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Project Management Practices in Construction Sector in Bahrain

A Thesis submitted in partial fulfillment of the requirements for the
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Abstract

This study examines project management techniques in Bahrain's construction industry, with an emphasis on their impact on project success and failure. Finding essential project management techniques, assessing their efficacy, and comprehending the difficulties experienced by industry specialists are the main goals. Considering the sector's importance to Bahrain's economic growth, the thesis emphasizes the significance of adhering to globally accepted project management practices.

The study uses a quantitative methodology over an online survey to gather information from a representative sample of engineers, project managers, and construction managers working in Bahrain's construction industry. A thorough literature review is the foundation of the research to identify best practices and current trends in Project Management. This magnifies the nonalignment existing in the field and further justifies the objectives of the study. A structured questionnaire is distributed to respondents to collect general information about them, assess the status of construction projects, and gauge their use of project management techniques.

108 respondents to the questionnaire. This forms the total sample size that was used for the analysis. Before data analysis was employed for this study, internal consistency and reliability were checked using Cronbach's Alpha Test, and homogeneity was checked using the Kruskal-Wallis Test. Data analysis is performed using descriptive methods, followed by the application of best practices. The model, interconnected between its elements, was validated using the Alias Design Structure Matrix.

The results show that although a lot of project management techniques are used extensively, there are still a lot of gaps, especially in the planning and initiation stages. According to the survey, a startling 30% of projects fail, underscoring pressing problems including imprecise goals and insufficient funding. Strong stakeholder communication, efficient planning, and the existence of competent teams have all been cited as critical success elements. Additionally, it is crucial to receive training and follow project management.

This research provides valuable insights for theorists, policymakers, and practitioners in project management. It enhances theoretical frameworks by emphasizing the importance of practical training and tailored best practices, while urging policymakers

to support initiatives that promote operational efficiency and proactive risk management. For practitioners, the findings underscore the importance of focusing on critical phases, such as initiation and planning, to ensure stakeholder engagement and effective communication, thereby aligning project goals and enhancing overall satisfaction. Together, these implications foster improved project outcomes in the Bahraini construction sector.

Dedication

This thesis is dedicated to Bahrain, my beloved nation, which deserves our utmost commitment and effort to excel in all areas. It is also dedicated to my parents, wife, family, friends, and everyone who believed in me and supported me in the pursuit of my dreams.

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Glossary

PMBOK	Project Management Body of Knowledge
SDGs	Sustainable Development Goals
PQQ	Prequalification Questionnaire
PM	Project Management
GDP	Gross Domestic Product
MOW	Ministry of Works
WBS	Work Breakdown Structures
PERT	Program Evaluation and Review Technique
CPM	Program Evaluation and Review Technique
GERT	Graphical Evaluation Review Techniques
PMI	Project Management Institute
HRM	Human Resource Management
PMP	Project Management Professional
CAPM	Certified Associate in Project Management
PRINCE2	Projects IN Controlled Environments
PMI-ACP	PMI Agile Certified Practitioner
CSM	Certified ScrumMaster
IPMP	International Project Management Professional
MPM	Master Project Manager
PPM	Project Portfolio Management
IRR	Internal rate of return
ROI	Return on investment
SWOT	Strengths, Weaknesses, Opportunities, and Threats
NPS	Net Promoter Score
DSM	Design Structure Matrix

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Chapter 1: Introduction

- 1.1 Introduction
- 1.2 Background
- 1.3 Research Objectives/Questions
- 1.4 Significance of Research
- 1.5 The study's Setting

1.1 Introduction

In recent decades, project management has evolved into a crucial discipline for achieving organizational and national development goals across various industries, including construction, information technology, manufacturing, and energy. (*Guide to the Project Management Body of Knowledge (PMBOK Guide)*, 2021). Globally, the use of structured project management methodologies such as PMBOK, PRINCE2, and Agile has been demonstrated to boost project efficiency, mitigate risks, and improve success rates in terms of scope, time, and budget adherence. (Serrador & Pinto, 2015; Turner, 2016). Effective project management is even more important in developing economies, which aim to diversify their economies, update their infrastructure, and draw in foreign investment. (Kwak & Anbari, 2009) .

Large-scale infrastructure and development projects are being significantly funded by nations in the Gulf Cooperation Council (GCC) as part of national transformation programs like Bahrain's Economic Vision 2030 and Saudi Arabia's Vision 2030. In order to prevent frequent hazards like cost overruns, schedule delays, and project cancellations, these initiatives highlight the necessity of strong project management frameworks (Almarri & Boussabaine, 2017). Although there is a wealth of research on project management techniques in the GCC, there are still few studies that concentrate exclusively on Bahrain. (Abusafiya & Suliman, 2017).

The Kingdom of Bahrain, as a rapidly developing nation with ongoing economic diversification and infrastructure growth, has the necessity of adopting effective project management practices. The increasing complexity of projects, particularly in sectors such as oil & gas, construction, manufacturing, and information technology, necessitates the implementation of structured project management methodologies to ensure

project success. There is limited direct information available on project management practices in the Kingdom of Bahrain (Abusafiya & Suliman, 2017). However, various studies in the Gulf region suggest that effective project management practices significantly contribute to project success. The consequences of not following project management practices systematically include schedule overruns, budget issues, and project failures (Ali et al., 2024; Almutairi & Almunifi, 2020).

This study aims to thoroughly investigate the primary causes of project failures in Bahrain's construction and project management sectors, examining various practices, selected tools and techniques, and adopted methodologies. Numerous causes, such as inadequate planning, poor risk management, poor communication, scope creep, inappropriate resource allocation, and external environmental stressors, can lead to project setbacks (Alharbi, 2024; Almutairi & Almunifi, 2020) (Abdulla & Al-Hashimi, 2019) By investigating the underlying reasons behind project failures as mentioned above in terms of practices and methodologies, a systematic understanding of the challenges and unforeseen hurdles of execution may be identifies that negatively affect the projects from being finished as per the plan. This study can be further used to create a framework that will indicate project management practices to be adopted in line with global standards to increase the efficacy of project management and lower possible losses in the sector, both of which will eventually help Bahrain's economy.

1.2 Research problem

In the kingdom of Bahrain, the construction industry is essential to the national economy. According to the Bahrain Economic Development

Board (Economic Development Agency, n.d.), the construction sector contributed around 7.2 % to Bahrain’s economy in the third quarter of 2022, as published in the financial report. Moreover, the contribution of the construction industry to the Bahrain economy will be higher if considering the sector with high correlation with the construction sector, such as the Transportation and Communication sector with 7.0 % contribution, and the Real Estate & Business Activities Sector with 5.5 % contribution. Refer to Figure 1.1 (Economic Development Agency, n.d.).

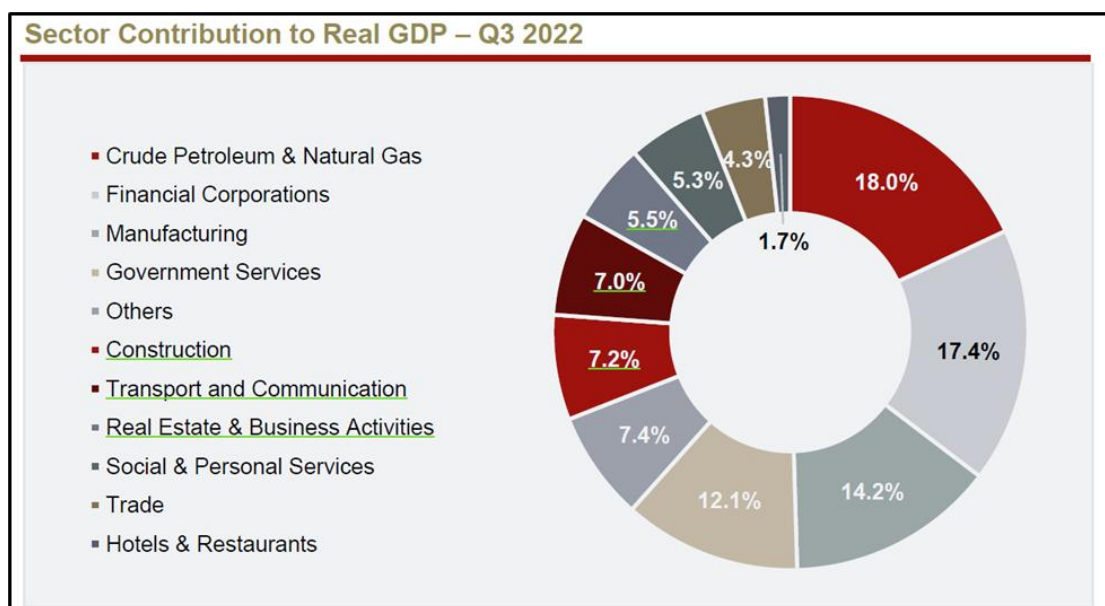


Figure 1. 1 Sector Contribution to Real GDP- Q3 2022 (Economic Development Agency, n.d.)

Referring to Figure 1.2 (Economic Development Agency, n.d.). A substantial portion of the nation's GDP comes from the building sector and provides employment opportunities to many people. The sector has been key in recent years, contributing 5.5% to the economy. According to the Bahrain Economic Report for the third quarter of 2022, infrastructure projects in the Kingdom of Bahrain continued to make progress in the third quarter, in line with the Sustainable Development Goals (SDGs) and the Bahrain Economic Vision 2030. When compared to the cumulative value as of Q3 2021, the infrastructure projects funded by the GCC Development

Fund showed progress in Q3 2022, awarding projects of USD 9 million, achieving a total value of USD 6.1 billion, or a 5.2% rise.

The contract, signed in the third quarter of 2022, consists of the building of a water and electricity substation for the Al Ramli Housing Project (Phase 1), an infrastructure project for Madinat Salman road, and a waterpower transmission station in Southern Governorate and East Hid. Furthermore, in Q3 2022, the Bahrain Southern Ring Road project (Phase 1) was finished.

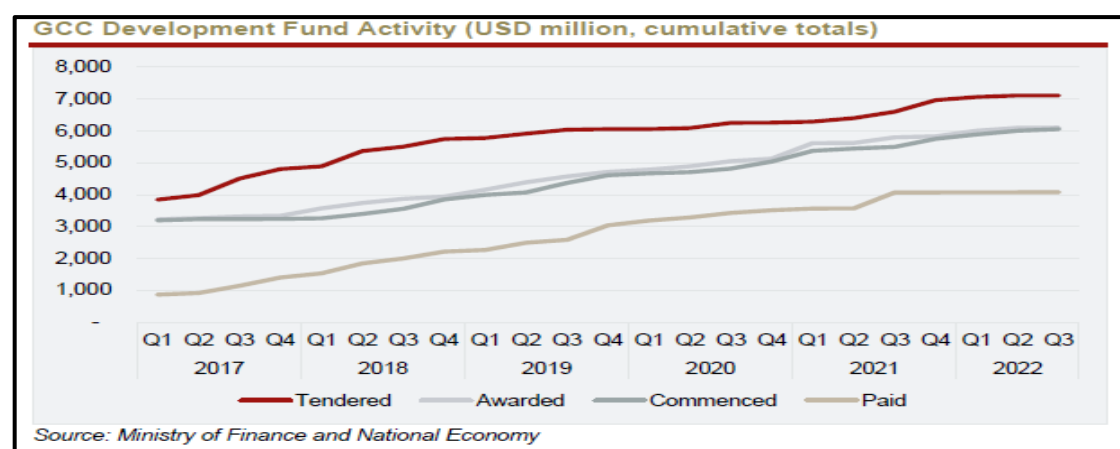


Figure 1. 2 GCC Development Fund Activity (Economic Development Agency, n.d.)

Bahrain is one of the five nations where the Saudi sovereign wealth fund, Public Investment Fund, plans to establish regional investment businesses. The business is anticipated to make investments in various industries, including manufacturing, telecommunications, IT, real estate, healthcare, financial services, food and agriculture, and infrastructure.

The following projects have been completed as part of the economic recovery plan, which includes the launch of major strategic projects worth more than \$30 billion: the first phase of Bilaj Al Jazayer, the first phase of the US Trade Zone, Vida Marassi Al-Bahrain Hotel, and the Address Beach Resort Bahrain & Address Residences.

A guide for regulating partnerships between the public and private sectors has been published to achieve comprehensive public-private cooperation. This enables efficient and effective implementation of projects by leveraging the skills and expertise of the private sector. In addition, it will reduce the financial burden on the national budget and increase the transparency and integrity of partnership procedures with the private sector. Other key developments include:

To develop a residual waste treatment plant project with incineration in the Kingdom of Bahrain, enterprises have been requested to complete the Prequalification Questionnaire (PQQ). A maximum design input capacity of 1,306,510 tons per year is the target operating capacity for the plant.

The USD 3.5 billion King Hamad Causeway project has finished its financial feasibility studies and will be carried out through a collaboration between the public and private sectors.

International Bechtel Co. Ltd. (Bechtel) was chosen by Aluminum Bahrain B.S.C. (Alba) to carry out the feasibility study for the Line 7 Project. It is anticipated that Line 7 would replace the outdated production lines 1-3, which have been in operation since the 1970s, and add more "environmentally friendly" capacity to the current production capacity of 1.561 million metric tons.

The construction sector comprises a range of projects of varying sizes and types, tailored to meet client/customer requirements. For each project, a project manager will be assigned to lead the project life cycle. The person designated by the performing organization to oversee the project team responsible for accomplishing the project's goals is known as the project manager. Project managers carry out several tasks, including controlling the procedures to produce the desired results and encouraging the project team to work together to accomplish the goals. Through management

practice, knowledge, skills, tools, and techniques are applied to project activities in order to achieve project requirements (PMI Seventh Edition, July 2021)

Therefore, the Project management practices in the construction sector in Bahrain are essential to ensure successful project completion within the specified time, budget, and quality standards (Refer to figure 1.3 (Williams & Samset, 2010)). Otherwise, the project may fail; project failure refers to the situation where a project does not achieve its intended objectives within the defined constraints of time, budget, and quality, which further will lead to stakeholder dissatisfaction and drain the company's resources.

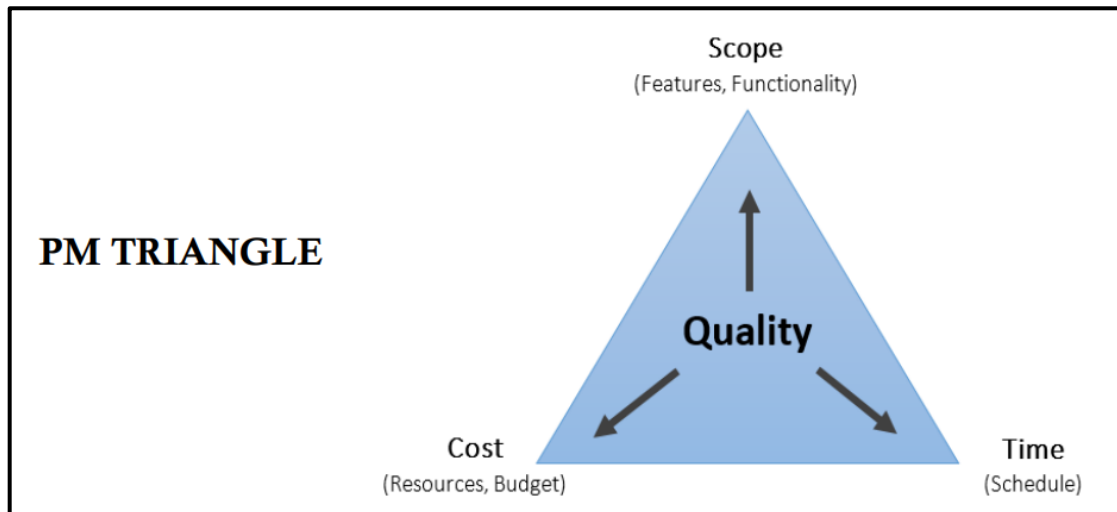


Figure 1. 3 Project Management Triangle (Williams & Samset, 2010)

The construction industry in Bahrain is a significant contributor to the country's economy, and as such, project management practices are highly valued (Economic Development Agency, n.d.; Nebrida & Nebrida, 2021). Moreover, the research landscape about project management and the construction sector in Bahrain, as reflected in published studies, has been relatively limited (Abusafiya & Suliman, 2017; Nebrida & Nebrida, 2021). As a result, conducting research in this sector presents notable challenges. Nevertheless, it is of importance to initiate and promote research

endeavors, given the critical role this sector plays in the Kingdom's economy. By undertaking comprehensive research and facilitating scholarly publications, a significant contribution to the advancement and understanding of project management practices within the construction industry, ultimately aiding in the sustainable growth of our nation, will be made.

1.3 Research Objectives/Questions

This research aims to achieve the following:

1. What are the number of successful projects, delayed projects, and failed projects in the construction sector of Bahrain, and the reason for the project failure from the project management point of view?
2. What practices, tools, and techniques are being used by project managers in these projects?
3. Is it possible to develop a framework to oversee the identified failure strands based on standard practices prescribed by internationally accepted bodies like the Project Management Institute?

1.4 Significance of Research

This research can be viewed as an effort to provide valuable insights into Bahrain's construction industry. It will highlight the areas where project management procedures need to be improved by identifying the main reasons behind project failures and their consequences. The results of this study will help to improve project management effectiveness, reduce financial losses, and promote long-term economic growth in the nation.

The scope of this research is limited to on large-scale construction companies operating in Bahrain. By targeting this specific segment, the study aims to involve the project management practices adopted by key

players within the industry and research their input to arrive at results and further recommendations.

1.5 The Study's Setting

The subsequent journey of this research will commence with an exploration of the theoretical foundations of project management, including its practices and the challenges faced by the sector, as outlined in Chapter 2. Chapter 3 will focus on developing an appropriate methodology to address the research objectives and evaluate the current state of the construction industry in Bahrain, utilizing an online survey to engage participants. In Chapter 4, prior to data analysis, the research will assess data internal consistency and reliability, as well as data homogeneity. Following these tests, the data will be analyzed to construct a model of best practices in project management, which will be validated using the Alias Design Structure Matrix (DSM). Lastly, Chapter 5 will discuss the research findings and provide suitable recommendations based on the assessment.

Economic conditions, cultural concerns, and regulatory frameworks are some of the elements that impact Bahrain's construction industry. These factors influence the success of building projects and mold the field of project management. Furthermore, conventional project management techniques are evolving in response to the growing popularity of sustainability and innovative construction trends.

By focusing on this context, the study aims to determine, examine, and evaluate the effectiveness of project management techniques currently employed⁷⁷ in the construction industry. This investigation is crucial to comprehending how regional customs conform to international norms and support the general accomplishment of building projects in Bahrain.

Chapter 2: Theoretical Framework and Literature Review

- 2.1 Introduction
- 2.2 Project management history and concepts
- 2.3 Project management practices in the construction sector
- 2.4 Project management challenges in Bahrain and internationally
- 2.5 Causes of project failure
- 2.6 Conclusion

2.1 Introduction

In recent decades, project management has demonstrated its efficacy and practicality in facilitating the organization and management of complex tasks and projects. The transition from employing traditional management methods to adopting more contemporary approaches that are specifically designed to address the fast-paced and ever-changing nature of the modern world is in progress. Furthermore, considering the volatile nature of the contemporary business environment, it is imperative to implement and embrace structured management methodologies, techniques, procedures, and strategies to anticipate and address unanticipated events effectively. Furthermore, this necessitates a prompt and flexible mindset capable of rightly addressing such occurrences and making critical judgments (Goodman, 2017).

Every organization frequently encounters circumstances that necessitate change. Several adjustments can be made, such as the establishment of a new office, the introduction of a novel product or service, the improvement of an existing work process, the implementation of a new computer system, the merger with another business entity, the relocation of operations, the entry into a new market, and other similar actions. To effectively achieve an organization's operational or strategic objectives, specific adjustments must be made. (Too & Weaver, 2014). Projects are utilized to accomplish these objectives. Furthermore, the primary objective of an organization is to generate value for its shareholders, a feature that is achieved by attaining its strategic objectives and realizing a substantial profit. Projects serve as the instrumental mechanism by which a business attains its strategic objectives (Archer & Ghasemzadeh; Archer & Ghasemzadeh, 1999; Anantatmula, 2020).

However, organizations strategically design and execute projects that can be classified into two main categories: internally funded projects and externally sponsored projects, based on the nature of their business. Efficiency in project management refers to the strategies employed by organizations engaged in externally funded projects to enhance their profitability (Beste & Klakegg, 2022). These projects are conducted on behalf of external clients in exchange for a fee. Moreover, the process of project management entails various tasks such as recognizing requirements, establishing attainable objectives, managing conflicting priorities related to quality, scope, cost, and time, and adapting plans, specifications, and methodologies. The stakeholders in this context include the client and the end user. Project management can be defined as the amalgamation of art and science, wherein experience, information, skills, tools, and procedures are utilized effectively and efficiently to meet the expectations of stakeholders (Anantatmula, 2020; Olsson, 2008).

According to (Walker, 2015), the project management process involves the activities of planning, coordinating, and overseeing a project on behalf of a client, from its initiation to its conclusion, which includes the commissioning phase. This process entails the identification of the client's objectives in terms of utility, function, quality, time, and cost. It also involves establishing relationships between resources, integrating, monitoring, and controlling the project's contributors and their output, and evaluating and selecting alternatives to ensure client satisfaction with the project.

Moreover, it is customary for sizable organizations embarking on significant initiatives to engage a dedicated project manager who either answers to a senior executive within the company or holds a position within the upper echelons of the firm's management structure (El-Sabaa, 2001).

The manager has the option to seek assistance from either a central-office functional group or a project team. In the context of smaller contracts, it is common for an individual to assume the role of project manager for multiple concurrent projects. The distinction between the responsibilities of a project manager and those of field supervision is a significant aspect of the job. The role of a site supervisor or field superintendent entails the responsibility of providing oversight and management of field operations daily. This individual engages in collaborative efforts with supervisors, facilitates coordination among subcontractors, oversees the construction process, and ensures the safe, efficient, and timely progression of activities. The project manager and field superintendent, who maintain a close working relationship, function as collaborative partners in overseeing the construction project. Nevertheless, for the efficient execution of a construction endeavor, the presence of a centralized authority is imperative, and the project manager asserts the necessity of maintaining such a central power (Sears et al., 2015).

According to the Bahrain Economic Development Board (2023) (Economic Development Agency, n.d.), the construction sector contributed approximately 7.2% to Bahrain's economy during the third quarter of 2022. The building industry exerts a substantial influence on the country's gross domestic product (GDP) while simultaneously providing ample employment opportunities for individuals. The Bahraini economy has experienced substantial growth due to the presence of various infrastructure projects and real estate developments that are currently in progress. These initiatives have made a significant contribution of 5.5% to the overall economy, establishing the sector as a key driver of economic expansion in Bahrain. The determination of project types and sizes in the construction industry is contingent upon the requirements of the client or

customer. The responsibility of overseeing the project life cycle for each project lies with the project manager. Hence, the utilization of project management methodologies holds significant importance within the construction sector of Bahrain, ensuring the successful completion of projects in adherence to predetermined timelines, financial allocations, and quality benchmarks. The recognition of project management techniques in Bahrain is attributed to the substantial impact of the construction sector on the country's overall economic development.

Furthermore, according to the Ministry of Works (MOW) in Bahrain (2023), a diverse array of prominent corporations and contractors is heavily investing in the construction sector. These entities are making substantial contributions to the economic development of the country and have duly registered with the ministry. Notable examples include: Kooheji Contractors W.L.L., Dadabhai Construction W.L.L., Mohammed Abdulmohsin Al-Kharafi & Sons for General Trading, General Contracting, and Industrial Structures W.L.L., Mohamed Jalal Contracting CO. W.L.L., Almoyayyed Contracting W.L.L., Alghanim International General Trading & Contracting CO. W.L.L., and ARABTEC Construction L.L.C. The companies mentioned include Alamiah Building Company K.S.C.C., Cyprus Building and Road Construction Company Limited (CYPRUS W.L.L.), Bahrain Motors Company, Alhabtoor Leighton Bahrain S.P.C., Burhan International Construction Company (BAHRAIN S.P.C.), Al Wardi Construction, and China Jiangsu Construction Corporation (represented by Sinogic Investment Holding Company W.L.L.).

The Ministry of Works, an official government agency, is responsible for implementing infrastructure projects in alignment with the national strategic plan of the Kingdom of Bahrain's government. The oversight of

public works construction, such as roads, buildings, and sanitary drainage, falls under the purview of the government's construction division. The successful completion of a project necessitates the overcoming of various obstacles. Some of the challenges encompassed in this context include divergent viewpoints, apprehensions regarding the level of craftsmanship, delays in project timelines, and financial burdens, among various other factors (Nebrida & Nebrida, 2021).

Moreover, the construction sector in Bahrain encounters numerous obstacles when it comes to effectively implementing project management practices (AlZayani & Bashir, 2020). These challenges include project delays, cost overruns, delays in decision-making, and inadequate planning and forecasting. (Haseeb et al., 2011). In the realm of project management and construction, it is widely recognized that various challenges can arise throughout the lifecycle of a project. These challenges have the potential to escalate and ultimately lead to project failure if not addressed promptly and effectively (Mir & Pinnington, 2014). It is crucial to understand that the occurrence of these challenges alone does not necessarily mean failure. Instead, it is the lack of proper action, taken promptly, to overcome these causes or mitigate their effects on the project that can ultimately lead to failure (Ahmadi, 2020).

Project failures can stem from a multitude of sources, such as inadequate planning, poor resource allocation, ineffective communication, scope creep, unforeseen risks, and external environmental factors. These challenges can manifest in various ways, disrupting project timelines, exceeding budgetary constraints, compromising quality standards, and negatively impacting stakeholder satisfaction (Alsulamy, 2022).

Furthermore, it is worth noting that there have been several studies conducted on project management and construction in Bahrain (Abusafiya

& Suliman, 2017; Al-Hashemi, 2015; AlZayani & Bashir, 2020; Haseeb et al., 2011; Alkhalifa, 2023; Mohammed, 2010). While some of these studies have examined the challenges encountered in managing and designing the largest project in Bahrain's history, others have focused on factors contributing to cost overruns (Hasan et al., 2014; Haseeb et al., 2011; Mohammed, 2010). Additionally, some studies have explored the impact of these factors on the overall project cost in Bahrain. Furthermore, studies have investigated the delays in road projects in Bahrain, with a particular emphasis on identifying the primary causes and effects of project failures (Hasan et al., 2014b; Haseeb et al., 2011). However, it is important to highlight that the literatures are yet to extensively address the specific topics of major causes and effects of project failures in Bahrain (AlZayani & Bashir, 2020). Hence, the objective of this study is to examine the primary factors and consequences associated with project failures within the nation and to identify key project management steps that could in future, support to develop a comprehensive framework for enhancing project management effectiveness in order to mitigate losses in this industry, thereby making a positive contribution to Bahrain's economy.

2.2 Project Management History and Concepts

3.1.1 2.2.1 History of Project Management:

According to (Tereso et al., 2019), Skilled master builders and creative architects typically oversaw civil engineering projects during the early decades of the 20th century. In the 1950s, the organization employed systematic methodologies and tools to facilitate the management of complex projects. The discipline of project management has undergone significant development, drawing upon diverse domains such as construction and defense.

Two prominent figures who have made significant contributions to its development, established the discipline of planning and control methodology, were Henry Gantt and Henri Fayol. Henry Gantt is widely recognized as the pioneer of this field and is acknowledged for developing the Gantt Chart, commonly referred to as a bar chart. (Kloppenborg, 2021). On the other hand, Henri Fayol formulated a set of five management roles that served as a foundational framework for the advancement of knowledge in the field of program and project management (Turner, 2016). This methodology serves as an exemplification for contemporary project management frameworks that incorporate the utilization of work breakdown structures (WBS). During the aforementioned period, a new era in project management began, characterized by the convergence of various prominent engineering disciplines for collaborative endeavors. As a result, project management has emerged as a distinct discipline within the broader field of management, specifically in relation to the engineering model (Anantatmula, 2020).

Furthermore, as the project grew larger, its scale expanded, and the requirements for construction grew, thereby prompting the adoption of progressively advanced techniques. There are two models commonly utilized in project management: the Program Evaluation and Review Technique (PERT) model and the Critical Path Method (CPM). By using these two methods as a network of precedence, more specialized techniques were made to replace sequential and repetitive production, as well as Graphical Evaluation Review Techniques (GERT), which include a higher level of uncertainty across the whole system (Dai, 2021; Kloppenborg, 2021). Additionally, the construction management industry established the Project Management Institute (PMI) in 1969 to advance its own interests. The establishment of PMI can be attributed to the

widespread utilization of construction management techniques and methods across various professions, ranging from the software industry to the building trades (Anantatmula, 2020; *Guide to the Project Management Body of Knowledge (PMBOK Guide)*, 2021).

Moreover, the combination of widely recognized principles and guidelines resulted in the authorization of a document titled "A Guide to the Project Management Body of Knowledge (PMBOK)" by the Board of Directors of PIB in 1987 (Tereso et al., 2019). The emergence of the concept of building project management can be traced back to notable construction projects such as the Great Pyramid in Egypt, the Great Wall of China, and the Pantheon in Rome, among others. These remarkable endeavors marked significant milestones in the development of project management practices.

The establishment of the knowledge base concerning project and program management can be traced back to 1911, when Henry Gantt introduced the bar chart and Henri Fayol proposed the five management functions (Turner, 2016; Walker, 2015). Therefore, the development of contemporary project management tools, such as the work breakdown structure and the line of balance tool in construction, has facilitated the efficient management of repetitive tasks assigned to workers. However, as construction projects became more intricate and extensive, the need for more advanced software arose. Consequently, software programs written in the C language and Fortran were developed to monitor and control the complexities of large-scale construction projects effectively. Subsequently, the Primavera and Microsoft software platforms were introduced, followed by the more recent emergence of the 4D construction project management and planning system (Heagney, 2011; Turner & Müller, 2020).

3.1.2 2.2.2 Project Management Concepts

The concept of project management can be delineated as the utilization of knowledge, expertise, methodologies, and resources to execute project-related tasks to fulfill the predetermined project objectives. The project management discipline is structured around five distinct process groups, namely initiation, planning, execution, monitoring and controlling, and closure. These process groups collectively comprise a comprehensive framework of 42 logically categorized project management processes, which are widely employed to manage projects effectively. Furthermore, there exists a wide array of models that can be utilized to delineate the various phases that a project undergoes during its life cycle. The initial phase of the project involves the establishment of a clear and concise specification. While this period may be of short duration, it is of utmost importance in order to fully comprehend the contextual aspects of the project. During the initial phase of a project, primary project stakeholders convene to establish the project's overarching parameters. The primary objective of this stage is to establish a collective comprehension of the project's intended deliverables and ascertain the essential resources required. Notably, the initiation phase of a project can offer valuable insights to organizations, enabling them to assess the degree to which a project aligns with their financial objectives and overall business strategy (Heagney, 2011; Fatima, 2014) .

The next stage in the project lifecycle involves the planning phase. This phase occurs once the project has been clearly defined and the stakeholders possess a comprehensive comprehension of its context. During this phase, the project plan is developed. The formulation and revision of assertions regarding anticipated actions, whether explicitly documented or not, take place within the planning phase. Organizations are required to consider the

project's timeline, conduct a comprehensive assessment of the project's outcomes, and formulate an implementation strategy. In an alternative context, it is imperative to observe the way the project tasks will be structured and aligned with a project schedule throughout the entirety of the project's life cycle at this particular juncture (Alotaibi & Mafimisebi, 2016).

Subsequently, the phase of project preparation or initiation follows, wherein the project is clearly defined, and the stakeholders possess a comprehension of its contextual framework. Consequently, the following step involves the development of the project plan. The formulation and revision of assertions regarding anticipated actions, whether explicitly established or not, takes place within the planning phase. Organizations are required to consider the project's timeline, conduct a comprehensive assessment of the project's outcomes, and formulate an implementation strategy. In an alternative context, it is imperative to direct one's focus towards the organization of project tasks throughout the entirety of the project's life cycle and their subsequent alignment with a project schedule during this phase (Alotaibi & Mafimisebi, 2016).

During the post-launch phase, project execution and control play a crucial role in maintaining project progress. This stage primarily involves assigning tasks to project team members and comprises the majority of the project's workload. Leaders, nonetheless, have the responsibility to monitor and exert authority over the project's tempo, expenditures, and level of achievement while engaging in cooperation with the project team. It is imperative to acknowledge that the utilization of this approach may facilitate the establishment of partnerships with external stakeholders and the preservation of their backing, thereby guaranteeing the efficient allocation of project resources as well as the mitigation and adjustment to

project pressures, disruptions, and modifications (Alotaibi & Mafimisebi, 2016).

The closeout phase marks the final stage of the project, during which the client is provided with the completed deliverables, services, and other outcomes of the project. This phase necessitates the requisite level of managerial and leadership dedication. The organizations must undertake a comprehensive reassessment of the project's financial implications, schedule, and level of excellence. To maintain consistency with the initial management and plans, it is necessary to ensure that the results are also consistent. This document is intended to function as a comprehensive guide for management in effectively managing forthcoming initiatives. Therefore, it is imperative that organizations consistently incorporate this element into their overarching objectives and strategic plans (Alotaibi & Mafimisebi, 2016).

Nevertheless, the attainment of a particular objective is realized through the implementation of the established project. These objectives can be monitored and are supported by specific targets. The primary objective of a project manager is to oversee project management efficiently. Another aim of the project is to guarantee client satisfaction and maintain quality control. The three constraints model of scope, time, and cost, which project management organizations widely adopt, supports each objective. It is essential to incorporate Specific, Measurable, Achievable, Relevant, and Time-bound (SMART) objectives into each goal (D. R. et al., 2019; Armenia et al., 2019).

Moreover, it is imperative to consider specific steps when undertaking project management. One such step involves identifying and defining the problem at hand, wherein the project's intended purpose and the issue it aims to address must be determined. The process of achieving a desired

outcome involves several key steps. Firstly, it is advantageous to engage in visualization, as it aids in clarifying the intended result. Subsequently, the generation of one or multiple solutions is recommended, enabling the consideration of various approaches to address the existing challenges. From these alternatives, the most optimal course of action can be selected. Following this, project planning becomes crucial, encompassing discussions regarding the necessary tasks, responsible individuals, and associated costs. Once the plan has been formulated and approved, its execution can commence. Lastly, it is essential to continuously monitor and control progress, ensuring that the established plans are adhered to and facilitating the successful attainment of the desired goal. The assurance of success is contingent upon the monitoring of progress (Heagney, 2011). Analogously, one could liken the act of neglecting road signs while following a roadmap to the completion of a project without due consideration for the subsequent audit phase. While reaching the intended objective signifies the conclusion of the project, it is essential to recognize the significance of the audit process in understanding areas of success and those that require improvement (Tereso et al., 2019; Turner & Müller, 2020).

2.3 Project Management Practices in the Construction Sector and their effect

One of the most authoritative sources about project management is the Project Management Body of Knowledge (PMBOK) Guide, which was created by the Project Management Institute (PMI) and conforms to internationally recognized standards (*Guide to the Project Management Body of Knowledge (PMBOK Guide)*, 2021). Ten knowledge areas and five process groups make up the organized framework described by the PMBOK, which covers every stage of a project's lifecycle, from planning

and initiation to execution, monitoring and control, and closing. Scope, time, cost, quality, communications, human resources, risk, procurement, stakeholder, and integration management are some of these knowledge domains (Turner, 2016). When taken as a whole, they offer a thorough manual for project governance, planning discipline, and execution control (Anantatmula, 2020). The PMBOK provides a valuable standard for assessing present project management techniques in the construction industry, particularly in intricate settings like Bahrain. Cost overruns, schedule delays, misaligned stakeholders, and inconsistent documentation are common problems in Bahrain's construction sector (Abusafiya & Suliman, 2017; Nebrida & Nebrida, 2021). The PMBOK's emphasis on structured planning, stakeholder involvement, risk anticipation, and communication management is precisely in line with these difficulties (Cohen & Callaway, 2021; Zulch, 2014). This study lays the groundwork for critically evaluating how closely local practices follow—or deviate from—these globally recognized criteria by introducing the PMBOK framework at this point.

Recent studies have also highlighted the importance of assessing local compliance with international norms. AlZayani and Bashir (2020), for instance, evaluated the maturity of project management in Bahrain's construction sector. Their research, based on a maturity model framework and a systematic survey, showed that although project management concepts are well understood, their practical application varies across firms. Significant shortcomings were identified in areas that the PMBOK framework prioritizes, including risk management, cost control, and stakeholder engagement (Mir & Pinnington, 2014; Too & Weaver, 2014). These results support the current study's focus on bringing Bahraini building methods into compliance with internationally recognized

standards and highlight the importance of comparing local practices to global benchmarks (Mir & Pinnington, 2014; Too & Weaver, 2014).

The subsequent sections will first present standard construction project practices observed in various national contexts, along with their documented effects. Later in this study, an assessment will be made to determine the extent to which PMBOK practices are followed within Bahrain's construction sector, as well as the frequency of their application. This alignment helps to identify both implementation gaps and opportunities for enhancing the overall effectiveness of project delivery in the Bahraini context.

3.1.3 2.3.1 Core Practices in Construction Project Management

In recent years, scholars in the field of project management have increasingly embraced a practice-oriented approach, which expands the traditional understanding of projects to encompass the various activities that take place within them. The practice approach emphasizes the examination of project managers' real-world activities during project execution, as opposed to project management research that originates from theoretical frameworks guiding actions. According to practitioners in the field of scholarship, their approach is believed to be a valuable addition to, rather than a substitute for, the prevailing normative and process-oriented perspectives in the realm of project management (Svejvig & Andersen, 2015).

To conclude these theoretical perspectives, it is essential to examine the actual practices followed within construction projects. Practices within the construction industry vary depending on the scale of the project and the stakeholders involved. However, there are fundamentally generic practices

in this field. One such practice involves the establishment of a well-defined project scope, which includes a precise schedule, interim objectives, and a concrete budget. To minimize the potential for errors, it is advisable to provide comprehensive details regarding the scope, goals, and budget of the project. It is advisable to proactively identify potential obstacles and develop contingency plans to account for the additional time or financial resources they may need. The level of precision in your bids and purchase orders is contingent upon the accuracy and comprehensiveness of your original documentation. Additionally, the inclusion of an auditor within the project team, working alongside the project manager, serves to thoroughly scrutinize all completed activities, ensuring their completion in full, adherence to budgetary constraints, and timely achievement of budget milestones. The allocation and completion of purchase orders are essential in order to facilitate their attachment to invoices (Svejvig & Andersen, 2015).

Alongside these structural elements, soft management practices play a crucial role in enhancing project delivery. The team must maintain effective communication among its members. Failure to disseminate comprehensive project information to all team members can result in the team's ultimate downfall. To ensure effective communication and alignment among team members, it is advisable to disseminate any project-related information collectively to the entire team. This approach facilitates the opportunity for comprehensive questioning and discussion, thereby promoting a shared understanding and consensus before proceeding further. Project team meetings serve as a practical approach to proactively addressing concerns to mitigate potential issues or delays. Closely linked to communication is change management, which is crucial for maintaining control over evolving project conditions. It is imperative to implement a

robust change management process for the project, whereby designated personnel assume the responsibility of overseeing all change requests and subsequently submitting them to the team for thorough evaluation, endorsement, and allocation (Svejvig & Andersen, 2015).

This approach ensures that individuals seeking modifications refrain from directly approaching individual members of the project team to communicate their requirements. Instead, it necessitates the collection of various documents from multiple team members and places the burden of unresolved change requests on the project staff. Furthermore, the implementation of a forty percent change threshold entails terminating the project if any change order leads to modifications in the scope, budget, or timetable that exceed 40% of the initial estimates.

To ensure ongoing control and learning, it is recommended to perform weekly audits as a means of adhering to best practices and identifying potential areas for improvement. Consequently, internal audits in the realm of building projects must adopt a non-confrontational approach in their management. The organization and execution of audits should adhere to professional standards. Construction managers must conduct audits that exhibit neutrality and lack bias while simultaneously adhering to established best practices. It is recommended that individuals engage in the process of gathering information and subsequently assess their level of attainment regarding metrics. Furthermore, conducting weekly audits is imperative for every construction project. It is imperative to thoroughly review one's schedule upon completion of each task, as any delay in a single task has the potential to disrupt the entire schedule, leading to potentially severe consequences (Taleb et al., 2017).

Such controls also enable dynamic scheduling adjustments, ensuring that remaining components remain aligned with project timelines. After

completing a task, it is imperative to verify whether all remaining project components are still on track to be completed according to the initial schedule or adjust the schedule if necessary. Furthermore, effective communication plays a crucial role in the achievement of project success, as it facilitates the emphasis and exchange of project-related data and information, fostering a shared understanding among project participants. Nevertheless, communication plays a crucial role in ensuring that project participants are well-informed about progress and can stay aligned with project objectives (Muszynska et al., 2015). Multiple studies have provided evidence to support the assertion that effective communication is essential for the achievement of project success, with communication playing a substantial role in the implementation of initiatives. Building initiatives are not an anomaly (Zulch, 2014).

3.1.4 2.3.2 Effects of Project Management Practices

Nevertheless, it is worth noting that the bulk of research on "projects as practices" with empirical investigations has primarily focused on developed economies. However, it is increasingly recognized that emerging economies present management challenges that have received limited attention in existing management research (Zulch, 2014).

In response to this gap, several recent studies have explored how project management practices influence outcomes in diverse settings. A recent study by (Narayanan & Huemann, 2021) Examines the impact of project management practices in construction companies on the economy within the Indian construction sector. The results and findings of the study provide an elucidation of the strategies employed by senior managers and project managers. The organization implemented three core practices, namely organizational field engagement, project management, and project

adoption. They also identified the key actions carried out by project managers and senior managers in relation to each practice.

These responsibilities often revolve around human and stakeholder coordination. In the field of project management, a significant portion of project managers' responsibilities revolve around Human Resource Management procedures and the coordination of stakeholders. These activities consumed a substantial amount of their time and attention. During the project adaptation, it involved the acquisition of knowledge, the application of problem-solving techniques, and the utilization of client resources. Moreover, the challenges faced by managers, such as the development and navigation of the organizational field, were evident in their responses to these issues. The process of navigation involved actively involving local authorities, effectively managing local political dynamics, particularly those related to land acquisition, interacting with the national government, and fostering collaboration with local authorities on matters concerning migrant labor. However, senior managers and project managers have identified four key corporate practices that were implemented in these projects: contract negotiations, the selection and assignment of project managers, engagement with clients and organizational field actors, and the establishment of coordination between headquarters' departments and project managers. Furthermore, the negotiations about the contract. The project's contract negotiations with the client and partners saw active involvement from senior management. The parameters of these negotiations establish the modalities for project completion and the financial gains to be achieved (Narayanan & Huemann, 2021).

These findings highlight the complexity of managing projects in dynamic environments. Project managers were required to effectively navigate and establish organizational fields, which encompassed two distinct types of

reactions within the context of a burgeoning economy. The theory of projects as practices distinguishes between practices as experiential processes and practices as observable actions, which can be associated with this differentiation. This study encompassed a broad range of activities, spanning from the initial contract negotiations to the subsequent project execution. Notably, the scope of engagement extended beyond the conventional stakeholders, incorporating external entities that are typically not considered in traditional stakeholder relations. The aforementioned interaction evoked a multifaceted reaction. The phrase "what people do" pertained to the necessity of establishing organizational domains to effectively oversee their endeavors (Eskerod et al., 2015).

Broader economic trends reinforce this necessity. Given the accelerated economic growth, there has been a significant increase in the need for constructing infrastructure and facilities, thereby establishing the indispensability of the construction industry. The construction sector plays a crucial role in providing the necessary living conditions for the sustenance and growth of human life on Earth. The popularity of construction projects is on the rise, with numerous nations witnessing a surge in activities aimed at addressing the challenges posed by a growing population, land constraints, and expanding economic endeavors. Furthermore, the implementation of initiatives and projects is undertaken to ensure sustainable growth of the nation's economy and foster robust interconnections within the economic framework. The implementation of an effective project management practice is crucial for the successful execution and attainment of functional objectives throughout the entire project lifecycle, encompassing the planning phase through project completion (Zhang et al., 2014).

Other studies from Malaysia and Nigeria echo similar challenges and adaptations. A study examining the impact of project management practices on project success in the Malaysian construction industry reveals the implementation and testing of various practices. These include decision analysis, Gantt bar chart, sensitivity analysis, life-cycle cost analysis, work breakdown structure, probability analysis, event tree analysis, critical path method, project management software, in-house risk assessment, and in-house decision-making techniques. Therefore, based on the findings of the study, it was concluded that there is a preference for limited project management practices and ad hoc approaches. This preference is attributed to the high expenses associated with comprehensive project management, an insufficient understanding of project management principles, and challenges in accurately representing real-life scenarios. Respondents frequently employ project management tools and approaches such as cost-benefit analysis, Gantt Bar charts, and critical path analysis due to their inherent simplicity and user friendliness (Haron et al., 2017).

Furthermore, Unegbu et al. (2022) conducted a study that examined the correlation between project performance measures and project management practices in the Nigerian construction industry. The findings revealed that the presence of multivariate issues poses a significant challenge to construction projects, potentially impacting their overall performance and success. The elements exhibit interdependence as opposed to operating in isolation. The objective of this study was to examine the interrelationships between performance metrics and project management techniques as multivariate variables within the context of construction projects. Moreover, a total of fifty-three project management practices has been categorized into nine distinct constructs, namely scope management, time management, cost management, quality management,

risk management, human resource management, communication management, procurement management, and stakeholder management. The literature provides a total of 19 performance measures derived from three constructions: project performance, customer satisfaction, and project success.

Additional studies further validate the link between practice and performance. One of the practices involves the estimation of resources for time-enhancing activities. The accuracy of cost estimation affects the calculation of the time necessary for activities that improve time and cost performance. (Abusafiya & Suliman, 2017). The implementation of cost-benefit research has led to an enhancement in quality. (Abbasi et al., 2020). Diagrams depicting causes and effects, specifically organizational charts, were utilized to enhance human resource management. The improvement of human resource management was achieved through the implementation of project performance appraisals. The utilization of suitable tools in project development to enhance Human Resource Management (HRM), the incorporation of market research to influence project management, the application of stakeholder analysis to impact scope management, and the utilization of performance reports to improve cost management (Mir & Pinnington, 2014).

While project management practices are well documented, persistent challenges still hinder successful delivery. The following section examines these challenges and their implications. These concerns may include, but are not limited to, planning for the transportation of substantial equipment, devising contingency plans, and resolving any project-related challenges.

2.4 Project Management Challenges Internationally and in Bahrain

This section outlines the recurring challenges that impact construction projects globally and regionally, identifying how these challenges contribute to delays and inefficiencies.

3.1.5 2.4.1 Project Management Challenges Internationally

According to a study conducted by (Hasan et al., 2014) The successful execution of a construction project is contingent upon the timely achievement of project objectives, as well as adherence to cost and quality specifications. Nevertheless, transportation and construction projects frequently experience delays or fail to submit documentation promptly. Project completion can be delayed because of anticipated or unanticipated events. In the realm of business, the significance of time cannot be overstated, thus rendering the timely completion of construction projects of utmost importance. The prolongation of construction periods may also result in an escalation of contractor overhead costs. Inflation has the potential to increase the cost of materials. The client, particularly an investor, incurs losses or forgoes potential gains when there is a delay in the transaction.

Delays attributable to the owner, such as the tardiness of drawings and specifications, the occurrence of frequent change orders, and the provision of incomplete or inaccurate site information, gave rise to claims from both primary contractors and subcontractors. These claims frequently culminated in protracted legal disputes with substantial financial implications. The primary cause of contractor delays is ineffective administration. The lack of adequate planning and inadequate accounting

and financial knowledge have been identified as significant factors contributing to the failure of numerous contractors (Fatima, 2014).

Stakeholders involved in the building project must possess a comprehensive understanding of the project's status and proactively identify any potential delays at an early stage. This will help individuals mitigate such causes if they arise.

However, the primary challenges encountered in project management within the construction industry include cost overruns, disputes among stakeholders, inadequate time management, arbitration, and legal abandonment in certain countries, such as Nigeria (Alotaibi & Mafimisebi, 2016). Nevertheless, there have been reports highlighting the issue of delay as a significant challenge encountered in project management within the construction industry, particularly in the context of Indonesia. Furthermore, delays can be attributed to alterations in design as well as deficiencies in trade skills (Hasan et al., 2014).

Construction progress delays are defined as deviations from the established baseline. Typically, in the event of project delays, two options arise: implementing overtime work or allocating additional resources to expedite specific project operations. The expenses associated with projects may experience a significant increase. Extended periods of working overtime can lead to a decline in both performance and productivity (Mir & Pinnington, 2014).

The objective of this study is to ascertain the causes behind the delays in Saudi Arabia and evaluate their implications for each contractual party involved. During the course of the investigation, a total of 73 causes of delay were identified and subsequently classified into nine distinct groups based on their respective sources. The concept of cost inflation refers to the

increase in the overall price level of goods and services over time. Research findings indicate that project time overruns commonly range from 10% to 30%. Moreover, a notable finding emerged indicating that 45 out of the total of 76 projects under examination experienced delays, with a substantial majority of 70% of projects exceeding their scheduled timeframes. There are multiple factors contributing to the delay of Bahraini highway and bridge development projects, amounting to a total of thirteen reasons. The research employed a survey instrument to elicit perspectives from engineers employed by contractors, consulting firms, and a client organization. The researcher found that delays are primarily caused by the functioning of services and utilities (Mohammed, 2010).

Furthermore, an examination was conducted on the prevailing hazards that impact the West Bank Road initiatives in Palestine, with a specific focus on the contractors' viewpoint. After conducting an extensive review of the existing literature, a total of 45 factors contributing to delays were identified. In order to establish a hierarchy of the issues being examined based on their frequency and severity, a questionnaire survey was conducted. The primary factors that pose risks to road projects in Palestine include the payment defaults of project owners, the political environment in the West Bank, and the financial stability of contractors (Mahamid, 2013).

Nevertheless, delays in construction projects can be attributed to various factors, as identified by contractors, owners, consultants, utilities, government regulations, and the external environment. The causes of delay for contractors encompass several factors. These include challenges faced by contractors in securing project funding, instances of rework resulting from construction-related errors, insufficient management and oversight of contractor sites, ineffective communication among contractors and other

project participants, inadequate personnel, limited resources, and the presence of foreign contractors who may be unfamiliar with the supplies available in the Bahraini market. The causes of delay, as reported by the owner, encompass the consultant's inability to timely complete testing and inspection activities. The occurrence of a delay caused by the consultant in granting authorization for substantial revisions to the scope of work, as well as a delay in the consultant's assessment and approval of the design documentation, alongside the provision of unreliable project cost estimates the occurrence of design issues and significant design modifications made by a consultant during the construction process resulted in a delay in their resolution (Mohammed, 2010).

Conversely, the factors contributing to delays associated with utilities include the following: descriptions of service network placements in designs may lack clarity or specificity. Services that impede progress are redirected, and there were delays in the response times of utility agencies.

The occurrence of delays can be attributed to the implementation of government regulations, including challenges in obtaining work permits, restrictions on work schedules during the summer season, and alterations in governmental rules and regulations. Ultimately, the factors contributing to delays that exhibit a correlation with the external environment are as follows: The impact of high temperatures on construction projects, traffic diversion, on-site accidents, and the limited availability of materials in the market (Mahamid, 2013).

The consequences of delays can manifest in various ways, including the passage of time, exceeding budgetary limits, disputes and disagreements among stakeholders, legal proceedings, and the deferment of interconnected projects. The impediment and disruption of traffic flow due to economic and urban development. Furthermore, it has been ascertained

that there are multiple factors about contractors that could potentially contribute to project delays, including inadequate planning, insufficient resources, and limited manpower. Furthermore, the factors associated with the owner, namely the Ministry of Work, include suspension of work, budget availability, and decision-making delays. The principal challenges associated with consultants arise from a dearth of expertise. The elevated magnitudes of their severity suggest that the variables about service and utility-related delays hold significant importance (Mohammed, 2010). In addition, cost and time overruns, as well as disturbances to traffic flow, were the most common consequences of delay (Durdyev et al., 2017).

Finally, it is advisable to provide recommendations to each of the parties involved in the group. Beginning with the contractors, they could: It is imperative to increase focus on the planning phase and allocate additional resources, both in terms of time and financial investment, to enhance its effectiveness. Proper planning and scheduling of the project are imperative to ensure continuous progress and align resource allocation with the schedule requirements, thereby mitigating the risk of exceeding budgetary and time constraints. It is imperative to allocate an adequate workforce and motivate them to enhance their productivity. It is essential to stay informed about the latest developments in building technology and reflect on the potential lessons that can be applied to future projects. By using exemplary contractors as a reference, one can effectively utilize progress payments to plan cash flow and efficiently manage financial resources strategically. Additionally, contractors should consider allowing employees to work during non-traditional hours, such as at night or in the early morning, or providing opportunities for overtime work. This approach can help mitigate the constraints imposed by summertime restrictions. Furthermore, contractors must prioritize time management in order to minimize delays

in the construction industry. The fundamental components for achieving efficient time management encompass the utilization of suitable project planning and scheduling techniques. Consequently, the implementation of a practical timetable ensures that the site manager can effectively allocate the workforce to suitable project structures (Durdyev et al., 2017).

The effective execution of a building project requires the use of a comprehensive management approach that consist of meticulous planning, systematic scheduling, accurate financial analysis, and adherence to relevant rules and regulations. Furthermore, these project plans serve as a framework for assessing the progress made at different phases of the development process (Koshe & Jha, 2016).

The inclusion of control is of paramount importance in a construction project, as it allows the owner to effectively oversee and monitor the contractor's activities in accordance with the terms outlined in the contract. This typically involves regular and systematic supervision and tracking of the construction progress on a daily or weekly basis. To mitigate potential delays, construction contractors diligently oversee the activities of their subcontractors. The second-ranked way of minimizing delay indicated that proper site management and monitoring can be used to enforce rules among construction partners. As stakeholders who have made financial investments in the project's development, owners bear significant responsibilities in overseeing and managing contractors and consultants to ensure the timely completion of the construction. Therefore, the customer must hold a weekly meeting or monitoring visit with the contractors and consultants to keep them informed of the status of the work and any problems (Elhaniash & Stevovic, 2016) .

Adding finance (or financial management) to construction requires good financial management because poor finances might delay projects. Timely

payment to the contractor has the potential to mitigate the risk of project delays. Compensation is required for all ongoing and completed projects that have been executed in accordance with the contractual agreement. Also, in order to continue project construction and reduce delays, it is crucial to pay contractors and personnel on time. One of the primary incentives for maintaining progress at work is financial compensation. Moreover, the timely settlement of payments facilitates the contractor's securing funds for subsequent construction projects. Furthermore, the presence of financial uncertainties poses significant challenges for contractors in securing the necessary funds for project development prior to receiving payment from project owners. This factor can also serve as a plausible explanation for the delays encountered in the execution of building projects. Therefore, it is imperative to expedite the payment process for the contractor, enabling them to secure the necessary funds for the project. It is essential to note that the provision of financial support from the owners to the contractor is crucial for ensuring the job progresses in alignment with the predetermined timetable and contractual agreement (Khoiry et al., 2018).

While owners have the potential to minimize change orders during the construction process, it is generally more advantageous to engage in collaborative decision-making rather than making decisions independently. By establishing a collaborative and interactive group that integrates a diverse range of expertise and information, the potential for generating additional options and ultimately arriving at a suitable decision is increased. Increased acceptance of the ultimate judgment is likely to occur as well. It is advisable to select a bidder who possesses the requisite resources, skills, and expertise to successfully accomplish the task rather than solely considering the bidder offering the lowest price. Additionally,

it is important to involve the landowners in the planning and design process for land acquisition. It is crucial to thoroughly comprehend and fulfill their requirements while also providing fair compensation in return for their land (Elhaniash & Stevovic, 2016).

Transitioning seamlessly to another critical challenge that holds significant importance during project implementation. Furthermore, the evaluation of a project's success often relies on factors such as its schedule, financial resources, and overall quality. A diverse range of threats can significantly influence the three fundamental factors contributing to project success. The risks associated with building activities can vary in type and are influenced by multiple factors, owing to the unique, intricate, and ever-changing nature of such endeavors. These potential risks have the potential to lead to financial losses, increase project costs, introduce delays, and ultimately result in the delivery of projects that do not meet the expected standards (Fatima, 2014). Moreover, a significant challenge faced by the construction industry is assessing the risk associated with cost overruns and ensuring the successful completion of projects within the designated timeframe and allocated budget (Mir & Pinnington, 2014). A variety of methodologies are employed in the field of literature to investigate and evaluate the risks associated with the construction industry. Based on the research conducted, a comprehensive analysis revealed the identification of twenty primary risk factors. The findings indicate that a significant proportion of these factors are associated with contractors, clients, and designers. At the same time, a smaller subset pertains to governmental entities, subcontractors and suppliers, and external challenges. According to the findings of this research, the construction stage is identified as the most perilous phase, followed by the feasibility stage. Additionally, the study reveals that these

hazards are distributed across the entirety of the project life cycle, with several of them manifesting in multiple phases (P. X. Zou et al., 2007).

A separate study conducted to investigate risk factors in the Ghanaian construction sector involved the participation of 103 professionals who were surveyed to gather their opinions. Notable disparities were identified among these subgroups' perspectives regarding the probability of threat risks arising in the subsequent five domains: construction method, price inflation, unusual weather, ground conditions and site contamination, and deficient project team communication (M. A. , & A. A. Khan, 2023).

Furthermore, the pre-construction period was substantially shorter than the building phase. However, it had the most significant impact on cost overruns, according to a study examining how the implementation phase affected cost overruns. There is a positive correlation between the duration of the implementation phase and the magnitude of cost overruns (P. X. , & Z. G. Zou, 2024).

The findings of a study conducted by Abusafiya and Suliman (2017) indicate that various factors about project management, contract administration, non-human resources, and contractor site management have a significant impact on cost overruns. Furthermore, it is essential to consider the potential economic implications associated with each of the identified risk variables when formulating estimation methodologies for construction projects. Hence, it is imperative to consider comprehensive input from analogous projects that have been previously constructed. Additionally, conducting thorough site surveys and measurements is essential, and involving maintenance engineers as integral members of the design team from the project's inception can effectively mitigate the need for frequent design revisions. Moreover, meticulous scrutiny of the contractor's drawings, specifications, and procurement documents at an

early stage can yield substantial cost and time savings. This process aims to detect and rectify any errors or conflicts promptly. Ultimately, prioritizing risk factors related to cost overruns in projects leads to an improved allocation of risk contingencies within budget estimations.

3.1.6 2.4.2 Project Management Challenges in Bahrain

Like many other quickly developing countries, Bahrain faces several project management difficulties, especially when it comes to major construction and infrastructure projects. Stakeholder management, cost overruns, delays, utility diversions, and traffic interruptions are common problems that combine to produce a complicated project environment that calls for careful planning and coordination.

Cost overruns are one of the most significant problems, often caused by unanticipated ground conditions, modifications to the project's scope, and inaccurate cost estimates. In a thorough investigation of cost overruns in Bahrain's construction sector, (Abusafiya & Suliman, 2017) It was discovered that the leading causes were stakeholder-related issues, such as late payments and contract disagreements. These results demonstrate how important it is for public projects to have proactive stakeholder participation and open financial planning.

Delays in time are another persistent problem. (Haseeb et al., 2011) Investigated the causes of time and cost overruns in construction projects in Bahrain and found that weak planning, delayed material supply, and poor scheduling were the most common causes. To avoid such delays, they underlined the significance of accurate time estimates and strong supply chain management.

The maturity of local organizations' project management is another problem. Many firms function at a relatively low maturity level, lacking established processes and performance evaluation tools, according to (AlZayani & Bashir, 2020) Assessment of project management practices in Bahrain's construction industry. This disparity frequently leads to uneven project results and a dearth of tools for ongoing development.

Furthermore, logistical issues with subsurface utilities and urban traffic usually affect project schedules and raise hazards. According to (Al-Hashemi, 2015) The lack of updated as-built records and agency collaboration frequently results in issues when traffic is diverted and utilities are relocated, particularly in places that are historically significant or heavily populated. Due to these technical difficulties, early stakeholder alignment and more complex urban planning are required.

Here is a paper that shows the challenges of a project in Bahrain, the study conducted by (Hassanain, 2009) This examined the establishment of the Sitra Bridge, the largest project in Bahrain's history, spanning a distance of 3.2 km. Given the complexity of the project, it is evident that numerous parties and stakeholders were involved at various levels. Based on the research conducted, the project involves approximately 40 primary stakeholders, along with a substantial number of secondary stakeholders. Furthermore, the acquisition and maintenance of stakeholders, public support, and collaboration have presented significant challenges throughout the project. In fact, this aspect has emerged as the most formidable hurdle encountered so far in the project's progression.

Additional challenges encompassed the provision of appropriate compensation to the fishermen residing in Tubli Bay who were adversely affected by the construction activities, necessitating their relocation to an alternative site within the project vicinity. Furthermore, the relocation of

23 occupants residing in the northern section of the Mina Salman industrial area was required to facilitate the expansion of the southern portion of the Shaikh Isa Bin Salman highway. Furthermore, the implementation of traffic management plans is imperative for large-scale projects, as they face significant pressure to mitigate, if not entirely eradicate, the adverse impacts of construction activities on individuals utilizing roadways. Furthermore, it is observed that urban areas with a long history and significant levels of activity often exhibit a pronounced prevalence of complex project challenges. The interplay of these variables posed considerable challenges for the aging traffic within and around construction zones. These elements significantly influenced the project's most effective traffic management (diversion) strategies. The primary requirement expressed by the client was the avoidance of any disruptions to traffic flow throughout the entirety of the construction phase. The primary objective of the traffic management plans was to mitigate construction-related traffic congestion by providing road users with secure and convenient alternative routes in the vicinity of the construction sites. The contractor has effectively executed a notable traffic management plan at Umm Al-Hassam junction, along with several minor and short-term traffic diversions. The agreement was established in May of 2007 to grant permission to the contractor to commence excavation on the western portion of the underpass. The intersection transformed a signalized intersection to an elongated signalized roundabout, colloquially referred to as the "tennis racket" by the project team due to its notable resemblance (Hassanain, 2009).

Additionally, due to Bahrain's small size, there are also underground service diversions in place. Consequently, various underground utilities are frequently found within road reserves. A multitude of utility crossings are

observable at prominent traffic intersections, such as the Umm Al-Hassam junction. Due to the installation of certain utilities several decades ago, the availability of accurate as-built plans depicting their alignments and depths appears to be lacking. In the process of project planning, it may not always be feasible to ascertain the precise locations of all utility crossings at significant points due to the potential for causing undesirable disruptions to traffic flow. Consequently, there have been occurrences wherein complete dependence on as-built designs has resulted in complications during the construction process. In addition, it has been observed through preliminary site investigations conducted after the commencement of the project that the foul sewer pipeline, with a diameter of 900 mm, situated adjacent to the northern side of Shaikh Isa Bin Salman Highway, deviates from its anticipated position by being positioned further south than initially projected at its western terminus. This misalignment results in the pipeline encroaching upon the excavation area designated for the subway construction. The contractor was assigned the responsibility of repositioning the pipeline to relocate it away from the underpass excavation site, where it was encroaching.

To wrap up, the Mobility of people, products, and services is a crucial condition for any nation's economic development. Where accessibility is good and mobility is quick, economic activity thrives. As a result, transport infrastructure facilities rank among the most crucial elements in driving an economy's growth. Additionally, Bahrain is making significant investments in modernizing its transportation system. The replacement of Sitra bridges is currently the focal point of this effort. When this massive project is finished in the middle of 2010, the road network in the kingdom will significantly improve, which will improve the economy of the nation. As will be shown in the next section, these challenges not only complicate

project execution but are often cited as direct causes of failure in various project environments.

2.5 Causes of Project Failure

Building upon the challenges outlined in the previous section, it becomes clear that many of these issues are not isolated events but are direct contributors to project failure. Going through literature, numerous studies have identified many causes and factors that can lead to project failure through the different project phases, particularly when successful planning is absent at the beginning of the project or before starting, or the absence of a proper action plan to mitigate the obstacles in the project life cycle. The following table (Table 2.1) presents a selection of these key causes, categorized by their occurrence within various project phases.

Table 2. 1 Summary of Causes and Factors Leading to Project Failure

Number	Paper Title	Failure (Factors/causes)	Failure Phase
1	Analysis of Project Failure Factors for Infrastructure Projects in Saudi Arabia: A Multivariate Approach (Ikediashi et al., 2014)	Poor Risk Management	Execution
		Budget overruns	Monitoring & Control
		Poor communication Management	Execution
		Schedule delays	Execution
		Poor estimation practices	Initiation
		Cash flow difficulties	Monitoring & Control

Number	Paper Title	Failure (Factors/causes)	Failure Phase
		Design discrepancies	Execution
		lack of efficient change management	Execution
		Inadequate project structure	Planning
		Lack of teamwork	Execution
2	Assessment of critical factors contributing to construction failure in Yemen(Gamil & Abdul Rahman, 2020)	Poor construction management	Execution
		Frequent design changes	Planning
		Work suspension	Execution
		Shortage of raw materials	Planning
		Hiring uneducated contractors	Initiation
		Low salary for engineers and workers	Initiation
		Cash flow and financial difficulties	Monitoring & Control
		Delay in progress payments to subcontractors	Financial Issues
		Financial difficulties faced by owners	Financial Issues
		Poor financial control and management	Monitoring & Control
3	Analyzing Delay Factors	Contractor's improper planning	Planning

Number	Paper Title	Failure (Factors/causes)	Failure Phase
	in Malaysian Construction Projects: A Systematic Review(Mohd, 2021)	Contractor's poor site management.	Execution
		Inadequate contractor experience	Initiation
		Inadequate client's finances and payments for completed work	Financial Issues
		Problems with subcontractors	Other
		Shortage of materials	Planning
		Labor supply issues	Other
		Equipment availability and failure	Planning
		Lack of communication between parties	Execution
		Mistakes during the construction stage	Execution
	Causes of Contractors' Failure in Industrial Projects in Saudi Arabia (Assaf et al., 2015)	Lack of experience in the business field	Initiation
		War	Other
		Poor project management	Execution
		Poor cost estimation	Initiation
		Unavailability of the stationed project leader at the site	Initiation

Number	Paper Title	Failure (Factors/causes)	Failure Phase
		Neglecting important aspects of the project	Initiation
		Type of the contract	Initiation
5	Causes of Delay in Construction Projects in the Oil and Gas Industry in the Gulf Cooperation Council Countries: A Case Study (Ruqaishi & Bashir, 2014)	Poor interaction with vendors in the engineering and procurement stages	Initiation
		Bureaucratic government systems and lengthy project approval procedures	Initiation
		Poor design	Initiation
		Incompetence of project teams	Initiation
		Inadequate tendering practices	Initiation
		Delay in internal approval processes from owners	Initiation
		Inadequate project planning	Planning
		Poor project management	Execution
		Lack of resources	Planning
		Unforeseen site conditions	Planning
		Weather-related constraints	Other
6	Analysis of delays in construction projects: A case study of	Change orders	Execution
		Financial problems	Financial Issues
		Decision-making delays	Execution
		Inadequate planning	Planning

Number	Paper Title	Failure (Factors/causes)	Failure Phase
	Egyptian contractors (Khalil, 2021)	Coordination and communication problems	Execution
		Weather conditions	Other
		Labor productivity issues	Other
		Material delays	Planning
		Design changes	Execution
		Inadequate resources	Planning
7	Causes of Delay in Road Construction Projects (Mahamid et al., 2012)	Political situation	Other
		Segmentation of the West Bank and limited movement between areas	Other
		Awarding projects to the lowest bid price	Initiation
		Progress payment delay by the owner	Financial Issues
		Shortage of equipment	Planning
8	Causes of delay in the global construction industry: a meta-analytical review (Sanni-Anibire et al., 2022)	Contractor's financial difficulties	Financial Issues
		Delay in approval of completed work	Closing
		Slow delivery of materials	Planning
		Poor site organization and coordination between various parties	Execution

Number	Paper Title	Failure (Factors/causes)	Failure Phase
		Poor planning of resources and duration estimation/scheduling	Planning
9	Causes of Delay in the Planning and Design Phases for Construction Projects (Yang & Wei; n.d., 2010)	Changes in the client's requirement	Design change
		Poor scope definition	Initiation
		Unreasonable or impractical initial plan	Planning
		Change orders by the client	Design change
		Project complexity	Planning, initiation
		Unreasonable contract duration	Initiation
		Insufficient or ill-integrated basic project data	Initiation
		Inadequate planning and scheduling	Planning
		Slow land expropriation due to resistance from occupants	Initiation
		Complicated administration process of the client	Initiation
		Causes of Delay in the Planning and Design Phases for Construction Projects	Planning

Number	Paper Title	Failure (Factors/causes)	Failure Phase
10	Identifying Delay Causes in Construction Projects: A Case Study of Iran (Ahmadi, 2020)	Finance and payments for completed work	Financial Issues
		Improper planning	Planning
		Site management	Planning, Execution
		Contract management	Initiation
		Lack of communication between parties	Execution
11	Causes of Failure of Small Contractors in Saudi Arabia (Assaf et al., 2013)	Management incompetence	Planning, Execution
		Poor accounting systems and records	Monitoring & Control
		Difficulties in attracting good personnel	Initiation
		Dependency on a limited customer base	Other
		Lack of effective business plans	Other
12	Exploring delay causes of road construction projects in	Weather conditions	Other
		Shortage (availability) of construction materials	Other
		Slowness of the owner decision-making process	Execution

Number	Paper Title	Failure (Factors/causes)	Failure Phase
	Egypt (Aziz & Abdel-Hakam, 2016)	Poor site management and supervision by the contractor	Execution, Monitoring
		Shortage of labor	Other
		Accidents/mistakes during construction	Execution
		Slow delivery of materials	Other
		Construction methods	Execution
		Shortage in equipment/insufficient numbers	Planning
		Financing by the contractor during construction	Financial Issues
		Preparation and approval of shop drawings, samples	Initiation
		Inadequate contractor experience is causing an error	Initiation
		Low productivity level work	Monitoring & Control
		Obtaining permits from the municipality (government)	Initiation
		Ineffective planning and scheduling of the project by the contractor	Planning

Number	Paper Title	Failure (Factors/causes)	Failure Phase
		Delays in the contractor's progress payment by the owner	Closing
		Unrealistic (unreasonable) contract time (duration) & requirements imposed	Initiation
		Owner's financial problems/client's finances/economic ability for the project	Financial Issues
		Change orders by owner during construction (variation)	Design change
		Legal/industrial disputes between various parties in the construction project (claims)	Closing
13	Exploring the Causes of Delays in the Construction Industry: Case Study for Iran (Abbasi et al., 2020)	The contractor's financial problems	Financial Issues
		Problems in financing and providing sufficient and stable cash flow during the construction phase	Financial Issues
		Delay in payment to the subcontractor due to	Financial Issues

Number	Paper Title	Failure (Factors/causes)	Failure Phase
		poor handling of financial documents	
		Financial problems and delays in payments for completed works	Financial Issues, closing
		Problems in the payment of salaries	Financial Issues
		Inflation and a rise in material prices	Other
		Developing an unrealistic schedule for the project	Planning
		Unrealistic scheduling due to the shortage of a professional and skilled workforce with executive experience	Planning
		Preferring relationships to rules in the bidding system	Initiation
		Defects in writing and controlling the project schedule	Planning
		Employing an incorrect method to select the contractor	Initiation

Number	Paper Title	Failure (Factors/causes)	Failure Phase
		Reworks due to executive errors and mismatch with design and plan	Execution
		Making many changes to drawings, even after the execution	Design change
		Making many changes at various levels of management and supervision	Monitoring & Control
		Delays in delivering works performed by subcontractors	Closing
14	Factors leading to construction projects' failure in Jordan (Khlaifat et al., 2019)	Financial difficulties faced by the contractor	Financial Issues
		Poor planning and scheduling of the project by the contractor	Planning
		Delays in the contractor's payments to subcontractors	Financial Issues, closing
		Proper technical study by the contractor during the bidding stage	Initiation

Number	Paper Title	Failure (Factors/causes)	Failure Phase
		Increased number of projects	Initiation
		Incompetent technical staff assigned to the project	Initiation
		Delays in subcontractors' work	Execution
		Lack of use of project management techniques	Planning, Execution
		Insufficient coordination among the parties by the contractor	Execution
		Use of unacceptable construction techniques by the contractor	Execution
15	Failure drivers of construction projects at planning in KSA (Alsulamy, 2022)	Time disputes: Time disputes were found to be the primary factor affecting project failures. Delays in project timelines and scheduling issues were significant contributors to project failures at the planning stage.	Planning
		Cost overruns: Cost overruns, where the actual project costs exceed the	Planning

Number	Paper Title	Failure (Factors/causes)	Failure Phase
		planned budget, were identified as another critical failure driver. Budgeting and cost estimation issues were found to have a significant impact on project failures.	
		Total abandonment: Total abandonment of projects was also identified as a significant failure driver. This refers to cases where projects are completely abandoned and not completed as planned.	Planning
16	Identifying Delay Factors in UAE Construction Projects: A Comprehensive Review (M. A., & A. U. Khan, 2022)	Approval of drawings	Initiation
		Inadequate early planning	Planning
		Slowness of the owners' decision-making process	Execution
		Financing issues	Financial Issues
		Poor site management	Execution
		Inadequate contractor experience	Initiation
		Changes in design	Design change

Number	Paper Title	Failure (Factors/causes)	Failure Phase
		Labor productivity issues	Monitoring & Control
		Material availability and delivery delays	Planning
		Weather conditions	Other
17	The Root Causes of Construction Project Failure (Shahhosseini et al., 2018)	Poor cash flow management	Monitoring & Control
		late payments	Financial Issues
		Inadequate financial resources	Initiation
		Inadequate evaluation of contractors	Initiation
		Inaccurate cost estimation	Initiation
		Ineffective contract management	Initiation
18	Time and cost overruns in the UAE construction industry: a critical analysis (Johnson & Babu, 2020)	Design variations from clients and consultants	Design change
		Unrealistic schedules and completion dates set by clients	Initiation
		Delays in obtaining government permits and approvals	Initiation

Number	Paper Title	Failure (Factors/causes)	Failure Phase
		Inaccurate time estimation by consultants	Planning
		Change orders from clients	Design change
		Poor cost estimation	Initiation
		Delays in the client's decision-making process	Execution
		Financial constraints of the client	Financial Issues
		Inappropriate procurement methods.	Planning
19	Causes of cost overrun in construction projects in Bahrain (Abusafiya & Suliman, 2017)	Poor project planning and scheduling	Planning
		Inadequate cost estimation	Planning
		Contractor's financial difficulties	Financial Issues
		Poor site management and supervision	Execution
		Inadequate procurement and equipment management	Execution
		Lack of coordination among stakeholders	Execution
20	Time and cost overrun in construction	Poor initial planning	Planning
		Underestimation of time and cost	Planning
		Ineffective site management	Execution

Number	Paper Title	Failure (Factors/causes)	Failure Phase
	projects(Haseeb et al., 2011)	Design errors during construction	Execution
		Labor shortages	Execution
21	Risk and stakeholder management in mega infrastructure projects (Mohammed, 2010)	Incomplete definition of project scope	Initiation
		Unrealistic scheduling by contractors	Planning
		Delays in utility diversions	Execution
		Poor on-site coordination and public resistance	Execution
		Lack of formal mitigation strategies	Monitoring & Control
		No follow-through on audit findings	Monitoring & Control

2.6 Gaps in Bahrain's Construction Sector (New section)

While the preceding sections have outlined a wide range of project management challenges across international and local contexts, several studies have noted that the body of literature focusing specifically on Bahrain remains limited in both depth and empirical scope (Abusafiya & Suliman, 2017; AlZayani & Bashir, 2020; Nebrida & Nebrida, 2021). Most research conducted in Bahrain primarily concentrates on case-specific issues such as cost overruns, utility delays, and stakeholder coordination,

with only a few efforts attempting to assess sector-wide maturity or performance benchmarks (Haseeb et al., 2011; Al-Hashemi, 2015).

Compared to regional research in countries like Saudi Arabia and the UAE, which have developed project maturity models and broader diagnostic frameworks (Alsulamy, 2022; Almarri & Boussabaine, 2017), studies in Bahrain tend to be fragmented and narrow in scale, often relying on limited datasets or isolated case studies (Hassanain, 2009; Abusafiya & Suliman, 2017).

Furthermore, research in Bahrain often overlooks systemic variables such as project governance models, communication frameworks, and organizational capabilities — areas explored in greater depth in international literature (Muszynska et al., 2015; Cohen & Callaway, 2021; Eskerod et al., 2015). This highlights a clear research gap: there is a pressing need for structured investigations that holistically evaluate Bahrain's construction project ecosystem, encompassing technical, institutional, and socio-political factors.

By addressing this gap, the current study contributes to the emerging conversation on national project management maturity and performance improvement in Bahrain's construction sector.

2.7 Conclusion

The review of literature clearly demonstrates that project management has evolved into an essential discipline for ensuring the successful delivery of complex construction and infrastructure projects. From its historical roots to modern-day frameworks such as PMBOK and Agile, project management practices have continued to adapt to the increasing scale and complexity of projects globally. However, despite the existence of structured methodologies, a recurring theme throughout both international

and local studies is the prevalence of project failures caused by a combination of poor planning, ineffective stakeholder coordination, and financial mismanagement.

Recent research highlights the importance of a practice-oriented approach to project management, in addition to structural considerations. Instead of merely depending on theoretical frameworks, this new viewpoint emphasizes the actions and choices that project managers actually make while carrying out their tasks. It emphasizes the value of adaptive decision-making, internal auditing, and real-time communication. Research also highlights the importance of strong change control procedures, weekly audits, and group stakeholder talks as best practices that increase accountability, decrease delays, and promote project transparency.

In the context of Bahrain, the construction sector plays a vital role in national development and contributes significantly to the economy. However, it continues to face significant challenges, particularly in project execution and stakeholder integration. Local studies have consistently reported cost overruns, time delays, coordination failures, and resource constraints as major issues affecting project performance. For example, projects like the Sitra Bridge highlight how technical difficulties, stakeholder misalignment, and outdated infrastructure records can compound project risks and hinder timely completion. Internationally, similar themes emerge, with studies identifying inadequate planning, unrealistic scheduling, change order mismanagement, and weak financial controls as common failure factors. The literature underscores the importance of project life cycle integration from initiation through to closure and stresses the need for rigorous risk assessment, effective communication, and proactive stakeholder engagement.

What is evident from this extensive analysis is that while the tools and frameworks for project management are well-established, their effectiveness is heavily contingent on contextual adaptation and implementation. In Bahrain's instance, the adoption of more mature project management approaches, capacity building, and institutional reforms is necessary to increase performance and reduce failure rates. The research also indicates a key gap in the literature related to Bahrain's particular project context, underlining the necessity for more empirical investigations focusing on finding core causes and proposing locally suited remedies.

Bahrain can only accomplish its strategic infrastructure goals while minimizing risks and maximizing public value if it enhances the effectiveness of its project management. This will ultimately require a deeper alignment of policies, planning processes, and stakeholder collaboration, in addition to the application of technical tools and best international practices.

Chapter 3: Methodology

- 3.1 Introduction
- 3.2 Participants
- 3.3 Data Collection
- 3.4 Data Analysis Approach Towards a Framework

3.2 Introduction

The construction industry is a significant sector in the Bahraini economy; therefore, it is required to improve and develop it continuously to enhance its efficiency and outputs. This research aims to examine the current project management practices employed in the construction sector in Bahrain, to draw conclusions based on the sector's statistics. This study aims to proceed by understanding the project management practices employed, identifying the causes of success and failure, and examining other related project management components used by professionals in the construction industry. This chapter will explain the research methodology that will provide a systematic road map to attain the research outcomes, i.e., a model of best project management practices and recommendations for areas of using these practices, thereby reducing the effect of identified challenges in future projects. Solutions for the current challenges.

Experiment, survey, case study, action research, grounded theory, ethnography, and archival research are some of the various research methodologies employed by researchers (Tereso et al., 2019). In this work, an online questionnaire was used as a study tool, and a survey was employed as the research strategy. Selecting an online questionnaire has various benefits, including (Tereso et al., 2019):

- Enabling the gathering of a large volume of data at a minimal cost.
- The capacity to communicate with multiple people at once, collect data quickly, and gather a wide range of data that is simple to interpret.

The survey was developed based on the study area and requirements. It was created as a Google form and circulated using emails, WhatsApp messages, and other social media platforms like LinkedIn, using a Google form

directed to professionals in the construction industry with experience in project management.

The findings directly informed the design of the survey questionnaire of the literature review (Chapter 2) to address the research questions, particularly studies highlighting challenges, practices, and failure causes in Bahrain's construction sector (e.g. (Abusafiya & Suliman, 2017; Al-Hashemi, 2015; AlZayani & Bashir, 2020)). The questions were structured to capture respondents' experience with common local issues such as cost overruns, delays, contractor coordination, scope creep, and weak stakeholder engagement. To ensure contextual relevance, the survey included sections focused on: the frequency and severity of project challenges encountered in Bahrain and the causes of failure and success; tools and practices currently adopted in managing these projects. Respondents were also asked about their adoption of the PMBOK or any other project management standard. Moreover, the respondents were asked to rate the importance of having project management certifications in impacting the success of the project. This design allowed the survey to not only gather quantitative data but also assess how well current practices align with global standards in the local context.

The use of structured questionnaires guided this process, and the choice of a quantitative research approach was premised on the fact that questionnaires have the advantage of reaching a large audience easily and quickly (Turner & Müller, 2020). The quantitative survey method was chosen for its ability to collect structured, generalizable data from a broad sample of professionals within Bahrain's construction sector (Turner & Müller, 2020). This aligns with the study's goal of identifying common challenges and assessing widespread practices. In contrast, while interviews offer rich detail, they are less practical for identifying patterns

across larger populations and may introduce researcher bias (Kwak & Anbari, 2009). Therefore, the survey was deemed more suitable for developing a statistically supported framework.

Through the online questionnaire, the research obtained quantitative and measurable input in the form of numerical data, which could be analyzed statistically to identify patterns, statistics, and relationships. Hence, the research will be quantitative in nature, which will help to achieve and answer the objectives of this research, which are:

1. What is the number of successful projects, delayed projects, and failed projects in the construction sector of Bahrain, and the reason for the project failure from the project management point of view?
2. What practices, tools, and techniques are being used by project managers in these projects?
3. Is it possible to develop a framework to oversee the identified failure strands based on standard practices prescribed by internationally accepted bodies like the Project Management Institute?

3.3 Participants

The survey targeted project managers, construction managers, project engineers, and other professionals involved in Bahrain's construction sector. Participants were drawn from both public and private sector projects, including major construction firms, consultancy offices, and government agencies. This ensured that the collected data reflected the broader realities of Bahrain's construction environment across diverse project types.

3.4 Data Collection

As previously discussed in this chapter, the structured survey offered distinct advantages over qualitative methods such as interviews. One of the most notable benefits became evident during the data collection process itself. Direct engagement with industry experts for interviews proved challenging due to their limited availability and demanding schedules. Moreover, efforts to obtain specific project data from contractors, such as completion dates and current project statuses, were often met with reluctance, mainly stemming from confidentiality concerns and a hesitancy to disclose information related to project failures. These challenges reinforced the decision to adopt an anonymous online survey, which facilitated broader participation while reducing access barriers and disclosure sensitivities.

To ensure that the survey captured relevant and context-specific insights, its design was directly informed by the literature review. The information gathered through this thorough literature review, including identified causes of project success and failure as well as standard project management practices, was used to formulate the questions of the research survey. More specifically, the survey was structured around key themes identified in the literature review, including cost overruns, time delays, stakeholder misalignment, and poor planning issues that are prevalent both globally and within Bahrain's construction sector. Insights from Chapter Two, such as the importance of adaptive practices, internal audits, and change control procedures, were translated into targeted questions aimed at capturing how these concepts are being applied (or neglected) in real-world Bahraini projects. Additionally, the review's emphasis on gaps in local research and the need for context-specific solutions directly informed the inclusion of questions that assess the maturity of current practices and

the extent of institutional challenges faced by practitioners in Bahrain. This ensured that the survey was not only grounded in theory but also responsive to the empirical realities highlighted in the literature.

This survey serves as the primary data collection method in the study. By grounding the survey instrument in a robust review of existing literature, the relevance and comprehensiveness of the data collection process were ensured. This methodological approach situates the findings within the broader context of project management knowledge (Turner & Müller, 2020).

The questionnaire, which can be administered via phone, paper, email, and other platforms, represents the second step in the data collection process. To distinguish this study from others, a decision was made to create the survey entirely from scratch. The survey was developed using Google Forms, published on LinkedIn on February 25, 2024, and disseminated via WhatsApp specifically to individuals with experience in the construction industry and project management. The survey instrument underwent a review, and pilot data were collected with the assistance of experts. Adjustments were made based on their feedback to enhance the survey's effectiveness before its final publication (see Appendix 3).

The questionnaire was divided into five major sections, and each section was designed to collect data to meet the strands embedded in the research objectives. They were as follows:

Section 1: General Information: It contains a set of personal questions that gather information about the participants and validate their expertise in the field of study.

Section 2: Project Evaluation - Different questions to assess the status of construction projects in Bahrain from the participants' point of view and experiences.

Section 3: Causes of Success or Failure: A set of questions to investigate the leading causes of project failure and success in the context of projects they have been involved in, in Bahrain.

Section 4: Project Management Practices for Project Phases - Likert scale rating-based questions for each phase of projects to gather information on the project management practices followed or considered by the participants.

Section 5: Additional Comments: It is kept as an open-ended question to collect any additional comments/information about project management practices, tools, and techniques.

(Refer to Appendix 3 for the expertise review acknowledging):

A detailed description of the various sections and their significance is given below.

Section 1: General Information: This section collects information about the respondent, including name, gender, role in the construction industry, and professional seniority (years of experience).

Section 2: Project Evaluation: This section aims to determine the status of construction projects in Bahrain based on each respondent's experience. Hence, the questions began with the number of projects the respondents were involved in and the number of projects completed in all dimensions. Referring to various dimensions, data about standard & specifications required in the specific project, the allocated budget, and the scheduled timetable were designed to be collected. As follows in the industry, a

successful project is a project handed over to its client, complying with its required standards and specifications, within the allocated budget and scheduled time (Tereso et al., 2019).

The next question prompted the respondent to disclose his professional certifications in Project Management, including PMP, CAPM, PRINCE2, PMI-ACP, CSM, CSM-IPMP, MPM, PPM, and others. A liker scale was employed to rate the importance of having a professional certification to enhance their skills that could impact the success of projects on a 1 to 5 scale, with one meaning "Not Important", two meaning "Somewhat Important", three meaning "Moderately Important", four meaning "Important", five meaning "Very Important". Asked. This was followed by a question about the support offered by the employer in acquiring the certification and training in the latest trends in project management. Then, finally, based on the respondent's experience, the percentage of construction projects completed successfully, the percentage of the projects completed but delayed, and whether the respondent was involved in any failed projects in Bahrain. The survey seeks to gather information on the respondent's experience with construction projects. Specifically, it asked for the percentage of projects that were completed successfully, the percentage of projects that were completed but experienced delays, and whether the respondent had been involved in any projects that failed in Bahrain. This data will help us understand the success rates and usual challenges faced in the construction industry within the region.

Section 3: Causes of Success or Failure: Several factors contribute to the success or failure of any project. Adhering to project management standards and having substantial experience in managing projects can help mitigate these factors and improve project outcomes. Therefore, the questions in this section assess whether the respondent follows standard

project management practices as outlined in the "Project Management Body of Knowledge" (PMBOK), which is more comprehensive and widely followed in the construction industry in the Middle East (Gamil & Abdul Rahman, 2020; Huda & Maliki, 2019). It is then asked to choose the main factors contributing to the success of construction from providing a list of factors not limited to: Effective project planning and scheduling, Skilled and experienced project team, Adequate project budget and resources, Clear project objectives and scope, Effective communication and collaboration among stakeholders, and efficient risk management. The survey questions further addressed the main factors contributing to the failure of construction projects in Bahrain, including poor project planning and scheduling, inadequate project budget and resources, lack of skilled and experienced personnel, unclear project objectives and scope, ineffective communication and collaboration among stakeholders, and inefficient risk management. The above-mentioned factors were compiled from research publications in the literature review presented in Chapter Two, Section 2.5.

Section 4: Project Management Practices for Project Phases: Each project usually has its unique requirements, encompassing distinct timelines, budget considerations, resource allocations, and performance criteria tailored to fulfill customer expectations. However, every project follows a standardized life cycle comprising key phases: Initiating, Planning, Execution, Monitoring and Controlling, and Closing. Each phase demands specific time, budget, effort, and practices to be diligently performed and completed by the project team. In this section, after conducting a thorough study and research into PMBOK Volume (1) and recent scholarly publications, several project management practices have been identified for each phase. To determine the frequency of project management techniques

and tools utilized during the project phase in construction projects in Bahrain, a comprehensive assessment was conducted for each phase to rate each practice based on how frequently respondents use it in construction projects in Bahrain, as per their experience. The rating was between 0 and 5, with 0 meaning “Not Aware”, 1 meaning "Not at all", 2 meaning "Rarely", 3 meaning "Occasionally", 4 meaning "Frequently", and 5 meaning “Very Frequently”. This evaluation aims to gauge the prevalence and effectiveness of such methodologies in facilitating project initiation within the construction industry context.

The questions will then cover the project phases one by one, listing the related project management techniques and tools used in the questionnaire to rate each one, and will define them according to the PMOBK. (*Guide to the Project Management Body of Knowledge (PMBOK Guide)*, 2021):

Initiating Phase:

Bid Documents: All documents used to solicit information, quotations, or proposals from prospective sellers.

Bid/Seller Evaluation: The process of assessing and selecting vendors or suppliers for a project through a bidding or proposal submission process. It is a crucial step in procurement management, particularly in projects that involve external resources or require the purchase of goods and services from third-party suppliers.

Graphic Presentation of Risk Information: The visual representation of risk-related data and information using various graphical techniques or tools. The objective of a graphic presentation is to effectively communicate and convey risk information to project stakeholders clearly and concisely.

Bidders Conferences: The meetings with prospective sellers prior to the preparation of a bid or proposal to ensure all prospective vendors have a clear and ordinary understanding of the procurement. Also known as contractor conferences, vendor conferences, or pre-bid conferences.

Project Scope Statement: The description of the project scope, major deliverables, and exclusions.

Bottom-up Estimating: Is a technique used to estimate the duration, effort, or cost of project activities or work packages by breaking them down into smaller, more detailed components. It involves estimating the individual tasks or work items and then aggregating those estimates to determine the overall estimate for the project or a specific phase.

Project Statement of Work: A document defining and describing the scope, objectives, deliverables, and key requirements of a project. It serves as a formal agreement between the project customer or sponsor and the performing organization or project team.

Feasibility Study: Is a systematic and analytical assessment of a proposed project's potential to be completed and deliver the intended outcomes. It aims to determine whether the project is technically, economically, legally, and operationally feasible before committing significant resources to its execution.

Top-down Estimating: Is a technique used to estimate the duration, effort, or cost of a project or its major components by using high-level information and assumptions. It involves starting with an overall estimate at the top level and then breaking it down into more detailed estimates for lower-level activities or work packages.

Requirements Analysis: Is the process of identifying, documenting, and understanding the needs, expectations, and constraints of stakeholders to

define the project's requirements. It involves gathering, analyzing, and prioritizing requirements to ensure that the project's deliverables meet the desired outcomes and satisfy the stakeholders.

Cost-Benefit Analysis: A Financial analysis method used to determine the benefits provided by a project against its costs.

Project Charter: A project charter is a document issued by the project initiator or sponsor that formally authorizes the existence of a project and provides the project manager with the authority to apply organizational resources to project activities.

Database for Cost Estimating: Refers to a repository or collection of historical cost data, cost estimates, and related information used as a reference or resource for developing cost estimates for future projects. It serves as a valuable tool for project managers and estimators to improve the accuracy and reliability of their cost estimates.

Stakeholders Analysis: A method of systematically gathering and analyzing quantitative and qualitative information to determine whose interests should be considered throughout the project.

Database of Contractual Commitment Data Project Communication Room:

Database of Historical Data: Refers to a repository or collection of past project information, records, and data used as a reference for future projects. It serves as a valuable resource for project managers and teams to learn from previous experiences, make informed decisions, and improve project performance.

Project Management Software for Cost Estimating: refers to specialized software tools designed to assist project managers and estimators in estimating project costs. These software solutions provide features and

functionalities that streamline and enhance the accuracy of cost estimation activities.

Alternatives analysis: A method used to evaluate identified options to select the options or approaches to use to perform the project's work.

Assumption and constraint analysis: An assessment that ensures assumptions and constraints are integrated into the project plans and documents, and that there is consistency among them.

Business justification analysis methods: This group of analysis methods is associated with authorizing or justifying a project or a decision. The outcomes of the following analyses

are often used in a business case that justifies undertaking a project:

- **Payback period.** The payback period is the time required to recover an investment, typically measured in months or years.
- **Internal rate of return (IRR).** The internal rate of return is the projected annual yield of a project investment, incorporating both initial and ongoing costs into an estimated percentage growth rate that a given project is expected to have.
- **Return on investment (ROI).** Return on investment is the percent return on an initial investment, calculated by taking the projected average of all net benefits and dividing them by the initial cost.
- **Net present value (NPV).** Net present value is the future value of expected benefits, expressed in the value those benefits have at the time of investment. NPV considers both current and future costs and benefits, as well as the impact of inflation.
- **Cost-benefit analysis.** A cost-benefit analysis is a financial analysis tool used to determine the benefits provided by a project against its costs.

Expected monetary value (EMV): The expected monetary value is the estimated value of an outcome expressed in monetary terms. It is used to quantify the value of uncertainty, such as a risk, or to compare the value of alternatives that are not necessarily equivalent. The EMV is calculated by multiplying the probability that an event will occur and the economic impact the event would have should it occur.

Simulations: This analytical technique uses models to show the combined effect of uncertainties to evaluate their potential impact on objectives. A Monte Carlo simulation is a method of identifying the potential impacts of risk and uncertainty using multiple iterations of a computer model to develop a probability distribution of a range of outcomes that could result from a decision or course of action.

SWOT analysis: SWOT analysis assesses the strengths, weaknesses, opportunities, and threats of an organization, project, or option.

Affinity grouping: Affinity grouping involves classifying items into related categories or collections based on their likeness. Common affinity groupings include T-shirt sizing and Fibonacci numbers.

Analogous estimating: Analogous estimating assesses the duration or cost of an activity or a project using historical data from a similar activity or project.

Function point: A function point is an estimate of the amount of business functionality in an information system. Function points are used to calculate a functional size measurement (FSM) of a software system.

Multipoint estimating: Multipoint estimating assesses cost or duration by applying an average or weighted average of optimistic, pessimistic, and most estimates when there is uncertainty with the individual activity estimates.

Parametric estimating: Parametric estimating uses an algorithm to calculate cost or duration based on historical data and project parameters.

Relative estimating: Relative estimating is used to create estimates that are derived from performing a comparison against a similar body of work, taking effort, complexity, and uncertainty into consideration. Relative estimating is not necessarily based on absolute units of cost or time. Story points are a common unitless measure used in relative estimating.

Single-point estimating: Single-point estimating involves using data to calculate a single value that reflects a best-guess estimate. A single-point estimate is opposed to a range estimate, which includes the best- and worst-case scenario.

Story point estimating: Story point estimating involves project team members assigning abstract, but relative, points of effort required to implement a user story. It tells the project team about the difficulty of the story considering the complexity, risks, and effort involved.

Wideband Delphi: Wideband Delphi is a variation of the Delphi estimating method, where subject matter experts complete multiple rounds of producing estimates individually, with a project team discussion following each round, until a consensus is achieved. For Wideband Delphi, those who created the highest and lowest estimates explain their rationale, following which everyone re-estimates. The process repeats until convergence is achieved. Planning poker is a variation of Wideband Delphi.

Impact mapping: Impact mapping is a strategic planning method that serves as a visual roadmap for the organization during product development.

Planning Phase:

Activity List: This document provides a tabulation of scheduled activities, showing the activity description, activity identifier, and a sufficiently detailed scope of work description, so that project team members understand what work is to be performed.

Baseline Plan: The approved version of a work product, used as a basis for comparison to actual results.

Gantt Chart: A bar chart of schedule information where activities are listed on the vertical axis, dates are shown on the horizontal axis, and activity durations are shown as horizontal bars placed according to start and finish dates.

Scheduling: The process of creating and managing a timeline or schedule that outlines the sequence of activities, tasks, and milestones required to complete a project. It involves determining the start and end dates for each activity, estimating their durations, and establishing their logical dependencies to ensure a smooth flow of work.

Qualitative Risk Analysis: Is a process that assesses and evaluates project risks based on their qualitative characteristics, such as their probability of occurrence, potential impact, and level of urgency. It is a subjective approach that focuses on understanding and prioritizing risks based on their qualitative attributes rather than assigning specific numerical values.

Life Cycle Cost: The cost of each phase that a project passes through from its start to its completion.

Milestone Planning: This type of schedule presents milestones with planned dates.

Quality Plan: such as the creation of plans for quality, reliability, operations, production, and inspection.

Communication Plan: A document or framework that outlines the communication objectives, strategies, channels, and stakeholders involved in a project. It details how project information will be shared, who will be responsible for communication, and what methods will be used to ensure effective and timely communication throughout the project's lifecycle.

Project Management Software for Resource Leveling: Any specialized software tools designed to assist project managers in optimizing and balancing resource utilization across project activities. Resource leveling is the process of adjusting the project schedule to minimize resource conflicts and ensure that resources are allocated efficiently.

Network Diagram: A graphical representation of the logical relationships among the project schedule activities.

Quantitative Risk Analysis is a process that uses numerical techniques and statistical models to assess and analyze project risks in terms of their potential impact on project objectives. It involves assigning numerical values to risks and their associated factors, such as probabilities, impacts, and monetary values, to quantify the overall risk exposure and aid in decision-making.

Ranking of Risks: The process of prioritizing risks based on their significance or importance. It involves assessing and assigning a relative ranking or priority to identified risks to determine which risks require the most attention and resources for further analysis, response planning, and mitigation.

Parametric Estimating: Parametric estimating uses an algorithm to calculate cost or duration based on historical data and project parameters.

Contingency Plans/Risk Response Plan: Is a proactive strategy developed to address identified risks and their potential impacts on a project. It

involves outlining specific actions, measures, or alternative approaches to mitigate, avoid, transfer, or accept risks, thereby reducing the negative consequences on project objectives.

Probabilistic Duration Estimate (PERT): Is a technique used to estimate the duration of project activities. PERT is an acronym for "Program Evaluation and Review Technique." It is a probabilistic approach that considers the inherent uncertainty and variability associated with activity durations.

Product Breakdown Structure: A hierarchical structure reflecting a product's components and deliverables.

Responsibility Assignment Matrix: This matrix is a grid that shows the project resources assigned to each work package. A RACI chart is a common way of showing stakeholders who are responsible, accountable, consulted, or informed and are associated with project activities, decisions, and deliverables.

Breakdown Structure: A hierarchical structure reflecting a product's/ activity components and deliverables.

Project Management Software for Simulation: A project management software for simulation, an analytical method that models the combined effect of uncertainties to evaluate their potential impact on objectives.

Risk Identification: Is the process of systematically identifying and documenting potential risks that may impact a project's success. It involves identifying events, conditions, or circumstances that could lead to negative or positive outcomes, uncertainties, or deviations from the project's objectives.

Benchmarking: Benchmarking is the comparison of actual or planned products, processes, and practices to those of comparable organizations, which identifies best practices, generates ideas for improvement, and provides a basis for measuring performance.

Decision tree analysis: A decision tree analysis is a diagramming and calculation method for evaluating the implications of a chain of multiple options in the presence of uncertainty. Decision trees can use the information generated from an expected monetary value analysis to populate the branches of the decision tree.

Life cycle assessment: This assessment is a tool used to evaluate the total environmental impact of a product, process, or system. It includes all aspects of producing a project “deliverable”, from the origin of materials used in the deliverables to their distribution and ultimate disposal.

Make-or-buy analysis: A make-or-buy analysis is the process of gathering and organizing data about product requirements and analyzing them against available alternatives, such as the purchase versus internal manufacture of the product.

Probability and impact matrix: Probability and impact matrix is a grid for mapping the probability of occurrence of each risk and its impact on project objectives if that risk occurs.

Sensitivity analysis: This analytical technique is used to determine which individual project risks or other sources of uncertainty have the most potential impact on project outcomes by correlating variations in project outcomes with variations in elements of a quantitative risk analysis model.

Value stream mapping: Value stream mapping is a lean enterprise method used to document, analyze, and improve the flow of information or materials required to produce a product or service for a customer.

Executing Phase:

Kick-off Meeting: A kickoff meeting is a gathering of project team members and other key stakeholders at the outset of a project to formally set expectations, gain mutual understanding, and commence work. It establishes the start of a project, phase, or iteration.

Change Request: A formal proposal to modify a document, deliverable, or baseline.

Quality Inspection: The process of examining and evaluating project deliverables or work products to ensure they meet pre-defined quality standards and requirements. It involves systematically inspecting, testing, and verifying the project outputs to identify any defects, non-conformities, or deviations from the desired level of quality.

Configuration Review: A Formal evaluation process that assesses the configuration of a system, product, or deliverable against predefined requirements and specifications. It involves examining the configuration items and their attributes to ensure that they conform to the intended design, functionality, and quality standards.

Decision Tree: A diagramming and calculation method for evaluating the implications of a chain of multiple options in the presence of uncertainty.

Progress Meetings: Regular meetings are held to discuss and assess the project's progress, as outlined in the progress report.

Critical Path Method: A method used to estimate the minimum project duration and determine the amount of schedule flexibility on the logical network paths within the schedule model.

Progress Report: Is a document or communication tool that provides an update on the status, accomplishments, and challenges of a project. It

reports project progress to stakeholders, team members, sponsors, and other relevant parties.

Self-Directed Work Teams: Refer to project teams that operate with a high degree of autonomy and are empowered to manage their own work processes and decision-making.

Team-Building Event: Refers to an organized activity or gathering designed to enhance team dynamics, collaboration, and relationships within a project team.

Backlog refinement: At a backlog refinement meeting, the backlog is progressively elaborated and (re)prioritized to identify the work that can be accomplished in an upcoming iteration.

Change control board: change control board meeting includes the group of people who are accountable for reviewing, evaluating, approving, delaying, or rejecting changes to the project. The decisions made at this meeting are recorded and communicated to the appropriate stakeholders. This meeting may also be called a change control meeting.

Daily standup: A standup is a brief collaboration meeting during which the project team reviews its progress from the previous day, declares intentions for the current day, and highlights any obstacles encountered or anticipated. This meeting may also be referred to as a daily scrum.

Iteration planning: An iteration planning meeting is used to clarify the details of the backlog items, acceptance criteria, and work effort required to meet an upcoming iteration commitment. This meeting may also be called a sprint planning meeting.

Planning meeting: A planning meeting is used to create, elaborate, or review a plan or plans and secure commitment for the plan(s).

Project closeout: A project closeout meeting is used to obtain final acceptance of the delivered scope from the sponsor, product owner, or client. This meeting indicates that the product delivery is complete.

Release planning: Release planning meetings identify a high-level plan for releasing or transitioning a product, deliverable, or increment of value.

Risk review: A meeting to analyze the status of existing risks and identify new risks. This includes determining whether the risk is still active and whether there have been changes to the risk attributes (such as probability, impact, and urgency). Risk responses are evaluated to determine whether they are effective or require updates. New risks may be identified and analyzed, and inactive risks may be closed. Risk reassessment is an example of a risk review meeting.

Status meeting: A status meeting is a regularly scheduled event to exchange and analyze information about the current progress of the project and its performance.

Steering committee: A meeting where senior stakeholders provide direction, support to the project team, and make decisions outside of the project team's authority.

Modeling: Modeling is the process of creating simplified representations of systems, solutions, or deliverables such as prototypes, diagrams, or storyboards. Modeling can facilitate further analysis by identifying information gaps, areas of miscommunication, or additional requirements.

Timebox: A Timebox is a short, fixed period of time in which work is to be completed, such as 1 week, 2 weeks, or 1 month.

Monitoring & Controlling Phase:

Financial Measurement Tools: Refer to various techniques and metrics used to assess and analyze the financial aspects of a project.

Project Management Software for Task: Software applications specifically designed to assist project managers and teams in planning, organizing, tracking, and managing individual tasks within a project.

Project Management Software for Monitoring Cost: Software tools specifically designed to assist project managers and teams in tracking, analyzing, and managing project costs throughout the project lifecycle.

Work Authorization: Formal approval or permission granted to initiate and proceed with a specific work activity or task within a project.

Cause-and-Effect Diagram: A visual representation that helps trace an undesirable effect back to its root cause.

Learning Curve: A Concept that describes the relationship between the cumulative production or performance of a task or activity and the corresponding learning or experience gained.

Quality Function Deployment (QFD) is a method used to translate customer requirements into specific technical requirements for a product or service.

Monte Carlo Analysis: A Statistical technique used to assess the impact of uncertainty and variability on project outcomes.

Project Management Software for Monitoring Schedule Value Analysis:

Re-baselining:

Pareto Diagram: A Visual tool used to identify and prioritize the most significant factors or causes contributing to a problem or outcome.

Control Charts: A graphical display of process data over time and against established control limits, featuring a centerline that helps detect a trend of plotted values toward the control limit.

Critical Chain Method: A Project scheduling and management approach that focuses on identifying and managing the critical resources and constraints that can impact project duration.

Risk Reassessment: The process of periodically reviewing and evaluating project risks to determine their status, likelihood, and potential impact.

Team Member Performance Appraisal: Is the evaluation and assessment of individual team members' performance within a project.

Project Issue Log: A Known issue register or issue tracker is a document or tool used to capture, monitor, and manage project-related issues or problems.

Trend Chart or S-Curve: Graphical representation of project performance over time.

Check sheet: A tally sheet that can be used as a checklist when gathering data.

Cost of quality: All costs incurred over the life of the product by investment in preventing nonconformance to requirements, appraisal of the product or service for conformance to requirements, and failure to meet requirements.

Earned value analysis: An analysis method that uses a set of measures associated with scope, schedule, and cost to determine the cost and schedule performance of a project.

Forecast: An estimate or prediction of conditions and events in the project's future based on information and knowledge available at the time of the forecast.

Influence diagram: A graphical representation of situations showing causal influences, time ordering of events, and other relationships among variables and outcomes.

Process analysis: This analysis is a systematic review of the steps and procedures to perform an activity.

Regression analysis: A regression analysis is an analytical technique where a series of input variables are examined in relation to their corresponding output results to develop a mathematical or statistical relationship.

Reserve analysis: This analytical technique is used to evaluate the amount of risk on the project and the amount of schedule and budget reserve to determine whether the reserve is sufficient for the remaining risk. The reserve contributes to reducing risk to an acceptable level.

Root cause analysis: This analytical technique is used to determine the basic underlying cause of a variance, defect, or risk. A root cause may underlie more than one variance, defect, or risk.

Trend analysis: A trend analysis uses mathematical models to forecast future outcomes based on historical results.

Variance analysis: Variance analysis is used to determine the cause and degree of difference between the baseline and actual performance.

What-if scenario analysis: This analytical technique evaluates scenarios to predict their effect on project objectives.

Iteration review: An iteration review is conducted at the end of an iteration to demonstrate the work accomplished during that iteration. This meeting may also be called a sprint review.

Lesson learned meeting: A lesson learned meeting is used to identify and share the knowledge gained during a project, phase, or iteration with a

focus on improving project team performance. This meeting can address situations that could have been handled better, in addition to good practices and situations that produced very favorable outcomes.

Project review: A project review meeting is an event at the end of a phase or a project to assess the status, evaluate the value delivered, and determine if the project is ready to move to the next phase or transition to operations.

Closing Phase:

Handover: The process of transferring project deliverables, responsibilities, and knowledge from the project team to the intended recipients or stakeholders.

Database of Lessons Learned: A project document used to record knowledge gained during a project, phase, or iteration, so that it can be leveraged to improve future performance for both the team and the organization.

Lessons Learned: The knowledge gained during a project, which shows how project events were addressed or should be addressed in the future, for the purpose of improving future performance.

Client Acceptance Form: Document used to formally confirm and record the acceptance of project deliverables by the client or customer.

Close Contracts: The process of formally completing and closing contractual agreements with suppliers, vendors, or contractors who have provided goods, services, or resources for the project.

Customer Satisfaction Surveys: Tools used to gather feedback from project stakeholders, particularly the clients or customers, about their level of satisfaction with the project outcomes, processes, and overall experience.

Project Closure Documentation: Project closure documentation consists of the final documents and records created to formally close the project.

Retrospective: A regularly occurring workshop in which participants explore their work and results to improve the process and product.

Net Promoter Score (NPS®): Net Promoter Score measures the degree to which a stakeholder (usually the customer) is willing to recommend a product or service to others. It measures a range from -100 to +100. A high Net Promoter Score not only measures satisfaction with a brand, product, or service, it is also an indicator of customer loyalty.

Section 5: Additional Comments: The participant has been asked if he/she has any comments or insights regarding project management practices in the construction sector in Bahrain.

To wrap it up, our data collection method has been through two stages. The first stage utilized data from the comprehensive literature review in Chapter Two to understand the problem, formulate a proper tool to investigate the same problem in Bahrain, and for comparison purposes. Moreover, the second phase involved a survey among construction sector participants to gain insight into the industry's status in Bahrain, as per their experiences.

3.5 Data Analysis Approach

In order to evaluate project management techniques in the construction industry from the standpoint of the Bahraini market, this study used the quantitative research method. The data obtained for the assessment was from experts such as (Project Managers, Construction Managers, Project In-charges, Project Engineers, and others), and the process was guided with

a structured questionnaire. Sample size refers to the number of participants or observations included in a study (Turner & Müller, 2020), which is crucial for ensuring the reliability and validity of research findings. The sample size for this study was defined as the number of responses received from the survey.

To ensure statistical adequacy, the required sample size was calculated using a 95% confidence level and a 10% margin of error, resulting in a minimum requirement of 96 participants. The final count of 108 valid responses meets this threshold, affirming the sufficiency of the sample for producing statistically reliable and generalizable results within the Bahraini construction context (Kadam & Bhalerao, 2010).

Descriptive statistics are used for each section of the questionnaire in a technical examination of data in quantitative research to summarize and describe the dataset's key characteristics. Finding mean, median, mode, frequency, ranking, and standard deviation is the analysis method employed in this study. Additionally, SPSS was used for the analysis.

The data to provide genuinely towards establishing results must be checked in terms of internal consistency, reliability, and homogeneity. In this study, the Cronbach's Alpha method is used to assess internal consistency and reliability, and the Kruskal-Wallis test is employed to examine homogeneity within the survey population.

The next step in the proposed and executed methodology is to arrive at a best practices model based on the survey and statistical analysis of the same. Although the model is expected to align with PMBOK published data, it still needs to be validated for its practicality in the construction sector. The validation is planned to make use of Alias Design Structure Matrix, which is a tool used both in Systems Engineering and Project

Management to represent and analyze the interdependencies between different elements or components of a complex system or project (Burge & Churchill, 2011)

Here is Table 3.1 showing analysis steps, and it is also provided with the pre- and post-analysis steps. Furthermore, Figure 3.1 is representing a roadmaps for data collection and data analysis processes may also be found alongside them.

Table 3. 1 Data Analysis Approach

Steps	Stage	Used Tool	Purpose of Using
Step 1	Pre-Data Descriptive Analysis	Cronbach's Alpha Test (Hakim et al., 2020)	Finding the internal consistency and reliability of the collected data in the survey.
Step 2	Pre-Data descriptive analysis	Kruskal Wallis Test (de Marco et al., 2021)	Finding the statistical homogeneity
Step 3	Data descriptive analysis	Mean, median, mode, frequency, ranking, and standard deviation	Statistical measures are used for analyzing and interpreting data.
Step 4	Post-Data descriptive analysis	Create a model of project management best practices	The survey and research outcome

Steps	Stage	Used Tool	Purpose of Using
Step 5	Post-Data descriptive analysis	Alias Design Structure Matrix (DSM) (Burge & Churchill, 2011)	To validate whether the model is interconnected between its elements or not, and whether the model can be dependable or not

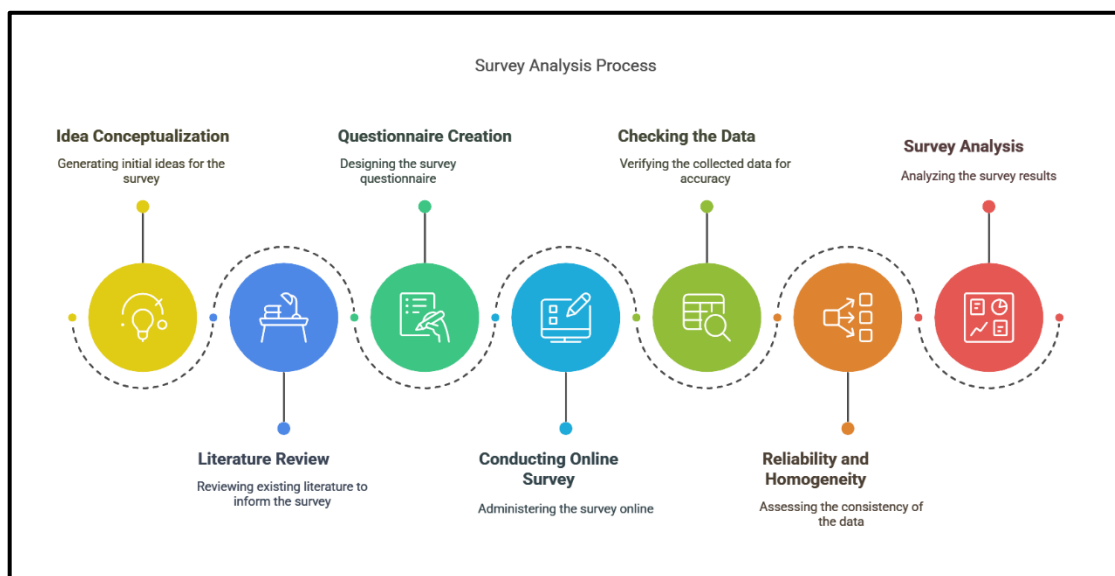


Figure 3. 1 Data Analysis Road Map

3.5.1 Cronbach's Alpha Method to check internal consistency and reliability

An indicator of measuring the survey instrument's reliability in behavioral research is its consistency in producing measurement results across time, even if the phenomenon being evaluated remains constant. To determine how consistent the measurement results are when repeated twice or more, reliability testing is carried out. Prior to the data analysis used in this study, the Cronbach's alpha test was used to verify the correctness and reliability

of the data obtained. This is a crucial step in guaranteeing the accuracy and dependability of the data collected. The outer loadings of the indicators on their corresponding constructs were used to assess indicator reliability. Items that had outer loadings greater than 0.7 were kept.

A statistical metric called Cronbach's alpha is used to evaluate the internal consistency or dependability of a group of variables or items in a test or scale. It is one of the most used reliability metrics.

Higher internal consistency and reliability are indicated by values nearer 1 on the Cronbach's alpha scale, which runs from 0 to 1. For the majority of research applications, a Cronbach's alpha value of 0.7 or greater is generally regarded as appropriate, signifying that the scale's items are assessing the same underlying concept.

The formula for calculating Cronbach's alpha is:

$$\alpha = \frac{N \cdot \bar{c}}{\bar{v} + (N - 1) \cdot \bar{c}} \quad \text{Equation 3. 1}$$

Where:

N is the number of items

c is the average inter-item covariance

v is the average variance

Referring to Table 3.1, the first step involves utilizing Cronbach's Alpha to assess the internal consistency and reliability of the collected data.

The primary objective of this research is to identify the best project management practices applicable in each phase of project development. Consequently, the survey attracted 108 participants who were generous to

evaluate the frequency of their use of various project management practices across different project phases.

For instance, during the closing phase, participants were required to indicate the likelihood of employing nine specific project management practices. To evaluate the internal consistency and reliability of the responses gathered during this phase, Cronbach's Alpha serves as an effective analytical tool. The following steps are to apply Cronbach's alpha test (Step 1- Pre-descriptive analysis of data) on the closing phase result in this research as an example, refer to Table 3.2 which represents a data set of participants response in closing phase:

Dataset:

Table 3. 2 Data set for Cronbach Alpha Method

Participant	[Handover]	Database of Lessons Learned	Lessons Learned	Client Acceptance Form	Close Contracts	Customer Satisfaction Surveys	Project Closure Documentation	Retrospective.	Net Promoter Score (NPS®)
Participant 1	Very frequently (5)	frequently (4)	frequently (4)	frequently (4)	frequently (4)	frequently (4)	Very frequently (5)	Rarely (2)	Rarely (2)
Participant 2	Very frequently (5)	Very frequently (5)	Very frequently (5)	Very frequently (5)	Very frequently (5)	Very frequently (5)	Very frequently (5)	Very frequently (5)	Very frequently (5)
Participant 3	Very frequently (5)	Occasionally (3)	Occasionally (3)	Very frequently (5)	Very frequently (5)	Occasionally (3)	Very frequently (5)	Rarely (2)	Rarely (2)
Participant 4	frequently (4)	frequently (4)	frequently (4)	Very frequently (5)	Very frequently (5)	Very frequently (5)	frequently (4)	frequently (4)	frequently (4)
Participant 5-107	...	...	...	...	...	...	...	...	...
Participant 108	Very frequently (5)	frequently (4)	Very frequently (5)	frequently (4)	frequently (4)	Very frequently (5)	Occasionally (3)	Occasionally (3)	frequently (4)

The above table shows the survey responses and every project management practice will be renamed to closing (eg. Handover = Closing₁).

Step 1.1: Calculate Total Scores for Each Participant

Calculate the total score for each participant by summing their responses:

$$\text{Participant } x_i = \text{Sum of responses, where } i=1, 2, \dots, 108 \quad \text{Equation 3. 2}$$

Step 1.2: Calculate Means

The formula for calculating the mean (average) of a set of values is:

$$\bar{x} = \frac{\sum_{i=1}^N x_i}{N} \quad \text{Equation 3. 3}$$

Where:

$\bar{x}$ = is the mean.

$\sum_{i=1}^N x_i$ = is the sum of all values in the dataset, in this case it is the sum of all values of each closing project management practice.

N = is the number of values in the dataset; in this case, it is the number of participants, which is 108.

Calculate the mean for each closing item

Step 1.3: Calculate Variances

Calculate the variance for each closing item using the formula:

$$V = \frac{\sum (x_{closing\ i} - \bar{x}_{closing\ i})^2}{N - 1} \quad \text{Equation 3. 4}$$

Variance Calculations

Calculate deviations from the mean:

$$(x_{closing\ i} - \bar{x}_{closing\ i})^2 \quad (3.4.1)$$

Sum of square deviations:

$$\sum (x_{closing\ i} - \bar{x}_{closing\ i})^2 \quad (3.4.2)$$

Variance:

$$V_{closing\ i} = \frac{\sum (x_{closing\ i} - \bar{x}_{closing\ 1})^2}{N - 1} \quad (3.4.3)$$

Step 1.4: Calculate Total Variance

Calculate the variance of the total scores:

Calculate the mean of total scores:

$$\bar{T} = \frac{\text{Total score for participant}}{108} \quad \text{Equation 3. 5}$$

Calculate deviations from the mean:

$$(T_1 - \bar{T}) + (T_2 - \bar{T}) + (T_{3 \text{ to } 107} - \bar{T}) + (T_{108} - \bar{T}) \quad (3.5.1)$$

Sum of squared deviations:

$$\Sigma(T_1 - \bar{T})^2 + (T_2 - \bar{T})^2 + (T_{3 \text{ to } 107} - \bar{T})^2 + (T_{108} - \bar{T})^2 \quad (3.5.2)$$

Variance:

$$V_T = \frac{\Sigma(T_1 - \bar{T})^2 + (T_2 - \bar{T})^2 + (T_{3 \text{ to } 107} - \bar{T})^2 + (T_{108} - \bar{T})^2}{N-1} \quad (3.5.3)$$

Step 1.5: Calculate Cronbach's Alpha

Using the formula for Cronbach's alpha:

$$\alpha = \frac{N \cdot \bar{c}}{\bar{v} + (N-1) \cdot \bar{c}} \quad , \text{referring to Equation 3.1}$$

Where:

N= 9 (number of closing project management practices)

Calculate average variance ($\bar{v}$):

$$\bar{v} = \frac{V_{closing1} + V_{closing2} + V_{closing3-8} + V_{closing9}}{9} \quad \text{Equation 3. 6}$$

Calculate average covariance ($\bar{c}$):

Calculate Covariance for Each Pair of Items:

Covariance Formula:

$$C_{ij} = \frac{\sum (x_{ik} - \bar{x}_i)(x_{jk} - \bar{x}_j)}{N - 1} \quad \text{Equation 3. 7}$$

Where:

x_{ik} = value of participant k for closing i

x_{jk} = value of participant k for closing j

$\bar{x}_i$ and $\bar{x}_j$ = means for closing i and j

N= number of participants

Calculate Average Covariance:

Once you have the covariance for each pair of items, you can calculate average covariance:

$$\bar{c} = \frac{C_{closing1,closing2} + \dots + C_{closing1,closing9} + C_{closing2,closing3} + \dots etc}{m}$$

Equation 3. 8

m is the number of pairs of items.

Now plug the values into the Equation (1)

Step 1.6: Evaluate Cronbach's Alpha Result

Value Range:

Cronbach's alpha values range from 0 to 1. A higher value indicates greater internal consistency among the items.

Common Interpretation Guidelines:

$\alpha < 0.5$: Unacceptable reliability

$0.5 \leq \alpha < 0.6$: Poor reliability

$0.6 \leq \alpha < 0.7$: Moderate reliability

$0.7 \leq \alpha < 0.8$: Good reliability

$0.8 \leq \alpha < 0.9$: Very good reliability

$\alpha \geq 0.9$: Excellent reliability (may indicate redundancy among items)

3.5.2 Kruskal-Wallis Test to Check Population Homogeneity

Analysis of Variance, or ANOVA, tests are statistical procedures used to ascertain if the means of two or more independent groups differ in any statistically significant way. However, ANOVA assumes that the data are continuous, normally distributed, and measured at the interval level, which is not appropriate for Likert-scale data that are ordinal in nature (Harpe, 2015).

Given these limitations, the Kruskal–Wallis test was selected as a more suitable alternative. It is a non-parametric method that does not assume normal distribution or equal intervals between scale points, making it particularly appropriate for analyzing ranked or ordinal data such as Likert responses (Wooldridge, 2020).

The results of the survey shed insight into the viewpoints of the professionals who took part. It is necessary to statistically confirm whether the variables converge to measure the same construct because the objective is to identify differences between the responses of the different respondent groups. An examination of variations could be utilized to do this. The data are not normally distributed, though, and the Likert scale used to collect

the replies is only ordinal, so there is no assurance that the difference between a score of 1 or 2 and a score of 4 or 5 is the same. These two items make this problematic. Consequently, it is incorrect to use the arithmetic mean and standard deviation in data analysis. The non-parametric Kruskal-Wallis test is employed to support the statistical analysis, overcoming these issues.

This test was therefore employed to assess whether the samples under study are from the same population (de Marco et al., 2021). If significant differences are observed, it indicates that at least one group's response distribution deviates from the others, justifying further investigation. The use of this method thus ensures the reliability and robustness of the analysis by aligning the statistical approach with the nature of the collected data.

Therefore, the Kruskal-Wallis test is a non-parametric statistical method used to compare the distribution of three or more independent groups or samples. It is the non-parametric equivalent of the one-way ANOVA test. Below are the details of its equation and how to apply it.

The equation for the Kruskal-Wallis test statistic, denoted as H , is:

$$H = (N - 1) \cdot \frac{\sum_{I=1}^g n_i (\bar{r}_i - \bar{r})^2}{\sum_{I=1}^g \sum_{j=1}^{n_i} (r_{ij} - \bar{r})^2} \quad \text{Equation 3. 9}$$

Where:

H : is the value of the test

N = the total number of observations across all groups

n_i = the number of observations in group i

r_{ij} = is the rank (among all observations) of observation j from group i

$$\overline{r_{ij}} = \frac{\sum_{j=1}^{n_i} r_{ij}}{n_i}, \text{ median value}$$

The steps to calculate the Kruskal-Wallis test statistics are as follows:

1. Rank all the observations from the smallest to the largest, regardless of which group they belong to.
2. Sum the ranks for each group (R_j).
3. Calculate the total number of observations (N) by summing the number of observations in each group (n_j).
4. Plug the values into the formula above to compute the H statistics.

The H statistic follows a chi-square distribution (refer to Figure 3.4) with $(k-1)$ degrees of freedom, where k is the number of groups being compared.

To determine the p-value, you would compare the calculated H statistic to the critical value from the chi-square distribution with $(k-1)$ degrees of freedom at the desired significance level (e.g., 0.05).

If the p-value is less than the significance level, you can conclude that there is a statistically significant difference in the distribution of the dependent variable across the groups. Otherwise, you fail to reject the null hypothesis that there is no significant difference.

The data homogeneity test was performed using the Kruskal-Wallis statistic in the main section of our questionnaire, which is Section 4 (Project Management Practices for Each Phase). A Likert scale scoring system was employed in this study, a widely adopted method in survey research for quantifying responses. This scale allows respondents to express their level of practice regarding a range of project management

tools and techniques, which were developed through a comprehensive literature review. Participants were asked to rate their familiarity and utilization of these tools, thereby providing valuable insights into their project management practices. The following steps are the procedure of applying Kruskal-Wallis in the section concerned in the survey:

Step 2.1: Initiating Groups for Checking Homogeneity

The conducted questionnaire facilitated the identification of two distinct types of groups for analysis. The first categorization was based on the respondents' roles, while the second was determined by their years of experience, referring to Table 3.3 and Table 3.4. Participants were prompted to provide this information directly in Section 1 of the questionnaire.

For the role categorization, respondents had the following options: Project Managers, Construction Managers, Project Engineers, and others. Regarding years of experience, the options included: less than five years, between 5-10 years, between 10-15 years, and greater than 15 years.

These two types of categorizations allow for a comparative analysis of the groups, enabling an assessment of homogeneity among the responses.

Step 2.2: Distribute and Ranking Groups

Referring to Table 3.5, following the identification and initialization of participant categories, the next step involves distributing and ranking (lowest to highest) the data obtained from Section 4 of the questionnaire according to these categories. This process will result in two main categories, each comprising four groups. The defined categories and their corresponding groups are as follows:

Table 3. 3 Categories and Groups as Per Role

Role	Number of samples	Initiation	Planning	Execution	MC	Closing
Project Manager	N	20	20	20	20	20
Construction Manager	N	5	5	5	5	5
Project Engineer	N	50	51	51	48	49
Other	N	28	28	29	28	29
Total	N	103	104	105	101	103

Table 3. 4 Categories and Groups as Per Years of Experience

Years of Experience	N	Initiation	Planning	Execution	MC	Closing
< 5	N	53	54	55	51	53
5-10	N	31	31	31	31	31
11-15	N	6	6	6	6	6
> 15	N	13	13	13	13	13
Total	N	103	104	105	101	103

The following sections outline the assumed dataset and the required steps for analysis.

Table 3. 5 Assumed Dataset for Kruskal-Wallis Test

Role	Initiation	Rank (Step 2.2.1)	Rank Sum(Step 2.2.2)	Mean Rank Sum(Step 2.2.3)
	Mean (Score)			
Project Manager	5	1	35	7
Project Manager	4	4		

Role	Initiation	Rank (Step 2.2.1)	Rank Sum(Step 2.2.2)	Mean Rank Sum(Step 2.2.3)
	Mean (Score)			
Project Manager	2	17		
Project Manager	3	12		
Project Manager	5	1		
Construction Manager	3	12	41	8.2
Construction Manager	3	12		
Construction Manager	3	12		
Construction Manager	4	4		
Construction Manager	5	1		
Project Engineer	4	4	49	9.8
Project Engineer	2	17		
Project Engineer	4	4		
Project Engineer	4	4		
Project Engineer	1	20		
Other	4	4	41	8.2
Other	4	4		

Role	Initiation	Rank (Step 2.2.1)	Rank Sum(Step 2.2.2)	Mean Rank Sum(Step 2.2.3)
	Mean (Score)			
Other	2	17		
Other	3	12		
Other	4	4		

$n_i = 5$ for all groups, r_{ij} is rank in step (2.2.1), $\sum_{j=1}^{n_i} r_{ij}$ is rank sum in (Step 2.2.2), the median value of $\bar{r}_i$ is mean rank sum in (Step 2.2.3)

Step 2.3: Finding the total median value of rank

$$\bar{r} = \frac{\sum \bar{r}_i}{(\text{No. of groups})} \quad \text{Equation 3. 10}$$

Step 2.4: Finding H Kruskal Wallis

$$H = (N - 1) \cdot \frac{\sum_{I=1}^g n_i (\bar{r}_i - \bar{r})^2}{\sum_{I=1}^g \sum_{j=1}^{n_i} (r_{ij} - \bar{r})^2} \quad \text{Equation 3. 11}$$

Step 2.5: Finding Degree of Freedom and Critical Value from Chi-Square Table

Step 2.5.1: Degree of Freedom is (d_f)

$$d_f = \text{No. of Groups} - 1 \quad \text{Equation 3. 12}$$

Step 2.5.2: Critical Value from Chi-Square Value

The Chi-Squared distribution table is a statistical tool used to determine critical values for the Chi-Squared distribution, which is commonly used in hypothesis testing, particularly for tests of independence and goodness-of-fit. Refer to the attached Figure 3.2

Assuming a significance level usually 5%, the critical value extracted from the Chi-Square Distribution Table is 7.81.

Step 2.6: Evaluate Kruskal-Wallis Test Result

Compare H to the Critical Value. If the calculated H is greater than the critical value, you reject the null hypothesis. Otherwise, the null hypothesis will be approved.

Percentage Points of the Chi-Square Distribution									
Degrees of Freedom	Probability of a larger value of χ^2								
	0.99	0.95	0.90	0.75	0.50	0.25	0.10	0.05	0.01
1	0.000	0.004	0.016	0.102	0.455	1.32	2.71	3.84	6.63
2	0.020	0.103	0.211	0.575	1.386	2.77	4.61	5.99	9.21
3	0.115	0.352	0.584	1.212	2.366	4.11	6.25	7.81	11.34
4	0.297	0.711	1.064	1.923	3.357	5.39	7.78	9.49	13.28
5	0.554	1.145	1.610	2.675	4.351	6.63	9.24	11.07	15.09
6	0.872	1.635	2.204	3.455	5.348	7.84	10.64	12.59	16.81
7	1.239	2.167	2.833	4.255	6.346	9.04	12.02	14.07	18.48
8	1.647	2.733	3.490	5.071	7.344	10.22	13.36	15.51	20.09
9	2.088	3.325	4.168	5.899	8.343	11.39	14.68	16.92	21.67
10	2.558	3.940	4.865	6.737	9.342	12.55	15.99	18.31	23.21
11	3.053	4.575	5.578	7.584	10.341	13.70	17.28	19.68	24.72
12	3.571	5.226	6.304	8.438	11.340	14.85	18.55	21.03	26.22
13	4.107	5.892	7.042	9.299	12.340	15.98	19.81	22.36	27.69
14	4.660	6.571	7.790	10.165	13.339	17.12	21.06	23.68	29.14
15	5.229	7.261	8.547	11.037	14.339	18.25	22.31	25.00	30.58
16	5.812	7.962	9.312	11.912	15.338	19.37	23.54	26.30	32.00
17	6.408	8.672	10.085	12.792	16.338	20.49	24.77	27.59	33.41
18	7.015	9.390	10.865	13.675	17.338	21.60	25.99	28.87	34.80
19	7.633	10.117	11.651	14.562	18.338	22.72	27.20	30.14	36.19
20	8.260	10.851	12.443	15.452	19.337	23.83	28.41	31.41	37.57
22	9.542	12.338	14.041	17.240	21.337	26.04	30.81	33.92	40.29
24	10.856	13.848	15.659	19.037	23.337	28.24	33.20	36.42	42.98
26	12.198	15.379	17.292	20.843	25.336	30.43	35.56	38.89	45.64
28	13.565	16.928	18.939	22.657	27.336	32.62	37.92	41.34	48.28
30	14.953	18.493	20.599	24.478	29.336	34.80	40.26	43.77	50.89
40	22.164	26.509	29.051	33.660	39.335	45.62	51.80	55.76	63.69
50	27.707	34.764	37.689	42.942	49.335	56.33	63.17	67.50	76.15
60	37.485	43.188	46.459	52.294	59.335	66.98	74.40	79.08	88.38

Figure 3. 2 Chi Square Distribution

3.5.3 Descriptive Statistics Tools Used to Analysis the Data

After checking the internal reliability and homogeneity of the resulting data. Descriptive statistics (step 2.4) are used to provide a high-level summary of the dataset, including the central tendency, spread, and distribution of the data. They help to gain a basic understanding of the data. And in our analysis, we used different tools such as mean, median, frequency, ranges, and variance.

The tools have been used in each section of the questionnaire based on the question types, and a proper tool used for each question to analysis its result and present it in tables and charts.

1. Mean

The mean (average) is calculated by summing all the values and dividing by the number of values.

Formula:

$$\text{Mean} = \frac{\sum_{i=1}^n x_i}{n} \quad \text{Equation 3. 13}$$

Where:

- x_i = each value
- n = number of values

2. Median

The median is the middle value of a dataset when it is ordered. If there is an even number of values, the median is the average of the two middle values.

Formula:

- If n is odd:

$$\text{Median} = x_{\left(\frac{n+1}{2}\right)} \quad \text{Equation 3. 14}$$

- If n is even:

$$\text{Median} = \frac{x_{\left(\frac{n}{2}\right)} + x_{\left(\frac{n}{2}+1\right)}}{2} \quad \text{Equation 3. 15}$$

3. Frequency

Frequency is the count of how many times each value occurs in a dataset.

Formula:

$$\text{Frequency of } x = \text{count of } x \text{ in the data set} \quad \text{Equation 3. 16}$$

4. Range

The range is the difference between the maximum and minimum values in the dataset.

Formula:

$$\text{Range} = \text{Max}(x) - \text{Min}(x) \quad \text{Equation 3. 17}$$

5. Variance

Variance measures how far a set of numbers is spread out from their mean.

Formula:

- Population Variance:

$$\sigma^2 = \frac{\sum_{i=1}^N (x_i - \mu)^2}{N} \quad (17.1)$$

- Sample Variance:

$$s^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n-1} \quad (17.2)$$

Where:

- μ = population mean
- $\bar{x}$ = sample mean
- N = number of population values
- n = number of sample values

Finally, after getting the result of the survey and knowing the statues of project management practices and knowing the causes of success and failure and the position of the construction sector in Bahrain a model for the best project management practices can be followed to minimize the causes of failure and their effects, and encourage the follow-up of the success factors and utilize them.

3.5.4 Initiating a Model of Project Management Best Practices

The best model of project management aims to assist professionals in the construction field by identifying the most frequently used practices that can enhance project performance.

To construct this model, practices with the highest mean scores and the lowest standard deviations will be selected from each project phase, ensuring that the chosen practices are both prevalent and consistent across the industry.

3.5.5 Alias Design Structure Matrix (DSM)

After establishing the best project management practices based on the perspectives of participants in the Bahraini construction sector, a proper

tool is required to validate whether the model's elements are interconnected and dependable. For this reason, the Alias Design Structure Matrix (DSM) is identified and utilized for validation. This tool, also known as N2 Analysis, is a systems engineering and project management instrument used to represent and analyze the interdependencies between different elements or components of a complex system through an $n \times n$ matrix (Burge & Churchill, 2011).

In the context of Bahrain, where construction projects often involve multi-stakeholder coordination and complex workflows across public and private sectors, validating whether best practices are truly interdependent is crucial. The DSM allows local project managers and firms to understand whether the proposed model reflects practical, actionable connections among practices—ensuring it is not only theoretically sound but operationally feasible. This helps align the model with the real-world constraints and collaborative structures of Bahrain's construction industry, where fragmented implementation has historically contributed to project failures.

The DSM serves several key purposes (Burge & Churchill, 2011):

- 1- To examine and reveal the inherent structure concealed within system issues. N2 Matrices are an extremely effective yet straightforward system architecting tool for locating possible sub-systems and crucial system components when used in conjunction with functional modeling tools such as Function Flow Diagrams.
2. To evaluate current or prospective systems to understand behavior and identify system flaws.
- 3- To provide easily readable documentation of the system interfaces.

4- To provide interface management during a system's life. By offering a straightforward, understandable overview, they can improve Interface Definition or Control Documents.

The core of N2 Analysis consists of a square matrix, with the elements, functions, or practices listed along both the rows and columns. Interconnections between these elements are indicated within the matrix using symbols such as checkmarks or numerical values. The rows represent the outputs from each element, while the columns represent the inputs. This structured approach enables a clear representation of relationships, allowing for the validation of the best practices model identified through the survey and analysis (Burge & Churchill, 2011).

In this research, after conducting descriptive analyses of the data, a model of best project management practices was developed based on a comprehensive analysis (Step 2.5), highlighting the most frequently utilized practices in each project phase to ensure successful projects in terms of these practices. These practices were then integrated into the Design Structure Matrix (DSM) to facilitate further analysis. The following sections give the steps in detail for the implementation of this tool:

Step 2.5.1: Choosing the Most Frequent Project Management Practices

The practices chosen from each project phase are used as the elements in the N2 Matrix, and the matrix diagonal elements are given below in Table 3.6.

Table 3. 6 Highest Frequent Project Management Practices

Number	Activity
Initiation Phase	
A	Bid Documents

Number	Activity
B	Project Scope Statement
C	Project Statement of Work
D	Bid/Seller Evaluation
E	Bottom-up Estimating
Planning Phase	
F	Scheduling
G	Gantt Chart
H	Baseline Plan
I	Activity List
J	Milestone Planning
K	Quality Plan
L	Life Cycle Cost
Execution Phase	
M	Progress Meetings
N	Progress Report
O	Quality Inspection
P	Change Request
Controlling & Monitoring Phase	
Q	Work Authorization
R	Financial Measurement Tools
S	Project Management Software for

Number	Activity
T	Project Management Software for Monitoring Cost
U	Check sheet
Closing Phase	
V	Handover
W	Project Closure Documentation
X	Close Contracts
Y	Client Acceptance Form

The resulting square matrix of these practices is a 25×25 matrix, representing the highest frequency practices in each phase.

Step 2.5.2: Identify Dependencies

Identify the dependencies of each element on another and record the data in binary format (1 or 0). Here, each element represents best practices, and hence the dependencies arrive from expert input. The expert list is shown in Appendix 3.

Moreover, list the relations and dependencies between each practice and another practice.

Step 2.5.3: Construct the Design Structure Matrix (DSM), Table 3.7.

Table 3. 7 Construct the Design Matrix (DSM)

A	0	0	0	0	0	0	0	0	0
0	B	1	0	0	0	0	0	0	0
0	0	F	1	1	0	0	0	0	0

0	0	0	G	0	0	0	0	0	0
0	0	0	0	M	1	0	0	0	0
0	0	0	0	0	N	1	1	1	0
0	0	0	0	0	0	Q	1	0	0
0	0	0	0	0	0	0	R	0	1
0	0	0	0	0	0	0	0	V	0
0	0	0	0	0	0	0	0	0	W

Step 2.5.4: Explanation of the Matrix

Diagonal Entries: All diagonal entries are the practice itself, indicating that there is no self-dependence.

Off-Diagonal Entries: Entries of 1, meaning a relationship between these two practices. Moreover, the entries of 0 indicate that there is no self-dependence.

Step 2.5.5: Finding the Critical Elements

Finding the critical elements involves summing all rows and columns, and the critical elements will be those with the highest summation, refer Table 3.8.

Table 3. 8 Summation of DSM Rows and Columns to Find the Critical Elements

A	0	0	0	0	0	0	0	0	0
0	B	1	0	0	0	0	0	0	0
0	0	F	1	1	0	0	0	0	0

0	0	0	G	0	0	0	0	0	0
0	0	0	0	M	1	0	0	0	0
0	0	0	0	0	N	1	1	1	0
0	0	0	0	0	0	Q	1	0	0
0	0	0	0	0	0	0	R	0	1
0	0	0	0	0	0	0	0	V	0
0	0	0	0	0	0	0	0	0	W
0	0	1	1	1	1	1	2	1	1

A critical element receives input from multiple other elements and sends outputs back to them. If this element fails, it could lead to a complete system failure. Identifying such elements can highlight areas where redundancy may be beneficial.

Step 2.5.6: Assessing the Resulted Matrix

Evaluate the interconnection in the initial matrix (unclustered matrix), if necessary, by recognizing the matrix to enhance the interconnections and convert it to a clustered matrix. This transformation reveals natural structures and dependencies within the system, making it easier to identify critical elements and potential sub-systems. Basically, it is rearranging the rows and columns of the matrix to reflect the identified clusters, ensuring that related elements are grouped.

3.6 Conclusion

This chapter outlined the methodological framework employed to investigate project management practices within Bahrain's construction sector. A quantitative research approach, anchored by a structured online questionnaire, was adopted to ensure the collection of measurable and statistically analyzable data. The design of the survey was directly informed by insights from the literature review in Chapter 2, ensuring contextual relevance and alignment with real-world project management issues encountered in Bahrain.

The chosen methodology directly supports the research questions by enabling broad participation from industry professionals, thereby capturing a wide spectrum of experiences and opinions. It addresses the first research question by collecting quantitative data on the success, delays, and failures of construction projects. The second research question is addressed through specific survey items designed to identify the tools, techniques, and practices commonly employed by Bahraini project managers. To answer the third research question, the survey findings were synthesized into a model of best practices, which was then validated using the Design Structure Matrix (DSM). This tool evaluates the interdependencies among practices to ensure they are practically implementable within Bahrain's construction environment.

In response to challenges such as reluctance to share failure data and limited expert availability, the chosen methodology offered anonymity, broad reach, and efficient data collection. By engaging professionals from both public and private sectors, including major firms and government bodies, the study ensured a representative sample relevant to Bahrain's construction context.

This approach provides a solid foundation for validating best practices and supports actionable recommendations. It effectively links theoretical frameworks with real-world applications in Bahrain's project management landscape.

Chapter 4: Research Results

- 4.1 Introduction
- 4.2 Data Internal Consistency and Reliability Test with Cronbach's Alpha
- 4.3 Data Homogeneity Test with Kruskal-Wallis Statistics
- 4.4 Data Analysis
- 4.5 Model of Project Management Best Practice
- 4.6 Validating the Model Using Alias Design Structure Matrix (DSM)

The methodological framework outlined in Chapter 3 laid the groundwork for collecting structured and context-specific data on project management practices in Bahrain's construction sector. The design of the survey instrument, informed by literature and tailored to the local context, enables reliable statistical analysis. The upcoming chapter builds on this foundation by examining the validity, consistency, and patterns in the collected data, setting the stage for meaningful interpretation and insight into the sector's current practices.

4.1 Introduction

A thorough examination of the information gathered via the research questionnaire is provided in this chapter. First, a detailed result and analysis of the data's dependability and internal consistency measures is provided to determine whether the components in the questionnaire are successfully transferring the intended thoughts or concepts to the target participants. This is to ensure that the data collected is capable of further analysis. That they are analyze. For every component of the survey, the Cronbach's alpha coefficient—a commonly used indicator of internal consistency is computed as discussed in the methodology Chapter 3 Section 3.4.1.

Additionally, the homogeneity of the data is assessed. This assessment is essential to evaluate the extent to which the responses within each section of the questionnaire exhibit a similar pattern or tendency. As discussed in Section 3.4.2 of Chapter 3, Kruskal Wallis Statistics Test is employed used for this purpose.

Adhering to the methodology proposed in the work the survey analysis is then presented for each section of the questionnaire separately. This is to make sure the comprehensiveness of reporting the descriptive statistics, including means, standard deviations, and frequency distributions, for the

responses to each question or item within a given section. This detailed analysis will provide insights into the participants' attitudes, perceptions, and experiences as captured by the research instrument.

By thoroughly examining the internal consistency, reliability, and homogeneity of the data, as well as reporting the survey findings for each section individually, this chapter is in good shape to offer a comprehensive evaluation of the data collected through the research questionnaire. The results presented in this chapter serve as a foundation for the subsequent interpretation and discussion of the study's findings.

4.2 Data Internal Consistency and Reliability Test with Cronbach's Alpha

Data reliability tests are typically used to assess the consistency and stability of measurements or responses in a research study. In line with the steps mentioned in Chapter 3, Section 3.4.1 SPSS is used to apply the steps (Step 1.1 to Step 1.5) on the data collected from the questionnaire as given in Section 4. Refer to Table 4.1 below, that shows the results Cronbach's Alpha values for each phase in the projects as being presented to participants via questionnaire.

For an assessment and evaluation of Cronbach's Alpha values, Section 3.4.1 and Step 1.6 may be referred. For every variable, Cronbach's Alpha values obtained are higher than 0.7. Therefore, as outlined in Section 3.4.4 it can be inferred that the data obtained from the participants to be used in this study is credible and valid. As a result, further studies can be carried out with assurance on the accuracy of the data.

Table 4. 1 Cronbach Result for Project Management Practices

Phase	Sample Size (N)	Cronbach's Alpha
Initiation Phase	34	0.976
Planning Phase	28	0.964
Execution Phase	22	0.954
Monitoring & Controlling Phase	32	0.979
Closing Phase	9	0.867

4.3 Data Homogeneity Test with Kruskal-Wallis

Statistics Homogeneity

Data homogeneity test to assess whether there are significant differences among the groups in terms of their distributions of scores on the dependent variable. Data homogeneity test was performed using Kruskal-Wallis Statistics in the main section of our questionnaire, which is section 4 (Project Management Practices for Each Phase). The scoring system is based on a Likert scale. This scale is frequently used when working with questionnaires to scale survey research responses. A list of project management tools and techniques derived from the literature study is given to the respondents along with their level of experience. According to the questionnaire, the survey respondents were divided into several roles based on their years of experience and functions, including project managers, construction managers, project engineers, and others. Additionally, there are four categories of experience: less than five years, five to ten years, ten to fifteen years, and more than fifteen years. The survey's findings provide insight into the opinions of the experts who participated. Since the goal is to find disparities between the responses of the various respondent groups, it is required to statistically verify if the variables converge to measure the same construct. Therefore, for this purpose, the Kruskal-Wallis statistic is

used in several steps as mentioned in (Chapter 3, section 3.4.2). Referring to step 2.1 of this section, Tables 4.2 and 4.3 show the groups and the number of samples for each group, along with their mean and median as part of the calculation to find the Kruskal-Wallis (H) statistic.

Table 4. 2 Mean and Median Scores for Each Role

Role		Initiation	Planning	Execution	MC	Closing
Project Manager	N	20	20	20	20	20
	Mean	3.359	3.537	3.745	3.604	3.748
	Median	3.191	3.446	3.727	3.969	4.000
Construction Manager	N	5	5	5	5	5
	Mean	3.329	3.757	3.636	3.687	3.511
	Median	3.088	3.821	3.773	3.688	3.888
Project Engineer	N	50	51	51	48	49
	Mean	3.188	3.538	3.767	3.428	3.935
	Median	3.138	3.536	3.818	3.672	4.111
Other	N	28	28	29	28	29
	Mean	3.242	3.519	3.784	3.221	3.764
	Median	3.155	3.482	3.956	3.375	3.778
Total	N	103	104	105	101	103
	Mean	3.242	3.543	3.761	3.418	3.830
	Median	3.118	3.519	3.818	3.625	4.000

Table 4. 3 Mean and Median Scores for Each Group for Years of Experience

Years of Experience		Initiation	Planning	Execution	MC	Closing
< 5	N	53	54	55	51	53
	Mean	3.146	3.418	3.640	3.287	3.705
	Median	3.100	3.321	3.636	3.344	3.778
5-10	N	31	31	31	31	31
	Mean	3.393	3.693	3.861	3.473	4.029
	Median	3.264	3.821	3.954	3.857	4.111
11-15	N	6	6	6	6	6

Years of Experience		Initiation	Planning	Execution	MC	Closing
	Mean	2.975	3.386	3.598	3.697	3.555
	Median	2.735	3.339	3.681	4.000	3.500
> 15	N	13	13	13	13	13
	Mean	3.402	3.777	4.108	3.670	3.993
	Median	3.265	4.000	4.273	4.000	4.111
Total	N	103	104	105	101	103
	Mean	3.242	3.543	3.761	3.418	3.830
	Median	3.118	3.518	3.818	3.625	4.000

To perform further steps from step 2.2 to step 2.5 of the above-mentioned section, SPSS is used to find the H values of Kruskal-Wallis. The values are shown in Tables 4.4 and 4.5, which show the result.

Table 4. 4 Kruskal-Wallis Result for Role Groups

Role					
	Initiation	Planning	Execution	MC	Closing
Kruskal- Wallis (H)	0.595	0.516	0.075	2.606	2.234
df	3	3	3	3	3
P- Value	0.898	0.915	0.995	0.456	0.525

Table 4. 5 Kruskal-Wallis Result for Years of Experience Groups

Years of Experience					
	Initiation	Planning	Execution	MC	Closing
Kruskal- Wallis (H)	2.538	4.483	4.637	2.978	6.097
df	3	3	3	3	3
P- Value	0.469	0.214	0.2	0.395	0.107

The final step is then to evaluate and assess the Kruskal-Wallis values as provided in Section 3.4.2 (Step 2.5.2). With the aid of Chi Square Distribution Table with a degree of freedom of 3 and significance level is 0.05 the corresponding critical value is found as 7.81. They are shown in Figure 4.1 below.

Percentage Points of the Chi-Square Distribution									
Degrees of Freedom	Probability of a larger value of χ^2								
	0.99	0.95	0.90	0.75	0.50	0.25	0.10	0.05	0.01
1	0.000	0.004	0.016	0.102	0.455	1.32	2.71	3.84	6.63
2	0.020	0.103	0.211	0.575	1.386	2.77	4.61	5.99	9.21
3	0.115	0.352	0.584	1.212	2.366	4.11	6.25	7.81	11.34
4	0.297	0.711	1.064	1.923	3.357	5.39	7.78	9.49	13.28
5	0.554	1.145	1.610	2.675	4.351	6.63	9.24	11.07	15.09
6	0.872	1.635	2.204	3.455	5.348	7.84	10.64	12.59	16.81
7	1.239	2.167	2.833	4.255	6.346	9.04	12.02	14.07	18.48
8	1.647	2.733	3.490	5.071	7.344	10.22	13.36	15.51	20.09
9	2.088	3.325	4.168	5.899	8.343	11.39	14.68	16.92	21.67
10	2.558	3.940	4.865	6.737	9.342	12.55	15.99	18.31	23.21
11	3.053	4.575	5.578	7.584	10.341	13.70	17.28	19.68	24.72
12	3.571	5.226	6.304	8.438	11.340	14.85	18.55	21.03	26.22
13	4.107	5.892	7.042	9.299	12.340	15.98	19.81	22.36	27.69
14	4.660	6.571	7.790	10.165	13.339	17.12	21.06	23.68	29.14
15	5.229	7.261	8.547	11.037	14.339	18.25	22.31	25.00	30.58
16	5.812	7.962	9.312	11.912	15.338	19.37	23.54	26.30	32.00
17	6.408	8.672	10.085	12.792	16.338	20.49	24.77	27.59	33.41
18	7.015	9.390	10.865	13.675	17.338	21.60	25.99	28.87	34.80
19	7.633	10.117	11.651	14.562	18.338	22.72	27.20	30.14	36.19
20	8.260	10.851	12.443	15.452	19.337	23.83	28.41	31.41	37.57
22	9.542	12.338	14.041	17.240	21.337	26.04	30.81	33.92	40.29
24	10.856	13.848	15.659	19.037	23.337	28.24	33.20	36.42	42.98
26	12.198	15.379	17.292	20.843	25.336	30.43	35.56	38.89	45.64
28	13.565	16.928	18.939	22.657	27.336	32.62	37.92	41.34	48.28
30	14.953	18.493	20.599	24.478	29.336	34.80	40.26	43.77	50.89
40	22.164	26.509	29.051	33.660	39.335	45.62	51.80	55.76	63.69
50	27.707	34.764	37.689	42.942	49.335	56.33	63.17	67.50	76.15
60	37.485	43.188	46.459	52.294	59.335	66.98	74.40	79.08	88.38

Figure 4. 1 Chi Square Distribution

Proceeding to step 2.6 of the same section mentioned above, it is observed that all p-values are below the presumptive significance threshold of 0.05, and the H value is below the critical value taken from the Chi-Square Distribution Table. As a result, the null hypothesis is accepted which is there are no differences in the medians across the groups. This statistic was chosen because of its capacity to offer a homogeneity test when the data is not normal. The Kruskal-Wallis test is then employed in this study to determine whether several groups of respondents, grouped based on their attributes, express distinct perceptions. Since the results obtained were less than 0.05, the null hypothesis was again not rejected.

4.4 Data Analysis

The data analysis is then further done using the SPSS for each questionnaire section with suitable tools from the statistical descriptive tools as per section 3.4.3 in chapter 3 based on the question-and-answer type. The results are shown for each questionnaire section for a better display and clarity.:

3.6.1 4.4.1 General Information of the Participants

This section of the questionnaire contained four distinct questions:

1. Name?
2. Gender?
3. What is your role in the construction industry?
4. How many years of experience do you have in the construction industry?

The consolidation of this data is tabulated in Table 4.6 and the general information of the sample participants is summarized in the following points:

- The majority of the participants are males ($n = 90$, 83.3%).
- The role of approximately half of the participants ($n = 52$, 48.1%) is project engineer, while the second most frequent role is project manager ($n = 20$, 18.5%).
- Approximately half of the participants ($n = 57$, 52.8%) have work experience and are observed to be below five years. The second most frequent portion of them are those who worked for 5-10 years ($n = 32$, 29.6%).

Table 4. 6 General Information of the Participants

Variable	Categories	Frequency (N = 108)	%
Gender	Male	90	83.3
	Female	16	14.8
	Others / not willing to tell	2	1.9
Role in the construction industry	Project Manager	20	18.5
	Construction Manager	5	4.6
	Project in charge	8	7.4
	Project Engineer	52	48.1
	Other	23	21.3
Experience in the construction industry (years)	< 5	57	52.8
	5-10	32	29.6
	11-15	6	5.6
	> 15	13	12.0

3.6.2 4.4.2 Project Success Evaluation

This section was designed to include mixed types of questions, such as short answers, multiple choice, and Likert scale. They were as follows:

1. Number of Projects you have managed or got involved? (Short Answer)
2. How many of the projects successfully completed all dimensions? (Short Answer)
3. Do you hold any PM Certificate? (Multiple Answers (Yes or No))
4. If yes, please specify?

5. Rate the importance of having a professional certification to enhance their skills that could impact the success of projects. (Likert scale from 1-5)
6. Is there any support offered by the employer in acquiring the certification and training in recent trends in project management? (Multiple Answers (Yes or No))
7. In your experience, what percentage of construction projects in Bahrain are completed successfully? (Multiple Answers)
8. In your experience, what percentage of construction projects in Bahrain are completed but delayed? (Multiple Answers)
9. Have you personally been involved in any failed construction projects in Bahrain? (Multiple Answers (Yes or No))

Answering this will be part of the first research question, which is (What are the number of successful projects, delayed projects, and failed projects in the **construction sector of Bahrain?**). Statistics regarding project success evaluation (Table 4.7) may be summarized as follows:

- The median number of managed (involved in) projects per participant is 7 (IQR: 3-15), while the median number of projects successfully completed all dimensions per participant is 5 (IQR: 2-14). In this regard, roughly one-third ($n = 37$, 34.3%) of the participants reported that they have been involved in construction projects that failed in Bahrain.
- Approximately one-quarter of the participants ($n = 29$, 26.9%) hold a PM certification; PMP represents most of this number ($n = 16$, 61.54%). Additionally, most participants ($n = 74$, 68.5%) give high importance to having such certifications to enhance their skills, which could impact the success of projects. However, most of the participants ($n = 68$, 63%) were not positive about the employer

support for certification/training in PM recent trends. This finding aligns with (AlZayani & Bashir, 2020) in chapter two, who assessed project management maturity in Bahrain's construction sector and identified low organizational maturity levels. The limited employer support for professional certification observed in the current study reinforces their conclusion that structured training and institutional adoption of standard frameworks like PMBOK remain underdeveloped.

- Exactly half of the participants expect the percentage of construction projects in Bahrain that were successfully completed to be in the range 51-75%; the other half is exactly divided between those giving lower expectations and those giving higher expectations.
- More than two-thirds ($n = 74$, 68.5%) of the participants expect the percentage of construction completed but delayed projects in Bahrain to be in the range 51-100%. This perception aligns with the findings of (Haseeb et al., 2011), who documented widespread time and cost overruns in Bahrain's construction projects, attributing delays to factors such as inadequate planning, contractor inefficiencies, and regulatory issues.

Table 4. 7 Statistics Regarding Project Success Evaluation

Variable	Categories	Frequency (N = 90)	%
No. of projects managed / involved in* Median = 7 (IQR: 3-15)	< 5	27	25.7
	5-9	23	21.9
	10-49	47	44.8
	50-99	4	3.8
	100+	4	3.8
No. of projects successfully completed all dimensions* Median = 5 (IQR: 2-14)	< 5	39	37.1
	5-9	27	25.7
	10-49	31	29.5
	50-99	4	3.8
	100+	4	3.8
Holding PM certification	Yes	29**	26.9
	No	79	73.1
Importance of having a professional certification to enhance their skills that could impact the success of projects	Not important	1	0.9
	Somewhat	7	6.5
	Moderately	26	24.1
	Important	52	48.1
	Very important	22	20.4
Employer support for certification / training in PM recent trends	Yes	38	35.2
	No	68	63.0
	Other	2	1.9
% of construction projects in Bahrain successfully completed (opinion)	0-25%	14	13.0
	26-50%	13	12.0
	51-75%	54	50.0
	76-100%	27	25.0
% of construction completed but delayed projects in Bahrain (opinion)	0-25%	15	13.9
	26-50%	19	17.6
	51-75%	38	35.2
	76-100%	36	33.3
Having been involved in a construction project that failed in Bahrain	Yes	37	34.3
	No	71	65.7

Note:

Total frequency does not sum up to 108 due to 3 omitted cases that reported a larger number of successful projects than total projects, which is a contradiction.

Out of 29 who answered with yes, 26 stated the certification they took; the most frequent was PMP (n = 16, 61.54%).

3.6.3 4.4.3 Causes of Success and Failure

This section focused on the causes of success and failure of the projects from the participants' perspective, and it was through the following three questions:

1. Are you following the standard for project management practices using " Project Management Body of Knowledge " PMBOK)?
2. In your opinion, what are the main factors contributing to the success of construction projects in Bahrain?
3. In your opinion, what are the main factors contributing to the failure of construction projects in Bahrain?

By answering this section, the second part of the first research question will be answered, which is the reason for the project failure from the project management point of view. Statistics regarding causes of success and failure can be summarized as follows:

Figure 4.2 shows that nearly half of the participants (n = 51, 47.22%) reported that they are not following standard for project management practices using Project Management Body of Knowledge (PMBOK), whereas 37.04% (n = 40) do follow such standard; the rest constitute 15.74% (n = 17) and more than half of these expressed the partial usage of such standard (in some conditions / where it suits / etc.). This result directly supports (AlZayani & Bashir, 2020) Findings in the literature review identified low maturity levels in Bahrain's construction project management landscape. The limited and selective adoption of PMBOK observed in this study reflects the authors' concern over the lack of formalized, standardized practices across key knowledge areas.

* More than half of the participants in this category (n = 10, 58.82%) expressed the partial usage (in some conditions / where it suits / etc.)

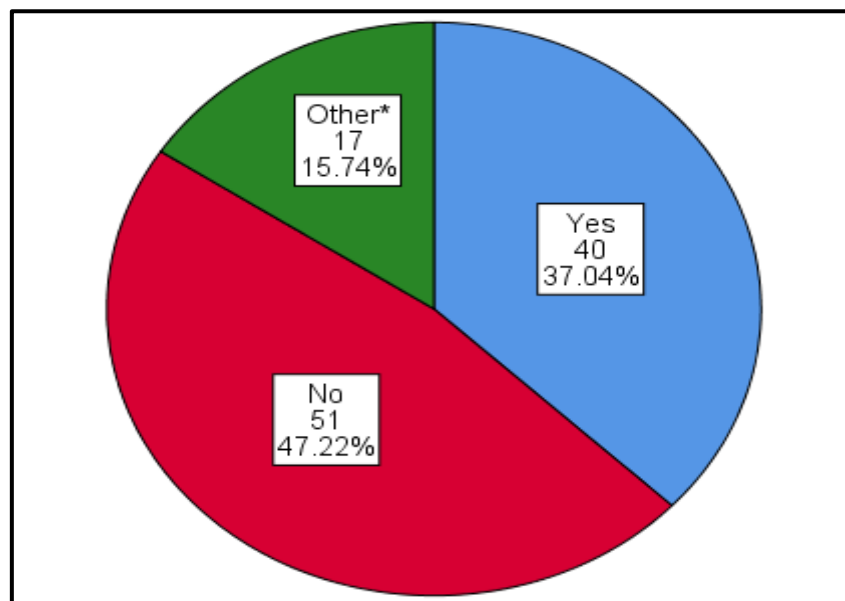


Figure 4. 2 Following the Standard for Project Management Practices Using PMBOK

It can be seen from Figure 4.3 that in very close percentages (57-70%), participants mentioned each of the listed factors as contributors to the success of projects in Bahrain (project planning, skilled team, budget/resources, clarity of objectives, and effective communication/collaboration of stakeholders). An exception is the factor of "efficient risk management," which was only mentioned by around 30% of the participants.

The same factors were also mentioned in the same pattern (with similar percentages) as contributors to failure if not taken care of (if the opposite had happened)—see Figure 4.4.

Referring back to Chapter Two findings, the results demonstrate a strong consensus among professionals regarding the critical role of planning, team competence, stakeholder coordination, and resource availability in

determining project success, findings that are strongly supported by (Al-Hashemi, 2015). Furthermore, the fact that these same factors were viewed as significant causes of failure when neglected reflects similar patterns observed in the work of (Abusafiya & Suliman, 2017), who linked cost overruns to weaknesses in planning, design control, and communication. However, the notably low recognition of risk management as a key success factor contrasts with the findings of (Haseeb et al., 2011), pointing to a potential disconnect between theoretical risk concerns and practical awareness in the Bahraini construction sector.

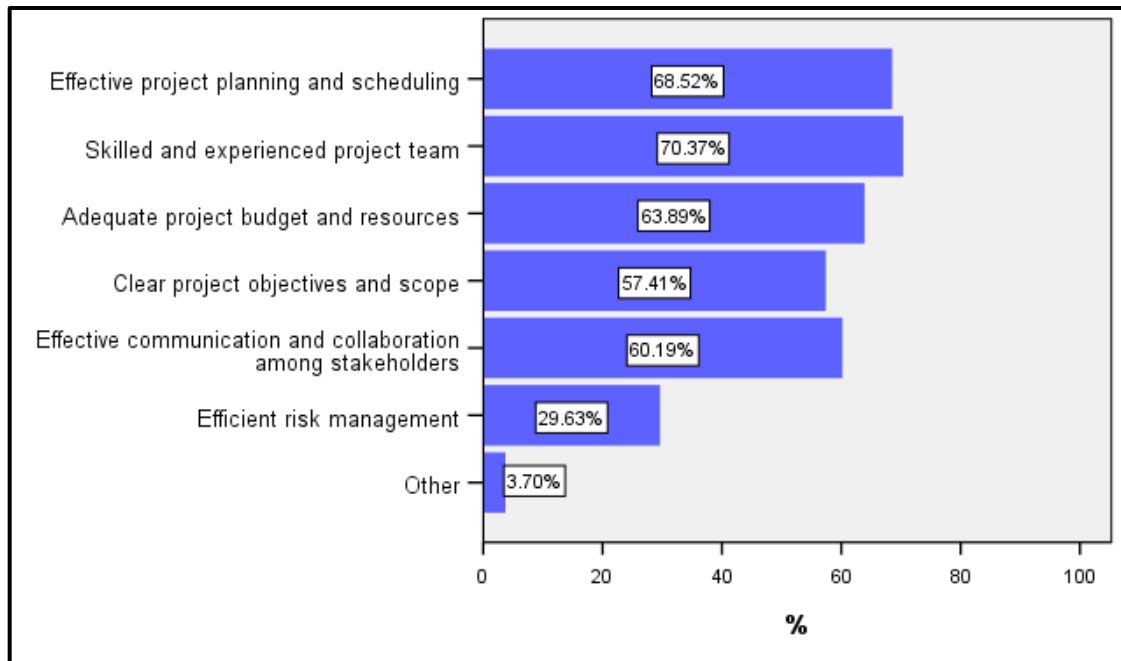


Figure 4. 3 Factors of Success

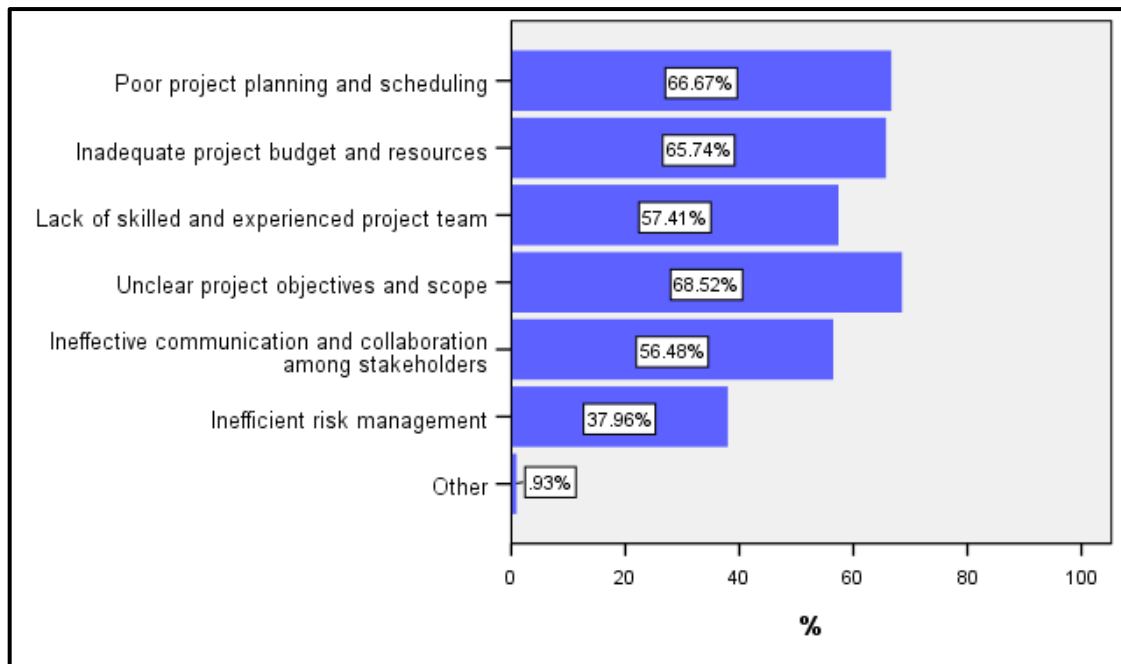


Figure 4. 4 Factors of Failure

3.6.4 4.4.4 Project Management Practices for each project phase:

The purpose of this study is to evaluate the application of well-known project management tools and techniques, particularly in light of the previously noted circumstances surrounding projects in Bahrain and the factors that influence their success or failure. The frequency with which participants use different tools and strategies across the five phases of project management was evaluated using a Likert scale.

Participants rated their usage on a scale from 1 to 5, where:

- 1 indicated "Never"
- 2 indicated "Rarely"
- 3 indicated "Sometimes"
- 4 indicated "Often"
- 5 indicated "Always"

Additionally, a score of 0 was assigned to participants who were unaware of any specific tools or techniques. The survey questions were designed to capture this information effectively. The question was:

1. How frequently are project management techniques and tools used in construction projects in Bahrain for (Initiating/ Planning/ Execution/ Monitoring & Controlling/ Closing) Phases?

By addressing this question, the second research question will also be answered: What practices, tools, and techniques are being used by project managers in these projects? The following sections present the findings about the above-mentioned questionnaire section for each project phase separately.

4.4.1.1 Initiation

Refer to Figure 4.5, which presents the mean participant responses for each project management practice within the initiation phase. Table 4.8 shows that above 60% of the participants' opinion that five components of initiation are frequently / very frequently applied, namely:

- Bid Documents (71.3% of the participants).
- Project Scope Statement (65.7%).
- Project Statement of Work (63.6%).
- Bid/Seller Evaluation (62.4%).
- Bottom-up Estimating (60.8%).

The areas for improvement could be identified from the components that are reported as rarely / not at all used. It is to be noted that this was done by 15% of the participants, which could be seen as a significant figure. This criterion applies to most components of initiation except the five just listed above, in addition to requirement analysis and cost-benefit analysis, which were listed in this section.

Table 4. 8 Evaluation of the Components of the Initiation Phase

Item	Not at all	Rarely	Occasionally	Frequently	Very frequently	M ± SD
Bid Documents	3 (3%)	1 (1%)	25 (24.8%)	47 (46.5%)	25 (24.8%)	3.89 ± 0.89
Project Scope Statement	7 (6.9%)	8 (7.8%)	20 (19.6%)	41 (40.2%)	26 (25.5%)	3.7 ± 1.14
Project Statement of Work	5 (5.1%)	7 (7.1%)	24 (24.2%)	34 (34.3%)	29 (29.3%)	3.76 ± 1.11
Bid/Seller Evaluation	6 (5.9%)	7 (6.9%)	25 (24.8%)	46 (45.5%)	17 (16.8%)	3.6 ± 1.04
Bottom-up Estimating	4 (4.1%)	7 (7.2%)	27 (27.8%)	46 (47.4%)	13 (13.4%)	3.59 ± 0.95
Requirements Analysis	3 (3.1%)	10 (10.3%)	29 (29.9%)	48 (49.5%)	7 (7.2%)	3.47 ± 0.89
Cost-Benefit Analysis	2 (2.1%)	12 (12.5%)	29 (30.2%)	33 (34.4%)	20 (20.8%)	3.59 ± 1.02
Database for Cost Estimating	7 (7.1%)	10 (10.2%)	31 (31.6%)	30 (30.6%)	20 (20.4%)	3.47 ± 1.14
Top-down Estimating	5 (5.2%)	14 (14.4%)	30 (30.9%)	37 (38.1%)	11 (11.3%)	3.36 ± 1.03
SWOT analysis.	6 (6.4%)	15 (16%)	28 (29.8%)	28 (29.8%)	17 (18.1%)	3.37 ± 1.15
Parametric estimating.	11 (11.8%)	11 (11.8%)	27 (29%)	25 (26.9%)	19 (20.4%)	3.32 ± 1.26
Impact mapping	8 (8.8%)	14 (15.4%)	26 (28.6%)	26 (28.6%)	17 (18.7%)	3.33 ± 1.2
Story point estimating.	14 (14.9%)	13 (13.8%)	23 (24.5%)	31 (33%)	13 (13.8%)	3.17 ± 1.27
Expected monetary value (EMV).	11 (12%)	15 (16.3%)	23 (25%)	28 (30.4%)	15 (16.3%)	3.23 ± 1.25
Feasibility Study	2 (2.1%)	17 (17.7%)	33 (34.4%)	27 (28.1%)	17 (17.7%)	3.42 ± 1.04
Project Charter	11 (11.2%)	15 (15.3%)	28 (28.6%)	26 (26.5%)	18 (18.4%)	3.26 ± 1.25

Item	Not at all	Rarely	Occasionally	Frequently	Very frequently	M ± SD
Function point.	8 (8.9%)	11 (12.2%)	31 (34.4%)	25 (27.8%)	15 (16.7%)	3.31 ± 1.16
Project Management Software for Cost Estimating	6 (6.1%)	21 (21.4%)	28 (28.6%)	28 (28.6%)	15 (15.3%)	3.26 ± 1.14
Assumption and constraint analysis	11 (11.2%)	16 (16.3%)	28 (28.6%)	28 (28.6%)	15 (15.3%)	3.2 ± 1.22
Business justification analysis methods.	9 (9.5%)	19 (20%)	26 (27.4%)	27 (28.4%)	14 (14.7%)	3.19 ± 1.2
Simulations.	11 (11.8%)	18 (19.4%)	24 (25.8%)	28 (30.1%)	12 (12.9%)	3.13 ± 1.22
Stakeholders Analysis	8 (8.2%)	15 (15.3%)	33 (33.7%)	28 (28.6%)	14 (14.3%)	3.26 ± 1.13
Single point estimating.	9 (9.6%)	15 (16%)	30 (31.9%)	25 (26.6%)	15 (16%)	3.23 ± 1.19
Wideband Delphi.	7 (7.6%)	21 (22.8%)	25 (27.2%)	25 (27.2%)	14 (15.2%)	3.2 ± 1.18
Analogous estimating.	8 (8.8%)	17 (18.7%)	28 (30.8%)	22 (24.2%)	16 (17.6%)	3.23 ± 1.2
Stakeholder analysis.	6 (6.1%)	17 (17.2%)	35 (35.4%)	29 (29.3%)	12 (12.1%)	3.24 ± 1.07
Multipoint estimating.	12 (13%)	15 (16.3%)	27 (29.3%)	26 (28.3%)	12 (13%)	3.12 ± 1.22
Bidders Conferences	5 (5%)	22 (22%)	33 (33%)	32 (32%)	8 (8%)	3.16 ± 1.02
Database of Contractual Commitment Data Project Communication Room	11 (11.2%)	14 (14.3%)	34 (34.7%)	23 (23.5%)	16 (16.3%)	3.19 ± 1.21
Affinity grouping.	10 (10.9%)	16 (17.4%)	30 (32.6%)	27 (29.3%)	9 (9.8%)	3.1 ± 1.14

Item	Not at all	Rarely	Occasionally	Frequently	Very frequently	M ± SD
Relative estimating.	12 (13%)	15 (16.3%)	29 (31.5%)	24 (26.1%)	12 (13%)	3.1 ± 1.21
Database of Historical Data	9 (9.6%)	20 (21.3%)	29 (30.9%)	27 (28.7%)	9 (9.6%)	3.07 ± 1.13
Alternatives analysis	12 (12.5%)	17 (17.7%)	32 (33.3%)	26 (27.1%)	9 (9.4%)	3.03 ± 1.16
Graphic Presentation of Risk Information	6 (6.3%)	24 (25.3%)	34 (35.8%)	15 (15.8%)	16 (16.8%)	3.12 ± 1.16

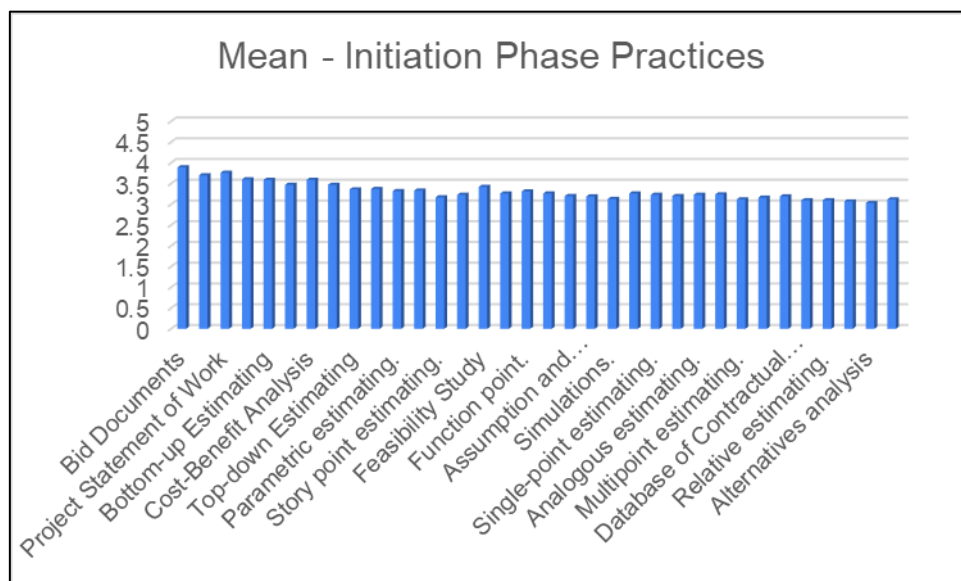


Figure 4. 5 Mean Scores for the Use of Project Management Practices During the Initiation Phase, as Rated by Participants

4.4.1.2 Planning

Refer to Figure 4.6, which presents the mean participant responses for each project management practice within the planning phase. Table 4.9 shows that more than 60% of the participants agreed on the following seven

components of planning as being used frequently / very frequently—scheduling (81.7%).

- Gantt Chart (80.2%).
- Baseline Plan (78%).
- Activity List (75.7%).
- Milestone Planning (70.9%).
- Quality Plan (65%).
- Life Cycle Cost (60.6%).

A closer look at the areas for improvement shows that the components that are reported as rarely / not at all done are more than 15% which again should be considered a significant proportion of the participants. This criterion applies to most components of planning, except for the seven listed above, in addition to the product breakdown structure, project management software for resource leveling, project management software for resource scheduling, work breakdown structure, and network diagram.

Table 4. 9 Evaluation of the Components of the Planning Phase

Item	Not at all	Rarely	Occasionally	Frequently	Very frequently	M ± SD
Scheduling	0 (0%)	4 (3.8%)	15 (14.4%)	31 (29.8%)	54 (51.9%)	4.3 ± 0.86
Gantt Chart	1 (1%)	2 (2%)	17 (16.8%)	42 (41.6%)	39 (38.6%)	4.15 ± 0.84
Baseline Plan	1 (1%)	4 (4%)	17 (17%)	40 (40%)	38 (38%)	4.1 ± 0.89
Activity List	0 (0%)	5 (4.9%)	20 (19.4%)	33 (32%)	45 (43.7%)	4.15 ± 0.9
Milestone Planning	1 (1%)	1 (1%)	28 (27.2%)	36 (35%)	37 (35.9%)	4.04 ± 0.87
Quality Plan	1 (1%)	14 (13.6%)	21 (20.4%)	34 (33%)	33 (32%)	3.82 ± 1.06
Life Cycle Cost	1 (1%)	7 (7.1%)	31 (31.3%)	37 (37.4%)	23 (23.2%)	3.75 ± 0.93
Product Breakdown Structure	4 (4.1%)	10 (10.3%)	27 (27.8%)	32 (33%)	24 (24.7%)	3.64 ± 1.09
Qualitative Risk Analysis	4 (4.1%)	14 (14.4%)	24 (24.7%)	29 (29.9%)	26 (26.8%)	3.61 ± 1.15

Item	Not at all	Rarely	Occasionally	Frequently	Very frequently	M ± SD
Project Management Software for Resource Leveling	4 (4%)	10 (10%)	30 (30%)	38 (38%)	18 (18%)	3.56 ± 1.03
Communication Plan	6 (6.1%)	10 (10.1%)	28 (28.3%)	29 (29.3%)	26 (26.3%)	3.6 ± 1.16
Benchmarking	3 (3%)	16 (16.2%)	25 (25.3%)	33 (33.3%)	22 (22.2%)	3.56 ± 1.1
Project Management Software for Resource Scheduling Work Breakdown Structure	3 (3.1%)	10 (10.2%)	33 (33.7%)	35 (35.7%)	17 (17.3%)	3.54 ± 1
Make-or-buy analysis.	8 (8.5%)	15 (16%)	22 (23.4%)	34 (36.2%)	15 (16%)	3.35 ± 1.18
Contingency Plans/Risk Response Plan	5 (5.1%)	20 (20.4%)	22 (22.4%)	36 (36.7%)	15 (15.3%)	3.37 ± 1.13
Network Diagram	2 (2.1%)	10 (10.3%)	36 (37.1%)	35 (36.1%)	14 (14.4%)	3.51 ± 0.94
Project Management Software for Simulation	11 (11.6%)	16 (16.8%)	21 (22.1%)	30 (31.6%)	17 (17.9%)	3.27 ± 1.27
Sensitivity analysis.	7 (7.8%)	17 (18.9%)	22 (24.4%)	31 (34.4%)	13 (14.4%)	3.29 ± 1.16
Probabilistic Duration Estimate (PERT)	10 (10.5%)	17 (17.9%)	22 (23.2%)	26 (27.4%)	20 (21.1%)	3.31 ± 1.28
Risk Identification	7 (7%)	18 (18%)	27 (27%)	36 (36%)	12 (12%)	3.28 ± 1.11
Quantitative Risk Analysis	8 (8.3%)	12 (12.5%)	30 (31.3%)	31 (32.3%)	15 (15.6%)	3.34 ± 1.14
Life cycle assessment	5 (5.5%)	14 (15.4%)	29 (31.9%)	31 (34.1%)	12 (13.2%)	3.34 ± 1.07

Item	Not at all	Rarely	Occasionally	Frequently	Very frequently	M ± SD
Parametric Estimating	6 (6.3%)	17 (17.7%)	28 (29.2%)	33 (34.4%)	12 (12.5%)	3.29 ± 1.09
Decision tree analysis.	3 (3.3%)	20 (21.7%)	26 (28.3%)	29 (31.5%)	14 (15.2%)	3.34 ± 1.08
Probability and impact matrix	9 (9.8%)	15 (16.3%)	25 (27.2%)	32 (34.8%)	11 (12%)	3.23 ± 1.16
Ranking of Risks	5 (5.1%)	18 (18.4%)	30 (30.6%)	36 (36.7%)	9 (9.2%)	3.27 ± 1.03
Responsibility Assignment Matrix	9 (9.2%)	11 (11.2%)	33 (33.7%)	29 (29.6%)	16 (16.3%)	3.33 ± 1.16
Value stream mapping.	10 (11%)	16 (17.6%)	28 (30.8%)	23 (25.3%)	14 (15.4%)	3.16 ± 1.21

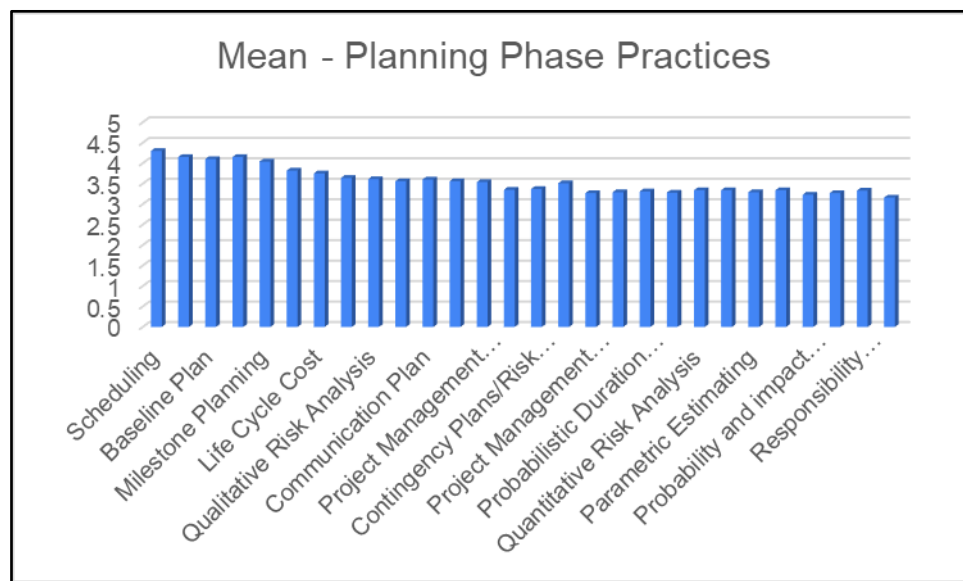


Figure 4. 6 Mean Scores for the Use of Project Management Practices During the Planning Phase, as Rated by Participants

4.4.1.3 Execution:

Refer to Figure 4.7, which presents the mean participant responses for each project management practice within the execution phase. As presented in Table 4.10, it could be observed that more than 60% of the participants are

of the opinion that 12 (out of 22) of the listed components of execution are frequently / very frequently applied. It implies that more than half of the listed components are frequently / very frequently applied by most participants in the line of work related to project management and hence dominate. The list of components that have space for improvement (i.e., rarely / not at all applied as reported by 15%+ of the participants) includes those with a lower percentage but still need to be considered. The items to be considered under this are not limited to:

- Timebox.
- Self-Directed Work Teams.
- Iteration planning.
- Risk review.
- Steering committee.
- Modeling.
- Change control board.
- Decision Tree.
- Backlog refinement.
- Team-Building Event.

Table 4. 10 Evaluation of the Components of the Execution Phase

Item	Not at all	Rarely	Occasionally	Frequently	Very frequently	M ± SD
Progress Meetings	0 (0%)	3 (2.9%)	11 (10.6%)	33 (31.7%)	57 (54.8%)	4.38 ± 0.79
Progress Report	1 (1%)	4 (3.8%)	11 (10.5%)	37 (35.2%)	52 (49.5%)	4.29 ± 0.87
Kick-off Meeting	1 (1%)	4 (3.8%)	15 (14.3%)	27 (25.7%)	58 (55.2%)	4.3 ± 0.92
Quality Inspection	1 (1%)	1 (1%)	18 (17.3%)	30 (28.8%)	54 (51.9%)	4.3 ± 0.86
Change Request	0 (0%)	3 (2.9%)	21 (20.6%)	37 (36.3%)	41 (40.2%)	4.14 ± 0.84
Project closeout.	3 (3%)	5 (5%)	16 (16%)	41 (41%)	35 (35%)	4 ± 0.99
Planning meeting.	3 (2.9%)	6 (5.8%)	18 (17.3%)	38 (36.5%)	39 (37.5%)	4 ± 1.02
Status meeting.	2 (2%)	4 (3.9%)	25 (24.5%)	34 (33.3%)	37 (36.3%)	3.98 ± 0.97

Timebox	2 (2.1%)	13 (13.4%)	22 (22.7%)	37 (38.1%)	23 (23.7%)	3.68 ± 1.05
Daily standup.	3 (2.9%)	12 (11.8%)	24 (23.5%)	38 (37.3%)	25 (24.5%)	3.69 ± 1.06
Critical Path Method	5 (4.9%)	6 (5.9%)	29 (28.4%)	33 (32.4%)	29 (28.4%)	3.74 ± 1.09
Self-Directed Work Teams	6 (6%)	11 (11%)	23 (23%)	34 (34%)	26 (26%)	3.63 ± 1.16
Iteration planning	5 (5.1%)	16 (16.2%)	20 (20.2%)	42 (42.4%)	16 (16.2%)	3.48 ± 1.1
Configuration Review	8 (7.9%)	7 (6.9%)	27 (26.7%)	26 (25.7%)	33 (32.7%)	3.68 ± 1.22
Release planning.	4 (4.1%)	9 (9.2%)	29 (29.6%)	34 (34.7%)	22 (22.4%)	3.62 ± 1.06
Risk review.	9 (8.8%)	10 (9.8%)	26 (25.5%)	31 (30.4%)	26 (25.5%)	3.54 ± 1.22
Steering committee.	5 (5.2%)	14 (14.6%)	24 (25%)	34 (35.4%)	19 (19.8%)	3.5 ± 1.12
Modeling	8 (8.3%)	11 (11.5%)	26 (27.1%)	31 (32.3%)	20 (20.8%)	3.46 ± 1.19
Change control board.	6 (6.3%)	12 (12.5%)	28 (29.2%)	30 (31.3%)	20 (20.8%)	3.48 ± 1.14
Decision Tree	10 (10%)	11 (11%)	29 (29%)	27 (27%)	23 (23%)	3.42 ± 1.24
Backlog refinement.	10 (10.9%)	12 (13%)	24 (26.1%)	27 (29.3%)	19 (20.7%)	3.36 ± 1.25
Team-Building Event	4 (4.1%)	16 (16.5%)	30 (30.9%)	24 (24.7%)	23 (23.7%)	3.47 ± 1.15

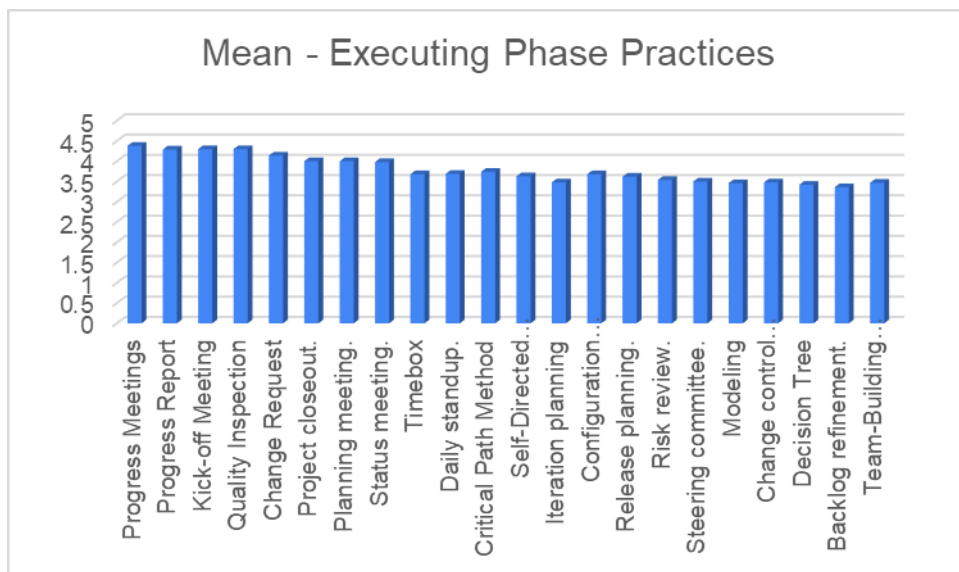


Figure 4. 7 Mean Scores for the Use of Project Management Practices During the Executing Phase, as Rated by Participants

4.4.1.4 Monitoring & Controlling

Refer to Figure 4.8, which presents the mean participant responses for each project management practice within the monitoring phase. This section follows the trend of the above sections, with more than 60% of participants acknowledging that the eight components of Monitoring and Controlling are frequently / very frequently applied, as shown in Table 4.11.

- Work Authorization (69.1%).
- Financial Measurement Tools (68.4%).
- Project Management Software for Task (67.7%).
- Project Management Software for Monitoring Cost (66.3%).
- Check sheet (66%).
- Project review (66%).
- Re-baselining (63.2%).
- Team Member Performance Appraisal (60.8%).

The areas for improvement are again those components that are reported as rarely / not at all done by a significant proportion of the participants (15%+). This criterion applies to most of the components of MC except work authorization, financial management tools, project management software for tasks, project management software for monitoring cost, and re-baselining.

Table 4. 11 Evaluation of the Components of the MC Phase

Item	Not at all	Rarely	Occasionally	Frequently	Very frequently	M ± SD
Work Authorization	2 (2.1%)	9 (9.3%)	19 (19.6%)	41 (42.3%)	26 (26.8%)	3.82 ± 1
Financial Measurement Tools	2 (2%)	12 (12.2%)	17 (17.3%)	34 (34.7%)	33 (33.7%)	3.86 ± 1.08

Item	Not at all	Rarely	Occasionally	Frequently	Very frequently	M ± SD
Project Management Software for Tasks	2 (2%)	11 (11.1%)	19 (19.2%)	40 (40.4%)	27 (27.3%)	3.8 ± 1.03
Project Management Software for Monitoring Cost	3 (3.1%)	10 (10.2%)	20 (20.4%)	43 (43.9%)	22 (22.4%)	3.72 ± 1.02
Check sheet	5 (5%)	10 (10%)	19 (19%)	42 (42%)	24 (24%)	3.7 ± 1.1
Project review	2 (2.1%)	15 (15.5%)	16 (16.5%)	33 (34%)	31 (32%)	3.78 ± 1.12
Re-baselining	4 (4.2%)	10 (10.5%)	21 (22.1%)	42 (44.2%)	18 (18.9%)	3.63 ± 1.04
Team Member Performance Appraisal	8 (8.2%)	9 (9.3%)	21 (21.6%)	41 (42.3%)	18 (18.6%)	3.54 ± 1.15
Cost of quality	11 (11%)	10 (10%)	20 (20%)	35 (35%)	24 (24%)	3.51 ± 1.27
Cause-and-Effect Diagram	4 (4%)	14 (14.1%)	24 (24.2%)	43 (43.4%)	14 (14.1%)	3.49 ± 1.03
Earned value analysis	11 (11.3%)	10 (10.3%)	21 (21.6%)	32 (33%)	23 (23.7%)	3.47 ± 1.28
Project Management Software for Monitoring Schedule Value Analysis	6 (6.3%)	15 (15.6%)	22 (22.9%)	36 (37.5%)	17 (17.7%)	3.45 ± 1.14
Risk Reassessment	6 (6%)	17 (17%)	22 (22%)	30 (30%)	25 (25%)	3.51 ± 1.21
Trend Chart or S-Curve	12 (12.2%)	15 (15.3%)	18 (18.4%)	37 (37.8%)	16 (16.3%)	3.31 ± 1.26
Lessons learned meeting	2 (2.1%)	13 (13.4%)	30 (30.9%)	36 (37.1%)	16 (16.5%)	3.53 ± 0.99
Process analysis	6 (6.2%)	11 (11.3%)	29 (29.9%)	35 (36.1%)	16 (16.5%)	3.45 ± 1.09
Quality Function Deployment	8 (8.2%)	16 (16.3%)	23 (23.5%)	34 (34.7%)	17 (17.3%)	3.37 ± 1.19
Critical Chain Method	7 (7.1%)	18 (18.4%)	22 (22.4%)	participant's score	19 (19.4%)	3.39 ± 1.2
Forecast.	9 (9.2%)	10 (10.2%)	28 (28.6%)	29 (29.6%)	22 (22.4%)	3.46 ± 1.21
Pareto Diagram	10 (10.5%)	13 (13.7%)	23 (24.2%)	39 (41.1%)	10 (10.5%)	3.27 ± 1.15

Item	Not at all	Rarely	Occasionally	Frequently	Very frequently	M ± SD
What-if scenario analysis.	11 (11.3%)	16 (16.5%)	20 (20.6%)	32 (33%)	18 (18.6%)	3.31 ± 1.27
Trend analysis	15 (15.6%)	7 (7.3%)	25 (26%)	34 (35.4%)	15 (15.6%)	3.28 ± 1.27
Control Charts	16 (16.3%)	13 (13.3%)	19 (19.4%)	33 (33.7%)	17 (17.3%)	3.22 ± 1.34
Root cause analysis.	10 (10.2%)	9 (9.2%)	29 (29.6%)	31 (31.6%)	19 (19.4%)	3.41 ± 1.2
Project Issue Log	6 (6.1%)	18 (18.2%)	25 (25.3%)	30 (30.3%)	20 (20.2%)	3.4 ± 1.18
Variance analysis	15 (15.6%)	12 (12.5%)	21 (21.9%)	34 (35.4%)	14 (14.6%)	3.21 ± 1.29
Reserve analysis.	5 (5.4%)	18 (19.4%)	25 (26.9%)	29 (31.2%)	16 (17.2%)	3.35 ± 1.14
Regression analysis	8 (8.5%)	11 (11.7%)	30 (31.9%)	32 (34%)	13 (13.8%)	3.33 ± 1.12
Monte Carlo Analysis	11 (11.3%)	14 (14.4%)	26 (26.8%)	33 (34%)	13 (13.4%)	3.24 ± 1.2
Influence diagram.	12 (12.5%)	12 (12.5%)	27 (28.1%)	32 (33.3%)	13 (13.5%)	3.23 ± 1.21
Learning Curve	6 (6.1%)	18 (18.2%)	29 (29.3%)	30 (30.3%)	16 (16.2%)	3.32 ± 1.13
Iteration review	11 (11.3%)	10 (10.3%)	35 (36.1%)	24 (24.7%)	17 (17.5%)	3.27 ± 1.2

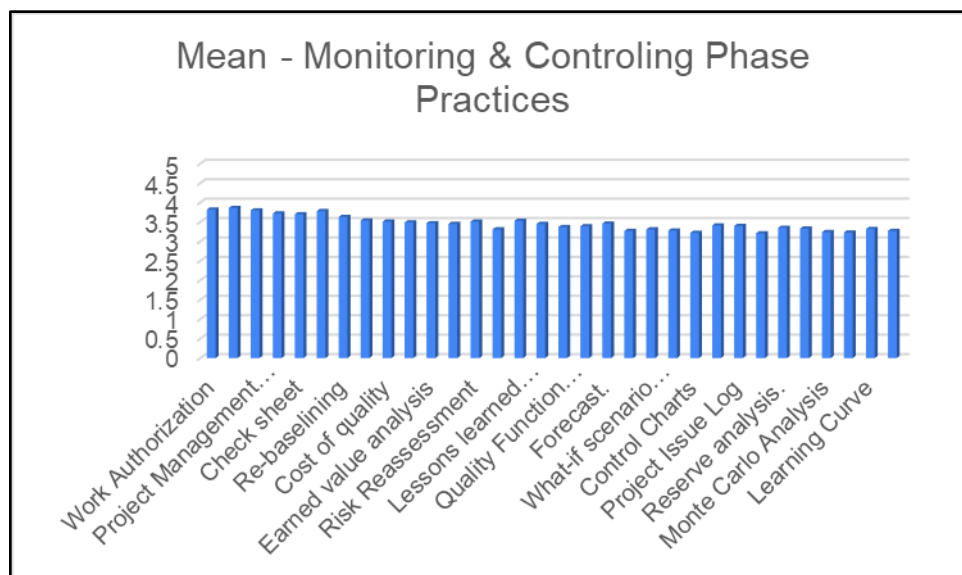


Figure 4. 8 Mean Scores for the Use of Project Management Practices During the Monitoring and Controlling Phase, as Rated by Participants

4.4.1.5 Closing

Figure 4.9 illustrates the mean scores of participant responses regarding the use of various project management practices during the closing phase. Referring to Table 4.12, it could be observed that an agreement in 7 out of 9 items in this phase is recorded, with more than 60% participants accepting the majority of the components in closing as frequently / very frequently applied. In other words, most of the listed components are frequently / very frequently applied by the above-mentioned percentage of the participants. Hence, those are not separately mentioned here. However, at the same time, it is essential to focus on those components that need to be improved (i.e., rarely / not at all applied as reported by 15%+ of the participants). This criterion would apply to:

- Retrospective.
- Lessons Learned.
- Database of Lessons Learned
- Net Promoter Score (NPS®).

Table 4. 12 Evaluation of the Components of the Closing Phase

Item	Not at all	Rarely	Occasionally	Frequently	Very frequently	M ± SD
Handover	2 (2%)	2 (2%)	9 (8.8%)	31 (30.4%)	58 (56.9%)	4.38 ± 0.88
Project Closure Documentation	2 (1.9%)	4 (3.9%)	13 (12.6%)	39 (37.9%)	45 (43.7%)	4.17 ± 0.93
Close Contracts	2 (1.9%)	4 (3.9%)	17 (16.5%)	28 (27.2%)	52 (50.5%)	4.2 ± 0.98
Customer Satisfaction Surveys	4 (4%)	5 (5%)	17 (16.8%)	41 (40.6%)	34 (33.7%)	3.95 ± 1.03
Client Acceptance Form	2 (1.9%)	6 (5.8%)	20 (19.4%)	33 (32%)	42 (40.8%)	4.04 ± 1.01
Retrospective.	7 (8.2%)	8 (9.4%)	17 (20%)	36 (42.4%)	17 (20%)	3.56 ± 1.16
Lessons Learned	5 (4.9%)	12 (11.8%)	24 (23.5%)	36 (35.3%)	25 (24.5%)	3.63 ± 1.13

Database of Lessons Learned	9 (8.9%)	15 (14.9%)	20 (19.8%)	36 (35.6%)	21 (20.8%)	3.45 ± 1.23
Net Promoter Score (NPS®)	10 (11.9%)	9 (10.7%)	19 (22.6%)	31 (36.9%)	15 (17.9%)	3.38 ± 1.24

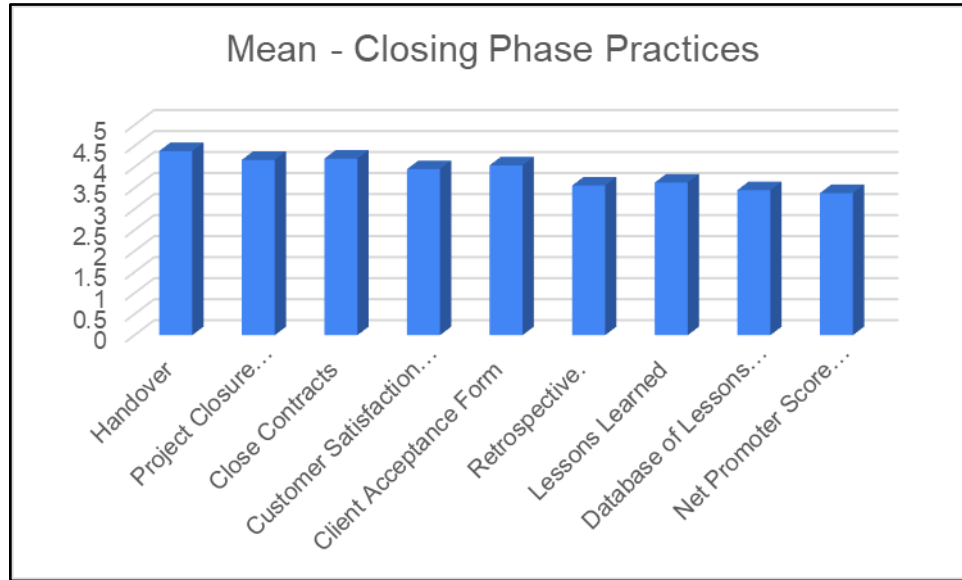


Figure 4.9 Mean Scores for the Use of Project Management Practices During the Closing Phase, as Rated by Participants

4.4.1.6 Overall Evaluation for Phases under Project Management Practices:

The overall evaluation is presented here based on 5 scores calculated for each participant under each phase. A score of a participant under a certain phase is his / her average response (i.e., the average coded response from 1 to 5) for all items under this phase.

- According to Figure 4.10, the average score is greater than 3 (the middle point of the five-point scale) under all phases. Hence, we should expect that high scores dominate most frequently, or even represent a majority, especially if they approach 4.

- The scores of execution and closing are close to 4, and this indicates that participants with high scores of execution or closure of the sample.
- Table 4.13 clarifies this clearly: under initiation, the percentage of high scores (3.5+) account for 41.7% (n = 45) of the sample—i.e., they are the most frequent; under planning, execution and monitoring & controlling, high scores represent more than half of the sample—51.9% (n = 56), 59.3% (n = 64) and 55.6% (n = 60) respectively; under closing, high scores represent most of the sample (n = 78, 72.2%).
- In terms of the size of area for future improvement, focus mainly on the low scores (i.e., < 2.5). It could be observed that low scores represent at least a tangible proportion of the participants that's not less than 15% in two dimensions, namely, initiation (n = 25, 24.1%) and monitoring & controlling (n = 20, 18.5%); in other words, a significant (not very small) proportion of the project team members feel the need for improving the initiation and monitoring & controlling in general.

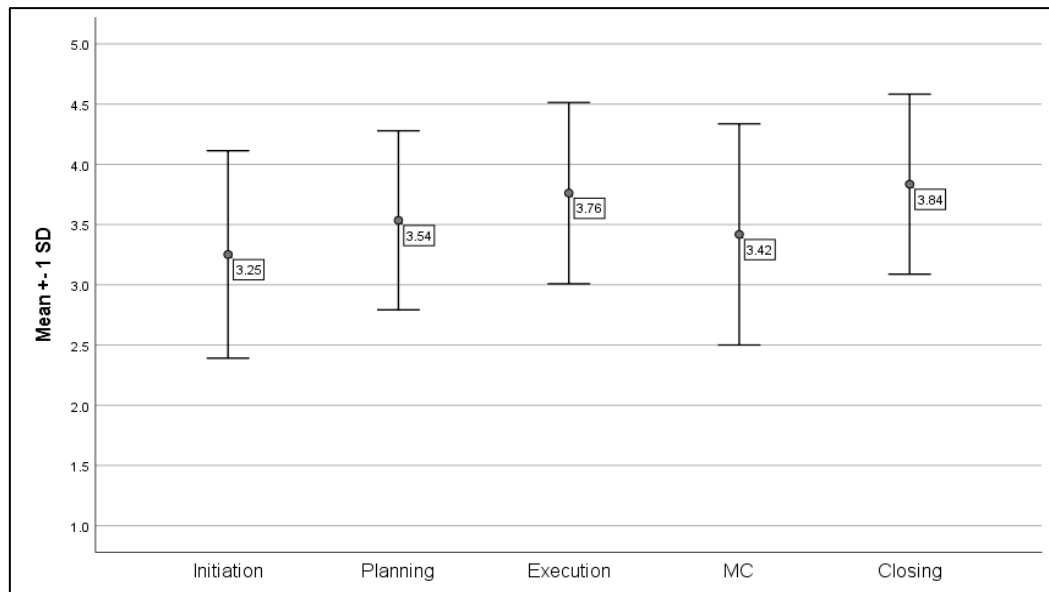


Figure 4. 10 Error-Bars (Mean and SD per Phase)

Table 4. 13 Score Classification Per Phase

Score Category	Initiation		Planning		Execution		MC		Closing	
	N	%	N	%	N	%	N	%	N	%
Low (< 2.5)	26	24.1	8	7.4	5	4.6	20	18.5	4	3.7
Moderate (2.5-3.49)	37	34.3	44	40.7	39	36.1	28	25.9	26	24.1
High (3.5+)	45	41.7	56	51.9	64	59.3	60	55.6	78	72.2
Total	108	100.0	108	100.0	108	100.0	108	100.0	108	100.0

The above sections are completed as per the steps broadly shown in Figure 3.1 of Chapter 3, which outlines the data analysis approach and answers the first and second research questions. The subsequent chapter is drafted to present further discussions and conclusions drawn from these results, focusing on a model for the construction sector in Bahrain. This model is framed based on the results accumulated from the above sections and aims

to provide a guide for project teams on best practices to enhance project success and minimize the occurrence of project failures.

4.5 Model of Project Management Best Practice

Referring to Chapter 3, Sections 3.4.4 & 3.4.5, the proposed model incorporates practices derived from the above results, selected based on the highest ‘mean’ and the lowest ‘standard deviation’ (Refer to step 2.5.1). Table 4.14 holds the proposed model with the selected practices from each project phase. This table addresses the final research question: **Is it possible to develop a framework to oversee the identified failure strands based on standard practices prescribed by internationally accepted bodies like the Project Management Institute?** A validation of this model will be conducted in the upcoming Section 4.6.

Table 4. 14 Selected Practices From Each Project Phase for DSM

Number	Activity
Initiation Phase	
A	Bid Documents
B	Project Scope Statement
C	Project Statement of Work
D	Bid/Seller Evaluation
E	Bottom-up Estimating
Planning Phase	
F	Scheduling
G	Gantt Chart
H	Baseline Plan
I	Activity List
J	Milestone Planning
K	Quality Plan
L	Life Cycle Cost
Execution Phase	

Number	Activity
M	Progress Meetings
N	Progress Report
O	Quality Inspection
P	Change Request
Controlling & Monitoring Phase	
Q	Work Authorization
R	Financial Measurement Tools
S	Project Management Software for
T	Project Management Software for Monitoring Cost
U	Check sheet
Closing Phase	
V	Handover
W	Project Closure Documentation
X	Close Contracts
Y	Client Acceptance Form

4.6 Validating the Model Using Alias Design Structure Matrix (DSM)

3.6.5 4.6.1 Constructing Alias Design Structure Matrix

Referring to chapter 3 section 3.4.5, as the best practices are listed in the model, the following matrix is constructed as per step 2.5.2 to 2.5.4 by inserting the best practices as a diagonal of the matrix and then entering the rest of the matrix depending on dependencies between each practice and another. The 1 entry indicates the dependency between the practicalal

value of 0 vice versa for the entries that have 0 in them. The matrix is presented in Table 4.15 and is provided below.

Table 4. 15 Constructed Alias Design Structure Matrix

A	1	1	1	1	0	0	0
1	B	1	1	1	0	0	0
1	1	C	1	1	1	1	1
1	1	1	D	0	1	0	0
1	1	0	0	E	1	0	1
0	0	0	0	0	F	1	1
0	0	0	0	0	1	G	1
0	0	0	0	0	1	1	H
0	0	0	0	0	1	1	1
0	1	1	0	0	1	1	1
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	1	1	1
0	0	0	0	0	1	1	1
0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0
0	0	0	0	0	1	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

0	0	0	0	0	0	0	0
0	1	0	0	0	0	0	0
1	1	1	1	1	1	1	0
0	0	0	0	0	0	0	0
1	0	0	1	0	0	0	0
1	1	1	1	1	1	0	0
1	1	0	1	1	1	0	0
1	1	0	1	1	1	0	1
I	1	0	1	1	1	1	1
1	J	0	1	1	1	0	0
0	0	K	1	1	1	1	0
0	1	0	L	1	1	0	0
1	1	1	1	M	1	1	1
1	1	1	1	1	N	1	1
0	1	1	0	1	1	O	0
0	0	0	0	0	0	0	P
1	1	0	0	1	1	0	
0	0	0	1	1	1	0	0
0	0	0	0	0	0	0	0
0	0	0	1	1	1	0	1

0	0	0	0	1	1	0	0
0	0	0	0	1	1	0	0
0	0	0	0	1	1	0	0
0	0	0	0	1	1	0	0
0	0	1	0	1	1	0	0

1	0	0	0	0	0	0	0	0
1	0	0	0	0	1	0	1	1
1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0
1	0	1	0	1	1	1	1	1
1	0	0	0	0	0	0	0	1
0	1	1	1	0	0	0	1	1
1	1	1	0	0	1	0	0	0
0	0	0	0	0	0	0	0	0
0	1	1	0	1	1	1	1	1
0	1	0	1	0	0	0	0	1
,0	0	1	1	0	0	0	0	0
0	0	1	1	0	0	0	0	0
0	0	0	0	1	1	1	1	1
1	1	1	1	0	1	0	0	1
Q	0	0	0	0	0	0	0	0
0	R	0	1	1	0	1	1	0

0	0	S	0	1	0	1	0	0
0	1	0	T	0	0	0	0	0
0	0	0	0	U	1	1	1	1
0	0	0	0	0	V	1	1	0
0	0	0	1	1	1	W	1	1
0	1	0	1	1	1	1	X	1
0	0	0	0	1	1	1	1	Y

3.6.6 4.6.2 Finding the Critical Elements

Referring to the methodology given in chapter 3, section 3.4.5, step 2.6, the summation of rows and columns is done. Then, it is necessary to identify the elements with the highest scores and label them as the critical elements. The summation of rows and columns is given in Table 4.16.

Table 4. 16 Summation of Matrix Rows and Columns

Serial	Sum of Rows	Sum of Columns	Total
1	5	4	9
2	9	5	14
3	23	4	27
4	5	3	8
5	6	3	9
6	15	10	25
7	9	7	16
8	13	9	22
9	13	9	22
10	9	11	20

Serial	Sum of Rows	Sum of Columns	Total
11	11	6	17
12	6	12	18
13	12	18	30
14	12	18	30
15	10	5	15
16	6	5	11
17	5	7	12
18	7	8	15
19	2	8	10
20	5	9	14
21	6	9	15
22	4	11	15
23	7	10	17
24	8	11	19
25	7	13	20

The matrix that carries and identifies the critical elements is given in Table 4.17.

Table 4. 17 Alias DSM with identifying critical elements

A	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
1	B	1	1	1	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	1	1
1	1	C	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1
1	1	1	D	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

1	1	0	0	E	1	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	F	1	1	1	1	1	1	1	1	0	0	1	0	1	0	1	1	1	1	1
0	0	0	0	0	1	G	1	1	1	0	1	1	1	0	0	1	0	0	0	0	0	0	0	1
0	0	0	0	0	1	1	H	1	1	0	1	1	1	0	1	0	1	1	1	0	0	0	1	1
0	0	0	0	0	1	1	1	I	1	0	1	1	1	1	1	1	1	0	0	1	0	0	0	0
0	1	1	0	0	1	1	1	1	J	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	K	1	1	1	1	0	0	1	1	0	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	1	0	L	1	1	0	0	0	1	0	1	0	0	0	0	1
0	0	0	0	0	1	1	1	1	1	1	1	M	1	1	1	0	0	1	1	0	0	0	0	0
0	0	0	0	0	1	1	1	1	1	1	1	1	N	1	1	0	0	1	1	0	0	0	0	0
0	0	0	0	0	0	0	1	0	1	1	0	1	1	O	0	0	0	0	0	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	P	1	1	1	1	0	1	0	0	0	1
0	0	0	0	0	1	0	0	1	1	0	0	1	1	0	Q	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	R	0	1	1	0	1	1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	S	0	1	0	1	0	0	0
0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	0	1	0	T	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	U	1	1	1	1
0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	V	1	1	0	0
0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	1	1	W	1	1
0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	1	1	1	1	X	1
0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	1	1	1	1	Y

3.6.7 4.6.3 Transformation to Cluster matrix

Referring to step 2.6 again the rearranging of the elements is carried out to arrive at the dependencies which lead to the formation of the cluster matrix as shown in 4.18.

Table 4. 18 Alias DSM (Cluster Matrix)

S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0
0	A	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
0	1	B	1	1	1	0	0	0	0	1	0	0	0	0	0	1	0	1	0	1	1	0	0
1	1	1	C	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
0	1	1	1	D	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
0	1	1	0	0	E	1	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	F	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	0
0	0	0	0	0	0	1	G	1	1	1	0	1	1	1	1	0	0	0	0	0	1	0	0
1	0	0	0	0	0	1	1	H	1	1	0	1	1	1	0	1	1	0	0	1	1	0	1
1	0	0	0	0	0	1	1	1	I	1	0	1	1	1	1	0	0	1	0	0	0	1	1
0	0	1	1	0	0	1	1	1	1	J	0	1	1	1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	K	1	1	1	0	1	0	1	1	1	1	1	0
0	0	0	0	0	0	0	0	0	0	1	0	L	1	1	0	1	1	0	0	0	1	0	0
1	0	0	0	0	0	1	1	1	1	1	1	1	M	1	0	0	1	0	0	0	0	1	1
1	0	0	0	0	0	1	1	1	1	1	1	1	1	N	0	0	1	0	0	0	0	1	1
0	0	0	0	0	0	1	0	0	1	1	0	0	1	1	Q	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	R	1	1	0	1	1	0	0
0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	T	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	U	1	1	1	1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	V	1	1	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1	1	W	1	1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	1	X	1	0	0
0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	1	1	1	Y	0	0

concerns. In this context, the cluster focused on planning—covering tools such as scheduling, Gantt charts, and milestone planning directly supports better upfront control and scope management. Similarly, the monitoring and controlling cluster, which includes practices like progress meetings and quality inspections, aligns with calls for improved oversight and accountability raised by (Al-Hashemi, 2015; AlZayani & Bashir, 2020). Together, these interconnected practices form a coherent model that not only validates industry input but also responds to documented gaps in Bahrain’s current project management approaches.

These findings will be further analyzed in Chapter 5, comparing them with global project management standards and Bahrain’s industry challenges.

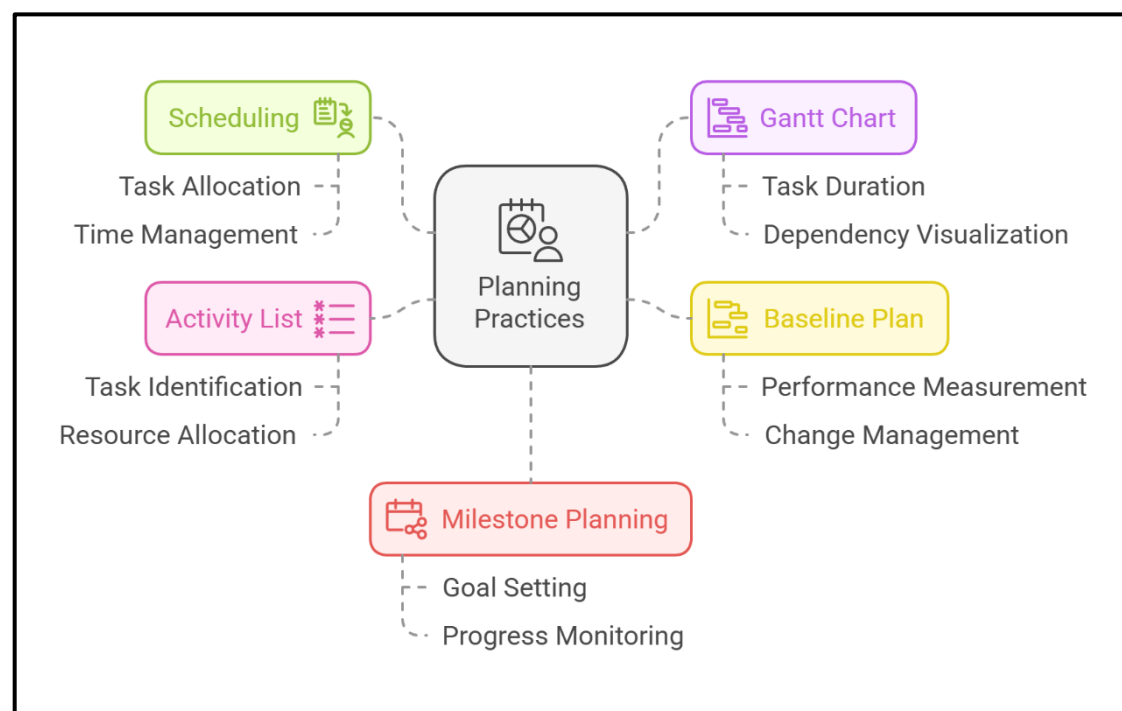


Figure 4. 11 Planning Practices Cluster

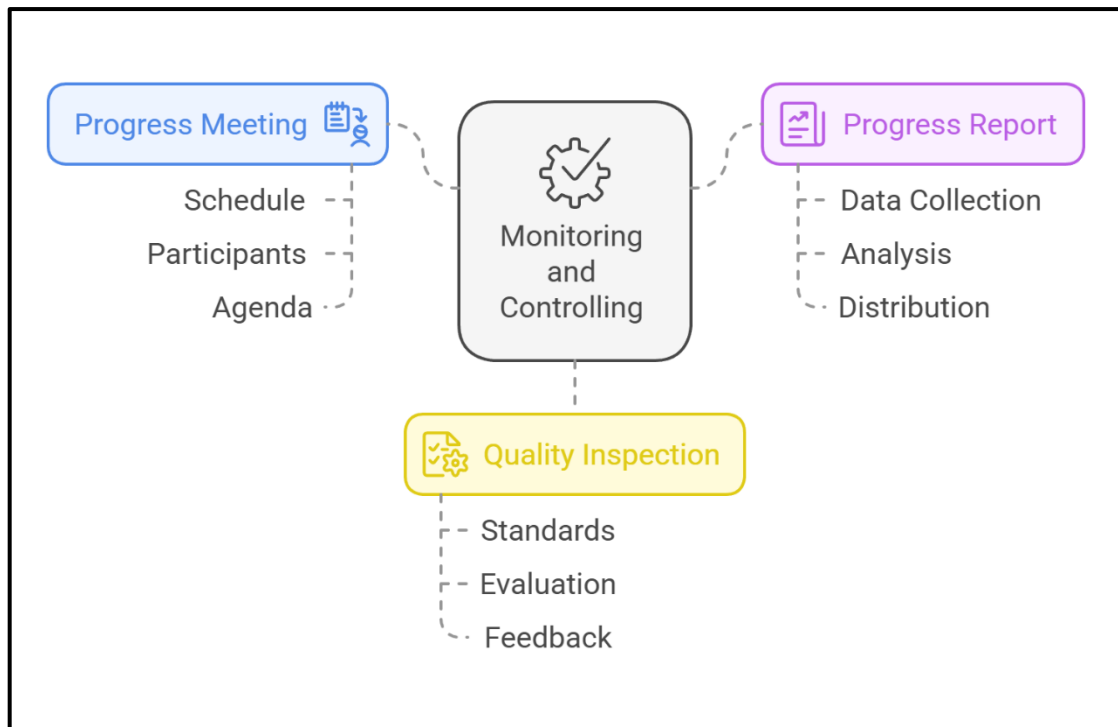


Figure 4. 12 Monitoring and Control Practices Cluster

Chapter 5: Discussion

- 5.1 Introduction
- 5.2 Overview of Findings
- 5.3 Interpretation of Results
- 5.4 Ranking Causes of Project Success and Failure
- 5.5 Area Needs to be Improved in the Construction Sector
- 5.6 Implications for the Construction Sector

4.1 Introduction

In-depth discussion of the study questionnaire results is provided in this chapter, which attempts to summarize the findings from Chapter 4. The Study examined the status of the construction projects (completed, delayed, failed) and the causes of success and failure. Moreover, the study examined several project management techniques utilized in Bahrain's construction sector, with a particular emphasis on internal consistency, reliability, data homogeneity, and the consequences of the conclusions for the industry.

This study aims to identify and structure the key project management practices predominantly adopted by participants in construction projects in Bahrain that contribute to project success. Additionally, it aims to highlight practices that are less frequently utilized, which can provide significant advantages in preventing project failures and enhancing overall performance. By evaluating the construction sector in Bahrain in terms of successful and failed projects, this research adheres to established project management standards, assesses the level of awareness regarding project management practices, and examines the support that employers provide to their employees to improve their project management skills and knowledge through certification programs.

4.2 Survey Significant Findings

The survey conducted as part of this research provided valuable insights into the project management practices within the construction industry in Bahrain. A total of 108 participants completed the questionnaire, with a significant majority being male ($n=90$, 83.3%). The roles of the participants varied, but the most frequently reported position was that of project engineer ($n = 52$, 48.1%), followed by project manager ($n=20$, 18.5%). In addition, 47.2% of the participants had more than 5 years of experience in the field. This demographic composition indicates a predominance of

experienced professionals in the construction sector, enhancing the credibility and reliability of the data collected.

At this stage, the research questions are revisited to assess whether the study's objectives have been achieved and to establish a foundation for future research. Below are the research questions and corresponding answers, based on the results in Chapter 4:

Research Question 1:

What are the number of successful projects, delayed projects, and failed projects in the construction sector of Bahrain, and the reason for the project failure from the project management point of view?

Answer:

Two-thirds of the participants reported that their projects were completed; however, a similar proportion indicated that these projects experienced delays. Additionally, around one-third of the respondents ($n = 37$, 34.3%) stated that they had been involved in failed projects.

The main success factor identified was the presence of a skilled and experienced project team capable of delivering projects with minimal losses. In contrast, the primary contributor to project failure was found to be unclear project objectives and poorly defined project scope.

A particularly notable finding is that 47.22% of respondents reported not following standard project management practices. This lack of adherence to best practices is a significant factor contributing to the relatively high failure rate. It poses a risk to economic stability, given the construction sector's importance to Bahrain's economy.

Research Question 2:

What are practices, tools, and techniques being used by project managers in these projects?

Answer:

Section 4.4.4 of this report details the practices applied across various project phases. The analysis revealed that the average usage scores for tools and techniques were around 3.0 on a five-point Likert scale in all phases, indicating that project management tools are used occasionally. However, the lowest scores were recorded in the initiation, control, and monitoring phases, suggesting a need for improvement in these areas.

A significant insight from the questionnaire relates to the limited use of project management tools and techniques. While 68.5% of participants (n = 74) agreed that having a project management-related certification is important, only 26.9% (n = 29) reported holding such a certification. Moreover, 63% of participants (n = 68) expressed dissatisfaction with the level of **employer support** for project management certification and training. This gap in professional development partially explains the inconsistent adoption of project management practices.

Research Question 3:

Is it possible to develop a framework to oversee the identified failure strands based on standard practices prescribed by internationally recognized bodies, such as the Project Management Institute?

Answer:

Section 4.5 presents a proposed model outlining best practices in project management across all phases, based on the most frequently applied practices identified in the survey. This model was then validated in Section

4.6 using the Alias Design Structure Matrix (DSM). The DSM analysis revealed two tightly connected clusters:

- The first cluster represents planning practices, including tools such as scheduling, Gantt charts, baseline plans, activity lists, and milestone planning.
- The second cluster pertains to monitoring and controlling activities, including progress meetings, reporting, and quality inspections.

To assess the practical value of this model, it is important to demonstrate how these recommended practices address known causes of failure in Bahrain's construction sector. A key objective of this study was not only to identify what practices are most commonly used but also to show how these practices can systematically reduce the risks associated with poor project outcomes. Accordingly, a detailed mapping was developed to link each failure cause identified in the literature (see Chapter 2, Table 2.5) with the relevant practices included in the proposed framework.

This mapping is presented in Table 5.1 and is based on failure causes documented by (Abusafiya & Suliman, 2017b; Haseeb et al., 2011; Mohammed, 2010). It explicitly shows how practices such as scheduling, milestone planning, bottom-up estimating, stakeholder reporting, and quality inspections provide direct responses to recurring project risks, including poor planning, cost underestimation, ineffective site management, and a lack of stakeholder coordination. For example:

Scheduling and milestone planning mitigate the risks of unrealistic timelines and poor scheduling.

Bottom-up estimating and life cycle costing address inaccurate cost estimation and resource planning failures.

Progress meetings and reporting tools improve stakeholder alignment and reduce coordination issues.

Quality inspections and appraisal tools strengthen control over execution and supervision quality.

Re-baselining and audit tracking tools support the mitigation of delayed corrective actions and follow-through.

This framework, therefore, goes beyond listing best practices. It operationalizes them as targeted solutions to documented causes of project failure, offering a PMBOK-aligned structure that supports more reliable project outcomes in Bahrain’s construction sector. This directly addresses the low project management maturity identified by AlZayani & Bashir (2020), who emphasized the need for structured training, standardized practices, and governance improvements to enhance performance across all project phases.

Table 5. 1 Mapping of Project Failure Causes to Corresponding Mitigation Practices from the Proposed Framework

Paper Title	Failure (Factors/causes)	Recommended practices from framework
Causes of cost overrun in construction projects in Bahrain (Abusafiya & Suliman, 2017)	Poor project planning and scheduling	Scheduling, Gantt Chart, Baseline Plan, Milestone Planning
	Inadequate cost estimation	Bottom-up Estimating, Life Cycle Cost, Baseline Plan
	Contractor’s financial difficulties	Financial Measurement Tools, Project Management Software for Monitoring Cost

Paper Title	Failure (Factors/causes)	Recommended practices from framework
	Poor site management and supervision	Quality Inspection, Progress Meetings, Team Member Performance Appraisal
	Inadequate procurement and equipment management	Quality Inspection, Progress Meetings, Team Member Performance Appraisal
	Lack of coordination among stakeholders	Quality Inspection, Progress Meetings, Team Member Performance Appraisal
Time and cost overrun in construction projects(Haseeb et al., 2011)	Poor initial planning	Bid Documents, Project Scope Statement, Project Statement of Works
	Underestimation of time and cost	Bottom-up Estimating, Life Cycle Cost
	Ineffective site management	Quality Inspection, Team Member Performance Appraisal
	Design errors during construction	Activity List, Quality Plan, Kick-off Meetings
	Labor shortages	Planning Meeting, Contractor Management (Execution practices)
Risk and stakeholder management in mega infrastructure projects (Mohammed, 2010)	Incomplete definition of project scope	Project Scope Statement, Project Statement of Works
	Unrealistic scheduling by contractors	Scheduling, Milestone Planning
	Delays in utility diversions	Re-baselining, Change Request, Execution Monitoring Tools

Paper Title	Failure (Factors/causes)	Recommended practices from framework
	Poor on-site coordination and public resistance	Kick-off Meetings, Stakeholder Progress Reporting
	Lack of formal mitigation strategies	Check Sheet, Re-baselining, Project Review
	No follow-through on audit findings	Team Member Performance Appraisal, Project Review, Closure Documentation

4.3 Interpretation of Results

Two checks do the interpretation of results, the first one is the internal consistency and reliability, and the second one is data homogeneity, as follows:

- Internal consistency and reliability

The results showed that Cronbach's Alpha coefficients for each phase of project management were above the acceptable threshold of 0.7, indicating a high degree of internal consistency. Specifically, the Execution Phase demonstrated the highest reliability score of 0.954, suggesting that respondents consistently understood and interpreted the questions related to this phase. This finding reinforces the reliability of the survey instrument and indicates that constructs measured are valid representations of the project management practices in use.

The implications of these findings are significant. A reliable measurement tool ensures that the conclusions drawn from the data are robust and can be trusted to inform future decisions and policies. This reliability is crucial in

the construction industry, where project management practices can significantly impact project outcomes.

- Data Homogeneity

The use of the Kruskal-Wallis test revealed no significant differences among the groups based on their roles or years of experience in terms of their perceptions of project management practices. This finding suggests a consensus among professionals regarding the importance and application of project management tools and techniques. For instance, the mean scores across various roles indicated that project managers, engineers, and other professionals generally perceive project management practices similarly.

This homogeneity of data may point to a shared understanding of the best practices in project management within the industry, potentially driven by standardized training and certification programs. However, it also raises questions about whether there is room for improvement or innovation in project management practices, especially given the dynamic nature of the construction sector.

4.4 Ranking Causes of Project Success and Failure

5.1.1 Ranking Causes of Project Success and Failure

Returning to Chapter 4, the causes of project success and failure have been ranked based on their frequency as mentioned by the participants. These percentages represent the frequency of participants in the questionnaire who chose these causes. The rankings are as follows:

Table 5. 1 Causes of Project Success

Rank	Cause of Success	Percentage %
1	Skilled and experienced project team	70.37%
2	Effective project planning and scheduling	68.52%
3	Adequate project budget and resources	63.89%
4	Effective communication and collaboration among stakeholders	60.19%
5	Clear project objective and scope	57.41%

Table 5. 2 Causes of Project Failure

Rank	Cause of Failure	Percentage %
1	Unclear project objective and scope	68.52%
2	Poor project planning and scheduling	66.67%
3	Inadequate project budget and resources	65.74%
4	Lack of skilled and experienced project team	57.41%
5	Ineffective communication and collaboration among stakeholders	56.48%

The results indicate that the most effective pathway to success involves having a skilled and experienced project team capable of leading the project and delivering it with minimal losses. This reliance on the expertise and cumulative experience of the team is essential for effectively managing the project and navigating challenges encountered throughout its execution.

Conversely, a primary contributor to project failure is the presence of unclear project objectives and scope, which can lead to misallocation of resources and hinder successful project completion. An effective project team plays a crucial role in identifying and mitigating these obstacles, thereby minimizing the potential for failure.

Additionally, the analysis reveals that participants identified the causes of project challenges with closely aligned percentages, except for risk management, which was distinctly separated from the other factors. This

suggests that various elements—including project planning and scheduling, the skills and experience of the project team, project budget and resources, project objectives and scope, and communication and collaboration among stakeholders—are all crucial to project success and failure. Therefore, project management must take into account the appropriate actions and considerations regarding these factors to enhance overall project outcomes.

5.1.2 Effect of the success and failure of the project

- Causes of Project Success

1. Skilled and Experienced Project Team (70.37%):

The composition and capabilities of the project team are pivotal for the success of construction projects. A skilled and experienced team can effectively address challenges, anticipate potential issues, and implement innovative solutions. Research by Gareis et al. (2020) demonstrates that project success is closely tied to the team's expertise, as members with diverse skills contribute to a comprehensive understanding of project complexities. Furthermore, Marcelino-Sádaba (2020) highlights that experienced teams are better equipped to manage uncertainties and risks, thereby enhancing project outcomes.

An effective project team is not just a collection of skilled individuals; it requires a synergy that fosters collaboration and collective problem-solving. Teams possessing a mix of technical expertise and soft skills can navigate challenges more adeptly, and their ability to innovate is enhanced when members feel confident in their roles and are encouraged to contribute ideas. Consequently, investing in team development through training and mentorship programs can lead to higher project success rates.

2. Effective Project Planning and Scheduling (68.52%):

Effective planning and scheduling are fundamental to the successful execution of construction projects. A well-structured plan outlines the project roadmap, identifies key milestones, and allocates resources efficiently. (Dai, 2021)Emphasize that comprehensive project plans enhance coordination among team members and stakeholders, leading to improved time management and resource utilization. Additionally, (Müller, 2022)Assert that effective scheduling provides a framework for monitoring progress and adjusting strategies in response to emerging challenges.

The importance of meticulous planning cannot be overstated, as a thorough project plan serves as a blueprint that aligns the efforts of all stakeholders. When planning is done effectively, it minimizes the risk of scope creep and ensures that resources are allocated appropriately. Moreover, advanced scheduling tools and methodologies, such as Agile or Lean practices, can enhance flexibility and responsiveness to changes, which is particularly crucial in the dynamic environment of construction.

3. Adequate Project Budget and Resources (63.89%):

The availability of adequate financial resources is a critical determinant of project success. Insufficient funding can lead to compromised quality, project delays, and unmet objectives (Zhao, 2021)Found that projects often fail when financial constraints limit the ability to hire skilled personnel or invest in necessary materials and technology. Furthermore, (Morris, 2021) Argue that comprehensive budgeting processes enable project managers to anticipate costs and allocate resources effectively, ensuring that the project remains on track.

Budgeting is not merely a financial exercise; it is a strategic tool that influences every aspect of project execution. Effective budget management

involves regular monitoring and adjustments to account for unforeseen circumstances, and stakeholder engagement in the budgeting process can enhance transparency and commitment to financial resources. Organizations should also consider establishing contingency funds to address unexpected challenges, thereby safeguarding project objectives.

4. Effective Communication and Collaboration Among Stakeholders (60.19%):

Effective communication is crucial for fostering collaboration among project stakeholders, which in turn enhances project success. (El-Dirani, 2020) Highlights that clear communication channels reduce misunderstandings and misalignments, enabling teams to work cohesively towards common goals. Furthermore, Bresnen & Marshall (2020) indicate that collaborative practices among stakeholders lead to improved trust and commitment, facilitating smoother project execution.

Communication is the lifeblood of project management; establishing robust protocols ensures that information flows seamlessly among all parties involved. Regular meetings, status updates, and feedback loops can help mitigate risks associated with miscommunication. Leveraging technology, such as project management software, can facilitate real-time information sharing. This enables quicker decision-making and problem-solving, ultimately supporting project success.

5. Clear Project Objective and Scope (57.41%):

Having clear project objectives and a well-defined scope is fundamental for guiding project efforts and measuring success. A lack of clarity in these areas can lead to scope creep, jeopardizing project timelines and budgets. (Khan et al., 2023) Argue that well-defined project goals help teams maintain focus and prioritize tasks effectively, while emphasizing the

importance of establishing a clear scope at the outset to manage stakeholder expectations.

Defining project objectives and scope involves engaging stakeholders early in the process to gather insights and expectations, ensuring a shared understanding of what success looks like. Regular reviews of project objectives can help identify potential misalignments early, allowing teams to make necessary adjustments before they escalate into larger issues. Establishing a change management process can also effectively control scope creep, thereby enhancing project delivery.

- Causes of Project Failure

Unclear Project Objective and Scope (68.52%):

Unclear project objectives and scope are significant contributors to project failure. When project goals are not well-defined, teams may struggle to prioritize tasks and allocate resources effectively. (Khan et al., 2023) It was found that ambiguity in project goals often leads to confusion and misalignment among team members, resulting in delays and cost overruns. Moreover, (Müller, 2022) emphasize that a lack of clarity in project scope can lead to scope creep, ultimately jeopardizing project outcomes.

To combat the challenges posed by unclear objectives, organizations must invest in comprehensive planning sessions that involve all relevant stakeholders. This collaborative approach fosters a sense of ownership and accountability, as stakeholders are more likely to commit to objectives they helped define. Additionally, ongoing communication about project goals throughout the project lifecycle can help maintain focus and alignment.

1. Poor Project Planning and Scheduling (66.67%):

Poor project planning and scheduling can severely hinder project success. Inadequate planning often results in unrealistic timelines, insufficient resource allocation, and overlooked risks. (Kloppenborg, 2021) Argue that projects lacking a solid planning foundation are more likely to encounter significant challenges, including delays and budget overruns. Furthermore, (Williams, 2020) Highlights that effective scheduling is vital for anticipating potential bottlenecks and managing stakeholder expectations.

Implementing a rigorous planning process that incorporates risk assessment and stakeholder input can mitigate the adverse effects of poor planning. Utilizing project management methodologies that prioritize iterative planning, such as Agile, can also enhance adaptability and responsiveness to changing project conditions. Revisiting and revising the project plan can ensure that it remains aligned with actual progress and stakeholder needs.

2. Inadequate Project Budget and Resources (65.74%):

Inadequate project budgets and resources are critical factors in project failure. Insufficient funding can lead to compromised quality and the inability to meet project requirements. (Flyvbjerg, 2021) Found that projects with poorly defined budgets often face significant challenges, including delays and unmet stakeholder expectations. Additionally, (Chua, 2020) Emphasize that financial constraints can limit the ability to hire skilled personnel or invest in necessary tools and technologies, further impacting project outcomes.

To address the risks associated with inadequate budgets, organizations must adopt a proactive budgeting approach that includes thorough cost estimation and regular financial reviews. Engaging financial experts during the planning phase can provide insights into realistic budget allocations.

Furthermore, establishing a culture of financial accountability among project managers can enhance the effective use of resources.

3. Lack of Skilled and Experienced Project Team (57.41%):

A lack of skilled and experienced project team members can significantly impact project success. Teams that lack the necessary expertise may struggle to navigate challenges and implement effective solutions. (Zhao, 2021) Found that projects led by inexperienced teams are more likely to encounter difficulties, resulting in delays and increased costs. Moreover, (Duncan, 2020) Emphasizes that investing in team development and ensuring the right mix of skills is crucial for project success.

Organizations should prioritize hiring and retaining skilled personnel through competitive compensation packages and professional development opportunities. Creating a supportive environment that encourages continuous learning and skill enhancement can contribute to a more capable workforce. Additionally, mentorship programs can help bridge the experience gap by pairing less experienced team members with seasoned professionals.

4. Ineffective Communication and Collaboration Among Stakeholders (56.48%):

Ineffective communication and collaboration among stakeholders can lead to misunderstandings, conflicts, and ultimately project failure. (Bresnen & Marshall, 2020) Highlight that weak communication practices hinder teamwork and can lead to project delays. Furthermore, (Cohen & Callaway, 2021) Emphasize that fostering a culture of open communication is essential for successful project execution, as it enables timely feedback and collaborative problem-solving.

Establishing clear communication protocols that outline how and when information should be shared can help prevent misunderstandings. Training team members in practical communication skills can also foster a collaborative culture. Utilizing collaborative tools and platforms can facilitate information sharing and improve transparency among stakeholders, thereby enhancing project coordination.

Understanding the causes of project success and failure is crucial for enhancing project management practices in the construction sector. By addressing these factors through effective strategies and processes, organizations can improve their project outcomes, reduce risks, and achieve greater alignment among stakeholders. The integration of academic insights further provides a robust foundation for developing the best practices in project management.

5.1.3 Widely Adopted Project Management Practices

In the context of the construction sector in Bahrain, several project management practices have gained widespread acceptance due to their proven effectiveness, such as bid documents, scheduling, progress meetings, work authorization, and handover. These widely adopted practices not only enhance project performance but also contribute to a culture of accountability within organizations.

5.1.4 Rarely Adopted Project Management Practices

Despite the availability of various effective project management methodologies, certain practices remain underutilized within the Bahraini construction sector. Such as project charter, Probability and impact matrix, team building event, Monte Carlo analysis, and lessons learned. The limited adoption of these practices suggests an opportunity for improvement that could significantly benefit project outcomes.

5.1.5 Recommended Model of Best Practices

Based on survey results and the collective expertise of project management professionals, a framework can be established to outline effective methods for managing projects. Adhering to best practices ensures consistency, efficiency, and quality in project execution.

5.4.5.1 Key Benefits Implementation Best Practices

Implementing a model of best practices can provide several key advantages for construction companies:

- **Improved Success Rates:** Projects are more likely to meet objectives when best practices are followed.
- **Reduced Risk of Failure or Delays:** Structured approaches minimize uncertainties.
- **Enhanced Predictability and Reliability:** Outcomes become more consistent and foreseeable.
- **Promotion of Continuous Improvement:** Encourages ongoing refinement of project management processes.
- **Alignment with Organizational Goals:** Ensures projects support strategic objectives.
- **Adopting a recognized model of best practices is fundamental for project management maturity and can lead to substantial organizational benefits.**

5.4.5.2 Tools and Techniques Applied by Phase

Here is a breakdown of the tools and techniques frequently used in each project phase, with participation percentages of more than 60%:

Table 5. 3 Project Management Tools and Techniques are Frequently Used in Each Project Phase.

Initiation Phase

• Bid Documents (71.3% of the participants) • Project Scope Statement (65.7 %) • Project Statement of Works (63.6%) • Bid/Seller Evaluation (62.4%). • Bottom-up Estimating (60.8%)
Planning Phase
• Scheduling (81.7%) • Gantt Chart (80.2%) • Baseline Plan (78%) • Activity List (75.7%) • Milestone Planning (70.9%) • Quality Plan (65%) • Life Cycle Cost (60.6%)
Execution Phase
• Progress Meetings (86.5%) • Progress Report (84.7%) • Kick off meetings (80.9%) • Quality Inspection (80.7%) • Change Request (76.5%) • Project Closeout (76%) • Planning Meeting (74%) • Status Meeting (69.4%)
Monitoring & Controlling Phase
• Work Authorization (69.1%). • Financial Measurement Tools (68.4%). • Project Management Software for Task (67.7%). • Project Management Software for Monitoring Cost (66.3%). • Check sheet (66%). • Project review (66%). • Re-baselining (63.2%). • Team Member Performance Appraisal (60.8%).
Closing Phase
• Handover (87.3%) • Project Closure Documentation (81.6%) • Close Contracts (77.7%) • Customer Satisfaction Surveys (74.3%) • Client Acceptance Form (72.8%)

4.5 Area Needs to be Improved in the Construction Sector

Referring to Chapter 4 (Section 4.4.3.6), the overall evaluation of project management practices across various phases indicates that the Initiation, Planning, and Monitoring and Closing phases exhibit lower mean scores. Specifically, in the Initiation Phase, 24.1% of participants reported scores below 2.5 out of 5, while 18.5% of participants in the Monitoring and Closing Phase similarly scored below this threshold.

Furthermore, the use of the Alias Design Structure Matrix (DSM) to validate the interconnections within the best practice model highlights critical areas for improvement. The findings suggest that where lower mean scores are observed, there is a pressing need for enhanced project management practices. Notably, the practices highly adopted in the Planning, Monitoring, and Controlling phases are closely related, indicating that even widely used practices have significant potential for improvement. This underscores the importance of continuous development within project management frameworks to enhance overall effectiveness and success rates.

Focusing on areas for improvement, it is essential to examine components that have been reported as rarely or not at all utilized by a significant proportion of participants, specifically those indicating such practices at rates of 15% or higher. This insight highlights critical gaps in the application of project management techniques and tools, signaling the need for targeted interventions to enhance overall effectiveness. Addressing these underutilized components can foster greater efficiency and success in project management practices, ultimately contributing to improved project outcomes. Here are the practices reported as rarely or not utilized across each phase of project management, with 15 % or more:

- Initiation Phase: All practices (N=34) reported as rarely or not utilized by participants exceeded 15%, with some practices reaching as high as 32%. Notably, seven practices (Bid Documents, Project Scope Statement, Project Statement of Work, Bid/Seller Evaluation, Bottom-Up Estimating, Requirements Analysis, and Cost-Benefit Analysis) demonstrated lower rates of underutilization, each falling below 15%. These findings underscore the urgent need for targeted actions to enhance the effectiveness of project management practices within this phase.

The importance of the Initiation Phase cannot be overstated, as it lays the foundation for project success. Effective initiation ensures that project objectives are clearly defined, stakeholder expectations are managed, and potential risks are identified early. Recent studies highlight that an intense Initiation Phase significantly contributes to overall project performance and stakeholder satisfaction (Smith & Jones, 2020; Lee et al., 2021). Therefore, addressing the gaps in practice within this phase is critical for improving project outcomes and achieving organizational goals.

- Planning Phase: 14 out of 28 practices reported as rarely or not utilized by participants exceeded 15%, with some practices reaching as high as 28.6%. The underutilized practices include Communication Plan, Benchmarking, Make-or-Buy Analysis, Contingency Plan, Project Management Software for Simulation, Sensitivity Analysis, Probabilistic Duration Estimate (PERT), Risk Identification, Life Cycle Assessment, Parametric Estimating, Decision Tree Analysis, Probability and Impact Matrix, Ranking of Risks, Responsibility Assignment Matrix, and Value Stream Mapping.

These findings indicate a pressing need for improvement in the Planning Phase, as effective planning is crucial for aligning project goals with stakeholder expectations and resource allocation. A well-executed planning process not only enhances project feasibility but also significantly increases the likelihood of successful project delivery (Turner & Müller, 2017; Kerzner, 2018). Addressing the gaps in practice within this phase is essential for optimizing project management processes and achieving desired outcomes.

- Execution Phase: As indicated in Figure 4 (Section 4.3.4.6), the Execution Phase exhibits the second-highest mean score, approaching 4. This is reflected here that the practices reported as rarely or not utilized by participants constitute less than half of the total practices, specifically 10 out of 12. The highest percentage of rarely or not utilized practices in this phase is 23.9%, which is lower than the percentages observed in other phases.

Despite this relatively favorable assessment, there remains a need for improvement to enhance the quality and performance of the Execution Phase. Effective execution is critical for translating project plans into actionable outcomes, ensuring that project objectives are met within the defined scope, time, and budget (Morris & Pinto, 2020; Project Management Institute, 2021). Addressing the identified gaps in practice can lead to significant advancements in project performance and stakeholder satisfaction.

- Monitoring and Controlling Phase: 26 out of 32 practices reported as rarely or not utilized by participants exceeded 15%, with some practices reaching as high as 29.6%. Consequently, only six

practices fell below this threshold. These practices include Work Authorization, Financial Management Tools, Project Management Software for Task Management, Project Management Software for Monitoring Cost, and Re-Baselining.

This finding indicates a significant weakness in the execution of monitoring and closing activities, suggesting inadequate oversight of project work and insufficient control over emerging issues. Such deficiencies can exacerbate problems and lead to diminished project outcomes and overall efficiency (Harris & McCauley, 2019; Kerzner & Saladis, 2021). Addressing these gaps is crucial to enhancing the monitoring processes and ensuring that projects are completed effectively and efficiently.

- Closing Phase: As indicated in Figure 4 (Section 4.3.4.6), the Closing Phase exhibits the highest mean score, approaching 4. This suggests that the practices reported as rarely or not utilized by participants constitute less than half of the total practices, specifically 4 out of 9. The highest percentage of rarely or not utilized practices in this phase is 23.8%, which is lower than the percentages observed in other phases and is nearly comparable to those in the Execution Phase.

Despite this relatively positive assessment, there is still room for improvement in the Closing Phase. Effective closure is vital for ensuring that all project deliverables are completed, stakeholder expectations are met, and lessons learned are documented for future projects (Gray & Larson, 2020; Project Management Institute, 2021). Enhancing the utilization of practices within this phase can

contribute to more successful project completions and improve overall project management effectiveness.

4.6 Implications for the Construction Sector in

Bahrain

Referring to Chapter 1, the construction sector plays a vital role in Bahrain's economy, contributing approximately 7.2% to the Gross Domestic Product (GDP) in the third quarter of 2022. This industry not only significantly bolsters the country's economic framework but also provides substantial employment opportunities for many individuals. Given its pivotal role in national development, it is crucial to understand the implications of both poor and strong performance within this sector.

The adverse effects of inadequate project management practices can lead to project failures, which not only impact financial outcomes but also threaten economic stability and growth. Conversely, effective project management can enhance project success rates, leading to improved resource utilization, stakeholder satisfaction, and overall economic contributions. Therefore, it is imperative to prioritize this sector by addressing its challenges, mitigating risks, and leveraging its strengths.

The findings from this research carry significant implications for the construction sector in Bahrain. Addressing the identified gaps in project management practices can lead to substantial improvements in project outcomes and overall industry performance. The following implications outline key areas for consideration:

1. **Enhanced Project Management Training:** The study emphasizes the need for greater knowledge and comprehension of efficient project management techniques. Employers should fund extensive training initiatives that give staff members the chance to earn certifications.

This would promote a culture of ongoing learning and professional growth in addition to enhancing individual competencies.

2. **Adoption of Best Practices:** By implementing the recommended model of best practices tailored to the Bahraini construction sector, companies can enhance their operational efficiency. This model should integrate both widely accepted practices and those that are underutilized, ensuring a balanced approach to project management.
3. **Focus on the Initiation and Planning Phases:** The research identifies critical weaknesses in the Initiation and Planning phases. Organizations should prioritize improvements in these areas, as effective initiation lays the foundation for project success, while robust planning aligns project goals with stakeholder expectations and resource allocation.
4. **Strengthening Monitoring and Controlling Mechanisms:** The findings indicate a lack of effective monitoring and controlling practices. Enhancing these mechanisms is vital for ensuring that projects remain on track, issues are addressed promptly, and resources are utilized efficiently. This might involve adopting advanced project management software and establishing clear performance metrics.
5. **Encouraging Collaboration and Communication:** Effective communication and collaboration among stakeholders are essential for project success. The sector should promote practices that facilitate open dialogue and teamwork, such as regular progress meetings and the use of collaborative tools that enhance information sharing.
6. **Addressing Project Failures Proactively:** The notable failure rate within the sector underscores the urgency for proactive measures to mitigate risks associated with project management. Organizations

should conduct thorough risk assessments and develop contingency plans that enable them to respond effectively to unforeseen challenges.

7. **Incorporating Feedback Loops:** Establishing mechanisms for capturing lessons learned at the end of each project can significantly contribute to organizational learning. This practice will help create a repository of knowledge that can inform future projects and improve overall project management practices.
8. **Engagement with Stakeholders:** Involving stakeholders in the project management process, particularly during the initiation and planning phases, ensures that their expectations and requirements are understood and addressed. This engagement can lead to higher satisfaction levels and reduce the likelihood of project scope changes later in the project lifecycle.
9. **Setting Minimum Requirements for Project Managers:** In order to create a competitive environment and guarantee that only competent candidates are hired, businesses should establish minimum educational and experience requirements for project managers. This strategy will enhance the level of professionalism and legitimacy of project management in the industry.
10. **Policy Advocacy:** Professionals should interact with legislators to support laws that encourage best practices in project management, including required training standards or rules for risk management in the building industry.
11. **Technology Adoption:** By offering grants or subsidies to construction companies that are prepared to invest in cutting-edge technologies, such as Building Information Modeling (BIM) and AI-driven project management systems, policymakers can encourage the adoption of these technologies.

By embracing these implications, the construction sector in Bahrain can improve not only the success rates of individual projects but also contribute positively to the broader economic landscape. Enhanced project management practices will lead to more efficient use of resources, improved stakeholder satisfaction, and ultimately, a stronger and more resilient construction industry.

Chapter 6: Conclusion

- 6.1 Summery of Key Findings and Contributions
- 6.2 Limitations, Policy Implications, and Future Research

6.1 Summary of Key Findings and Contributions

This study has examined the complex terrain of project management techniques in Bahrain's construction industry, highlighting their pivotal function in determining the success or failure of projects. The study emphasizes the pressing need for better project management frameworks to improve performance results and lower risk exposure, given that the industry in question makes a substantial contribution to the national economy.

This study used a systematic quantitative approach to gather the opinions of 108 construction professionals, most of whom have a great deal of experience in the industry. The analysis revealed that although many project management practices are moderately adopted, significant shortcomings persist, particularly in the initiation and planning stages, which are crucial for project success. Interestingly, about one-third of participants reported being involved in unsuccessful projects, with unclear project objectives, noncompliance with standards, and poor stakeholder alignment cited as major contributing factors.

The results also showed that the use of project management tools and techniques remains uneven, with most respondents recognizing the value of project management certification. However, only a small percentage possess such credentials. Furthermore, a lack of employer support for training and development hinders the broader adoption of best practices. This discrepancy between awareness and implementation highlights a crucial area for industry intervention.

The Alias Design Structure Matrix (DSM) was used to create and test a validated model of best practices. The DSM revealed two closely related clusters: one focused on planning methods (like scheduling and Gantt

charts) and the other on monitoring and control instruments (like progress meetings and quality inspection). These clusters offer a road map for enhancing project results via targeted training and practice interventions.

These findings have important significance for scholars, practitioners, and policymakers. They highlight the need for enhanced training programs, more comprehensive stakeholder involvement, and organizational adjustments that promote the systematic and consistent application of project management principles. In particular, enhancing the resilience and efficacy of the construction industry requires advancements in the early stages of projects as well as the implementation of feedback systems, risk-reduction techniques, and contemporary technologies.

In sum, the Bahraini construction industry stands at a critical juncture. By adopting internationally recognized standards, investing in workforce development, and aligning policy with practice, the sector can significantly improve project delivery outcomes. These changes will not only lead to better project performance but also foster long-term economic sustainability and stakeholder trust.

6.2 Limitations, Policy Implications, and Future Research

It is important to recognize the various limitations of this study. First, the sample size, participant variety, and the use of self-reported data, which may introduce subjectivity, may limit the broad applicability of the results. It is possible that by concentrating on particular project management techniques, other pertinent methods employed in the building sector were also missed. Moreover, project engineers comprised 48.2% ($n = 52$) of the participants. Future research focusing specifically on project managers and

construction managers could yield more comprehensive and credible results. Additionally, extending the survey period in future studies would allow for a broader and more representative dataset, addressing one of the limitations of the current study.

Furthermore, the report does not thoroughly examine the developing role of artificial intelligence (AI) in project management, even while it highlights technologies like Gantt charts and scheduling software. Future studies should examine the practical uses of AI technologies and their effects on project performance as they continue to advance, improving forecasting, scheduling, risk analysis, and decision-making. This is particularly pertinent to large-scale building projects, where complexity and unpredictability are being managed more and more through automation and predictive analytics. The abilities needed by project managers to successfully implement and use AI systems should also be investigated by researchers.

Moreover, access to actual project performance records from Bahraini building projects and longitudinal data will be beneficial for future research. The development of more flexible and technologically integrated project management frameworks that are suited to the local context may be aided by the identification of success and failure trends over time.

Lastly, future studies could evaluate the implementation of the proposed best-practices framework through pilot programs and longitudinal tracking. Researchers may explore metrics for adoption, stakeholder feedback, and outcome comparisons before and after implementation. Such work would help validate the model's real-world utility. Policy research could also examine the impact of mandating framework compliance, particularly in public-sector construction projects in Bahrain.

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Appendices

Appendix 1: Full Online Survey Questionnaire

Appendix 2: Example of Survey Done by One of the Participant

Appendix 3: Profile of experts who did the evaluation of the survey.

Appendix 1

In this appendix, the full online survey questionnaire will be shown:

Project Management Practices in Construction Sector in Bahrain - ممارسات إدارة المشاريع في قطاع البناء في البحرين

As part of the requirements for my Master's degree in Engineering Management at the University of Bahrain, I am conducting this study to evaluate the strategies, challenges, and factors contributing to both the success and failure of projects in Bahrain. Your insights will contribute significantly to advancing our understanding of project management in this context and may help inform future project management practices. The findings from this research will also be compiled into a comprehensive report for publication in international journals, thus making a meaningful contribution to the global knowledge base in project management.

We are Kindly requested to spare part of your valuable to answer all attached questions carefully and substantively.

Please note that all data will remain confidential when analyzing the questionnaire. Also, no personal information will be shared. The collected data will be analyzed by statistical method to help in finding model to improve the project management practices in construction which will reflect on the performance and reduces the failure causes and their effects.

Your collaboration will be highly appreciated. For further information or clarifications please contact me through my email: 20162771@stu.uob.edu.bh
Number: +973 36499986
Name: Taher Ebrahim Yusuf Ebrahim Abdulla

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* Indicates required question

Appendix 1 - Figure 1 The Introduction of the Online Survey

Section 1: General Information

Name:

Your answer

Gender *

- ☐ Male
- ☐ Female

What is your role in the construction industry? *

- ☐ Project Manager
- ☐ Construction Manager
- ☐ Project In charge
- ☐ Project Engineer
- ☐ Other: _____

How many years of experience do you have in the construction industry? *

- ☐ Less than 5 years
- ☐ 5-10 years
- ☐ 10-15 years
- ☐ More than 15 years

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Appendix 1 - Figure 2 Section 1 of the Online Survey

Section 2: Project Success Evaluation

Number of Projects you have managed or got involved? *

Your answer

How many of the projects successfully completed all dimensions? *

Your answer

Do you hold any PM certification like (PMP, CAPM, PRINCE 2, PMIACP, CSM, CSM
IPMP, MPM, PPM, and Others *

☐ Yes

☐ No

If yes, please specify the certification

Your answer

Rate the importance of having a professional certification to enhance their skills
that could impact the success of projects. *

☐ 5 - Very Important

☐ 4 - Important

☐ 3 - Moderately Important

☐ 2 - Somewhat Important

☐ 1 - Not Important

Appendix 1 - Figure 3 Section of the Online Survey (Part 1)

Is there any support offered by the employer in acquiring the certification and training in recent trends in project management. *

☐ Yes

☐ No

☐ Other: _____

In your experience, what percentage of construction projects in Bahrain are completed successfully? *

☐ 0-25%

☐ 26-50%

☐ 51-75%

☐ 76-100%

In your experience, what percentage of construction projects in Bahrain are completed but delayed? *

☐ 0-25%

☐ 26-50%

☐ 51-75%

☐ 76-100%

Have you personally been involved in any failed construction projects in Bahrain? *

☐ No

☐ Yes

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Appendix 1 - Figure 4 Section 3 of the Online Survey (Part 2)

Section 3: Causes of Success or Failure

There are many success & failure causes, the below listed options are consolidated from latest research publications.

Are you following the standard for project management practices using " Project Management Body of Knowledge " PMBOK. *

Your answer

In your opinion, what are the main factors contributing to the success of construction projects in Bahrain? *

- ☐ Effective project planning and scheduling
- ☐ Skilled and experienced project team
- ☐ Adequate project budget and resources
- ☐ Clear project objectives and scope
- ☐ Effective communication and collaboration among stakeholders
- ☐ Efficient risk management
- ☐ Other: _____

In your opinion, what are the main factors contributing to the failure of construction projects in Bahrain? (Select all that apply) *

- ☐ Poor project planning and scheduling
- ☐ Inadequate project budget and resources
- ☐ Lack of skilled and experienced project team
- ☐ Unclear project objectives and scope
- ☐ Ineffective communication and collaboration among stakeholders
- ☐ Inefficient risk management
- ☐ Other: _____

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Appendix 1 - Figure 5 Section 3 of the Online Survey

Section 4: Project Management Practices for each project phase

After conducting a thorough study and research into PMBOK and recent scholarly publications, the following project management practices have been identified for each phase.

Section 4-1: Project Management Techniques and Tools (Initiating Phase)

To ascertain the frequency of utilization of project management techniques and tools during the Initiating Phase in construction projects in Bahrain, a comprehensive assessment will be conducted. This evaluation aims to gauge the prevalence and effectiveness of such methodologies in facilitating project initiation within the construction industry context.

How frequently are project management techniques and tools used in construction projects in Bahrain for Initiating Phase? *

	Very frequently (5)	Frequently (4)	Occasionally (3)	Rarely (2)	Not at all (1)	Not Aware (0)
Bid Documents	☐	☐	☐	☐	☐	☐
Bid/Seller Evaluation	☐	☐	☐	☐	☐	☐
Graphic Presentation of Risk Information	☐	☐	☐	☐	☐	☐
Bidders Conferences	☐	☐	☐	☐	☐	☐
Project Scope Statement	☐	☐	☐	☐	☐	☐
Bottom-up Estimating	☐	☐	☐	☐	☐	☐
Project Statement of Work	☐	☐	☐	☐	☐	☐
Feasibility Study	☐	☐	☐	☐	☐	☐
Top-down Estimating	☐	☐	☐	☐	☐	☐
Requirements Analysis	☐	☐	☐	☐	☐	☐
Cost-Benefit Analysis	☐	☐	☐	☐	☐	☐
Project Charter	☐	☐	☐	☐	☐	☐

Appendix 1 - Figure 6 Section 4 of the Online Survey (Part 1)

Project Charter	☐	☐	☐	☐	☐	☐
Database for Cost Estimating	☐	☐	☐	☐	☐	☐
Stakeholders Analysis	☐	☐	☐	☐	☐	☐
Database of Contractual Commitment Data Project Communication Room	☐	☐	☐	☐	☐	☐
Database of Historical Data	☐	☐	☐	☐	☐	☐
Project Management Software for Cost Estimating	☐	☐	☐	☐	☐	☐
Alternatives analysis	☐	☐	☐	☐	☐	☐
Assumption and constraint analysis	☐	☐	☐	☐	☐	☐
Business justification analysis methods.	☐	☐	☐	☐	☐	☐
Expected monetary value (EMV).	☐	☐	☐	☐	☐	☐
Simulations.	☐	☐	☐	☐	☐	☐
Stakeholder analysis.	☐	☐	☐	☐	☐	☐
SWOT analysis.	☐	☐	☐	☐	☐	☐
Affinity grouping.	☐	☐	☐	☐	☐	☐
Analogous estimating.	☐	☐	☐	☐	☐	☐
Function point.	☐	☐	☐	☐	☐	☐
Multipoint estimating.	☐	☐	☐	☐	☐	☐

Appendix 1 - Figure 7 Section 4 of the Online Survey (Part 2)

Multipoint estimating.	☐	☐	☐	☐	☐	☐
Parametric estimating.	☐	☐	☐	☐	☐	☐
Relative estimating.	☐	☐	☐	☐	☐	☐
Single-point estimating.	☐	☐	☐	☐	☐	☐
Story point estimating.	☐	☐	☐	☐	☐	☐
Wideband Delphi.	☐	☐	☐	☐	☐	☐
Impact mapping	☐	☐	☐	☐	☐	☐

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Appendix 1 - Figure 8 Section 4 of Online Survey (Part 3)

Section 4-2: Project Management Techniques and Tools (Planning Phase)

To ascertain the frequency of utilization of project management techniques and tools during the planning Phase in construction projects in Bahrain, a comprehensive assessment will be conducted. This evaluation aims to gauge the prevalence and effectiveness of such methodologies in facilitating project planning within the construction industry context.

How frequently are project management techniques and tools used in construction projects in Bahrain for Planning Phase? *

	Very frequently (5)	Frequently (4)	Occasionally (3)	Rarely (2)	Not at all (1)	Not Aware (0)
Activity List	☐	☐	☐	☐	☐	☐
Baseline Plan	☐	☐	☐	☐	☐	☐
Gantt Chart	☐	☐	☐	☐	☐	☐
Scheduling	☐	☐	☐	☐	☐	☐
Qualitative Risk Analysis	☐	☐	☐	☐	☐	☐
Life Cycle Cost	☐	☐	☐	☐	☐	☐
Milestone Planning	☐	☐	☐	☐	☐	☐
Quality Plan	☐	☐	☐	☐	☐	☐
Communication Plan	☐	☐	☐	☐	☐	☐
Project Management Software for Resource Leveling	☐	☐	☐	☐	☐	☐
Network Diagram	☐	☐	☐	☐	☐	☐
Quantitative Risk Analysis	☐	☐	☐	☐	☐	☐
Ranking of Risks	☐	☐	☐	☐	☐	☐
Parametric Estimating	☐	☐	☐	☐	☐	☐
Contingency Plans/Risk Response Plan	☐	☐	☐	☐	☐	☐
Probabilistic Duration Estimate (PERT)	☐	☐	☐	☐	☐	☐
Product Breakdown	☐	☐	☐	☐	☐	☐

Appendix 1 - Figure 9 Section 4 of the Online Survey (Part 4)

Contingency Plans/Risk Response Plan	☐	☐	☐	☐	☐	☐
Probabilistic Duration Estimate (PERT)	☐	☐	☐	☐	☐	☐
Product Breakdown Structure	☐	☐	☐	☐	☐	☐
Responsibility Assignment Matrix	☐	☐	☐	☐	☐	☐
Project Management Software for Resource Scheduling Work Breakdown Structure	☐	☐	☐	☐	☐	☐
Project Management Software for Simulation	☐	☐	☐	☐	☐	☐
Risk Identification	☐	☐	☐	☐	☐	☐
Benchmarking	☐	☐	☐	☐	☐	☐
Decision tree analysis.	☐	☐	☐	☐	☐	☐
Life cycle assessment	☐	☐	☐	☐	☐	☐
Make-or-buy analysis.	☐	☐	☐	☐	☐	☐
Probability and impact matrix	☐	☐	☐	☐	☐	☐
Sensitivity analysis.	☐	☐	☐	☐	☐	☐
Value stream mapping.	☐	☐	☐	☐	☐	☐

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Appendix 1 - Figure 10 Section 4 of the Online Survey (Part 5)

Section 4-3: Project Management Techniques and Tools (Executing Phase)

To ascertain the frequency of utilization of project management techniques and tools during the Executing Phase in construction projects in Bahrain, a comprehensive assessment will be conducted. This evaluation aims to gauge the prevalence and effectiveness of such methodologies in facilitating project executing within the construction industry context.

How frequently are project management techniques and tools used in construction projects in Bahrain for Executing Phase? *

	Very frequently (5)	Frequently (4)	Occasionally (3)	Rarely (2)	Not at all (1)	Not Aware (0)
Kick-off Meeting	☐	☐	☐	☐	☐	☐
Change Request	☐	☐	☐	☐	☐	☐
Quality Inspection	☐	☐	☐	☐	☐	☐
Configuration Review	☐	☐	☐	☐	☐	☐
Decision Tree	☐	☐	☐	☐	☐	☐
Progress Meetings	☐	☐	☐	☐	☐	☐
Critical Path Method	☐	☐	☐	☐	☐	☐
Progress Report	☐	☐	☐	☐	☐	☐
Self-Directed Work Teams	☐	☐	☐	☐	☐	☐
Team-Building Event	☐	☐	☐	☐	☐	☐
Backlog refinement.	☐	☐	☐	☐	☐	☐
Change control board.	☐	☐	☐	☐	☐	☐
Daily standup.	☐	☐	☐	☐	☐	☐
Iteration planning	☐	☐	☐	☐	☐	☐
Planning meeting.	☐	☐	☐	☐	☐	☐
Project closeout.	☐	☐	☐	☐	☐	☐

Appendix 1 - Figure 11 Section 4 of the Online Survey (Part 6)

Project closeout.	☐	☐	☐	☐	☐	☐
Release planning.	☐	☐	☐	☐	☐	☐
Risk review.	☐	☐	☐	☐	☐	☐
Status meeting.	☐	☐	☐	☐	☐	☐
Steering committee.	☐	☐	☐	☐	☐	☐
Modeling	☐	☐	☐	☐	☐	☐
Timebox	☐	☐	☐	☐	☐	☐

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Appendix 1 - Figure 12 Section 4 of the Online Survey (Part 7)

Section 4-4: Project Management Techniques and Tools (Monitoring & Controlling Phase)

To ascertain the frequency of utilization of project management techniques and tools during the monitoring & controlling Phase in construction projects in Bahrain, a comprehensive assessment will be conducted. This evaluation aims to gauge the prevalence and effectiveness of such methodologies in facilitating project monitoring & controlling within the construction industry context.

How frequently are project management techniques and tools used in construction projects in Bahrain for Monitoring & Controlling Phase? *

	Very frequently (5)	frequently (4)	Occasionally (3)	Rarely (2)	Not at all (1)	Not Aware (0)
Financial Measurement Tools	☐	☐	☐	☐	☐	☐
Project Management Software for Task	☐	☐	☐	☐	☐	☐
Project Management Software for Monitoring Cost	☐	☐	☐	☐	☐	☐
Work Authorization	☐	☐	☐	☐	☐	☐
Cause-and-Effect Diagram	☐	☐	☐	☐	☐	☐
Learning Curve	☐	☐	☐	☐	☐	☐
Quality Function Deployment	☐	☐	☐	☐	☐	☐
Monte Carlo Analysis	☐	☐	☐	☐	☐	☐
Project Management Software for Monitoring Schedule Value Analysis	☐	☐	☐	☐	☐	☐
Re-baselining	☐	☐	☐	☐	☐	☐
Pareto Diagram	☐	☐	☐	☐	☐	☐
Control Charts	☐	☐	☐	☐	☐	☐

Appendix 1 - Figure 13 Section 4 of the Online Survey (Part 8)

Control Charts	☐	☐	☐	☐	☐	☐
Critical Chain Method	☐	☐	☐	☐	☐	☐
Risk Reassessment	☐	☐	☐	☐	☐	☐
Team Member Performance Appraisal	☐	☐	☐	☐	☐	☐
Project Issue Log	☐	☐	☐	☐	☐	☐
Trend Chart or S-Curve	☐	☐	☐	☐	☐	☐
Check sheet	☐	☐	☐	☐	☐	☐
Cost of quality	☐	☐	☐	☐	☐	☐
Earned value analysis	☐	☐	☐	☐	☐	☐
Forecast.	☐	☐	☐	☐	☐	☐
Influence diagram.	☐	☐	☐	☐	☐	☐
Process analysis	☐	☐	☐	☐	☐	☐
Regression analysis	☐	☐	☐	☐	☐	☐
Reserve analysis.	☐	☐	☐	☐	☐	☐
Root cause analysis.	☐	☐	☐	☐	☐	☐
Trend analysis	☐	☐	☐	☐	☐	☐
Variance analysis	☐	☐	☐	☐	☐	☐
What-if scenario analysis.	☐	☐	☐	☐	☐	☐
Iteration review	☐	☐	☐	☐	☐	☐
Lessons learned meeting	☐	☐	☐	☐	☐	☐
Project review.	☐	☐	☐	☐	☐	☐

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Appendix 1 - Figure 14 Section 4 of the Online Survey (Part 9)

Section 4-5: Project Management Techniques and Tools (Closing Phase)

To ascertain the frequency of utilization of project management techniques and tools during the closing Phase in construction projects in Bahrain, a comprehensive assessment will be conducted. This evaluation aims to gauge the prevalence and effectiveness of such methodologies in facilitating project closing within the construction industry context.

How frequently are project management techniques and tools used in construction projects in Bahrain for Closing Phase? *

	Very frequently (5)	frequently (4)	Occasionally (3)	Rarely (2)	Not at all (1)	Not Aware (0)
Handover	☐	☐	☐	☐	☐	☐
Database of Lessons Learned	☐	☐	☐	☐	☐	☐
Lessons Learned	☐	☐	☐	☐	☐	☐
Client Acceptance Form	☐	☐	☐	☐	☐	☐
Close Contracts	☐	☐	☐	☐	☐	☐
Customer Satisfaction Surveys	☐	☐	☐	☐	☐	☐
Project Closure Documentation	☐	☐	☐	☐	☐	☐
Retrospective.	☐	☐	☐	☐	☐	☐
Net Promoter Score (NPS®).	☐	☐	☐	☐	☐	☐

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Appendix 1 - Figure 15 Section 4 of the Online Survey (Part 10)

The image shows a screenshot of a survey section titled "Section 5: Additional Comments". The title is in a purple header bar. Below the header, there is a white box containing the instruction: "Please provide any additional comments or insights regarding project management practices in the construction sector in Bahrain." Below this instruction is a text input field with the placeholder text "Your answer". At the bottom of the form, there are three buttons: a white "Back" button, a purple "Submit" button, and a purple "Clear form" link.

Section 5: Additional Comments

Please provide any additional comments or insights regarding project management practices in the construction sector in Bahrain.

Your answer

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Appendix 1 - Figure 16 Section 5 of the Online Survey

Appendix 2

In this appendix, a sample of a survey done by one of the participant will be shown:

Section 1: General Information

Name:
XXXXX

Gender *

☒ Male
☐ Female

What is your role in the construction industry? *

☒ Project Manager
☐ Construction Manager
☐ Project In charge
☐ Project Engineer
☐ Other: _____

How many years of experience do you have in the construction industry? *

☐ Less than 5 years
☒ 5-10 years
☐ 10-15 years
☐ More than 15 years

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Appendix 2 - Figure 1 Sample of Completed Survey by Participant (Part 1)

Section 2: Project Success Evaluation

Number of Projects you have managed or got involved? *

10

How many of the projects successfully completed all dimensions? *

6

Do you hold any PM certification like (PMP, CAPM, PRINCE 2, PMIACP, CSM, CSM IPMP, MPM, PPM, and Others) *

☐ Yes

☒ No

If yes, please specify the certification

Your answer

Rate the importance of having a professional certification to enhance their skills that could impact the success of projects. *

☒ 5 - Very Important

☐ 4 - Important

☐ 3 - Moderately Important

☐ 2 - Somewhat Important

☐ 1 - Not Important

Is there any support offered by the employer in acquiring the certification and training in recent trends in project management. *

☐ Yes

☒ No

☐ Other:

Appendix 2 - Figure 2 Sample of Completed Survey by Participant (Part 2)

Is there any support offered by the employer in acquiring the certification and training in recent trends in project management. *

☐ Yes

☒ No

☐ Other: _____

In your experience, what percentage of construction projects in Bahrain are completed successfully? *

☐ 0-25%

☐ 26-50%

☒ 51-75%

☐ 76-100%

In your experience, what percentage of construction projects in Bahrain are completed but delayed? *

☐ 0-25%

☒ 26-50%

☐ 51-75%

☐ 76-100%

Have you personally been involved in any failed construction projects in Bahrain? *

☐ No

☒ Yes

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Appendix 2 - Figure 3 Sample of Completed Survey by Participant (Part 3)

Section 3: Causes of Success or Failure

There are many success & failure causes, the below listed options are consolidated from latest research publications.

Are you following the standard for project management practices using " Project Management Body of Knowledge " PMBOK. *

Yes _____

In your opinion, what are the main factors contributing to the success of construction projects in Bahrain? *

- ☒ Effective project planning and scheduling
- ☒ Skilled and experienced project team
- ☒ Adequate project budget and resources
- ☐ Clear project objectives and scope
- ☒ Effective communication and collaboration among stakeholders
- ☐ Efficient risk management
- ☐ Other: _____

In your opinion, what are the main factors contributing to the failure of construction projects in Bahrain? (Select all that apply) *

- ☒ Poor project planning and scheduling
- ☒ Inadequate project budget and resources
- ☒ Lack of skilled and experienced project team
- ☐ Unclear project objectives and scope
- ☒ Ineffective communication and collaboration among stakeholders
- ☐ Inefficient risk management
- ☐ Other: _____

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Appendix 2 - Figure 4 Sample of Completed Survey by Participant (Part 4)

Section 4: Project Management Practices for each project phase

After conducting a thorough study and research into PMBOK and recent scholarly publications, the following project management practices have been identified for each phase.

Section 4-1: Project Management Techniques and Tools (Initiating Phase)

To ascertain the frequency of utilization of project management techniques and tools during the Initiating Phase in construction projects in Bahrain, a comprehensive assessment will be conducted. This evaluation aims to gauge the prevalence and effectiveness of such methodologies in facilitating project initiation within the construction industry context.

How frequently are project management techniques and tools used in construction projects in Bahrain for Initiating Phase? *

	Very frequently (5)	Frequently (4)	Occasionally (3)	Rarely (2)	Not at all (1)	Not Aware (0)
Bid Documents	☒	☐	☐	☐	☐	☐
Bid/Seller Evaluation	☒	☐	☐	☐	☐	☐
Graphic Presentation of Risk Information	☐	☐	☐	☒	☐	☐
Bidders Conferences	☐	☐	☐	☒	☐	☐
Project Scope Statement	☒	☐	☐	☐	☐	☐
Bottom-up Estimating	☐	☐	☐	☒	☐	☐
Project Statement of Work	☐	☐	☒	☐	☐	☐
Feasibility Study	☐	☐	☐	☒	☐	☐
Top-down Estimating	☐	☐	☐	☒	☐	☐
Requirements Analysis	☐	☒	☐	☐	☐	☐
Cost-Benefit Analysis	☐	☐	☐	☒	☐	☐
Project Charter	☐	☒	☐	☐	☐	☐

Appendix 2 - Figure 5 Sample of Completed Survey by Participant (Part 5)

Project Charter	☐	☒	☐	☐	☐	☐
Database for Cost Estimating	☐	☐	☐	☐	☒	☐
Stakeholders Analysis	☐	☐	☐	☐	☒	☐
Database of Contractual Commitment Data Project Communication Room	☐	☐	☐	☐	☒	☐
Database of Historical Data	☐	☐	☐	☐	☒	☐
Project Management Software for Cost Estimating	☐	☐	☐	☐	☒	☐
Alternatives analysis	☐	☐	☐	☒	☐	☐
Assumption and constraint analysis	☐	☐	☐	☒	☐	☐
Business justification analysis methods.	☐	☐	☒	☐	☐	☐
Expected monetary value (EMV).	☐	☐	☐	☐	☒	☐
Simulations.	☐	☐	☐	☐	☒	☐
Stakeholder analysis.	☐	☐	☐	☐	☒	☐
SWOT analysis.	☐	☐	☐	☒	☐	☐
Affinity grouping.	☐	☐	☐	☐	☒	☐
Analogous estimating.	☐	☐	☐	☐	☒	☐
Function point.	☐	☐	☐	☐	☒	☐
Multipoint estimating.	☐	☐	☐	☐	☒	☐
Parametric estimating.	☐	☐	☐	☐	☒	☐

Appendix 2 - Figure 6 Sample of Completed Survey by Participant (Part 6)

Parametric estimating.	☐	☐	☐	☐	☒	☐
Relative estimating.	☐	☐	☒	☐	☐	☐
Single-point estimating.	☐	☐	☐	☒	☐	☐
Story point estimating.	☐	☐	☐	☒	☐	☐
Wideband Delphi.	☐	☒	☐	☐	☐	☐
Impact mapping	☐	☐	☐	☒	☐	☐

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Appendix 2 - Figure 7 Sample of Completed Survey by Participant (Part 7)

Section 4-2: Project Management Techniques and Tools (Planning Phase)

To ascertain the frequency of utilization of project management techniques and tools during the planning Phase in construction projects in Bahrain, a comprehensive assessment will be conducted. This evaluation aims to gauge the prevalence and effectiveness of such methodologies in facilitating project planning within the construction industry context.

How frequently are project management techniques and tools used in construction projects in Bahrain for Planning Phase? *

	Very frequently (5)	Frequently (4)	Occasionally (3)	Rarely (2)	Not at all (1)	Not Aware (0)
Activity List	☒	☐	☐	☐	☐	☐
Baseline Plan	☒	☐	☐	☐	☐	☐
Gantt Chart	☒	☐	☐	☐	☐	☐
Scheduling	☒	☐	☐	☐	☐	☐
Qualitative Risk Analysis	☐	☐	☒	☐	☐	☐
Life Cycle Cost	☐	☒	☐	☐	☐	☐
Milestone Planning	☒	☐	☐	☐	☐	☐
Quality Plan	☒	☐	☐	☐	☐	☐
Communication Plan	☐	☒	☐	☐	☐	☐
Project Management Software for Resource Leveling	☐	☐	☒	☐	☐	☐
Network Diagram	☐	☐	☒	☐	☐	☐
Quantitative Risk Analysis	☐	☐	☐	☒	☐	☐
Ranking of Risks	☐	☐	☒	☐	☐	☐
Parametric Estimating	☐	☐	☐	☒	☐	☐
Contingency Plans/Risk Response Plan	☐	☒	☐	☐	☐	☐

Appendix 2 - Figure 8 Sample of Completed Survey by Participant (Part 8)

Contingency Plans/Risk Response Plan	☐	☒	☐	☐	☐	☐
Probabilistic Duration Estimate (PERT)	☐	☐	☒	☐	☐	☐
Product Breakdown Structure	☐	☒	☐	☐	☐	☐
Responsibility Assignment Matrix	☐	☐	☒	☐	☐	☐
Project Management Software for Resource Scheduling Work Breakdown Structure	☐	☒	☐	☐	☐	☐
Project Management Software for Simulation	☐	☐	☐	☐	☒	☐
Risk Identification	☐	☐	☐	☒	☐	☐
Benchmarking	☐	☒	☐	☐	☐	☐
Decision tree analysis.	☐	☐	☐	☐	☒	☐
Life cycle assessment	☐	☐	☐	☐	☒	☐
Make-or-buy analysis.	☐	☐	☐	☐	☒	☐
Probability and impact matrix	☐	☐	☐	☐	☒	☐
Sensitivity analysis.	☐	☐	☐	☒	☐	☐
Value stream mapping.	☐	☐	☐	☐	☒	☐

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Appendix 2 - Figure 9 Sample of Completed Survey by Participant (Part 9)

Section 4-3: Project Management Techniques and Tools (Executing Phase)

To ascertain the frequency of utilization of project management techniques and tools during the Executing Phase in construction projects in Bahrain, a comprehensive assessment will be conducted. This evaluation aims to gauge the prevalence and effectiveness of such methodologies in facilitating project executing within the construction industry context.

How frequently are project management techniques and tools used in construction projects in Bahrain for Executing Phase? *

	Very frequently (5)	Frequently (4)	Occasionally (3)	Rarely (2)	Not at all (1)	Not Aware (0)
Kick-off Meeting	☒	☐	☐	☐	☐	☐
Change Request	☒	☐	☐	☐	☐	☐
Quality Inspection	☒	☐	☐	☐	☐	☐
Configuration Review	☐	☐	☒	☐	☐	☐
Decision Tree	☐	☐	☐	☒	☐	☐
Progress Meetings	☒	☐	☐	☐	☐	☐
Critical Path Method	☐	☐	☒	☐	☐	☐
Progress Report	☒	☐	☐	☐	☐	☐
Self-Directed Work Teams	☐	☐	☒	☐	☐	☐
Team-Building Event	☐	☐	☒	☐	☐	☐
Backlog refinement.	☐	☐	☐	☒	☐	☐
Change control board.	☐	☐	☐	☒	☐	☐
Daily standup.	☒	☐	☐	☐	☐	☐
Iteration planning	☐	☐	☐	☒	☐	☐
Planning meeting.	☒	☐	☐	☐	☐	☐
Project closeout.	☐	☒	☐	☐	☐	☐

Appendix 2 - Figure 10 Sample of Completed Survey by Participant (Part 10)

Project closeout.	☐	☒	☐	☐	☐	☐
Release planning.	☐	☐	☒	☐	☐	☐
Risk review.	☐	☐	☒	☐	☐	☐
Status meeting.	☒	☐	☐	☐	☐	☐
Steering committee.	☐	☐	☐	☐	☒	☐
Modeling	☐	☐	☐	☐	☒	☐
Timebox	☐	☐	☐	☐	☒	☐

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Appendix 2 - Figure 11 Sample of Completed Survey by Participant (Part 11)

Section 4-4: Project Management Techniques and Tools (Monitoring & Controlling Phase)

To ascertain the frequency of utilization of project management techniques and tools during the monitoring & controlling Phase in construction projects in Bahrain, a comprehensive assessment will be conducted. This evaluation aims to gauge the prevalence and effectiveness of such methodologies in facilitating project monitoring & controlling within the construction industry context.

How frequently are project management techniques and tools used in construction projects in Bahrain for Monitoring & Controlling Phase? *

	Very frequently (5)	frequently (4)	Occasionally (3)	Rarely (2)	Not at all (1)	Not Aware (0)
Financial Measurement Tools	☐	☒	☐	☐	☐	☐
Project Management Software for Task	☐	☐	☒	☐	☐	☐
Project Management Software for Monitoring Cost	☐	☐	☒	☐	☐	☐
Work Authorization	☒	☐	☐	☐	☐	☐
Cause-and-Effect Diagram	☐	☐	☐	☒	☐	☐
Learning Curve	☐	☐	☐	☒	☐	☐
Quality Function Deployment	☐	☐	☐	☐	☒	☐
Monte Carlo Analysis	☐	☐	☐	☐	☒	☐
Project Management Software for Monitoring Schedule Value Analysis	☐	☐	☒	☐	☐	☐
Re-baselining	☒	☐	☐	☐	☐	☐
Pareto Diagram	☐	☐	☐	☐	☒	☐
Control Charts	☐	☐	☐	☐	☒	☐

Appendix 2 - Figure 12 Sample of Completed Survey by Participant (Part 12)

Control Charts	☐	☐	☐	☐	☒	☐
Critical Chain Method	☐	☐	☐	☐	☒	☐
Risk Reassessment	☐	☐	☒	☐	☐	☐
Team Member Performance Appraisal	☐	☒	☐	☐	☐	☐
Project Issue Log	☐	☐	☐	☐	☒	☐
Trend Chart or S-Curve	☐	☐	☐	☐	☒	☐
Check sheet	☐	☒	☐	☐	☐	☐
Cost of quality	☐	☐	☐	☐	☒	☐
Earned value analysis	☐	☐	☐	☐	☒	☐
Forecast.	☐	☐	☒	☐	☐	☐
Influence diagram.	☐	☐	☐	☒	☐	☐
Process analysis	☐	☒	☐	☐	☐	☐
Regression analysis	☐	☐	☐	☒	☐	☐
Reserve analysis.	☐	☐	☐	☐	☒	☐
Root cause analysis.	☐	☐	☐	☒	☐	☐
Trend analysis	☐	☐	☐	☒	☐	☐
Variance analysis	☐	☐	☐	☒	☐	☐
What-if scenario analysis.	☐	☐	☐	☒	☐	☐
Iteration review	☐	☐	☐	☐	☒	☐
Lessons learned meeting	☐	☐	☐	☐	☒	☐
Project review.	☐	☐	☒	☐	☐	☐

Appendix 2 - Figure 13 Sample of Completed Survey by Participant (Part 13)

Section 4-5: Project Management Techniques and Tools (Closing Phase)

To ascertain the frequency of utilization of project management techniques and tools during the closing Phase in construction projects in Bahrain, a comprehensive assessment will be conducted. This evaluation aims to gauge the prevalence and effectiveness of such methodologies in facilitating project closing within the construction industry context.

How frequently are project management techniques and tools used in construction projects in Bahrain for Closing Phase? *

	Very frequently (5)	frequently (4)	Occasionally (3)	Rarely (2)	Not at all (1)	Not Aware (0)
Handover	☒	☐	☐	☐	☐	☐
Database of Lessons Learned	☐	☐	☐	☐	☒	☐
Lessons Learned	☐	☐	☐	☐	☒	☐
Client Acceptance Form	☒	☐	☐	☐	☐	☐
Close Contracts	☒	☐	☐	☐	☐	☐
Customer Satisfaction Surveys	☒	☐	☐	☐	☐	☐
Project Closure Documentation	☒	☐	☐	☐	☐	☐
Retrospective.	☐	☐	☐	☐	☐	☒
Net Promoter Score (NPS®).	☐	☐	☐	☐	☐	☒

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Appendix 2 - Figure 14 Sample of Completed Survey by Participant (Part 14)

Section 5: Additional Comments

Please provide any additional comments or insights regarding project management practices in the construction sector in Bahrain.

Nothing, and thank you for the valuable survey

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Appendix 2 - Figure 15 Sample of Completed Survey by Participant (Part 15)

Appendix 3

In this appendix, the list of experts who supported the validation process will be shown:

Appendix 3 - Table 1 The list of Experts Who Supported the Validation Process

Name	Designation	Specialization/Key Skills	Organisation	Years of Experience	Remarks
Mr. ACHU RAJ	Director	Project Management & Program Management, Civil Engineering	Srishti Bengaluru, Karnataka, India	12+	PMP certified
Mr. Paul Beevers	Project Manager	NEC Contracts, Risk Management, Cost Management, Negotiation Leadership	Kier Group, Sheffield, England, United Kingdom	30+	
Mr. Haythm Eldawakhli	Construction Manager	Project Planning, Procurement, Program Management, Civil Engineering	Zutari, United Arab Emirates	15+	PMP Certified
Mr. Anoop Jose	Construction Manager	Civil Engineering, Project Management	Bothar Group, Doha, Qatar	15+	PMP Certified.
Mr. M.M Junaidi	Senior Resedintant Engineer	Civil Engineering, Project Management	MSCEB	30	

الخلاصة

تبحث هذه الدراسة في تقنيات إدارة المشاريع في قطاع البناء والتشييد في البحرين، مع التركيز على تأثيرها على نجاح المشاريع أو فشلها. وتتمثل الأهداف الرئيسية في تحديد تقنيات إدارة المشاريع الأساسية، وتقييم فعاليتها، وفهم الصعوبات التي يواجهها المتخصصون في القطاع. ونظرًا لأهمية هذا القطاع في النمو الاقتصادي لمملكة البحرين، تؤكد الرسالة على أهمية الالتزام بالممارسات المعترف بها عالميًا في إدارة المشاريع.

تعتمد الدراسة على منهجية كمية من خلال استبيان إلكتروني لجمع البيانات من عينة ممثلة تضم مهندسين، ومديري مشاريع، ومديري إنشاءات يعملون في قطاع البناء البحريني. ويبنى البحث على مراجعة أدبية شاملة لتحديد أفضل الممارسات والاتجاهات الحالية في إدارة المشاريع، مما يبرز أوجه عدم التوافق القائمة في الميدان ويعزز مبررات وأهداف الدراسة. وقد تم توزيع استبيان منظم على المشاركين لجمع معلومات عامة عنهم، وتقييم حالة المشاريع الإنشائية، وقياس مدى استخدامهم لتقنيات إدارة المشاريع.

بلغ عدد المستجيبين للاستبيان 108 مشاركين، وهو ما شكّل حجم العينة الكلي المستخدم في التحليل. وقبل إجراء التحليل الإحصائي، تم التحقق من الاتساق الداخلي والموثوقية باستخدام اختبار كرونباخ ألفا، كما تم التحقق من التجانس باستخدام اختبار كروسكال-واليس. وتم تنفيذ تحليل البيانات باستخدام الأساليب الوصفية، تلتها تطبيق أفضل الممارسات. كما تم التحقق من صحة النموذج، المترابط بين عناصره، باستخدام مصفوفة هيكل التصميم (Alias Design Structure Matrix).

أظهرت النتائج أنه على الرغم من الاستخدام الواسع لعدد كبير من تقنيات إدارة المشاريع، إلا أن هناك فجوات عديدة ما تزال قائمة، خصوصًا في مرحلتَي التخطيط والبداية. ووفقًا لنتائج الاستبيان، فإن حوالي 30% من المشاريع تفشل، مما يسلب الضوء على مشكلات ملحة تشمل غموض الأهداف وعدم كفاية التمويل. كما تمت الإشارة إلى أن التواصل الفعال مع أصحاب المصلحة، والتخطيط الكفاء، ووجود فرق عمل مؤهلة تُعد من أهم عوامل النجاح. بالإضافة إلى ذلك، فإن التدريب والالتزام بممارسات إدارة المشاريع يُعدان أمرًا أساسيًا.

تُقدّم هذه الدراسة رؤية قيّمة للباحثين وصنّاع القرار والممارسين في مجال إدارة المشاريع. فهي تعزز الأطر النظرية من خلال التأكيد على أهمية التدريب العملي وتبني أفضل الممارسات المخصصة، كما تحث صنّاع القرار على دعم المبادرات التي تعزز الكفاءة التشغيلية والإدارة الاستباقية للمخاطر. أما بالنسبة للممارسين، فتؤكد النتائج على ضرورة التركيز على المراحل الحرجة، مثل البداية والتخطيط، لضمان إشراك أصحاب المصلحة وتحقيق التواصل الفعال، مما يؤدي إلى مواءمة أهداف المشاريع وتعزيز مستوى الرضا العام. وبالمجمل، تسهم هذه النتائج في تحسين مخرجات المشاريع في قطاع البناء البحريني.