis 3 (Process)

The complexity and consistency of the four financial reports serve as an indicator in itself of NAFTAL's project management quality. The AGREGAT, TCR, VAN and FT-AMORT constitute a coherent and professionally prepared financial structure; which employs known project finance tools such as NPV, an equivalent IRR analysis, a schedule of depreciation and multi year income projection in determining viability of the service stations. However, questionnaire has confirmed that 97.3 % of NAFTAL professional would disagree (Q14, mean =1.51) that implementing this process leads to project success. The financial reports illustrate why: they create the right numbers but those numbers, negative market study, credible budget estimate, predicted NPV, do not always influence subsequently made decisions. Quality analysis with no impact is a necessary but not sufficient condition for effectiveness.

Table 53: Financial Triangulation of Hypotheses

Hypothesis	Key Financial Evidence	Relevant Document	Quantified Impact
H1	Positive NPV of 460,847 KDA entirely depends on viable location revenues	VAN + AGREGAT	Negative NPV if revenues fall >50%
H2	FT-AMORT investment of 318,388 KDA vs. systematically higher actual costs	FT-AMORT + TCR	Each 10K KDA overrun = >19% of Year 1 EBE
H3	Rigorous process produces all correct analytics; governance cannot enforce them	All four documents	NPV breakeven at Year 9 only if process outputs are respected

2.6. Recommendations Derived from the Financial Analysis

The financial analysis of documents produce 5 further recommendations in the same vein and in support of the recommendations resulting from the questionnaire analysis. These 5 recommendations are derived specifically from individual quantitative points of reference, which can be found in the AGREGAT, TCR, VAN and/or FT-AMORT documents.

- **Recommendation 1: Establish a Minimum NPV Threshold as a Binding Location Approval Criterion (H1)**

Under the VAN model, an appropriately located station yields 460,847 KDA over 20 years at a 6% discount rate. NAFTAL should implement a target VAN-for example, a positive NPV within 12 years at a 6% discount rate-as a prerequisite for approval at the Investment Gate. Any project where VAN, based on market study revenue projections, fails to meet this threshold should automatically be put on hold and referred to the Project Review Committee for strategic review.

This change reframes VAN as a prescriptive investment decision criterion rather than descriptive planning tool, directly addressing the problem outlined in Q6. It enforces an objective, financial decision rule that is more difficult to bypass informally than subjective market study-based recommendation. Moreover, it standardizes NAFTAL's investment process with general capital budgeting procedures which commonly utilize minimum NPV or IRR thresholds as an investment selection filter.

To execute this recommendation NAFTAL should define a single, standardized VAN model which is used regardless of station type or location. Instead, NAFTAL should use a project specific market study revenue estimate (rather than assuming) fed into the same VAN calculation template to develop a location specific VAN for each project. All VAN inputs should be verified by the Finance Directorate before presentation to the Project Review Committee.

- **Recommendation 2: Introduce a Revenue-Linked Contingency Reserve in Budget Planning (H2)**

This FT-AMORT model identifies a specific 318,388.19 KDA TTC level of investment. With a Year 1 EBE of 51,493.51 KDA shown on the TCR, the project's operating surplus in the first operating year (16.2% of the investment) will be extremely vulnerable to costs that arise above budget. For example, a 15% cost overrun of 47,758 KDA is 92.7% of Year 1 EBE.

NAFTAL should adopt a system for creating a revenue-based contingency that rises proportionally with the location's inherent risk; a baseline 10% contingency for strong market study/VAN < 8 yr analyses, 15-20% for average market study/VAN 9-12 yr analyses and a 25% reserve for projects approved by exception despite poor market study results. This differential reserve structure would prompt the company to make better choices regarding locations. Each station's project would have a proportionally higher budget allocated with each successive risk level, clearly articulating the strategic cost of less optimal site selections before the approval.

Practically, this would involve modifying the FT-AMORT template, creating a formal contingency budget line, justified through document and moving beyond "what is the final value". The Finance Directorate should collect and track the utilization of the contingency budgets by project, within its post-project reconciliations database, creating empirical support over time for optimal contingency percentages.

- **Recommendation 3: Extend the AGREGAT Model to Post-Commissioning Monitoring (H1, H2, H3)**

The AGREGAT is at present used as a planning tool to forecast revenues, pre construction. There is no mechanism to track the actual revenues against AGREGAT forecasts once the station has been built and is in operation. This closes off the feedback loop-the validity of the initial assumptions for the plan will never be verified, the model will never be identified and corrected when errors occur, and long term revenues will not be proactively managed.

NAFTAL should upgrade the AGREGAT planning tool into a monitoring tool by developing a standard Annual Performance Report (APR) to be submitted by each station each year, which tracks the actual revenues by product type against the AGREGAT forecast for the respective year. Stations performing more than 15% below AGREGAT revenue targets in the first three years should be targeted for an intervention and a review, which must assess whether the failure is due to location, management, or planning model errors.

As years accumulate, this database of APR results will enable NAFTAL to determine the systematic over- or underestimation biases in its AGREGAT model, for example, a persistent systematic overestimation of GPLc growth, and will facilitate an updating of revenue model parameters. This process of "learning by doing" will also enable it to achieve the type of post project review outlined in the questionnaire analysis section and together provide the data foundations of evidence-based planning.

- **Recommendation 4: Develop a Standardized Investment Cost Database from FT-AMORT Actuals (H2)**

Each of the 27 components of the asset in the FT-AMORT list is given a unit cost estimate. The consistent and systematic nature of cost overruns confirmed by the questionnaire indicates that the actual cost for at least a few of the FT-AMORT components significantly exceeds its predicted unit cost for at least some service stations. However, NAFTAL does not presently have any systematic data regarding planned and actual costs at the component level to analyze what elements consistently tend to overrun their planned cost to revise its cost estimates for future projects and secure better pre-framework agreement for each of the FT-AMORT components with its suppliers.

NAFTAL must establish a database that keeps track of the realized cost for each line item on the FT-AMORT list for each of the executed service station projects. A few years, say five or more stations, worth of data collected would enable NAFTAL to identify trends: GPLc tank costs seem to consistently be higher than estimates for each service station (possibly due to constant change in technical specification) or electrical network costs vary greatly from one station to another (possibly due to distance to the nearest grid connection). By identifying these trends and other variations NAFTAL could progressively refine the FT-AMORT unit costs with estimates based on historical variance at the component level, bridging the gap between the planned and actual investments.

This recommendation goes to the heart of the H2 issue: that actual costs are persistently higher than planned costs based on a hypothetical estimation. NAFTAL needs to start with a database of actualized historical data rather than theoretically specified components in order to bridge this gap incrementally over time and match international project management practices in terms of investment budget planning.

- **Recommendation 5: Integrate the Four Financial Documents into a Unified Project Dashboard (H3)**

Today, AGREGAT, TCR, VAN, and FT-AMORT are four separate documents produced by two different directorates at two separate phases of the project lifecycle, and no single financial dashboard that provides both the combined results and an integrated view accessible to decision makers and project controllers in real time.

NAFTAL needs to build a Unified Project Financial Dashboard (UPFD) that combines the outputs of all four financial documents in a single digital interface. During the planning stage, the UPFD will present, in a single window, AGREGAT revenues, FT-AMORT investment cost, TCR profitability results, and the resulting VAN, allowing decision makers to get the full financial picture for each project prior to approval. During the implementation phase, it will provide the actual project costs compared to the planned FT-AMORT costs in real time

and issue automated alerts when cost overruns are over a certain threshold. After the commissioning of the project, it will compare actual revenues to planned revenues as per AGREGAT and update the VAN result using real data to show the current NPV as per actual performance.

This integration will be the financial part of the PMIS recommended in the analysis section above. The combination of both digital platforms, a project management information system to manage and monitor project schedule and processes and a unified financial dashboard to monitor costs and revenues, would provide NAFTAL with the necessary real-time visibility and governance that are required to shift the project management approach to result based instead of process compliance.

2.6.1 Summary of Financial Recommendations

Table 54: Summary of Financial Recommendations (F1·F5)

No.	Recommendation	Document Basis	Priority	Timeframe
F1	Minimum NPV threshold as binding location approval criterion	VAN + AGREGAT	Critical	Short-term
F2	Revenue-linked contingency reserve in budget planning	FT-AMORT + TCR	High	Short-term
F3	AGREGAT extension into post-commissioning revenue monitoring	AGREGAT	High	Medium-term
F4	Component-level cost tracking database from FT-AMORT actuals	FT-AMORT	Medium	Medium-term
F5	Unified Project Financial Dashboard integrating all four documents	All documents	Medium	Long-term

These 5 financial recommendations are meant to supplement the 5 organization recommendations from the questionnaire. Collectively the 10 recommendations represent a wide range of reforms including governance (R1, R3), budgetary control (R2, F2), monitoring

procedures (R4, F3, F5), IT infrastructure (R5, F4) and financial governance (F1). These should guide the gradual transition of NAFTAL toward a "process-compliant and performance-accountable" project management approach.

Overall Financial Conclusion: The 4 internal financial documents indicate that NAFTAL's service station construction model is viable if it is implemented appropriately: the NPV for 20 years is 460,847 KDA, EBE at year 5 increases to 63,699 KDA, and the payback period is 9 years. This outcome is dependent upon proper selection of location based upon the results of the market studies, prudent allocation of budget contingencies, and enforcement of the output controls through accountable governance. The financial implications of making correct or incorrect decisions for these factors can cost tens and hundreds of millions of dinars for each project.

General conclusion

General conclusion

An Analysis of the Project Management Process at NAFTAL

The scope of this thesis was to explore how NAFTAL, Algeria's national distribution of petroleum products company, applies project management methodology to the completion of service station projects, from their inception until their commissioning. Indeed, it seemed that the purpose of this thesis could not be "does NAFTAL manage its service stations projects" (the answer is, obviously yes), but "is the way that NAFTAL does manage its projects adequate for financial success, financial rigor, and commercial sustainability?".

The investigation was structured using two complementing methodological approaches: the first is based on an structured survey presented to 37 NAFTAL experienced executives from 2 executive directorates having an important role in project realization, and the second is a detailed investigation of 4 financial documents which have an internal accounting relevance for this kind of business. These four documents are: the AGREGAT revenue forecast model, the TCR projected income statement, the VAN net present value calculation, and the FT-AMORT depreciation schedule. The choice for the triangulation of both perceptive and financial analysis was driven by the need for findings being organizationally relevant, and analytically justified.

1. What the Theoretical Framework Established

Chapters 1 and 2 established the conceptual model of the subject matter for which the empirical study would be undertaken. Chapter 1 argued that project management is a multi-disciplinary concept, whose importance rests not in its being in the form of a process framework, but rather on the strength of the controls, governance, decision-making, and accounting systems that make the process useful and operational. Project success, it argued (based on PMBOK, PRINCE2 and ISO 21500) as the accomplishment of defined ends, within project management constraints of time, cost, and scope – rather than delivering an "object".

In Chapter 2, the concept of quality management, governance maturity, and organizational learning were discussed in order to elaborate on project management. The notion of process maturity, viewed as movement from a haphazard, individual effort, to a planned, controlled and measured institutionalized process, was conceptualized and employed as a reference for judging NAFTAL's own practices. Every paper read for the theoretical portion asserted the

fact that organizations are not doomed by a lack of knowledge of processes, but rather by their lack of governance discipline to insist that processes achieve their objectives.

This was exactly the situation at NAFTAL.

2. What the Empirical Study Confirmed

The empirical chapter confirmed all three research hypotheses with a high degree of confidence in both statistics and qualitative content, the results giving us a picture of NAFTAL's project management challenge with unparalleled accuracy.

Hypothesis 1 - confirmed – established that the most significant factor in the financial outcome of service stations is the location. It also found that NAFTAL fails consistently and systematically to uphold the outcomes of its market studies when it comes to deciding on a service station's location. That 100% of respondents stated they do not believe the findings of market studies are consistently followed (Q6, mean = 1.59) while simultaneously 100% believe that sites have been chosen that the market studies themselves declared to be unfeasible (Q7, mean = 4.68) indicates a primary failure of governance. NAFTAL's project management planning tools generate the correct response, while NAFTAL's project management mechanisms fail to implement it.

Hypothesis 2 - confirmed with spectacular statistical certainty (T-test $t = 23.369$, $p < .001$) - established that budget estimates, while all respondents believed them to be realistic (Q9, mean = 4.32), are exceeded during project execution reliably and systematically. The T-test established this is a consistent organizational reality rather than a mere statistical anomaly. The relatively neutral response to Q12, 73% of respondents remaining neither agreeing nor disagreeing that overruns of project costs impact on project results negatively, indicates another area where organizations can easily miss a critical piece of information: the consistent acceptance of cost overruns as the norm eliminates a potent source of pressure on managers to tackle their root causes.

Hypothesis 3 – confirmed – produced the strongest finding of this entire study; the simultaneous 4.73 for a clear and structured process and the 1.51 for the sufficiency of that process to ensure success. This near-perfect reversal between what NAFTAL's project management documents detail and what NAFTAL's project management mechanisms demand or allow is what this thesis terms the "Process-Reality Gap". This is observed in all

three validated hypotheses, and constitutes this study's key organizational diagnosis of NAFTAL's project management problem.

Translating the perceptual findings into their monetary value, the financial document analysis calculated the VAN of a well-located service station to be 460,847 KDA, over twenty years with a discount rate of 6%; investment cost was recovered in year nine. Revenues are projected to rise steadily from 384,378 KDA in year one to 452,397 KDA by year five, while the TCR is positive throughout the projection period with an EBE rising steadily from 51,494 to 63,699 KDA. The FT-AMORT details investment cost to be a sound 318,388 KDA TTC broken down across twenty-seven categories of fixed assets.

These figures tell us what is at stake. Every ignored market study and every unaddressed project cost overrun erodes the financial performance modeled here, with every single poorly chosen site potentially risking the loss of all or a portion of 318,388 KDA in fixed assets, with a potential loss over 20 years at 6% discount rate equivalent to 460,847 KDA of NPV per site.

3. The Central Diagnostic: A Governance Gap, Not a Knowledge Gap

The most critical conclusion derived from this thesis (and also the most counter-intuitive) is that NAFTAL's project management problem is not a knowledge problem, a methodology problem or a process-design problem: it is a governance problem.

NAFTAL has all the components which textbook project management theory identifies as preconditions for success; a documented realization process which covers the whole project life cycle from market study to acceptance commissioning, sophisticated analytical tools such as calculation of NPV, multi-year income forecasts and depreciation schedule, know-how experienced professionals, and an organizational structure that includes detailed definitions of directorate responsibilities. The questionnaire survey confirms that these components are appreciated by people employed in the environment.

What NAFTAL lacks (and what this survey has documented empirically) is the institutional governance system that ensures that the outputs from processes are translated into obligatory decisions. Market studies are executed but their outputs are not mandatory, budget estimates are calculated professionally but are not shielded by contengency arrangements, the project management process is applied but does not stand in the way for decisions of greatest importance for project outcomes being made "on extra-processual grounds". In terms of

project management maturity theory, NAFTAL is on a level where process is defined and followed, but not on a level where process is measured, enforced and continuously improved.

A process capable of producing superior analytics, yet incapable of enforcing its results, is necessary but not sufficient. NAFTAL possesses the former; it needs the latter and with much more immediacy.

4. The Reform Agenda: Ten Recommendations for a Governance-Led Transformation

In light of the results obtained from this study, ten proposed interdependent and complementary recommendations were presented within the organizational and financial levels of control:

First, at the organizational level of governance, five proposed controls: A formal Market Study Gate which forbids proceeding to next stages without authenticated site verification. A contingent budget reserve defined as a function of the return. A Project Review Committee composed of multiple directors having a sign-off role in main life-cycle gates. A formal post-project evaluation mechanism in order to stimulate an organizational learning process. An up-dated and automatedBAOSSEM purchasing process with an integrated project management information system.

Second, at the financial level of control, five proposed complementary controls: An absolute minimum NPV as a formal investment approval threshold. Budget contingencies as a function of the risk associated to the location. Use of AGREGAT for post-commissioning revenue verification. An analytical component-level tracking tool built from FT-AMORT actual figures. An aggregated Project Financial dashboard providing a central real-time decision making framework using all four documents.

Combined, these five proposed controls provide a platform for NAFTAL's migration from a process-based system of control toward one based on performance results and financial accounting for results.

5. Limitations and Perspectives for Future Research

This study was undertaken in a master thesis and must be taken in a number of specific circumstances. The sample used for the questionnaire (high professional relevance, but only 37 responses coming from 2 directorates of the same enterprise) cannot be directly extrapolated to all NAFTAL activities or to the whole of Algerian public enterprise sector. The financial documents used are derived from a single station typology, one geographic and commercial zone and must therefore not be taken as a generalized reference point for all NAFTAL activities.

Further to this, though the questionnaires and financial evidence complement each other, we did not benefit from a retrospective file of all concluded activities that could permit to establish in concrete numbers the global sum of the cost incurred to the organisation due to failure of the governance by location and over expenditures for the totality of the activities of the NAFTAL company. A comparative analysis (planned vs realized) of cost, benefits and NPV of all service stations developed in the NAFTAL sector over a given period, for instance, would be a remarkable addition in terms of practical added value to the organization.

Another perspective could involve researching in the aspect of the culture and incentive systems, as related to the observed governance gap. How come market studies results showing negative returns for projects were ignored by the managers, and under what organizational pressures are they working?

Closing Reflection

NAFTAL is strategically positioned within the Algerian national economy, as the sole distributor of petroleum products and LPG to the nation's population of over 45 million people. The service station realization program is thus, not simply an act of commerce investment activity, but one of the construction of the national energy infrastructure infrastructure, of which the distribution program holds consequences for regional equity, access to fuel and the generation of economic activity throughout the entire country.

Consequently, the organizational dysfunctions documented in this thesis – of locational choices trumping technical knowledge, budgetary overruns normalized as standard procedure, and a process framework which cannot enforce the information it generates, are not solely concerns of financial management. Rather, they concern the expenditure of public resources, failure to reap maximal social and economic benefit from sizable national investments, and an inability to achieve the project management success required to service the NAFTAL mission into the future.

The encouraging and positive outlook on which this thesis concludes is that the building blocks for that success already exist. The process already exists. The tools exist. The know-how exists. The models are rigorous and the process of planning sound. The component which must be constructed now is that organizational structure and governance architecture that links together all the individual components of effective program management in a process which successfully converts sound planning into optimal results. The architecture itself is not inherently complex: what is necessary is the will on the part of institutions, the backing of top management and the courage within an organization to hold decision-making processes responsible for standards they already defined themselves within the planning processes. This thesis endeavors to demonstrate the necessity for this step, the cost of not taking it, and what moving towards this step would actually look like.

The process is there. The tools are there. The know-how is there. What NAFTAL now requires is the governance discipline to let them work.

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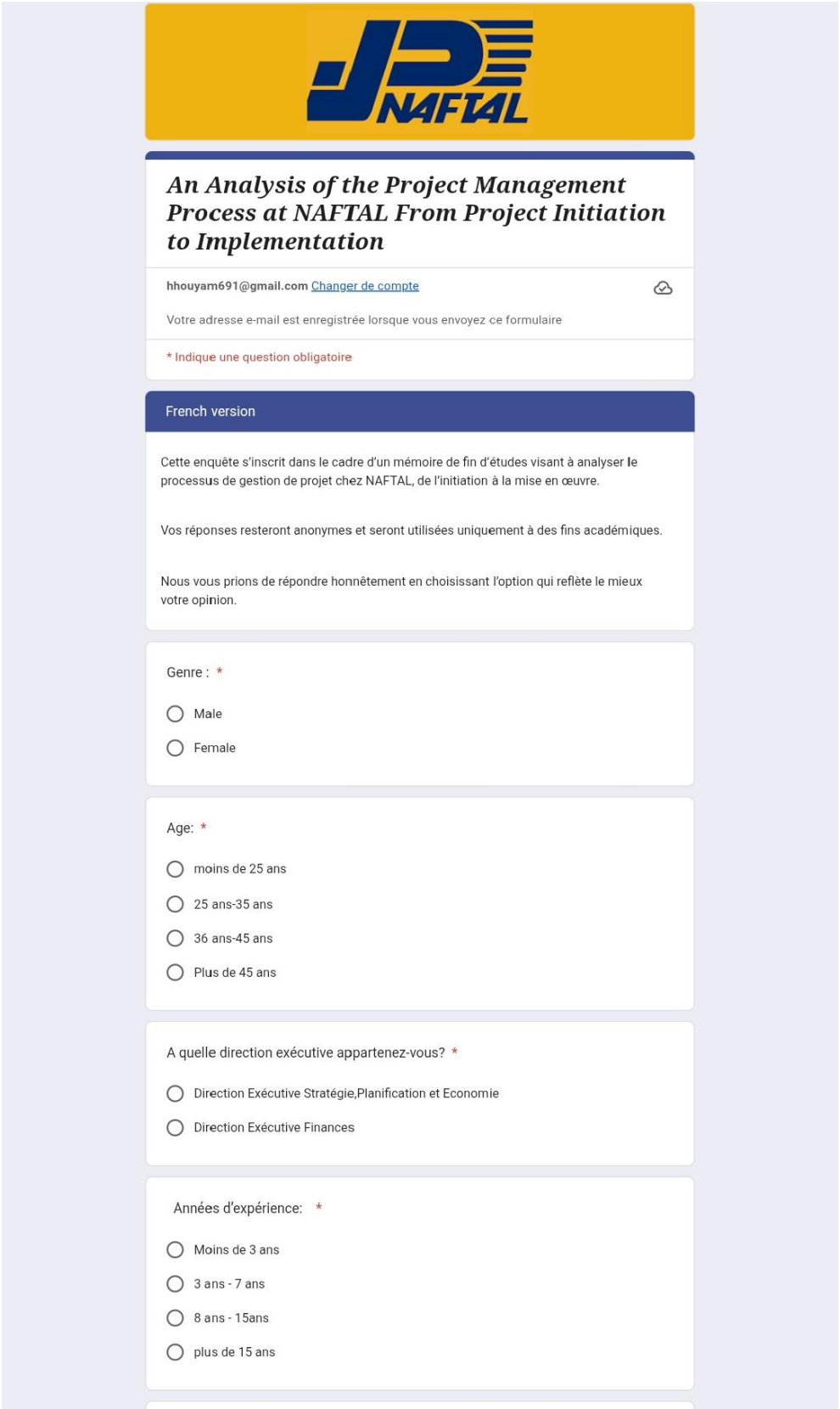
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Annex:



An Analysis of the Project Management Process at NAFTAL From Project Initiation to Implementation

hhouyam691@gmail.com Changer de compte

Votre adresse e-mail est enregistrée lorsque vous envoyez ce formulaire

* Indique une question obligatoire

French version

Cette enquête s'inscrit dans le cadre d'un mémoire de fin d'études visant à analyser le processus de gestion de projet chez NAFTAL, de l'initiation à la mise en œuvre.

Vos réponses resteront anonymes et seront utilisées uniquement à des fins académiques.

Nous vous prions de répondre honnêtement en choisissant l'option qui reflète le mieux votre opinion.

Genre : *

- Male
- Female

Age: *

- moins de 25 ans
- 25 ans-35 ans
- 36 ans-45 ans
- Plus de 45 ans

A quelle direction exécutive appartenez-vous? *

- Direction Exécutive Stratégie,Planification et Economie
- Direction Exécutive Finances

Années d'expérience: *

- Moins de 3 ans
- 3 ans - 7 ans
- 8 ans - 15ans
- plus de 15 ans

H01 : Choix de l'Emplacement *

	Pas du tout d'accord	Pas d'accord	Neutre	D'accord	Tout à fait d'accord
L'emplacement géographique d'une station-service influence directement ses revenus.	○	○	○	○	○
Les résultats de l'étude de marché sont toujours pris en compte lors du choix de l'emplacement d'une station.	○	○	○	○	○
Certaines stations ont été construites dans des emplacements que l'étude de marché avait identifiés comme non viables.	○	○	○	○	○
Une station mal positionnée sera toujours en difficulté financière, quelle que soit la qualité de sa gestion	○	○	○	○	○

H02 : Estimation Budgétaire *

	Pas du tout d'accord	Pas d'acc	Neutre	D'accord	tout à fait d'accord
Les estimations budgétaires établies lors de la phase de planification sont réalistes.	○	○	○	○	○
Le coût réel de réalisation d'une station-service dépasse toujours le budget initial prévu.	○	○	○	○	○
Les dépassements budgétaires sont un problème récurrent dans les projets de stations-service chez NAFTAL.	○	○	○	○	○
L'écart entre le budget prévu et le coût réel affecte négativement les résultats du projet.	○	○	○	○	○

H03 : Processus de Gestion de Projet *

	Pas du tout d'accord	Pas d'accord	Neutre	D'accord	Tout à fait d'accord
NAFTAL suit un processus clair et structuré pour la réalisation des stations-service.	○	○	○	○	○
Le respect du processus standard est suffisant pour garantir le succès d'un projet.	○	○	○	○	○
Des problèmes tels que les dépassements budgétaires et les mauvais choix d'emplacement surviennent même lorsque le processus est correctement suivi.	○	○	○	○	○
Le processus de gestion de projet chez NAFTAL nécessite des améliorations pour être plus efficace.	○	○	○	○	○

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An Analysis of the Project Management Process at NAFTAL From Project Initiation to Implementation

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Your email will be recorded when you submit this form

* Indicates required question

English version

This survey is part of a graduation thesis that aims to analyze the project management process at NAFTAL, from initiation to implementation.

Your answers will remain anonymous and will be used only for academic purposes.

Please answer honestly by selecting the option that best reflects your opinion.

Gender: *

- ◯ Male
- ◯ Female

Age: *

- ◯ Under 25
- ◯ 25-35
- ◯ 36-45
- ◯ Over 45

Which executive directorate do you belong to? *

- ◯ Executive Directorate of Strategy,Planning and Economy
- ◯ Executive Directorate of Finance

Years of experiance : *

- ◯ Less than 3 years
- ◯ 3yrs-7yrs
- ◯ 8yrs-15yrs
- ◯ More than 15 yrs

H01: Location Choice *

	Strongly desagree	Desagree	Neutral	Agree	Strongly agree
The geographic location of a service station directly affects its revenue.	○	○	○	○	○
The market study results are always taken into account when choosing a station location.	○	○	○	○	○
Some service stations were built in locations that the market study showed were not viable.	○	○	○	○	○
A poorly located station will always struggle financially regardless of how well it is managed.	○	○	○	○	○

H02: Budget Estimation *

	Strongly desagree	Desagree	Neutral	Agree	Strongly agree
The budget estimates prepared during the planning phase are realistic.	○	○	○	○	○
The actual cost of building a service station always exceeds the initial budget estimate.	○	○	○	○	○
Budget overruns are a recurring problem in service station projects at NAFTAL.	○	○	○	○	○
The gap between planned and actual costs negatively affects project outcomes.	○	○	○	○	○

H03: Project Management Process *

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
NAFTAL follows a clear and structured process for realizing service stations.	○	○	○	○	○
Following the standard process is sufficient to guarantee a successful project.	○	○	○	○	○
Problems such as cost overruns and bad location choices occur even when the process is followed correctly.	○	○	○	○	○
The project management process at NAFTAL needs to be improved to be more effective.	○	○	○	○	○

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