Palestine Polytechnic University

Master of Administrative Science (MAS)

"The impact of Project Management Knowledge Areas (PMKA's) according to PMBOK on the quality of infrastructure projects in the municipalities of the Southern Hebron Governorate"

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This study is submitted in partial fulfillment of the requirements for the master's degree in Administrative Sciences (MAS)

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In the name of Allah, the most gracious, the Most Merciful, and prayers and peace be upon Mohamed, his servant and messenger. First, I must acknowledge my thanks to Allah, the Giver of all, for His help and blessings.

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Dedication

This thesis is dedicated to my homeland, Palestine, the warmest womb: To the great martyrs and prisoners, the symbol of sacrifice. To all the people in Gaza, the martyrs and the living. To the ones that still fighting for their freedom and rights.

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Definitions of Terms

Project Management: the implementation of standards, processes, and tools to effectively plan, organize, and control project activities and resources to achieve specific goals within constraints such as time, budget, and quality.

The PMBOK Guide: a comprehensive guide formulated by the Project Management Institute (PMI) and a global standard that compiles best practices, processes, tools, and techniques for project management.

Project Management Knowledge Areas: specific areas that every project manager might use in most projects based on their knowledge needs, outlining procedures, applications, tools, and project outcomes.

Project Quality: meeting customer requirements while ensuring the integration of three key dimensions: design, process, and organization.

Public Projects: projects that is undertaken, managed, or supervised by one or more publicly funded organizations and serves the public interest.

Infrastructure Projects: projects that aim to meet citizens' needs and requirements and contribute to delivering the essential goods and services for a sustainable community life such as water, electricity, roads, etc...

Municipalities: are semi-official or civil institutions with legal personality and financial and administrative autonomy, as they in charge of planning and executing public services, building and maintaining infrastructure, and providing citizens with basic services.

Abstract

This study aimed to examine the impact of project management knowledge areas and its relationship with the quality of infrastructure projects implemented by municipalities of Southern Hebron Governorate. A quantitative explanatory cross-sectional design was used, and a census survey approach, targeting the entire population of 103 of municipal engineers and heads of project departments. A total of 95 valid questionnaires were returned and included in the statistical analysis. Descriptive and inferential statistics (PLS-SEM) through Smart-PLS4 to analyze data. The findings revealed that project management knowledge areas positively affected the quality of infrastructure projects, where project procurement management had the strongest positive effect, followed by project resources management. However, project schedule management showed a positive but statistically non-significant effect on the quality of infrastructure projects. The study recommended increasing awareness among project management staff by conducting training programs and workshops on project management best practices to ensure quality, ensuring full coordination among municipal departments, and clearly allocating responsibilities and powers to minimize issues that hinder effective project management implementation.

Key words: project management, project management knowledge areas, PMBOK Guide, project quality, public projects, municipalities, infrastructure projects.

Chapter One

The General Framework

1.1. Introduction

Public infrastructure projects are considered an integral component in achieving development at all levels, as they contribute to enhancing the quality of citizens' lives and providing fundamental services to promote and sustain societal well-being (Al-Ghunaimat, 2022). Since those kinds of projects are sophisticated in structure and have a low success rate (Kothandath & Haran, 2020), adopting advanced management methodologies has become an absolute necessity to effectively and efficiently attain their goals.

In this regard, the Project Management Institute (PMI) has evolved professional standards for project management based on global best practices outlined in the *PMBOK Guide* to enhance the chances of project success and deliver the expected outcomes (PMI, 2017). These practices are represented in Project Management Knowledge Areas, which constitute an integrated framework for efficient project management. Each of these aspects contributes to elevating the quality of project outputs and optimizing their performance (Dahleez & Anbar, 2017).

Building on this framework, project quality has emerged as a major performance indicator in assessing the success of infrastructure projects (Basu, 2014). Achieving quality at or above the required level leads to client contentment, enhances cost efficiency, reduces resource waste, and raises productivity rates, ultimately leading to superior project performance (Rose, 2014). In this context, quality refers to meeting customer requirements while ensuring the integration of three key dimensions: design, process, and organization.

In the Palestinian context, municipalities, as key public institutions, frequently suffer from the poor quality of their projects during the execution phase due to inadequate planning and design, the use of substandard materials, weak oversight, and resource scarcity, which adversely impact the standard of living in the Palestinian communities (Al-Wanneh, 2022). Accordingly, the need to improve resource efficiency and address these challenges has become increasingly essential. In this regard, adopting project management best practices can be an effective tool for municipalities to improve their performance and deliver high-quality projects by enhancing planning, resource allocation, and sufficient management.

From this standpoint, the current study seeks to clarify the nature of the relationship between the level of application of project management knowledge aspects as defined in the *PMBOK Guide* and the quality of projects implemented in municipalities in the South of Hebron Governorate. It further aims to bridge the gap between management theory and practical application in municipal project management, and to provide decision-makers in the Palestinian municipal sector with reliable scientific data to assist them in making informed decisions and improving their performance. The findings revealed that project management knowledge areas positively affected the quality of infrastructure projects, where project procurement management had the strongest positive effect, followed by project resources management. While project schedule management showed a positive but statistically non-significant effect on the quality of infrastructure projects.

1.2. Problem Statement

Infrastructure projects within Palestinian municipalities represent a fundamental framework for local growth and improving urban quality while providing vital public provisions that are necessary for the community's well-being (e.g., service provision through roads and bridges, water supply, and electricity connections, etc.) (Al-Ghunaimat, 2022). However, several studies indicate significant shortcomings in Palestinian municipalities' ability to effectively develop and implement public projects, including delays in meeting the approved schedules, budget management issues, inadequate tender documentation, and poor quality projects that adversely affect service sustainability and public trust (Al-Shantaf, & Yousef, 2015; Issa et al., 2022). Therefore, a pressing need emerged to ensure the essential requirements for the success of municipal projects through delivering high-quality infrastructure services. And by following a set of international standards that represent best practices in project management (PMBOK), infrastructure projects can be completed successfully with high quality and outstanding performance. Based on that, the study problem will focus on the following primary question:

"What is the impact of implementing Project Management Knowledge Areas (PMKA's) according to PMBOK on the quality of infrastructure projects in the municipalities of Southern Hebron Governorate?"

Therefore, the following questions may be answered:

1. "To what extent do municipalities of Southern Hebron Governorate apply the project management knowledge areas in their infrastructure projects?"

2. “What is the level of quality of infrastructure projects in municipalities of Southern Hebron Governorate?”
3. Is there a significant difference in the impact of project management knowledge areas on the quality of infrastructure projects in the municipalities of Southern Hebron Governorate across respondents' professional characteristics (job title and years of experience)?

1.3. Hypotheses

Main hypothesis:

H1: There is a statistically significant impact of project management knowledge areas on the quality of infrastructure projects in the municipalities of southern Hebron Governorate.

Sub-Hypotheses for the main question:

- H1.1: There is a statistically significant impact of project schedule management on the quality of infrastructure projects in the municipalities of southern Hebron Governorate.
- H1.2: There is a statistically significant impact of project procurement management on the quality of infrastructure projects in the municipalities of southern Hebron Governorate.
- H1.3: There is a statistically significant impact of project resources management on the quality of infrastructure projects in the municipalities of southern Hebron Governorate.

The second main hypothesis (H2): There is a statistically significant difference in the impact of project management knowledge areas on the quality of infrastructure projects in the municipalities of southern Hebron Governorate across job title groups.

The third main hypothesis (H3): There is a statistically significant difference in the impact of project management knowledge areas on the quality of infrastructure projects in the municipalities of southern Hebron Governorate across years of experience groups.

1.4. Research objectives

This study seeks to:

1. Clarify the relationship between project management knowledge areas and its effect on the quality of municipal infrastructure projects of Southern Hebron Governorate.
2. Examine the extent to which the municipalities of Southern Hebron Governorate apply project management knowledge areas in their infrastructure projects.
3. Discover the quality level of infrastructure projects in the municipalities of Southern Hebron Governorate.

1.5. Research signification and importance

This study, one of the few to explore the impact of project management knowledge areas on project quality in the Southern Hebron Governorate, provides a new source in this field that can be supported and validated through future research. Besides, this topic aligns with the researcher's academic interest in the field of project management as an area of study that bridges theories with practices in public-sector organizations, particularly in municipal projects. Therefore, the researcher's focus on enhancing the efficiency and quality of municipal projects has drawn attention to how core project management practices affect the project quality.

This study stands out from previous research by investigating a vital area of project management by highlighting the effect of employing the knowledge approaches in project management, specifically in municipal projects, thereby enhancing performance, reducing the likelihood of failure, and boosting the chances of success.

The importance of this study lies in:

1. The fact that municipalities, as a part of the public sector, play a sensitive role in society, being obligated to provide services to their communities by implementing successful projects that contribute to local and national development. This calls for targeting this sector to enhance the quality of services provided to Palestinian citizens.
2. Providing senior management, project managers, and supervisors in municipalities of the Southern region of Hebron with the mechanisms and methods to successfully implement projects, demonstrating how employing project management knowledge areas can lead to better project quality, thus project success.
3. It is expected from the results of this study to introduce a clear perspective on the level of project management practices implemented by municipalities of South Hebron Governorate, as well as their commitment to applying the dimensions of project quality assessment. This study may serve as a starting point for future management, planning, and development programs aimed at achieving excellence in municipal projects.
4. Providing recommendations that may contribute to addressing the shortcomings in the municipal infrastructure projects in the Southern

region of Hebron Governorate in order to meet the challenges facing this sector in the near future.

1.6. Research Delimitations

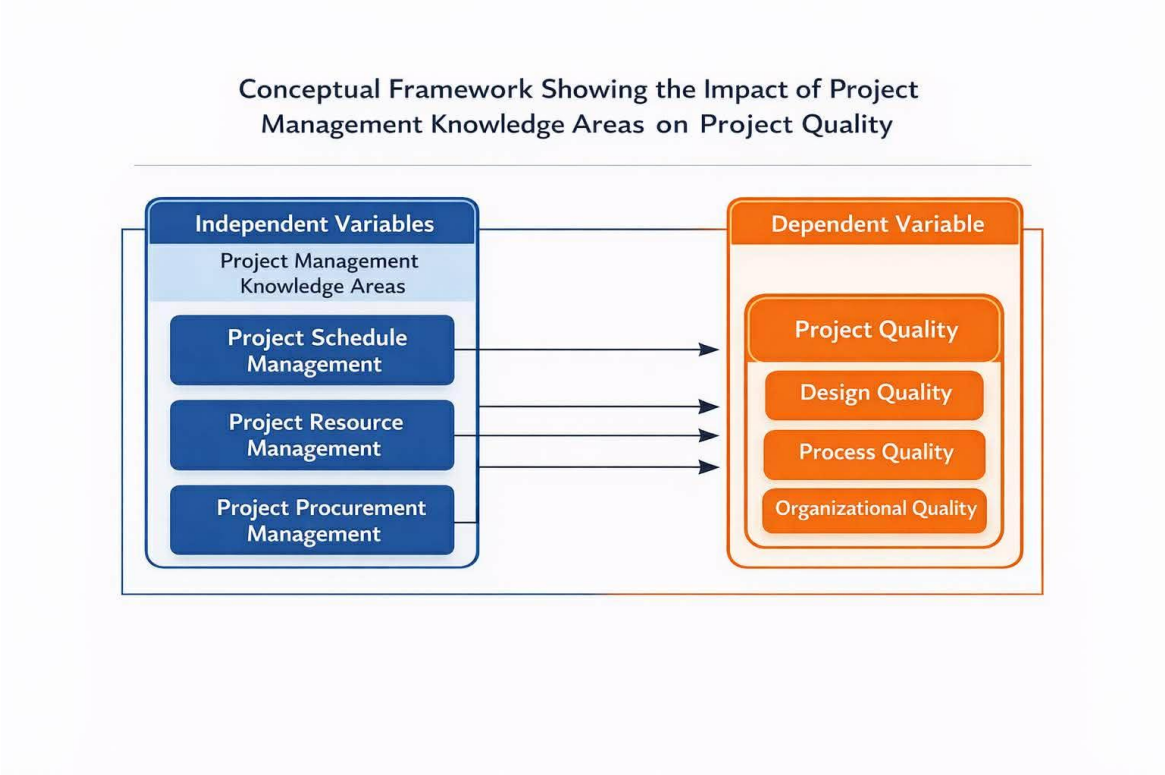
1. **Topical Delimitations:** The study is limited to examining the impact of selected project management areas – project schedule management, project procurement management, and project resource management- on the quality of infrastructure projects in the municipalities of South Hebron Governorate.
2. **Geographical Delimitations:** The study is confined to municipalities located in the Southern region of Hebron Governorate, Palestine, which are Dura, Yatta, AL Sumu'e, AdDaheriyya, Deir Samit, Beit Awwa, Al-Karmel, Khalet AL Maia, and Al Kum.
3. **Human Delimitations:** The study targets engineers and heads of project departments involved in infrastructure projects within the targeted municipalities in the Southern part of Hebron Governorate, excluding municipal council members due to municipal elections.
4. **Temporal Delimitations:** the study was conducted from (2025\9) to (2026\5).

1.7. The Conceptual Framework

Based on the study's problem, objectives, and importance, and after reviewing some Arabic and foreign studies, a conceptual model was developed to

explain the relationship between the study's variables, represented in the Project Management Knowledge Areas (the independent variable) and the quality of infrastructure projects (the dependent variable). The following is an explanation of the dimensions of those variables:

1. **The independent variable(s)**, the Project Management Knowledge Areas, are considered an international reference developed by the Project Management Institute (PMI). They serve as a globally recognized framework employed by many governmental and non-governmental organizations. Therefore, the independent variable in this study is represented by the Project Management Knowledge Areas, sixth edition, which includes ten knowledge domains that directly correspond to the study's conceptual framework and present them in a clear, structured, and systematic manner, making them well suited to the variables adopted in this study. Three Knowledge areas were selected: Projects Schedule Management, Project Procurement Management, and Project Resources Management. They were selected based on the major challenges faced by the municipal sector in Palestine, supported by the findings from previous studies in the region to examine their effect on the quality of municipal infrastructure projects in the South Hebron Governorate.
2. **The dependent variable(s);** the dependent variable of this study is represented by the project quality, including process, design, and organizational quality assessment. These dimensions were chosen for their suitability for infrastructure projects, their measurability and analyzability, and their alignment with international standards, as emphasized by Basu (2014).



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1.8. Organizational Structure of the Study

The study structure consists of five main chapters:

- **Chapter One:** The General Framework, which contained:
  - introduction
  - Research Problem
  - Research Objectives
  - Research Significance and Importance
  - Research Hypotheses
  - Research Delimitations
  - Research Limitations
  - The Conceptual Framework

- **Chapter Two:** deals with the theoretical framework and previous studies, and it is divided into three sections as follows:
    - **Section One:** Basic Concepts and Knowledge Aspects of Project Management.
    - **Section Two:** Basic Concepts of Project Quality and the Relationship of Knowledge Areas to Project Quality
    - **Section Three:** Palestinian Municipalities Context and Infrastructure Projects
    - **Section Four:** Previous Related Arabic and Foreign Studies that are related to the topic.
- **Chapter Three:** deals with the methodology and procedures of the study, and it is divided into five sections:
    - **Section One:** Study Design
    - **Section two:** Population and Sample
    - **Section Three:** Instruments Used
    - **Section Four:** Study Construct
    - **Section Five:** Statistical Treatment
- **Chapter Four:** presents and discusses the results related to answering the study's questions and hypotheses.
- **Chapter Five:** presents the study's key findings and recommendations.

Chapter Two

The Literature Review

2.1. Introduction

2.2. The Theoretical Framework

2.2.1. Project Management

2.2.2. Project Quality

2.2.3. Palestinian Municipalities Context

2.3. Previous Studies

2.3.1. The Arab Studies

2.3.2. The Foreign Studies

2.3.3. The Research Gap

2.1. Introduction

This chapter provides an overview of core project management principles. **First,** the concept of project, project management, and the project life cycle have been briefly and generally addressed. Furthermore, the role of project manager was defined in the public context, with a brief overview of the vital role of project management in municipalities.

Second, the project management knowledge areas have been addressed, with clarification of the rationale for adopting the PMBOK Guide as a standard framework for assessing project management practices. Additionally, the definitions of project schedule management, project procurement management, and project resources management were explained, along with their practices, processes, and tools and techniques. Additionally, challenges relevant to these variables were identified based on the Palestinian context, in general, and in municipal and infrastructure projects in particular.

Third, the concept of project quality, its dimensions, and its practical role in research were explained. The project quality assessment was also identified, and the impact of project management knowledge areas (schedule, procurement, and cost) on project quality was explained separately.

Fourth, this section addressed infrastructure projects in the Palestinian context, the definition of municipalities, the scope of

work, and the structure of Palestinian municipalities. Ultimately, a general overview of the challenges facing Palestinian municipalities.

Overall, this study drew on a collection of local, Arab, and foreign scholarly work related to the current study or its variables, and compared them to identify the research gap.

2.2. The Theoretical Framework

2.2.1. Project management

2.2.1.1. project and project management

According to the *PMBOK Guide* (PMI, 2017, P.36), a project is *"a temporary endeavor undertaken to create a unique product, service, or result*." The concept "*temporary*" denotes that the project has a limited duration with a start and a finish, and therefore it's not permanent (PMI, 2021). However, project management refers to the implementation of standards, processes, and tools to effectively plan, organize, and control project activities and resources to achieve specific goals within constraints such as time, budget, and quality (Kilani et al., 2024; Keleş et al., 2025). It can be achieved by the adoption and harmonization of project stages: initiation, planning, execution, monitoring and control, closure (Mohammed, 2022). These stages represent the project life cycle (Novosák & Vytrhlíková, 2022).

2.2.1.2. The Project Life Cycle

The project life cycle is defined as a systematic process of the project from its inception to its conclusion (Mohammed, 2022). Dividing the project into separate stages enables project managers to monitor the project progress more effectively and address challenges promptly (Moreno et al., 2019). According

to Novosák & Vytrhlíková (2022), the project life cycle consists of five main phases. The initiating phase encompasses identifying the project objectives, establishing a long-term vision, and mandating key focus areas and achievements. During the planning phase, the projects tasks, timelines, and assets are clearly articulated and maintained. The implementation phase focuses on assigning and utilizing resources, carrying out plans, undertaking adjustments, and achieving the intended outputs. In the monitoring and evaluation phase, project plans are assessed against actual performance, and objectives are evaluated to ensure alignment with expectations. Lastly, the closing phase entails reviewing the overall project, formulating the final inferences, and approving or rejecting the project deliverables.

2.2.1.3. The project manager role in the public context

Project manager is the one who is in charge of the project to try to finish it based on the estimated schedule and cost, and he also has the authority to make project-related decisions, and without him, the project may be falling down (Ćwiąkała et al., 2023) Accordingly, competences and skills required for a project manager in the public sector differ from those in the private one, as the skills of a private project manager pertain solely to managing the whole project from its initiation to its closure (PMI, 2017). While Wirick (2011) argues that public project managers need more complex competencies. These include: grasping government procedures, managing workers in the absence of motivations and rewards that are deficient in the public context, working with a wide range of stakeholders like government departments, communities, and legislative bodies, and managing disputes with internal and external parties to a degree that exceeds what is requisite in non-public enterprise project manager.

2.2.1.4. Project management in municipalities as a public projects sector

A public project is defined as *"a project that is undertaken, managed, or supervised by one or more publicly funded organizations"* and serves the public interest (Kassel, 2016; Gasik, 2016). Many researchers have considered this definition to encompass public and governmental projects alike, excluding those against the government (Gasik, 2016). Managing such projects is more sophisticated than the private one (Wirick, 2011; Varajão, 2016; Gasik, 2016), and the focus should be on the government structure, as well as the procedures and systems for effective management (Van der Waldt, 2011).

The need for project management practices has been raised, as most public projects are remaining incomplete and fall short of the quality level to meet public expectations (Ntshangase & Msosa, 2022). Therefore, municipal project management has become an imperative to plan and manage resources efficiently, monitor progress, and evaluate efforts to enhance the likelihood of successful project completion, thus improving life in cities and communities (Al-Khawaldeh, 2024). Furthermore, municipal projects play a vital role in delivering infrastructure services that are fundamental to meeting public needs and achieving sustainable development (Mabika & Nyawo, 2023). By effectively deploying project management standards, the quality and success of projects can be improved (Al-Zahrani & Al-Madani, 2025).

2.2.1.5 Project Management Knowledge Areas according to *PMBOK Guide*

2.2.1.5.1 What is *the PMBOK Guide*?

The Project Management Body of Knowledge (PMBOK) is a comprehensive guide formulated by the Project Management Institute (PMI) and a global standard that compiles best practices, processes, tools, and techniques for project management (Churampi-Cangalaya et al., 2025; Plemmons, 2020). The main objective of the *PMBOK Guide* is to give a structured framework for the effective planning, execution, monitoring, and closure of projects across different economic sectors (Churampi-Cangalaya et al., 2025).

The researcher chose the PMBOK guide as a standard for defining the project management knowledge areas because it contains the fundamental and methodological knowledge related to project management (Gasik, 2015). In addition, the PMBOK guide offers more detailed information on project management processes, input elements, tools, and techniques, as well as outputs, which distinguishes it from other guides like ISO 21500 that focus more on managing individual projects (Čabarkapa, 2019), and PRINCE 2, which does not cover all knowledge areas, including procurement management (Simonaitis et al., 2023). Therefore, this study considers the *PMBOK Guide* more suitable, as it encompasses a broader range of project management knowledge areas, particularly time, procurement, and resources, which are considered the central focus to examine their impact on the quality of municipal infrastructure projects in the South of Hebron Governorate.

2.2.1.5.2 Project Management Knowledge Areas (PMKAs)

There are some knowledge areas that every project manager might use in most projects. These knowledge areas define specific domains of project management based on their knowledge needs, outlining procedures, applications, tools, and project outcomes (PMI, 2017). According to the PMBOK Guide 6th ed. (2017), there are ten knowledge areas:

1. ***Project Integration Management*** involves recognizing, clarifying, integrating, and coordinating the various PM activities within the Project Management Process Groups (Azizah & Yudoko, 2025).
2. ***Project Scope Management*** involves identifying all the necessary activities and tasks required to achieve the desired project outcome (El Yamami et al., 2018).
3. ***Project schedule Management*** encompasses all activities needed to finish the project work within the estimated time (El Yamami et al., 2018; Davidov et al., 2023).
4. ***Project Cost Management*** involves activities related to preparing, predicting, capitalizing, and running costs to verify the project completion within the estimated financial plan (El Yamami et al., 2018).
5. ***Project Quality Management*** involves the integration of the overall entity's quality plan in terms of designing, executing, and monitoring the quality needed to get along with stakeholders' expectations. ·
6. ***Project Resources Management***: encompasses all the activities required to determine, obtain, and allocate resources for a successful project fulfillment. It also includes organizing and managing the project team, leading them and assigning roles to different individuals. This

will also include Human Resource Management (Niyibaho Urwibutso, 2022).

7. ***Project Communications Management:*** Ensures timely and appropriate planning, collection, creation, distribution, storage, retrieval, management, control, monitoring, and ultimate disposition of project information (Keleş et al., 2025)..
8. ***Project Risk Management***: This involves the procedure of planning for risk management recognizing, evaluating and managing risks, within a project (El Yamami et al., 2018; Keleş et al., 2025).
9. ***Project Procurement Management:*** This process involves obtaining goods, services, or results from external parties (Niyibaho Urwibutso, 2022; Davidov et al., 2023).
10. ***Project Stakeholder Management:*** This means finding out who or what organizations will be affected by the project, figuring out what they want, and coming up with the best ways to get them involved (Keleş et al., 2025).

Some projects may need extra knowledge areas besides the main ten domains; for example, the construction field may need to add safety and health management as an additional knowledge area, depending on the project requirements (PMI, 2017).

2.2.1.5.2.1 Project Schedule Management

The concept of project **time** management has evolved into project **schedule** management in the sixth edition of PMBOK, as a project manager oversees a schedule throughout the project life cycle, rather than just managing time. However, project schedule management encompasses all activities needed to

finish the project work within the estimated time. According to the *PMBOK Guide*, project schedule management contains six processes, which are:

1. ***Plan schedule management*** involves setting up policies, procedures, and registration to plan, develop, manage, execute, and control a project's schedule before defining activities. It is a way to map out how to manage the timeline throughout the project life cycle. This process was added in the sixth edition of the PMBOK Guide.
2. ***Defining activities*** involves determining and recording the particular actions required to achieve project outcomes. In this process, the work is broken down into packages that facilitate managing the work performed in the project.
3. ***Sequence activities*** involve defining and recording connections between project activities. This process illustrates the logical workflow, identifying dependencies to maximize efficiency within the project's limitations.
4. ***Estimating activity durations*** involves estimating of the time required to accomplish every single activity based on the resources allocated to it. This process shows the estimated time to finish each activity.
5. ***Developing a schedule*** involves analyzing the logical order of activities, time periods, resource needs, and schedule limitations, and then generating a project schedule model that can be implemented, tracked, and controlled. This process reveals a timeline for finishing project activities on their arranged dates.
6. **Schedule control** involves observing the project progress to address modifications and to update the project plan regularly. In this process, schedule changes are controlled throughout the project life cycle.

2.2.1.5.2.1.1 Project schedule management techniques and tools

Techniques, such as the Critical Chain Method (CCM), PERT, and expert judgment, outline how to apply tools to achieve a specific result or outcome in project management processes. While tools refer to the instruments that are used to apply those techniques that help in the execution of project management processes (PMI, 2017). Here are some project schedule management techniques:

1. ***Decomposition***: Break down work into smaller, easier-to-manage components, such as the Work Breakdown Structure (WBS) (Cretu, 2025).
1. ***Precedence Diagramming Method (PDM):*** This method uses nodes, arrows, and boxes to illustrate the sequence of activities (Novitasari et al., 2018).
2. ***Analogous estimating:*** Estimate the time required for the current project based on previous similar projects (PMI, 2017).
3. ***Project management information system (PMIS):*** Tracking progress, monitoring the schedule by comparing the planned timeline with actual accomplishments, and reporting any necessary adjustments (Haloul et al., 2025).

2.2.1.5.2.1.2 Challenges of poor schedule management in Palestine Municipalities

There are many challenges that hinder a project from being completed on time in infrastructure projects in the public sector, especially in Palestinian municipalities, which are:

1. Municipalities often issue new change orders in a single project due to problems in design blueprints, schemes, and tender documents, resulting in time delays (Issa et al., 2022).
2. In the West Bank, municipalities face issues with project contractors, including the lack of managerial skills needed for infrastructure projects, the inability to meet financial and technical requirements, and failing to take decisive action against those contractors, which further hinders project completion and pushes them beyond their estimated schedules (Issa et al., 2022).
3. The fragile political conditions and the occupation policy, which divide the West Bank into several areas and restrict the movement of people, goods, and materials, frequently delay the completion of municipal infrastructure projects (Mahamid, 2013; MDLF, 2025).
4. Infrastructure projects often experience misestimated completion times during the planning phase, which can delay the project and push it behind schedule (Issa et al., 2022).
5. The project's completion time is being delayed due to the owner's late payment of necessary infrastructure construction expenditures, which incur high daily costs (Mahamid, 2013; Abu Hamdiya & Ibrahim, 2014).

2.2.1.5.2.2 Project Procurement Management

Project procurement management (PPM) involves obtaining goods, services, or results from external parties and managing contracts and purchase orders issued by project members (PMI, 2017). According to the PMBOK Guide (2017), project procurement management includes the following practices:

1. **Planning procurement management:** involves recording make-or-buy decisions, defining the tactics and possible vendors for the project, and determine the supply methods and the types of goods and services required for the project from internal or external parties.
2. **Conduct procurement:** it includes reviewing vendors' offers and choosing the competent one to finalize contractual agreements.
3. **Controlling procurement** entails making sure that suppliers align with agreement specifications by administering relationships through contract oversight, performance monitoring, making adjustments and rectifications, and terminating them when needed.

2.2.1.5.2.2.1 Project procurement management tools and techniques

1. ***Expert judgment:*** Leverage the expertise of professionals in acquiring goods, agreements, and navigating policies and legislation for the project (PMI, 2017).
2. ***Bidder conference or pre-bid conferences:*** Meetings are held between buyers and potential vendors to clarify the procurement process, and to emphasize equal treatment among all sellers in order to minimize legally procurement issues (Chou & Yang, 2012; PMI, 2017).
3. ***Claims administration:*** A system that manages disputes between buyers and sellers, while also recording, treating, and monitoring claims throughout the contract, ensuring conformity with its terms (PMI, 2017; Abdelalim et al., 2025).

2.2.1.5.2.2.2 Challenges Palestinian municipalities face in project procurement management for infrastructure projects:

- The central government has the exclusive power to approve bids submitted by local authorities to initiate infrastructure projects, which causes delays and hinders authorities' work, especially municipalities that issue bids every week (Al-Bitawi & Jaffal, 2023).
- The tender documents prepared by Palestinian municipalities are of poor quality, failing to comply with required standards, and are characterized by unclear and incomplete sketches, as well as inaccurate quantity descriptions in the schedules (Issa et al., 2022; MDLF, 2025).
- The lack of a clear, documented procurement system for managing and controlling purchases, and the absence of clear mechanisms for evaluating and monitoring supplier performance and financial authority in Palestinian local bodies (Abd al-Aati, 2002; MDLF, 2025).
- Most Palestinian local authorities do not coordinate with warehouses when purchasing materials from abroad, and the purchase process is carried out without referring to budget items (Abd al-Aati, 2002).

2.2.1.5.2.3 Project Resource Management

Project resource management encompasses all the activities required to determine, obtain, and allocate resources for a successful project fulfillment. It also includes organizing and managing the project team and assigning roles

to different individuals within the project (PMI, 2017). While project resource management includes several processes, which are:

1. ***Plan resource management:*** includes determining, obtaining, and deploying the human and physical materials (materials, tools, facilities, and infrastructure) needed for project implementation.
2. ***Estimate activity resources:*** involves assessing the material and human resource requirements for each project activity necessary for project implementation.
3. ***Acquire resources:*** includes attaining people for project accomplishment and securing tools, assets, and all resources needed to project fulfillment.
4. ***Develop team:*** the activity of enhancing skills and collaboration among team members in order to increase project effectiveness.
5. ***Manage team:*** the activity of evaluating project team productivity, monitoring work performance reports, and manage disputes and changes that may occur during work, in order to improve efficiency.
6. ***Control resources:*** making sure that project resources are allocated and designated as intended, and assessing the planned resource utilization versus the actual usage to try to take the appropriate remedial actions.

2.2.1.5.2.3.1 Project resources management tools and techniques

The following are key techniques and tools linked with project resources management processes:

1. ***Resource breakdown structure:*** a framework for grouping and detailing human and material resources to facilitate tracking and management of project operations (Rad & Cioffi, 2004; PMI, 2017)

2. ***Bottom-up estimation:*** human and material stuff are assessed at each task level and gathered for project work units' projection (PMI, 2017).
3. **Data analysis**, such as a performance review, assesses the planed against the actual consumption of resource during the project life cycle (PMI, 2017).

2.2.1.5.2.3.2 Challenges Palestinian municipalities face in project resource management for infrastructure projects:

- The scarcity of construction materials for implementing and developing infrastructure projects in Palestinian municipalities (Abd al-Aati, 2002; Enshassi et al., 2017; Baghdadi, 2024) is due to three main factors: the low commitment of citizens to pay their financial obligations to local authorities (Abd al-Aati, 2002; Al-Bitawi & Jaffal, 2023), debts accumulation to local banks and electricity companies (Abd al-Aati, 2002), and the unstable political situation resulting from the Israeli occupation policy (Baghdadi, 2024).
- Weak technical capabilities and unqualified municipal presidents hinder project implementation (Abd al-Aati, 2002), as candidate selection is dominated by families, clans, and political parties, often disregarding qualified individuals with practical scientific skills and experience (Al-Bitawi & Jaffal, 2023).
- The limited technical skills and abilities of local construction firms that impeded the efficient use of financial resources allocated to the project (Enshassi et al., 2017).

2.2.1.6 Justification for selecting study variables

This study examined how Project Schedule Management, Project Procurement Management, and Project Resources Management affect project quality. However, the study's variables selection was guided by the most common challenges encountered in municipal infrastructure projects in Palestine, supported by the findings of limited previous studies that link the project management knowledge areas with project quality in the region.

2.2.1.6.1 Project Schedule Management (PSM)

The researcher's study examines the impact of schedule management on the quality of municipal infrastructure projects in South Hebron Governorate. Precious findings highlight time delays as a major issue in Palestine, especially in the West Bank, where research has been limited. For instance, Mahamid et al. (2012) found that most projects were delayed, with over 70% experiencing delays of 10-30% of the estimated time period. While Issa et al. (2022) reported that approximately 92% of infrastructure projects in the northern West Bank were behind schedule. These are considerable percentages, since Siddiqui & Faheem (2021) have noted that any delays in the schedule may lead to expediting the project work and, consequently, a compromise in quality, as work is attempted to be accomplished faster. This is a great issue that should be taken into account, especially in municipal projects (Kothandath & Haran, 2020). Although previous studies, in Palestine, such as Dahleez & Anbar (2017), has examined the significant relationship between project schedule management and project quality.

2.2.1.6.2 Project procurement management (PPM)

The researcher selected project procurement management for study due to several challenges, including an internal governance crisis and major exogenous challenges. The structural dependence nature of the Palestinian Central Government on Israel under the Paris Protocol limits local authorities' sovereignty over resources and may thus impair the procurement process (Halas, 2021). These restrictions may be the reason of poor procurement management and may adversely affect the quality of infrastructure projects, leading to unsustainable infrastructure or substandard services, thus wasting public funds (IMF, 2020). Accordingly, Dahleez & Anbar (2017) found that project procurement management has the greatest impact on the quality of Palestinian projects. While Shomali & Nassar (2021) have demonstrated that project procurement management has a significant influence on the quality of public infrastructure projects in the West Bank.

2.2.1.6.3 Project resources management (PRM)

The researcher chose to study resource management in the South Hebron Governorate to assess its impact on the quality of municipal infrastructure projects. The unstable political situation under Israel occupation limits the availability of construction material and equipment (Mahamid et al., 2012; Baghdadi, 2024). Along with workforce shortages, these constraints are major determinants of the performance of Palestinian infrastructure projects, as Abushaban & Mohamed (2009) revealed. Moreover, MDLF (2025) reported that a lack managerial and technical resources required to administer tasks such as tender assessment, report drafting, and oversight of municipal projects causes delays and setbacks for those kinds of projects. The shortage of

qualified labor may affect the quality of work and the process of evaluating project quality in Palestine (Saleh et al., 2021). Thus, such deficiencies call for a sufficient management of resources in order to promote the value of public funds and generate a high-quality infrastructure and services to society (Alzate-Ibanez et al., 2023), since project resource management plays a critical role in shaping the output quality and often determines the timeline and finances required for a project (Niyibaho Urwibutso, 2022). Shomali & Nassar (2021) support this strong link between project resources management and the quality of infrastructure projects in the West Bank.

Ultimately, the empirical evidence pointed out that examining the impact of these three management areas (schedule, procurement, and resources) on project quality in the Palestinian municipal context is not merely an academic study; it is an imperative for understanding the unique challenges of the municipal sector and providing practical solutions that contribute to improving the quality of infrastructure and public projects in the region.

2.2.2 Project Quality

2.2.2.1 What is project quality?

The term quality refers to the level at which intrinsic characteristics meet requirements (ISO 9000, 2017, p. 21; PMI, 2017, p. 274). As for project quality, it denotes to the degree to which project outputs conform to agreed-upon specifications (Shomali & Nassar, 2021; Ahmed, 2023; Ibrahim et al., 2024). Meanwhile, Al-Jubouri (2019) has defined project quality as assessing the cost-efficiency of project outcomes to ensure that results are delivered as intended, examining their sustained positive effect, and evaluating the continuity of their results after completion. However, Basu (2014) has proposed a different concept of project quality. He suggested that the process

quality, design quality, and organizational quality be considered in assessing project quality. Thus, despite variations in project quality definitions, these perspectives go beyond conformity to specifications to include efficient processes, resilient design, and a supportive organizational structure.

Defining stakeholders' needs and requirements in the design and exclusion phase of a project is a crucial part of project quality (Petrillo et al., 2021). Rose (2014) pointed out that quality is not a random event but a result of thoughtful planning and requires proper management. So, defining quality is very important in the evaluation process; without a clear definition, you cannot measure it (Basu, 2014; Petrillo et al., 2021). Furthermore, project managers should not forget to encompass both quantitative (normative standards, empirical tests, and cost-effectiveness metrics) and qualitative (subjective evaluation) metrics and define how they will be measured (Petrillo et al., 2021).

Basu (2014) holds that the sustained viability of the project's outputs can be achieved through three attributes, which are:

1. **Process quality (quality of conformance):** related to all activities necessary to produce an output that achieves quality specifications during the execution process (Junior et al., 2018). When the project design is aligned with available technological tools and capabilities, project quality improves (Al-Mahyawi & Al-Waeli, 2019). Process quality encompasses numerous variables that measure the efficiency and effectiveness of project implementation activities, including:
    - Contractor's execution quality in relation to the contract: it is assessed by the extent to which the contractor complies with the stipulated requirement and technical specifications, and can be

measured through many indicators such as the percentage of contractor-rejected work or the work rectification requirement (Dawood & Abdulhadi, 2016). However, Basu (2014) articulated it as the extent of the contractor's commitment to the procedures and standards stipulated in the contract.

- Implementation efficiency: the level of remedial work needed to fix the project products or outputs that do not conform to quality requirements (PMI, 2017), due to inadequate information flow, defects, and frequent changes in project orders (Hassan et al., 2023).
- Examination of the quality of materials used in the implementation process (Khalid, 2018).
- Process integration by ensuring a streamlined workflow between project stages (e.g., design, implementation, and operations) (Basu, 2014).

2. **Product/Design quality (quality of specifications):** defining the output specification and standards (Junior et al., 2018), and transforming customers' requirements into achievable technical methods (Al-Mahyawi & Al-Waeli, 2019). Product/design quality should be based on specific characteristics that combine quantitative specifications and customer perceptual evaluation of product quality (Basu, 2014). This attribute is concentrating on the inherent characteristics of the project's final outputs and their conformance to technical specifications (Basu, 2014). However, there are several factors that influence the design quality, including:
    - Completion of documentation design: it is measured by the level of detail, completeness, definiteness, explicitness, and

exhaustiveness of the engineering drawings, plans, and technical documents that guide the implementation process and ensure that there are no gaps affecting the final product quality, as holding inaccurate and incomplete documentation information may lead to delivering a low-quality project (Agbaxod et al., 2023).

- Meeting project's requirements: it is evaluated by the extent to which the project's outputs attain its predefined objectives and stakeholders' expectations (Yuristanti et al., 2020). This requires precise commitment to the technical specifications to achieve the project's goal (Al-Ali & Abdul-Jabbar, 2005).
- Feasibility and innovation are evaluated by the design's ability to deliver practical and feasible solutions, taking into consideration project challenges, such as cost and local constraints (Basu, 2014).

2. **Organization quality (sustainable culture):** this is a conceptual approach; it relates to a sustainable quality pursuit and to the overall functional role of individuals within the organization towards a holistic culture of quality (Junior et al., 2018; Al-Mahyawi & Al-Waeli, 2019). This attribute focuses on the human and organizational dimensions, such as:

    - Senior management support for quality policies and procedures within its projects (Khalid, 2018; Basu, 2014).
    - The employees possess advanced skills and experience in executing the firm's projects at the required level (Khalid, 2018; Basu, 2014).

- The effectiveness of the information flow between the project's stakeholders, such as contractors, the owners, and the designers (Basu, 2014).
- Creating a work environment that promotes dispute resolution between project parties and encourages transparency (Basu, 2014).

Although the majority of studies consider process and design as the main dimensions of quality, empirical studies addressing the organization quality aspect remain limited (Basu, 2014; Junior et al., 2018). A successful project often requires a balance between two attributes: product quality and process quality, as Wild (2022) has noted. But Basu (2014) has disagreed and noting that most studies have focused on these two attributes, especially on process quality, such as PMBOK and PRINCE 2, and have disregarding the organizational one, which is essential for achieving project quality and success and should be included in assessing the quality of projects. Therefore, this study focus on measuring three quality attributes: process, design, and organizational quality. Meanwhile, several studies (Al-Mahyawi & Al-Waeli, 2019; Khalid, 2018; Basu, 2014) examined these attributes in evaluating the quality of construction and infrastructure projects.

2.2.2.2 Why project quality?

Project quality is typically considered as one of the three determinants of project success, besides time and cost constraints (Basu, 2014; Mukhtar & Amirudin, 2016; Junior et al., 2018; Dias et al., 2023), while some researchers (Zhenge et al., 2019; Al-Nabae & Sammani, 2021; Yusof et al., 2021) emphasized project quality as an integral dimension of project performance effectiveness. Junior et al. (2018) concluded that project quality, as part of the

iron triangle, may contribute to the attainment of both cost and time aspects, leading to successful project completion. As for the public sector, project quality is considered a crucial element in determining whether the project delivered its objectives as expected and in demonstrating effective resource management and accountability in front of the public (Yusof et al., 2021). While poor quality is one of the problems associated with schedule delays and financial difficulties (Yusof et al., 2021), leading to dissatisfaction and disappointment from the public side towards municipalities (Dias et al., 2023). This is where the role of quality as a performance and success measure in public-sector projects becomes crucial. Furthermore, several authors viewed project quality as an interesting topic to discuss since there were limited studies that addressed it, especially in the public sector (Basu, 2014; Junior et al., 2018; Shomali & Nassar, 2021). Ultimately, project quality is not just an added value, but rather it's the essence of a project's success, especially in entities that serve the general public, like municipalities. Therefore, examine project quality as a key variable to gain insight into how to improve project performance and maximize community value.

2.2.2.3 Project Quality Assessment

Project quality is typically measured throughout the project phases (initiating, planning, execution, monitoring and evaluation, and closure and delivery of project outputs) rather than at the end, in order to identify early deficiencies and take corrective actions (Ofori, 2013). The aim of this process is to ensure that the project achieves its intended objectives and the final product meets the required specifications (Paquin et al., 2000). Usually, the project manager is the one who responsible for assessing the quality of the organization's projects and the project beneficiaries (Ofori, 2013). In the municipal context,

project quality is assessed by quality assurance departments in accordance with the established standards. Meanwhile, in some cases, third parties are engaged to conduct objective quality inspections (Ntshangase & Msosa, 2022).

2.2.2.4 Project management knowledge areas and project quality

Project quality is a fundamental element that ensure its success (Basu, 2014; Pamuji et al., 2024). Where it is defined as the degree to which a project product/service meets its specifications (Ahmed, 2023). The knowledge aspects of project management support the project implementation process, whereas a sound understanding of these knowledge aspects contributes to the overall project performance, particularly to project quality (Kilani et al., 2024). So, this study aims to examine the effect of three knowledge aspects - schedule, procurement, and resources- on project quality.

2.2.2.4.1 The impact of project schedule management on project quality

Carvalho et al. (2015) found a significant relationship between project schedule management and project quality. They noted that a project's success can be recognized if it is completed within the planned timeframe, as on-time handling ensures outputs are delivered on schedule, and allocating sufficient time for each project activity to be implemented effectively, thus guaranteeing high quality for these outputs. On the other hand, any delays in the schedule may lead to expediting the project work and, consequently, a compromise in quality, as the work is attempted to be accomplished faster (Siddiqui & Faheem, 2021). In the public sector, particularly in infrastructure projects,

adherence to schedule helps meet project timeline objectives, thereby ensuring efficient service delivery (Kothandath & Haran, 2020).

2.2.2.4.2 The effect of project procurement management on project quality

Jama & Mohamud (2024) found that sufficient procurement management may lead to selecting vendors with good quality products or services, thereby producing high-quality outputs. Meanwhile, insufficient procurement management may lead to selecting vendors with inferior quality products or services, or to holding-ups in providing the required materials, which adversely affect the final outputs quality. In the public context, the quality of purchases depends on compliance with the established regulations and legal frameworks that govern the purchasing and contracting process (Anin et al., 2022). However, poor procurement management may adversely affect the quality of infrastructure projects, leading to unsustainable infrastructure or substandard services, thus wasting public funds (IMF, 2020).

2.2.2.4.3 The impact of project resources management on project quality

Chou & Yang (2012) found a strongly correlation between project resource management and project quality, whereas optimal resource allocation maintains adequate availability of the skills and materials necessary to execute tasks according to the established standards, leading to high-quality outputs. On the other side, inefficient resource utilization can lead to limited material availability and the use of substandard inputs, and diminish quality (Albert et al., 2021). In public-sector projects, effective resource management requires promoting the value of public funds and ensuring efficient use of resource to

deliver durable infrastructure and services that benefit society long-term (Alzate-Ibanez et al., 2023).

2.2.3. Palestinian Municipalities Context

2.2.3.1. Infrastructure projects in Palestine

Infrastructure projects are a pivotal engine for economic growth and represent a significant benchmark for assessing the country development. Besides, it contributes to delivering the essential goods and services for a sustainable community life (Nasrallah & Abu Ziada, 2019). That's for, infrastructure projects aim to meet citizens' needs and requirements, encompassing essential services such as water, energy, transport, communications, roads, gas, and electricity (El-Mougher & Mahfuth, 2021). While the infrastructure sector in Palestine can be classified as follows (Halas, 2019; Al-Ghunaimat, 2022):

- **Water and Sanitation Sector**, which includes water networks, wells, dams and sewage facilities.
- **Transportation Sector**, including roads, bridges, tunnels, ports and shipping channels, and airports and railways.
- **Waste Management Sector**, including landfills and waste treatment plants.
- **Energy Production and Distribution Sector**, which includes electricity generation, transmission and distribution networks, and oil and gas pipelines and storage.
- **Telecommunication Sector,** including telephone networks, distribution cables, power supplies, data processing stations, and buildings and transmission towers.

In Palestine, public infrastructure services are largely confined to basic sectors such as roads and water distribution networks. While the provision and development of other essential services such as sewage, solid waste, and international transport service remain limited due to Israeli occupation policies (Nasrallah & Abu Ziada, 2019)

2.2.3.2. Palestinian municipalities

In Palestine, there are several parties contributing to social development, including the Ministry of Local Government (MOLG) and Local Authorities. The Ministry of Local Government plays a vital role in overseeing local authorities and developing public policies to promote the capacities and resources, making them more effective in serving citizens within the local governance framework (MOLG, 2019). In this context, local governance, represented by municipalities and village councils, works on meeting citizens' needs and contributing to the development process (MOLG, 2019). This role is shaped by the prevailing centralized or "unitary" system of local government in Palestine in which the central government retains primary authority, while delegating certain powers to local authorities in each region (Hamdeh & Ibrahim, 2014; MOLG, 2019).

According to BNGO (2021), the number of local authorities in the West Bank and the Gaza Strip reached 417 by 2018-2021. This large number makes it difficult to present a genuine study of their reality (Ismail, 2005). Despite this, Palestinian local authorities play a crucial role in achieving community development and promoting political participation, serving as the closest tier of government to the people, and allowing them to participate in local decision-making (Ismail, 2005). A Municipality is a semi-official or civil institution with legal personality and financial and administrative autonomy

(Al-Dhamour, 2023). In addition, they are in charge of planning and executing public services, building and maintaining infrastructure, and providing citizens with basic services (Al-Tahrawi, 2021). However, this role remains relatively restricted in providing infrastructure projects and executing cultural and social projects (Abd al-Aati, 2002).

Palestinian municipalities are considered a part of the Palestinian local government system, where their role is to develop the economic and social aspects of society and provide services to citizens, as well as the power to determine and implement procedures within their area of influence and the freedom to make decisions within the provisions of the law (Zaitoun, 2015). According to the Central Election Commission of Palestine's (2025) report, Hebron Governorate has 59 local authorities, comprising 24 municipalities and 35 local councils. Furthermore, based on the Municipal Development and Lending Fund (MDLF) data for 2025, the number of municipalities in the Southern Hebron area is approximately 10 municipalities, which are: Dura, Yatta, AL Sumu'e, AdDaheriyya, Deir Samit, Beit Awwa, Al Ramadeen, Al-Karmel, Khalet AL Maia, Al Kum.

2.2.3.3. Challenges facing Palestinian municipalities

Municipalities in the Occupied Palestinian territories suffer from several obstacles that hinder the provision of effective local services to the community. It's important to note that these obstacles stem from external circumstances caused by the Israeli occupation, while others arise from their organizational structure, management mechanisms, and the nature of the relationship that governs their activities (Zaitoun, 2015). Here we will review some of the political, administrative, and financial challenges:

- Political instability: infrastructure projects in Palestine suffer from external control related to Israeli occupation that limits financial availability and resources (Baghdadi, 2024).
- Administration challenges: Palestinian local authorities, including municipalities, have a restricted role in providing limited services (Ismail, 2005). Palestinian law does not grant local authorities extensive powers or independent decision-making authority. Instead, the central government has the power to exert influence over local authorities, hindering democratic development at the local level and discouraging citizens' political participation (Ismail, 2005). Furthermore, taking advantage of membership in the municipal council to protect personal and family interests, and the prevalence of nepotism in hiring people, ends up with non-recruiting the most qualified candidate within Palestinian municipalities (Jarbawi, 1992).
- Financial challenges: The limited financial capabilities of Palestinian local authorities have led to their grater dependence on the central authority for funding, thereby limiting their financial independence (MOLG, 2019). Moreover, the absence of an effective collection system has limited Palestinian municipalities from collecting revenue from citizens, resulting in a poor financial situation (Jarbawi, 1992).

Those challenges highlight the nature of the complex environment that Palestinian municipalities operate in, impacting their success across several dimensions.

2.3. Previous studies

2.3.1. The Arab Studies

Al-Zahrani & Al-Madani (2025) examined the effect of project management knowledge areas – integration, scope, time, procurement, cost, risk, stakeholders, communications, and resources - on the quality of Ministry of Health projects in Makkah. The researchers adopted a descriptive-analytical approach, with data collected via questionnaire from 100 project workers within the Ministry of Health. Findings showed a significance relationship between all nine project management knowledge areas and project quality.

Abdulkarem & Al-Qurashi (2025) investigated the effect of project management knowledge areas (PMBOK) – integration, schedule, cost, resource, and procurement - on the quality of construction projects in Yemen. The study followed a descriptive-analytical approach, with a survey administered to 73 workers in Yemeni construction projects. The study revealed a positive relationship between project management knowledge areas and project quality, with project integration and resource management exerting the greatest influence.

Al-Khatib (2024) studied the impact of procurement management practices on the performance of projects implemented in non-governmental organizations in the southern governorates of Palestine. A descriptive-analytical approach was employed, with data collected via a questionnaire from a sample of 68 workers in Palestinian non-governmental organizations. The findings revealed that procurement management has a significant impact on project performance.

Al-Ghunaimat (2022) explored the degree to which Palestinian Local Authorities apply the Knowledge areas of project management – integration, scope, time, cost, quality, resource, communication, risks, and procurement- in their infrastructure projects and their relation to local development. A descriptive-analytical approach was employed, and a questionnaire was distributed to 16 Palestinian local bodies. The findings demonstrated that project management knowledge areas were well implemented, with project procurement management has the strongest influence, while project resource management recorded the lowest level among other domains. Also, there was a medium degree of local development in those authorities.

Issa et al. (2022) investigated the causes of budget and schedule variations in municipal infrastructure projects in Palestine. To carry out this study, the researchers grounded it on positivist philosophy and deployed both quantitative and qualitative approaches. The findings revealed that inadequate budget planning, hold-ups from project executors, the absence of preventive actions, and scope modifications that added additional work were the major causes of budget and schedule deviations.

Hirzallah (2022) explored the reality of quality management implementation in the Palestinian Public Sector and its impact on institutional performance. A descriptive methodology was employed, with a questionnaire administered to 134 workers within the Ministry of Interior in Ramallah governorate. The analysis demonstrated a high degree of Total Quality Management (TQM) application in the Palestinian Public Sector, and the institutional performance of the Palestinian Ministry of Interior was also high. Moreover, a statistically significant relationship was found between quality management and institutional performance.

Al-Wanneh (2022) examined the key determinants influencing quality performance in the Palestinian construction and governmental infrastructure projects. A quantitative approach was employed using a structured questionnaire to collect data from 323 engineers. The results revealed that owner-related aspects were the most influential factor on quality performance, followed by planning and design considerations, whereas construction-related aspects demonstrated the least effect. On the other hand, material and external aspects showed no statistically significant influence on quality performance.

Shomali & Nassar (2021) examined the impact of project management knowledge areas - cost, resource, communication, and procurement management - on the quality of infrastructure projects in Palestine. Using a descriptive-analytical approach, data were collected via a questionnaire from (113) workers in the Ministry of Public Works and Housing. The results showed that there is statistically significant relationship between PMKA's and project quality, with project communication management and project resource management have the strongest influence, while project cost and procurement management showed relatively low influence.

Al-Jubouri (2019) analyzed the effect of project management knowledge areas – time and cost management, scope and integration management, procurement and resource management, and communication management - on the quality of Jordanian Social Security corporation projects. A descriptive-analytical approach was employed, and a questionnaire was distributed to 435 workers within the Social Security corporations. Findings revealed that the project management knowledge areas (time and cost, procurement and resource, and communication) have a significant impact on

project quality, meanwhile scope and integration management have a negative influence.

Al-Mahyawi & Al-Waeli (2019) examined the influence of knowledge areas (PMBOK) – integration, scope, time, cost, quality, human resource, communication, risk, stakeholders, and procurement management- on the quality of construction projects in Dhi-Qar governorate. The study followed a descriptive-analytical approach, with a survey administered to 122 workers at construction project institutions. The results showed that the application of knowledge aspects was medium, as was the level of quality of projects in the targeted sample. Also, there was a significant relationship between knowledge aspects and project quality, with the procurement management exerting the strongest influence, while risk management exerted the least. Ultimately, it was found that process quality has the greatest level of practice.

Abuzoom et al. (2019) investigated the relationship between human resource management and project quality in the construction industry in Libya. The researchers used a quantitative method to collect data. The results showed that human resource management has a significant impact on project quality.

Dahleez & Anbar (2017) investigated the effect of the cognitive aspects of project management - integration, scope, time, cost, communication, resources, risk, procurement, quality, and stakeholders management - on the quality of projects conducted by Palestinian non-governmental organizations (PNGOs). Project quality was measured using sustainability, effectiveness, efficiency, impact, and correlation dimensions. A descriptive and analytical approach was employed, and a questionnaire was administered to (220) workers from PNGOs' in the Gaza Strip. The study revealed that the knowledge areas have a significant relationship with project quality, where

procurement management demonstrated the highest impact, followed by HR management, integration management, and risk management.

2.3.2. The Foreign Studies:

Keleş et al. (2025) explored the impact of all ten project management knowledge areas according to the PMBOK Guide – integration, scope, schedule, cost, quality, resource, communications, risk, procurement, and stakeholders - on project success and how they may achieve sustainability. The study adopted a quantitative approach using a questionnaire distributed to 272 workers in the infrastructure sector in Turkiye. The findings indicated that systematic implementation of project management knowledge areas enhances project performance and sustainability, with project schedule, quality, and risk exerting the strongest significant influence. Also, integrating of project management knowledge areas leads to sustainable quality.

Wawak (2024) examined the association between workforce management and project quality, highlighting the key determinants that affect project quality. A quantitative approach was employed, using an online questionnaire, to collect data from 510 project managers and team members across several countries. The findings showed that successful workforce management can lead to better project quality, with effective interaction, well-structured planning, clearly assigned roles and duties, alignment with stakeholders' expectations, and engagement in workplace culture as key determinants of project success.

Davidov et al. (2023) examined the degree to which project management international standards (PMBOK) are applied by project managers. A quantitative approach was employed using a survey to collect data from (117)

project managers. The results showed that project integration management, cost management, and procurement management were the most applicable standards. Meanwhile, scope, quality, and stakeholder management were not applicable.

Niyibaho Urwibutso (2022) evaluated the impact of project management cognitive aspects, including integration, scope, schedule, cost, quality, resource, procurement, risk, and stakeholders, on the performance of the Kirehe watershed project. The study followed a descriptive-analytical approach, using both questionnaires and interviews collected from 140 project implementers and end users. The results revealed that by effectively implementing the project management knowledge areas, the Kirehe watershed project has met its objectives and enhanced the beneficiaries' quality of life.

Gomes et al. (2021) explored the extent to which project management knowledge areas can play a role in the success of the project. A survey was utilized to collect data using an online questionnaire from 101 project managers in Portugal. The findings revealed a link between the knowledge aspects and project success, with time, cost, and scope management identified as the most commonly practiced by project managers.

Basu (2014) examined the position of quality within the iron triangle (time, cost, quality) as an attribute of project success. The scope of the study comprised the infrastructure projects in the UK. Data were collected across three stages: semi-structured interviews, a questionnaire surveys, and an empirical examination of two comparable large-scale projects. The study defined project quality in three dimensions: design quality, process quality, and organizational quality. The findings revealed that organizational effectiveness has a direct impact and a strong relationship with project quality,

and that organizational effectiveness and organizational quality are strongly positively correlated.

2.3.3. The Research Gap

Despite the presence of numerous studies linking knowledge areas to project quality, several gaps remain evident. First, several studies addressed the impact of knowledge areas on project quality in Arab countries, such as the study of **Al-Mahyawi & Al-Waeli (2019)** in Dhi-Qar**, Al-Jubouri (2019)** in Jordan**,** and **Al-Zahrani & Al-Madani (2025)** in Makkah. Meanwhile, scholarly attention to this topic remains minimal in the region of Palestine, where there are studies by **Dahleez & Anbar (2017)** in the Gaza Strip and **Shomali & Nassar (2021)** in the West Bank. This holds the need to conduct further studies that combine the knowledge areas and project quality in the region.

Second, in Palestine, some studies examine the relationship among all project management knowledge aspects (integration, scope, time, cost, communication, resources, risk, procurement, quality and stakeholder management), as in the study by **Dahleez & Anbar (2017)**. Whereas **Shomali & Nassar (2021)** adopted a different perspective by investigating the effect of cost, resource, communications, and procurement management on the project quality of infrastructure projects. While this study is one of the few that have investigated the combined and comparative effect of schedule, procurement, and resources on project quality within a unified framework in the region of Palestine. This highlights an integrative gap in understanding how these cognitive aspects will interact to impact the quality attributes.

Third, some prior studies were carried out within the governmental authorities like Ministries, such as the study of **Shomali & Nassar (2021).** Others focused on the non-governmental organizations, such as the study of **Dahleez & Anbar (2017)**. It is noticeable that there is limited empirical attention given to municipal infrastructure projects operating in the public sector. This creates a contextual gap, particularly within Palestinian municipalities, where the financial, regulatory, and administrative systems differ from those of private and governmental organizations.

Fourth, previous studies, such as **Dahleez & Anbar (2017)**, have relied on the International Standards for evaluating project quality, which are sustainability, effectiveness, efficiency, impact, and correlation criteria. While this study considers different dimensions for evaluating project quality, as Basu (2014) has proposed, which are process quality, design quality, and organizational quality. This indicates a methodological gap regarding the practical application of quality evaluation.

Accordingly, this study seeks to address these gaps by analyzing the effect of project schedule, procurement, and resources management on project quality dimensions in the municipal infrastructure projects in Hebron.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Introduction

3.2. Study Design

3.3. Population and Sample

3.4. Ethical Approval

3.5. Instruments Used

3.6. Data Analysis Method

3.7. Data Validation

3.8. Reliability and Validity Evaluation (Measurement Model (Outer Model) Evaluation)

3.9. Summary

3.1 Introduction

This section represents a fundamental area through which the practical aspect of the study is carried out. This involves obtaining all the data required for conducting the statistical analysis, leading to results that are interpreted in light of relevant literature, thus achieving the study's objectives.

Accordingly, this chapter presents the methodology used to conduct the study. It explains the study design, population and sample, data collection instrument, and data analysis methods. The chapter also describes the procedures used to ensure the reliability and validity of the questionnaire, as well as the steps followed to prepare the data for analysis. Since the study aimed to examine the effect of project management knowledge areas on the quality of infrastructure projects in the municipalities of South Hebron Governorate, a quantitative approach was used to collect and analyse the data. Overall, this chapter provides the methodological basis for the empirical analysis presented in the following chapter.

3.2 Study Design

The present study aimed to examine the effect of project management knowledge areas on the quality of infrastructure projects in the municipalities of South Hebron Governorate. The project management dimensions included project schedule, procurement, and resource management. The quality of infrastructure projects was examined through three dimensions: process, design, and organizational quality. These dimensions were consistent with the study questions, hypotheses, and questionnaire structure.

To achieve the study aim, a quantitative explanatory cross-sectional design was used. This design was appropriate because the study examined relationships among measurable variables at a single point in time, consistent with quantitative explanatory and cross-sectional survey designs. Quantitative explanatory designs are commonly used when the researcher aims to test proposed relationships between independent and dependent variables using statistical analysis (Creswell & Creswell, 2023; Saunders et al., 2023). Data were collected using a structured questionnaire with a five-point Likert scale ranging from strongly disagree to strongly agree.

3.3 Population and Sample

The target population of this study consisted of employees working in project-related positions in the municipalities of South Hebron Governorate. The study targeted employees expected to be knowledgeable about infrastructure project planning, implementation, procurement, resource use, supervision, or quality follow-up. These included engineers, heads of project departments or sections, and other employees involved in municipal project work.

The study was initially planned to cover ten municipalities in South Hebron: Dura, Yatta, Al Sumu'e, Ad Daheriyya, Deir Samit, Beit Awwa, Al Ramadeen, Al-Karmel, Khalet AL Maia, and Al Kum. However, Al Ramadeen municipality could not be reached during the data collection period due to closures, movement restrictions, and difficulties with field access. Several attempts were made to contact the municipality, but no response was received. Therefore, the final data collection covered the nine accessible municipalities.

A total of 103 questionnaires were distributed among the accessible municipalities, and 95 valid questionnaires were returned and used in the final analysis. This represents a response rate of 92.2%. Accordingly, the study used an attempted census approach, as the researcher initially intended to reach the relevant employees in all targeted municipalities; however, the final sample was limited to the accessible municipalities. This approach is consistent with methodological guidance indicating that an attempted census may be used when the target population is relatively limited and identifiable. At the same time, the achieved sample may still be affected by accessibility and field constraints (Saunders et al., 2023).

The distribution of the study population across municipalities is presented in Table 3.1. In the smaller municipalities, the researcher was able to include the full accessible population of relevant employees. However, in the larger municipalities, particularly Dura and Yatta, the achieved sample was slightly lower than the planned population due to field constraints, non-response, and the limited availability of some employees during the data collection period. Al Ramadeen municipality was not represented in the final sample because it could not be reached during the data collection period.

Table 3.1: Distribution of Population and Sample by Municipality

#	Municipalities	Population		Sample	
		Frequency (N)	Percentage (%)	Frequency (N)	Percentage (%)
1	Dura	27	26.0	23	24.2
2	Yatta	32	30.8	28	29.5
3	Al Sumu'e	11	10.6	11	11.6
4	AdDaheriyya	13	12.5	13	13.7
5	Deir Samit	4	3.8	4	4.2
6	Beit Awwa	5	4.8	5	5.3
7	Al Ramadeen	1	1.0	0	0.0
8	Al-Karmel	4	3.8	4	4.2
9	Khalet AL Maia	3	2.9	3	3.1
10	AlKum	4	3.8	4	4.2
	Total	104	100.0	95	100.0

Source: Developed by the Author

3.4 Ethical Approval

The study followed the basic principles of research ethics. Participation was voluntary, and respondents were informed that the questionnaire was used for academic research purposes only. They were also informed that their responses would be treated confidentially and analyzed in aggregate, without identifying individual participants.

No personal identifying information was required from respondents, and the questionnaire did not include sensitive questions or any intervention. The respondents had the right to refuse to participate or to leave any question unanswered. These procedures were used to protect participants' privacy and ensure that the data collection process was conducted ethically and respectfully, consistent with general research ethics principles related to

voluntary participation, confidentiality, respect for participants, and responsible data use.

3.5 Instruments Used

The study used a structured questionnaire to collect data from municipal employees. The questionnaire consisted of three main parts. The first part included demographic and employment information, such as gender, age group, educational level, job title, years of experience, and municipality name. The second part measured the extent to which project management knowledge areas were applied in municipal infrastructure projects. This part included three dimensions: project schedule management, project procurement management, and project resource management. The third part measured the quality of infrastructure projects in terms of process, design, and organizational quality.

The questionnaire items were measured on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). This scale was appropriate because it allowed respondents to indicate their level of agreement with each statement and enabled the researcher to compute means, standard deviations, and other statistical measures. Likert-type scales are commonly used in survey research to measure attitudes and perceptions because they allow responses to be summarized using descriptive statistics (Boone & Boone, 2012; Joshi et al., 2015).

The project management dimensions were developed in line with the logic of project management standards, particularly the project management body of

knowledge and international project management guidance, which emphasize time scheduling, procurement planning, resource management, monitoring, and project control as important elements of successful project delivery (International Organization for Standardization, 2020; Project Management Institute, 2021). The quality dimensions were also aligned with general quality management principles, especially the focus on process control, compliance with specifications, stakeholder coordination, and organizational support for quality improvement (International Organization for Standardization, 2015). Table 3.2 displays study constructs, measurement Items, and references

Table 3.2: Study Constructs, Measurement Items, and References

Construct	Measurement items	Reference
Project Schedule Management	1. A clear schedule is drawn up for the project implementation phases. 2. The activities required for the project are identified, along with their durations. 3. Work is carried out within the planned timeframe without delay. 4. The estimated time required to complete the project is commensurate with its financial value. 5. Corrective action is taken when delays occur in the project schedule. 6. The time required to complete the project is managed effectively.	Developed by the researcher based on PMI (2017)
Project Procurement Management	1. The project's procurement requirements are identified, and a clear procurement plan is drawn up. 2. Suppliers are selected according to clear and transparent criteria. 3. Contractors are selected in accordance with established criteria. 4. Contracts are managed, and the performance of project suppliers is monitored. 5. Procurement implementation is monitored to ensure that suppliers comply with the terms of the contract and the required specifications.	Developed by the researcher based on PMI (2017)

Project Resource Management	1. A clear plan for project resource management is drawn up before the project commences. 2. The requirements for human resources with the necessary expertise and skills are identified before the project begins. 3. It is ensured that the equipment and materials supplied to the project meet the required conditions and specifications. 4. Suitable human resources are available to carry out the planned project activities. 5. Appropriate technical equipment is available to carry out the planned project activities. 6. The required materials are delivered to the project site on time. 7. The use of resources is monitored effectively, and their efficient utilization in the project is ensured.	Developed by the researcher based on PMI (2017)
Process Quality	1. Work is carried out in accordance with the contract requirements and technical specifications. 2. Comments and defects in project implementation are addressed promptly and effectively. 3. The quality of materials used in the project is checked. 4. Contractors adhere to the approved quality plans during project implementation. 5. There is effective coordination between project stakeholders to avoid errors during implementation. 6. Lessons learned from previous projects are applied to improve the current implementation. 7. Project performance is monitored on an ongoing basis.	Developed by the researcher based on Basu (2014) and Al-Mahyawi & Al-Waeli **(**2019)
Design Quality	1. Project documents and drawings are prepared clearly and accurately before implementation. 2. Project documents and drawings are checked to ensure they are free from technical or computational errors. 3. Designs and projects are compatible with the technical capabilities and equipment available. 4. Stakeholders are involved in the design and study phase of municipal projects. 5. Project outputs comply with the technical specifications and requirements defined before implementation. 6. Designs and documents comply with technical, environmental, and public safety requirements.	Developed by the researcher based on on Basu (2014) and Al-Mahyawi & Al-Waeli **(**2019)
Organizational Quality	1. Senior management supports the implementation of quality policies and procedures in projects.	Developed by the researcher based

	2. Staff possess the necessary skills and expertise to deliver projects to the required standard. 3. Coordination and communication between project stakeholders regarding project quality is effective. 4. Disputes arising between project stakeholders are resolved effectively to ensure work continuity.	on on Basu (2014) and Al-Mahyawi & Al-Waeli (2019)

Source: Developed by the Author.

3.6 Data Analysis Method

Both descriptive and inferential statistical methods were used to analyze the study data and answer the study questions. Descriptive statistics were used to describe the demographic and employment characteristics of the respondents and to summarize their responses regarding the application of project management knowledge areas and the quality of infrastructure projects. Inferential statistical analysis was used to test the study's hypotheses and examine relationships among the variables. This analytical approach is consistent with quantitative survey research, in which descriptive statistics summarize sample and study variables, while inferential statistics test relationships between variables (Creswell & Creswell, 2023; Saunders et al., 2023).

The study variables were analyzed in accordance with the questionnaire's structure. The independent variables included project schedule management, project procurement management, and project resource management. In contrast, the dependent variable was the quality of infrastructure projects, represented by process, design, and organizational quality. This structure is consistent with the study questions, hypotheses, and questionnaire dimensions.

3.6.1 Descriptive Statistics

Means and standard deviations were used to summarize responses to the study factors, while frequencies and percentages were used to characterize the study sample. The sample responses were interpreted using a five-point classification scheme to make interpretation easier. Furthermore, the breadth of each class was calculated using the following equation to classify the five-point Likert mean scores into meaningful interpretation levels (Alkharusi, 2022; Boone & Boone, 2012):

$$\text{Class width} = \frac{\text{Maximum} - \text{Minimum}}{\text{Number of classes}} = \frac{5 - 1}{5} = 0.80$$

Following the class width calculation, the answer categories were gradually formed, beginning with the scale's lowest value of one and working their way up to the class width value. The distribution of mean scores for these agreement class levels is shown in Table 3.3.

Table 3.3: Mean Score Interpretation

Mean Score	**Interpretation**
1.00 – 1.79	Very Low
1.80 – 2.59	Low
2.60 – 3.39	Medium
3.40 – 4.19	High
4.20 – 5.00	Very High

Source: Developed by the Author.

3.6.2 Inferential Statistical Tools

Inferential statistical analysis was used to test the study's hypotheses and examine the relationships between project management knowledge areas and the quality of infrastructure projects. The study used Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4.

3.6.2.1 Structural Equation Modeling (SEM)

When a research model includes multiple interrelated constructs and simultaneous direct (and potentially interaction) effects, multivariate techniques are required to estimate relationships jointly rather than in isolation. Structural equation modeling (SEM) is a second-generation multivariate technique that enables the simultaneous assessment of relationships among latent constructs while accounting for measurement error (Chin, 1998; Gefen et al., 2000; Golob, 2003).

SEM can be implemented using covariance-based SEM (CB-SEM) or partial least squares SEM (PLS-SEM). CB-SEM is typically employed for strict theory testing and confirmation under stronger distributional and sample-size assumptions. In contrast, PLS-SEM is primarily variance-based and well-suited for prediction-oriented models and for maximizing explained variance in endogenous constructs (Hair et al., 2017).

Structural equation modeling using partial least squares (PLS-SEM) was employed in this study due to its suitability for the research model and analytical objectives. The study deals with latent variables that are not directly measured but are instead expressed through a set of indicators that reflect their conceptual dimensions. Therefore, the analysis is not limited to testing the direct relationship between variables, as in traditional regression analysis, but

also evaluates the measurement model for reliability, convergent validity, and discriminant validity. It also includes testing the structural model and the assumed relationships between knowledge domains in project management and the quality of infrastructure projects.

Furthermore, PLS-SEM is suitable for interpretive and predictive studies, especially when the goal is to explain variance in the dependent variable and determine the extent to which independent variables contribute to that variance. In addition, the sample size in the current study (n = 95) and the non-normal distribution of the data, as detailed in Appendix 1, support the choice of this method, given its flexibility in handling limited samples and non-normal data compared to some other modeling techniques. Therefore, PLS-SEM was adopted as the most appropriate method for testing the study model, combining the assessment of measurement quality with the analysis of the structural relationships among variables. Accordingly, the measurement and structural models were estimated using SmartPLS 4 (Ringle et al., 2024). The significance of the hypothesized relationship was assessed using bootstrapping with 5,000 resamples at a 0.05 significance level.

PLS-SEM distinguishes between (i) the structural (inner) model, which specifies relationships among latent constructs, and (ii) the measurement (outer) model, which specifies the relationships between constructs and their observed indicators (Hair et al., 2014, 2017). In the present study, all constructs were modeled reflectively, as changes in the latent construct are expected to be reflected in corresponding changes in the indicators, and removing an indicator would not alter the construct's conceptual meaning.

Figure 3.1 illustrates the PLS-SEM measurement and structural models, where a construct is represented by a circle and the study items by rectangles.

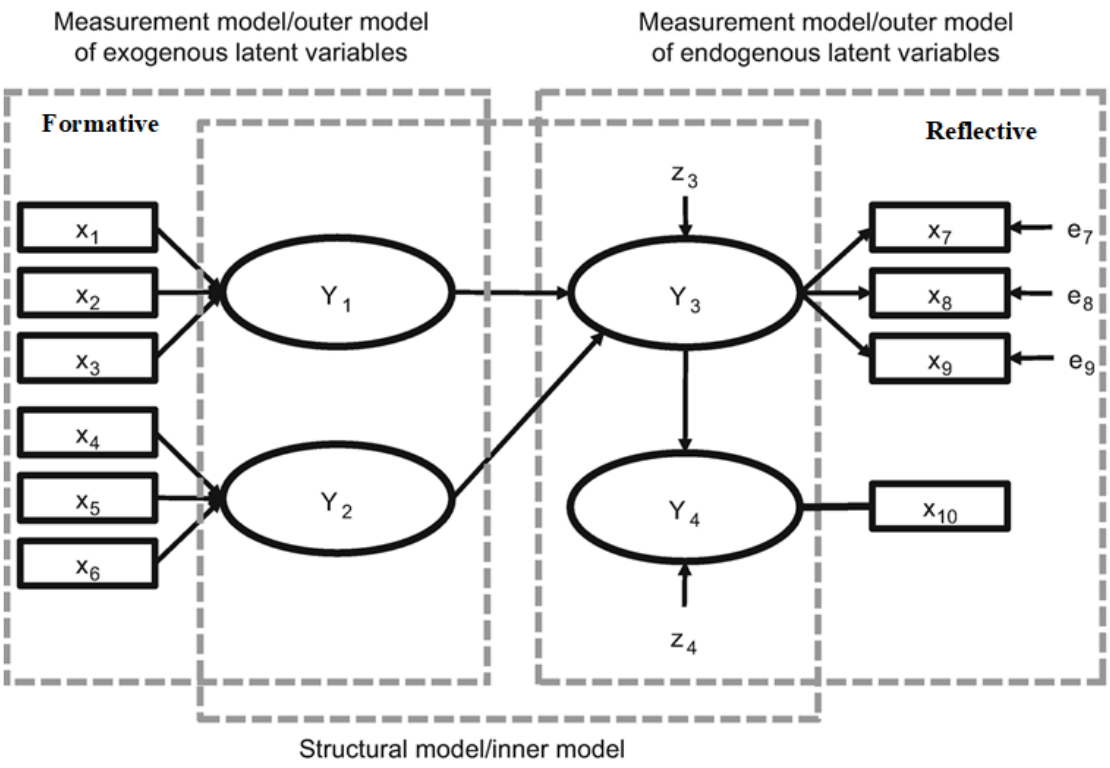

Figure 3.1: Simple PLS-SEM; Adapted from Hair et al., 2022.

In addition, sometimes, researchers try to construct latent variables (constructs) in higher orders to form what is acknowledged as Hierarchical Component Models (HCMs); these constructs are more general constructs built from lower-order constructs (Sarstedt et al., 2019). The main benefit of creating a higher-order construct is to reduce the number of relationships in the path model.

Based on the study constructs, hypotheses, and the SmartPLS model, the measurement model was specified as reflective for the first-order constructs. The study model included two higher-order constructs. The first second-order constructs were project management knowledge areas (PMKA), represented by three first-order constructs: project schedule management, project procurement management, and project resource management. The second was

quality of infrastructure projects (QIP), represented by three first-order constructs: process, design, and organizational quality.

This structure was consistent with the questionnaire design, as each construct was measured through several Likert-scale items. The higher-order constructs represented the broader concepts of project management practices and infrastructure project quality, while the first-order dimensions provided a more detailed measurement of each concept. The study factors are summarized in Table 3.4.

Table 3.4: **Study Factors**

Abbreviations	Constructs	# of items
PMKA	**Project Management Knowledge Areas**	**18**
PSM	Project Schedule Management	6
PPM	Project Procurement Management	5
PRM	Project Resource Management	7
QIP	**Quality of Infrastructure Projects**	**17**
PQ	Process Quality	7
DQ	Design Quality	6
OQ	Organizational Quality	4

Source: Developed by the Author.

Figure 3.2 clarifies the PLS-SEM of the current study.

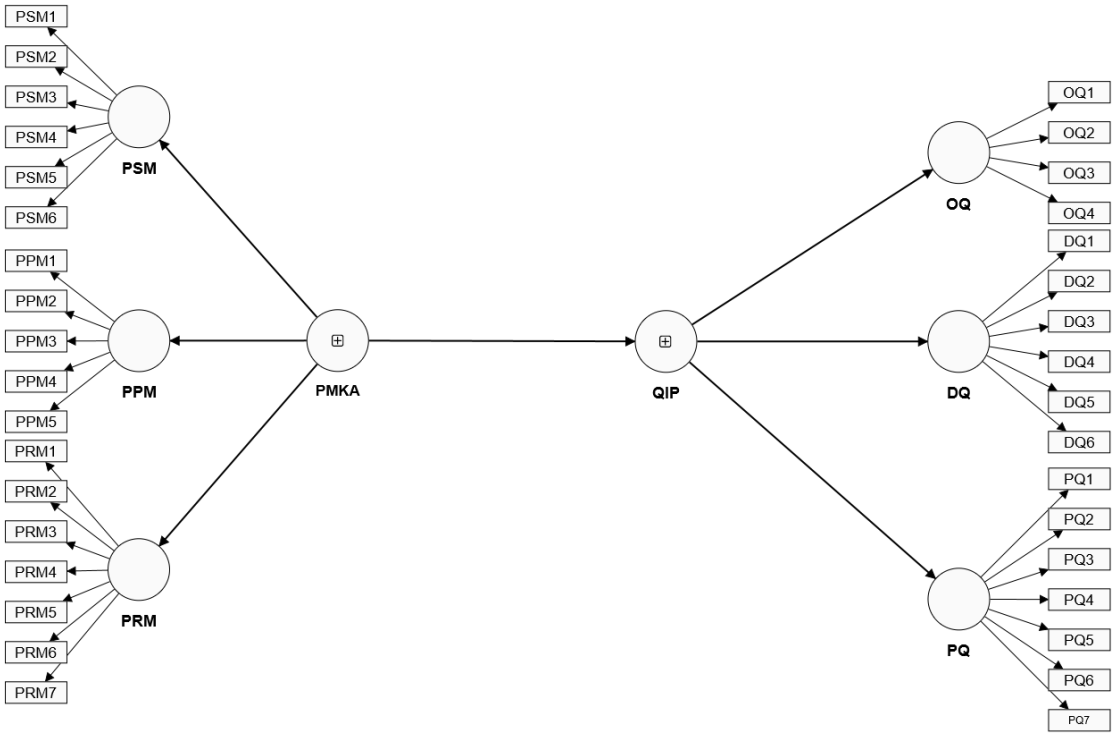

Figure 3.2: PLS-SEM Measurement Model of the Study

3.6.2.1.1 PLS-SEM Evaluation

Two steps of the analytical procedure were conducted to evaluate the study model: measurement evaluation (validity and reliability of the measures) and structural model evaluation (testing the study hypotheses).

3.6.2.1.1.1 Measurement Model Evaluation

The measurement model is evaluated in three main stages: internal consistency, convergent validity, and discriminant validity (Hair et al., 2021). First, internal consistency is verified using both Cronbach's alpha and composite reliability, with values exceeding 0.70 being acceptable (Hair et al., 2021)

Convergent validity is measured by outer loadings, which must be higher than 0.50, and average variance extracted (AVE), which must exceed the same

value (0.50), as stated by Fornell and Larcker (1981). However, outer loadings between 0.40 and 0.70 may be retained when the indicators are theoretically important, support content validity, and when the construct reliability remains acceptable.

For discriminant validity, cross-loadings are used, whereby each item must load more heavily on the construct it is intended to measure than on the other constructs. The Fornell-Larcker criterion is also applied, which states that the square root of the AVE value for any construct must be higher than any correlation between that construct and any other constructs. Finally, the heterotrait–monotrait ratio (HTMT) was examined as an additional criterion for discriminant validity; HTMT values should preferably be below 0.85, while values below 0.90 may be acceptable for conceptually similar constructs (Henseler et al., 2015).

3.6.2.1.1.2 Structural Model Evaluation

Hair et al. (2017) have identified four basic tests for evaluating a structural model. The first involves using variance inflation factors (VIFs) to assess multicollinearity among the independent variables. Ideally, the results should be below 5, indicating no significant multicollinearity.

The second involves using the coefficient of determination (R^2) to assess the proportion of variance explained by the independent variables. According to Cohen (1988), an R^2 value below 0.02 is considered insignificant, while values of 0.02, 0.15, and 0.35 indicate weak, medium, and strong effects, respectively. Finally, the effect size test (f^2) examines the relative importance of each independent variable used in the structural model. According to Cohen (1988), f^2 values of 0.02, 0.15, and 0.35 indicate small, medium, and large effects, respectively.

3.7 Data Validation

3.7.1 Treatment of Missing Data

Missing data is an important issue in quantitative research because it may affect the accuracy of statistical results, reduce statistical power, and lead to biased estimates if it is not examined or handled properly (Enders, 2022). Therefore, before conducting the descriptive and inferential analyses, the dataset was reviewed to ensure that the returned questionnaires were complete and suitable for statistical analysis.

After data entry and coding, the returned questionnaires were reviewed. The final dataset included 95 valid questionnaires. The screening process revealed no missing values among the variables included in the analysis. In addition, all responses fell within the questionnaire's valid coding ranges. The demographic and employment variables were coded by category, while the study items were measured on a 5-point Likert scale ranging from 1 to 5. As shown in Table 3.5, all study variables had 95 valid responses and zero missing values. Therefore, no missing data treatment or replacement method was required before conducting the statistical analysis.

Table 3.5: Summary of Study Variables: Measurement Scale, Valid/Missing Frequencies, and Observed Range.

Variable	Measurement scale (Coding range)	Valid (n)	Missing (n)	Min	Max
Gender	Nominal categorical (1–2)	95	0	1	2
Age group	Ordinal categorical (1–4)	95	0	1	4
Educational level	Ordinal categorical (1–3)	95	0	1	3
Job title	Nominal categorical (1–3)	95	0	1	3
Years of experience	Ordinal categorical (1–4)	95	0	1	4
Municipality	Nominal categorical (1–9)	95	0	1	9
PSM1	Ordinal Likert-scale (1–5)	95	0	1	5
PSM2	Ordinal Likert-scale (1–5)	95	0	1	5
PSM3	Ordinal Likert-scale (1–5)	95	0	1	5
PSM4	Ordinal Likert-scale (1–5)	95	0	1	5
PSM5	Ordinal Likert-scale (1–5)	95	0	1	5
PSM6	Ordinal Likert-scale (1–5)	95	0	1	5
PPM1	Ordinal Likert-scale (1–5)	95	0	1	5
PPM2	Ordinal Likert-scale (1–5)	95	0	1	5
PPM3	Ordinal Likert-scale (1–5)	95	0	1	5
PPM4	Ordinal Likert-scale (1–5)	95	0	1	5
PPM5	Ordinal Likert-scale (1–5)	95	0	1	5
PRM1	Ordinal Likert-scale (1–5)	95	0	1	5
PRM2	Ordinal Likert-scale (1–5)	95	0	1	5
PRM3	Ordinal Likert-scale (1–5)	95	0	1	5
PRM4	Ordinal Likert-scale (1–5)	95	0	1	5
PRM5	Ordinal Likert-scale (1–5)	95	0	1	5
PRM6	Ordinal Likert-scale (1–5)	95	0	1	5
PRM7	Ordinal Likert-scale (1–5)	95	0	1	5
PQ1	Ordinal Likert-scale (1–5)	95	0	1	5

PQ2	Ordinal Likert-scale (1–5)	95	0	1	5
PQ3	Ordinal Likert-scale (1–5)	95	0	1	5
PQ4	Ordinal Likert-scale (1–5)	95	0	1	5
PQ5	Ordinal Likert-scale (1–5)	95	0	1	5
PQ6	Ordinal Likert-scale (1–5)	95	0	1	5
PQ7	Ordinal Likert-scale (1–5)	95	0	1	5
DQ1	Ordinal Likert-scale (1–5)	95	0	1	5
DQ2	Ordinal Likert-scale (1–5)	95	0	1	5
DQ3	Ordinal Likert-scale (1–5)	95	0	1	5
DQ4	Ordinal Likert-scale (1–5)	95	0	1	5
DQ5	Ordinal Likert-scale (1–5)	95	0	1	5
DQ6	Ordinal Likert-scale (1–5)	95	0	1	5
OQ1	Ordinal Likert-scale (1–5)	95	0	1	5
OQ2	Ordinal Likert-scale (1–5)	95	0	1	5
OQ3	Ordinal Likert-scale (1–5)	95	0	1	5
OQ4	Ordinal Likert-scale (1–5)	95	0	1	5

Source: Developed by the Author Using SPSS Output

3.7.2 Outliers

Outliers are observations that differ markedly from the dataset's overall pattern and may affect the accuracy of statistical estimates. Therefore, before conducting the main statistical analysis, the study variables were screened for extreme values across the questionnaire items. In this study, univariate outliers were assessed using skewness and kurtosis for all measurement items. According to commonly used guidelines, absolute skewness values below 2 and kurtosis values below 7 indicate that the data do not show serious deviation at the indicator level (Kim, 2013).

As shown in Table 3.6, all study items were within the acceptable range. The highest absolute skewness was 1.388 for PPM5, and the highest kurtosis was 3.407 for the same item. Since these values were below the recommended thresholds, the results indicate that there were no serious univariate outliers among the study variables. Accordingly, all 95 valid responses were retained for the analysis, and no cases were excluded at this stage.

Table 3.6: Skewness and Kurtosis Values for the Study Variables

	Skewness		**Kurtosis**	
	Value	**Std. Error**	**Value**	**Std. Error**
PSM1	-0.999	0.247	2.766	0.490
PSM2	-0.335	0.247	1.855	0.490
PSM3	-0.308	0.247	0.100	0.490
PSM4	-0.776	0.247	0.580	0.490
PSM5	-0.845	0.247	1.474	0.490
PSM6	-0.550	0.247	-0.215	0.490
PPM1	-0.576	0.247	0.428	0.490
PPM2	-0.793	0.247	0.885	0.490
PPM3	-1.084	0.247	2.125	0.490
PPM4	-0.796	0.247	0.642	0.490
PPM5	-1.388	0.247	3.407	0.490
PRM1	-0.667	0.247	1.221	0.490
PRM2	-1.279	0.247	3.248	0.490
PRM3	-1.333	0.247	2.520	0.490
PRM4	-1.056	0.247	1.651	0.490
PRM5	-0.344	0.247	-0.089	0.490
PRM6	-0.722	0.247	0.832	0.490
PRM7	-1.085	0.247	2.308	0.490
PQ1	-0.096	0.247	-0.494	0.490

PQ2	-0.954	0.247	2.170	0.490
PQ3	-1.212	0.247	2.816	0.490
PQ4	-0.914	0.247	1.842	0.490
PQ5	-0.937	0.247	1.761	0.490
PQ6	-0.460	0.247	0.156	0.490
PQ7	-1.217	0.247	2.734	0.490
DQ1	-0.864	0.247	1.039	0.490
DQ2	-0.986	0.247	1.396	0.490
DQ3	-0.961	0.247	1.776	0.490
DQ4	-0.524	0.247	0.017	0.490
DQ5	-0.733	0.247	1.398	0.490
DQ6	-0.854	0.247	1.406	0.490
OQ1	-0.439	0.247	0.350	0.490
OQ2	-0.437	0.247	0.651	0.490
OQ3	-0.284	0.247	0.156	0.490
OQ4	-0.449	0.247	-0.156	0.490

Source: Developed by the Author Using SPSS Output

3.8 Reliability and Validity Evaluation (Measurement Model (Outer Model) Evaluation)

The first step in evaluating the PLS-SEM model was to assess the measurement model. This step was conducted to ensure that the study instrument was reliable and valid before testing the structural relationships among the study constructs. The measurement model evaluation included internal consistency reliability, convergent validity, and discriminant validity.

3.8.1 Internal Consistency Reliability

Internal consistency reliability refers to the extent to which items measuring the same construct are consistent with one another. In other words, it indicates whether the indicators of each construct measure the same underlying concept. In this study, internal consistency reliability was evaluated using Cronbach's alpha (CA) and composite reliability (CR). Cronbach's alpha is commonly used to assess the reliability of multi-item scales. In contrast, composite reliability is particularly useful in PLS-SEM because it accounts for the different outer loadings of the indicators.

According to commonly used reliability criteria, CA and CR values above 0.70 indicate acceptable internal consistency, while values above 0.80 indicate good reliability (Sarstedt et al., 2022). As shown in Table 3.7, all constructs achieved acceptable reliability values. The CR values ranged from 0.867 to 0.936, and the CA values ranged from 0.796 to 0.927. Therefore, the results indicate that the study constructs had good internal consistency and were suitable for further validity assessment and structural model testing.

Table 3.7: **Result of Cronbach's α (CA) and the Composite Reliability (CR) coefficients**

Abbreviations	**Construct**	**CR**	**CA**
PMKA	**Project Management Knowledge Areas**	**0.933**	**0.924**
PSM	Project Schedule Management	0.875	0.828
PPM	Project Procurement Management	0.888	0.840
PRM	Project Resource Management	0.892	0.859
QIP	**Quality of Infrastructure Projects**	**0.936**	**0.927**

PQ	Process Quality	0.898	0.866
DQ	Design Quality	0.899	0.864
OQ	Organizational Quality	0.867	0.796

Source: Developed by the Author Using Smart-PLS Output

3.8.2 Validity

Validity refers to the extent to which the research instrument measures the concepts it is intended to measure. In this study, validity was assessed using content, convergent, and discriminant validity. Content validity was examined during the questionnaire development stage. In contrast, convergent and discriminant validity were assessed statistically using outer loadings, average variance extracted (AVE), cross-loadings, the Fornell-Larcker criterion, and the HTMT criterion.

3.8.2.1 Content Validity

Content validity refers to the extent to which the items of a questionnaire adequately represent the conceptual domain of the construct being measured. In this study, content validity was ensured through several steps. First, the questionnaire items were developed based on previous studies and relevant literature related to project management practices and infrastructure project quality. The items were then organized according to the study constructs: project management knowledge areas (project schedule management, project procurement management, and project resource management) and quality of infrastructure projects (process quality, design quality, and organizational quality). This structure was consistent with the study questions, hypotheses, and questionnaire dimensions.

Second, the questionnaire was reviewed by academic and field experts to ensure that the items were clear, relevant, and suitable for measuring the intended constructs. This procedure is consistent with recommended content validation practices, where expert judgment is used to evaluate whether questionnaire items are relevant, clear, and representative of the intended construct domain (Yusoff, 2019). The experts' feedback was used to improve the wording of some statements and to ensure that the questionnaire was appropriate for the municipal infrastructure project context in South Hebron. This step helped confirm that the items were understandable to the target respondents and reflected the practical nature of municipal project work.

Third, the questionnaire was translated into Arabic to suit the respondents. During translation, attention was paid to preserving the meaning of the original items while ensuring the wording was clear and culturally appropriate for the Palestinian municipal context. This linguistic review was important to ensure that the translated items preserved the intended meaning of the original wording and were understandable within the Palestinian municipal context, consistent with guidance on cross-cultural adaptation of self-report instruments (Beaton et al., 2000). After reviewing and refining the translated version, the final questionnaire was considered suitable for data collection. The final version of the questionnaire is presented in Appendix 1**.**

3.8.2.2 Convergent Validity

Convergent validity refers to the degree to which the indicators of the same construct are related to each other and measure the same underlying concept. In PLS-SEM, convergent validity is commonly assessed using outer loadings

and average variance extracted (AVE) (Fornell & Larcker, 1981; Sarstedt et al., 2022).

3.8.2.2.1 Outer Loading

Outer loadings reflect the strength of the relationship between each indicator and its corresponding latent construct. In PLS-SEM, outer loadings are used to assess indicator reliability and to determine whether items adequately represent their intended constructs. Generally, outer loadings of 0.70 or higher are preferred. However, indicators with loadings between 0.40 and 0.70 may be retained if they are theoretically important and the construct's reliability and validity remain acceptable (Sarstedt et al., 2022).

As shown in Table 3.8, the outer loading values for the study indicators ranged from 0.584 (PSM4) to 0.881 (PPM4). Most indicators exceeded the recommended value of 0.70. Some indicators, namely PSM4, PPM1, PPM5, PRM5, and PQ7, had outer loadings below 0.70 but above the acceptable minimum threshold. These indicators were retained because they represent important aspects of their constructs and the internal consistency reliability results showed acceptable values for all constructs. Therefore, the outer loading results support the reliability of the measurement model's indicators.

Table 3.8: Outer loading of indicators and first order constructs

Construct and Indicators		Outer Loading
First-order constructs		
PSM	**Project Schedule Management**	
PSM1	A clear schedule is established for the project's implementation phases	0.716
PSM2	The activities required for the project are identified, along with their durations	0.789
PSM3	Work is carried out within the planned timeframe without delay	0.738
PSM4	The estimated time required to complete the project is commensurate with its financial value	0.584
PSM5	Corrective action is taken when delays occur in the project schedule	0.735
PSM6	The time required to complete the project is managed effectively	0.829
PPM	**Project Procurement Management**	
PPM1	The project's procurement requirements are identified, and a clear procurement plan is drawn up	0.672
PPM2	Suppliers are selected according to clear and transparent criteria	0.852
PPM3	Contractors are selected in accordance with established criteria	0.810
PPM4	Contracts are managed, and the performance of project suppliers is monitored	0.881
PPM5	Procurement implementation is monitored to ensure suppliers comply with contract terms and required specifications	0.684
PRM	**Project Resource Management**	
PRM1	A clear plan for project resource management is drawn up before the project commences	0.711
PRM2	The requirements for human resources with the necessary expertise and skills are identified before the project begins	0.764

PRM3	It is ensured that the equipment and materials supplied to the project meet the required conditions and specifications	0.707
PRM4	Suitable human resources are available to carry out the planned project activities	0.764
PRM5	Appropriate technical equipment is available to carry out the planned project activities	0.676
PRM6	The required materials are delivered to the project site on time	0.758
PRM7	The use of resources is monitored effectively, and their efficient utilization in the project is ensured	0.773
PQ	**Process Quality**	
PQ1	Work is carried out in accordance with the contract requirements and technical specifications	0.755
PQ2	Comments and defects in project implementation are addressed promptly and effectively	0.812
PQ3	The quality of materials used in the project is checked	0.787
PQ4	Contractors adhere to the approved quality plans during project implementation	0.749
PQ5	There is effective coordination between project stakeholders to ensure understanding of work requirements and to avoid errors during implementation	0.784
PQ6	Lessons learnt from previous projects are applied to improve the quality of implementation in current projects	0.719
PQ7	Project performance is monitored on an ongoing basis	0.604
DQ	**Design Quality**	
DQ1	Project documents and drawings are prepared clearly and accurately before being put into implementation	0.744
DQ2	Project documents and drawings are checked to ensure they are free from any technical or computational errors	0.864
DQ3	Designs and projects are compatible with the technical capabilities and equipment available to the municipality or contractors	0.789

DQ4	Stakeholders are involved in the design and study phase of municipal projects	0.752
DQ5	Project outputs comply with the technical specifications and requirements defined prior to implementation	0.750
DQ6	Designs and documents comply with technical, environmental, and public safety requirements	0.730
OQ	**Organizational Quality**	
OQ1	Senior management supports the implementation of quality policies and procedures in projects	0.776
OQ2	Staff possess the necessary skills and expertise to deliver projects to the required standard	0.731
OQ3	Coordination and communication between project stakeholders regarding project quality is effective	0.820
OQ4	Disputes arising between project stakeholders are resolved effectively to ensure the continuity of work	0.820
Second-order constructs		
PMKA	**Project Management Knowledge Areas**	
PSM	Project Schedule Management	0.880
PPM	Project Procurement Management	0.880
PRM	Project Resource Management	0.900
QIP	**Quality of Infrastructure Projects**	
PQ	Process Quality	0.924
DQ	Design Quality	0.918
OQ	Organizational Quality	0.784

Source: Developed by the Author Using Smart-PLS Output

3.8.2.2.2 Average Variance Extracted

Average Variance Extracted (AVE) is one of the main criteria used to assess convergent validity in PLS-SEM. It indicates the average amount of variance

that a construct explains in its indicators. According to Fornell and Larcker (1981), an AVE value of 0.50 or above is generally considered acceptable, as it means that the construct explains at least half of the variance in its indicators. However, AVE should also be interpreted together with composite reliability, Cronbach's alpha, and the theoretical importance of the construct, especially when higher-order constructs are used.

As shown in Table 3.9, all first-order constructs achieved acceptable AVE values above 0.50. The AVE values were 0.541 for project schedule management, 0.616 for project procurement management, 0.543 for project resource management, 0.558 for process quality, 0.597 for design quality, and 0.620 for organizational quality. These results indicate that the first-order constructs had acceptable convergent validity.

The AVE values of the two higher-order constructs, project management knowledge areas and quality of infrastructure projects, were 0.441 and 0.463, respectively. Although these values were slightly below the conventional threshold of 0.50, the constructs were retained because they represent broader higher-order concepts measured through several related dimensions. In addition, both constructs demonstrated strong internal consistency, with composite reliability and Cronbach's alpha values exceeding the recommended threshold of 0.70. Therefore, the overall results support the convergent validity of the measurement model, particularly at the first-order construct level.

Table 3.9: Result of average variance extracted (AVE)

Abbreviations	Construct	AVE
PMKA	**Project Management Knowledge Areas**	**0.441**
PSM	Project Schedule Management	0.541
PPM	Project Procurement Management	0.616
PRM	Project Resource Management	0.543
QIP	**Quality of Infrastructure Projects**	**0.463**
PQ	Process Quality	0.558
DQ	Design Quality	0.597
OQ	Organizational Quality	0.620

Source: Developed by the Author Using Smart-PLS Output

3.8.2.3 Discriminant Validity

Discriminant validity refers to the extent to which each construct is distinct from the others in the model. In other words, it indicates whether the indicators of one construct load more strongly on their intended construct than on other constructs. In this study, discriminant validity was assessed using cross-loadings, the Fornell-Larcker criterion, and the heterotrait-monotrait ratio (HTMT), which are commonly used in reflective PLS-SEM measurement models (Fornell & Larcker, 1981; Henseler et al., 2015; Sarstedt et al., 2022).

3.8.2.3.1 Cross Loading

Cross-loading analysis was used to examine whether each indicator loaded more strongly on its assigned construct than on the other constructs. This test is commonly used in reflective measurement models to support discriminant

validity. If each indicator has its highest loading on its intended construct, this indicates that the construct is empirically distinct from the other constructs in the model.

In this study, cross-loadings were examined for the first-order reflective constructs: project schedule management, project procurement management, project resource management, process, design, and organizational quality. The higher-order constructs, project management knowledge areas, and quality of infrastructure projects, were excluded from the cross-loading comparison table because they represent broader constructs formed by their related dimensions.

As shown in Table 3.10, each indicator had its highest loading on its assigned construct compared with the other first-order constructs. For example, the PSM indicators loaded most strongly on project schedule management, the PPM indicators on project procurement management, and the quality indicators on their respective quality dimensions. Therefore, the cross-loading results support the discriminant validity of the measurement model.

Table 3.10: Result of cross-loading

Indicator	DQ	OQ	PPM	PQ	PRM	PSM
DQ1	**0.744**	0.463	0.640	0.636	0.479	0.389
DQ2	**0.864**	0.517	0.660	0.702	0.585	0.452
DQ3	**0.789**	0.509	0.537	0.527	0.395	0.547
DQ4	**0.752**	0.522	0.438	0.466	0.392	0.496
DQ5	**0.750**	0.367	0.422	0.641	0.486	0.378
DQ6	**0.730**	0.467	0.606	0.555	0.464	0.519

OQ1	0.508	**0.776**	0.472	0.437	0.391	0.449
OQ2	0.430	**0.731**	0.372	0.399	0.235	0.322
OQ3	0.479	**0.820**	0.459	0.497	0.436	0.473
OQ4	0.511	**0.820**	0.524	0.556	0.506	0.496
PPM1	0.285	0.362	**0.672**	0.419	0.476	0.481
PPM2	0.575	0.475	**0.852**	0.566	0.511	0.515
PPM3	0.628	0.504	**0.810**	0.541	0.640	0.588
PPM4	0.746	0.583	**0.881**	0.623	0.572	0.595
PPM5	0.523	0.329	**0.684**	0.538	0.452	0.487
PQ1	0.506	0.480	0.490	**0.755**	0.531	0.441
PQ2	0.564	0.528	0.594	**0.812**	0.568	0.620
PQ3	0.532	0.449	0.533	**0.787**	0.486	0.588
PQ4	0.534	0.409	0.389	**0.749**	0.448	0.295
PQ5	0.650	0.556	0.560	**0.784**	0.552	0.480
PQ6	0.619	0.312	0.486	**0.719**	0.498	0.388
PQ7	0.592	0.395	0.535	**0.604**	0.483	0.417
PRM1	0.377	0.332	0.513	0.395	**0.711**	0.522
PRM2	0.298	0.313	0.456	0.411	**0.764**	0.526
PRM3	0.350	0.331	0.552	0.437	**0.707**	0.479
PRM4	0.453	0.304	0.460	0.486	**0.764**	0.411
PRM5	0.311	0.350	0.392	0.515	**0.676**	0.387
PRM6	0.637	0.461	0.527	0.622	**0.758**	0.568
PRM7	0.656	0.495	0.587	0.645	**0.773**	0.566
PSM1	0.376	0.400	0.557	0.336	0.375	**0.716**
PSM2	0.463	0.463	0.594	0.540	0.598	**0.789**
PSM3	0.347	0.372	0.359	0.407	0.397	**0.738**
PSM4	0.335	0.195	0.346	0.267	0.394	**0.584**
PSM5	0.546	0.487	0.516	0.589	0.566	**0.735**
PSM6	0.527	0.482	0.585	0.540	0.599	**0.829**

Source: Developed by the Author Using Smart-PLS Output

3.8.2.3.2 Fornell-Larcker Criterion

The Fornell-Larcker criterion was used as an additional method to assess discriminant validity among the reflective first-order constructs. According to this criterion, the square root of the Average Variance Extracted (AVE), which appears on the diagonal of the matrix, should be greater than the correlations between the construct and the other constructs. This indicates that each construct shares more variance with its own indicators than with other constructs in the model.

As shown in Table 3.11, all constructs met the Fornell-Larcker criterion, since the square root of all constructs is more than their correlation with other constructs. Fornell-Larcker results generally support the discriminant validity of the first-order constructs.

Table 3.11: Fornell-Larcker Criterion for the First-order Constructs

Constructs	DQ	OQ	PPM	PQ	PRM	PSM
DQ	**0.773**					
OQ	0.613	**0.788**				
PPM	0.716	0.584	**0.785**			
PQ	0.765	0.604	0.688	**0.747**		
PRM	0.608	0.506	0.681	0.684	**0.737**	
PSM	0.597	0.557	0.683	0.623	0.676	**0.736**

Source: Developed by the Author Using Smart-PLS Output.

3.8.2.3.3 Heterotrait-monotrait Ratio of Correlations (HTMT)

The Heterotrait-Monotrait Ratio of Correlations (HTMT) was used as an additional criterion to assess discriminant validity. HTMT is considered one of the stronger approaches for evaluating discriminant validity in PLS-SEM because it examines whether the correlations between different constructs are sufficiently lower than the correlations among indicators of the same construct. According to commonly used guidelines, HTMT values below 0.85 indicate strong discriminant validity, while values below 0.90 may still be considered acceptable when the constructs are conceptually related (Henseler et al., 2015; Sarstedt et al., 2022).

As shown in Table 3.12, all HTMT values among the first-order constructs were below the recommended threshold of 0.90. The highest HTMT was between design quality (DQ) and process quality (PQ), at 0.883. Although this value was relatively high, it remained below 0.90 and is theoretically reasonable because both constructs represent related dimensions of infrastructure project quality. Therefore, the HTMT results support the discriminant validity of the first-order constructs in the measurement model.

Table 3.12: Heterotrait-monotrait Ratio Result

Constructs	DQ	OQ	PPM	PQ	PRM	PSM
DQ						
OQ	0.740					
PPM	0.825	0.702				
PQ	0.883	0.719	0.807			
PRM	0.690	0.597	0.795	0.790		
PSM	0.700	0.666	0.805	0.715	0.782	

Source: Developed by the Author Using Smart-PLS Output

3.9 Summary

This chapter presented the methodological approach used to examine the effect of Project Management Knowledge Areas on the quality of infrastructure projects in the municipalities of South Hebron Governorate. The study adopted a quantitative, explanatory, cross-sectional design and used a structured questionnaire with a 5-point Likert scale. The main independent construct was project management knowledge areas, represented by project schedule management, project procurement management, and project resource management. The dependent construct was Quality of Infrastructure Projects, represented by process, design, and organizational quality. These constructs aligned with the study questions, hypotheses, and questionnaire structure.

The target population comprised employees engaged in project-related work in the South Hebron municipalities, including engineers, heads of project departments or sections, and other employees involved in municipal infrastructure projects. The study initially aimed to cover ten municipalities; however, the Al Ramadeen municipality could not be reached due to closures, movement restrictions, and a lack of response. Therefore, data were collected from the nine accessible municipalities. A total of 103 questionnaires were distributed, of which 95 were valid and retained for analysis.

The chapter also explained the data analysis procedures used in the study. Descriptive statistics were used to summarize respondents' characteristics and

to interpret response levels using means, standard deviations, frequencies, and percentages. Inferential analysis was conducted using PLS-SEM with SmartPLS to evaluate the measurement model and test relationships among the study constructs.

To ensure data quality, the dataset was screened before analysis. The results showed no missing values, and all responses were within the valid coding ranges. Univariate outliers were assessed using skewness and kurtosis values, and the results indicated that all items were within acceptable limits. Therefore, all 95 valid responses were included in the final analysis.

Finally, the chapter presented the procedures for evaluating the measurement model. Reliability was assessed using Cronbach's alpha and composite reliability, while validity was examined through content validity, convergent validity, and discriminant validity. The results supported the reliability and validity of the study instrument, providing a suitable basis for presenting the empirical findings and testing the hypotheses in the next chapter.

Chapter Four

Data Analysis and Results

4.1. Introduction

4.2. Descriptive Statistics

4.3. Structural Model Evaluation

4.4. Discussion of Results

4.5. Summary

4.1 Introduction

This chapter presents the analysis of the study data and the main results obtained from the questionnaires. The chapter begins by describing the demographic and employment characteristics of the respondents, then presents the descriptive statistics for the study constructs: project management knowledge areas and quality of infrastructure projects. It also includes the results of the structural model analysis using PLS-SEM, including multicollinearity, coefficient of determination, effect size, and path coefficient testing. Finally, the chapter presents the results of the main hypothesis, the sub-hypotheses, and the additional multi-group analysis, providing the empirical basis for the discussion and conclusions in the following chapter.

4.2 Descriptive Statistics

This section presents the descriptive statistical analysis of the study data. The analysis includes two main parts. First, it describes the demographic and employment characteristics of the respondents, including gender, age group, educational level, job title, and years of experience. Second, it presents descriptive results for the study constructs to answer the first two questions: project management knowledge areas as the independent construct and quality of infrastructure projects as the dependent construct. Means and standard deviations were used to assess respondents' level of agreement with each construct and its dimensions.

4.2.1 Profile of Respondents

The total number of valid respondents included in the analysis was 95. These respondents were employees working in project-related positions in the municipalities of South Hebron Governorate. The profile of respondents was examined by gender, age group, educational level, job title, and years of experience.

In terms of gender, males represented the majority of the sample, with 60 respondents (63.2%), while females represented 35 respondents (36.8%). This indicates that the sample was male-dominated, which may reflect the nature of technical and project-related positions in municipal infrastructure work.

Regarding age, the largest group of respondents was aged 30–39 years, representing 57 respondents (60.0%). This was followed by respondents aged 40–49 years, who represented 18 respondents (18.9%). Respondents aged below 30 years numbered 14 (14.8%), while those aged 50 years and above numbered 6 (6.3%). This shows that most respondents were in the middle-aged working group, which is well-suited for evaluating project management and infrastructure project quality, as they are likely to have practical work experience.

With respect to educational level, most respondents held a bachelor's degree (n=69, 72.6%). Postgraduate degree holders represented 20 respondents (21.1%), while diploma holders represented 6 respondents (6.3%). This educational profile supports the relevance of the sample, as most respondents

had qualifications that may enable them to understand project management procedures and quality-related issues.

By job title, engineers were the largest group, with 57 respondents (60.0%). Heads of departments or project-related units represented 32 respondents (33.7%), while other job titles represented 6 respondents (6.3%). This distribution is consistent with the study's purpose, as the respondents were primarily employees directly or indirectly involved in municipal infrastructure projects.

In terms of years of experience, 31 respondents (32.6%) had 10–14 years, followed by 30 respondents (31.6%) with 5–9 years. Respondents with less than 5 years of experience and those with 15 years or more each represented 17 respondents (17.9%). This indicates that the sample included respondents with sufficient practical exposure to municipal project work.

Table 4.1: Descriptive Statistics of the Sample Characteristics

Variable	**Category**	**Frequency (N)**	**Percentage (%)**
Gender	Female	35	36.8
	Male	60	63.2
Age group	Less than 30 years	14	14.8
	30–39 years	57	60.0
	40–49 years	18	18.9
	50 years and above	6	6.3
Educational level	Diploma	6	6.3
	Bachelor	69	72.6
	Postgraduate	20	21.1

Job title	Engineer	57	60.0
	Other	6	6.3
	Head of department/projects	32	33.7
Years of experience	Less than 5 years	17	17.9
	5–9 years	30	31.6
	10–14 years	31	32.6
	15 years and above	17	17.9

Source: Developed by the Author Using SPSS Output

4.2.2 Descriptive Analysis of Study Factors

4.2.2.1 Project Management Knowledge Areas Analysis

Project management knowledge areas (PMKA) were assessed through three dimensions: project schedule management, project procurement management, and project resource management. These dimensions reflect the extent to which municipalities apply project management practices related to time scheduling, procurement procedures, and resource management in infrastructure projects.

Table 4.2 presents the answer to the first question: **"To what extent do the municipalities of the southern Hebron Governorate apply the project management knowledge areas in their infrastructure projects?"** The overall mean score for project management knowledge areas was 3.94, with a standard deviation of 0.52, indicating a high level of application. Among the three dimensions, project procurement management recorded the highest mean score (M = 4.10, SD = 0.61), suggesting that procurement-related practices were perceived as the strongest project management area among the

surveyed municipalities. Meanwhile, project schedule management and project resource management recorded very close mean scores (M = 3.88 for both), also indicating a high level of application. Overall, these results suggest that the municipalities included in the study generally apply project management knowledge areas at a high level, with procurement management showing a slightly stronger position compared with scheduling and resource management.

Table 4.2: Descriptive Statistics of Project Management Knowledge Areas

	Construct and Items	**Mean**	**Standard Deviation**	**Max.**	**Min.**	**Interpretation**
PMKA	Project Management Knowledge Areas	3.94	0.52	5	3	High
PSM	Project Schedule Management	3.88	0.55	5	2	High
PPM	Project Procurement Management	4.10	0.61	5	2	High
PRM	Project Resource Management	3.88	0.60	5	2	High

Source: Developed by the Author Using SPSS Output

3.2.2.1.1 Project Schedule Management

Project schedule management was assessed to examine the extent to which municipalities prepare clear project schedules, define project activities and durations, monitor implementation time, and take corrective actions when delays occur. This construct included six items related to scheduling practices in municipal infrastructure projects.

As shown in Table 4.3, the overall mean score for project schedule management was 3.88, with a standard deviation of 0.55, indicating a high level of application. The highest mean scores were recorded for PSM1 “A clear schedule is drawn up for the project implementation phases” (M = 4.24, SD = 0.65) and PSM2 “The activities required for the project are identified, along with their durations” (M = 4.23, SD = 0.55), both interpreted as very high. This suggests that municipalities generally pay strong attention to schedule preparation and activity identification before or during project implementation.

The lowest mean was recorded for PSM3 “Work is carried out within the planned timeframe without delay” (M = 3.43, SD = 0.88). Although this item remained high, it was clearly weaker than the other scheduling items, indicating that delays may still occur during actual implementation. Overall, the results show that scheduling practices are generally applied at a high level, but maintaining implementation within the planned timeframe remains the main scheduling challenge.

Table 4.3: Descriptive Statistics of the Project Schedule Management Construct

	Construct and Items	Mean	Standard Deviation	Max.	Min.	Interpretation
PSM	**Project Schedule Management**	**3.88**	**0.55**	**5**	**2**	**High**
PSM1	A clear schedule is drawn up for the project implementation phases	4.24	0.65	5	2	Very High

PSM2	The activities required for the project are identified, along with their durations	4.23	0.55	5	2	Very High
PSM3	Work is carried out within the planned timeframe without delay	3.43	0.88	5	1	High
PSM4	The estimated time required to complete the project is commensurate with its financial value	3.71	0.85	5	1	High
PSM5	Corrective action is taken when delays occur in the project schedule	3.89	0.69	5	2	High
PSM6	The time required to complete the project is managed effectively	3.79	0.87	5	2	High

Source: Developed by the Author Using SPSS Output

4.2.2.1.2 Project Procurement Management

Project procurement management was assessed to examine the extent to which municipalities identify procurement needs, prepare procurement plans, select suppliers and contractors according to clear criteria, manage contracts, and monitor supplier compliance with contract terms and technical specifications. This construct included five items related to procurement practices in municipal infrastructure projects.

As shown in Table 4.4, the overall mean score for project procurement management was 4.10, with a standard deviation of 0.61, indicating a high level of application. These results indicate that procurement management

practices are generally well applied in municipal infrastructure projects, with all items showing high levels of agreement.

Among the items, the highest mean was recorded for PPM3, “Contractors are selected in accordance with established criteria” (M = 4.16, SD = 0.79), suggesting that contractor selection is one of the strongest procurement practices in the surveyed municipalities. This was followed by PPM2 and PPM5, both with a mean score of 4.11, reflecting a high level of agreement on supplier selection and procurement monitoring.

The lowest mean was recorded for PPM1: “The project’s procurement requirements are identified, and a clear procurement plan is drawn up” (M = 4.05, SD = 0.73). Although it was the lowest item, it still fell within the high level.

Table 4.4: Descriptive Statistics of the Project Procurement Management Construct

	Construct and Items	Mean	Standard Deviation	Max.	Min.	Interpretation
PPM	Project Procurement Management	4.10	0.61	5	2	High
PPM1	The project’s procurement requirements are identified, and a clear procurement plan is drawn up	4.05	0.73	5	2	High
PPM2	Suppliers are selected according to clear and transparent criteria	4.11	0.75	5	2	High

PPM3	Contractors are selected in accordance with established criteria	4.16	0.79	5	1	High
PPM4	Contracts are managed, and the performance of project suppliers is monitored	4.07	0.79	5	2	High
PPM5	Procurement implementation is monitored to ensure that suppliers comply with the terms of the contract and the required specifications	4.11	0.82	5	1	High

Source: Developed by the Author Using SPSS Output

4.2.2.1.3 Project Resource Management

Project resource management was assessed to examine the extent to which municipalities plan, allocate, provide, and monitor the human and physical resources required for infrastructure project implementation. This construct included seven items covering human resources, expertise, equipment, materials, and the efficient use of project resources.

As shown in Table 4.5, the overall mean score for project resource management was 3.88 with a standard deviation of 0.60, indicating a high level of application. The highest mean was recorded for PRM1: “A clear plan for project resource management is drawn up before the project commences” (M = 4.04, SD = 0.68), followed by PRM2: “The requirements for human resources with the necessary expertise and skills are identified before the

project begins" (M = 4.00, SD = 0.80). This indicates that municipalities generally give strong attention to resource planning before implementation.

The lowest mean was recorded for PRM5: "Appropriate technical equipment is available to carry out the planned project activities" (M = 3.74, SD = 0.77). Although this item was still interpreted as high, it suggests that the availability of technical equipment may be a relatively weaker area compared with planning and identifying human resource needs. Overall, the findings indicate that resource management practices are applied at a high level, but equipment availability may still require further improvement.

Table 4.5: Descriptive Statistics of the Project Resource Management Construct

	Construct and Items	Mean	Standard Deviation	Max.	Min.	Interpretation
PRM	**Project Resource Management**	**3.88**	**0.60**	**5**	**2**	**High**
PRM1	A clear plan for project resource management is drawn up before the project commences	4.04	0.68	5	2	High
PRM2	The requirements for human resources with the necessary expertise and skills are identified before the project begins	4.00	0.80	5	1	High
PRM3	It is ensured that the equipment and materials supplied to the project meet	3.93	0.89	5	1	High

	the required conditions and specifications					
PRM4	Suitable human resources are available to carry out the planned project activities	3.77	0.84	5	1	High
PRM5	Appropriate technical equipment is available to carry out the planned project activities	3.74	0.77	5	2	High
PRM6	The required materials are delivered to the project site on time	3.81	0.89	5	1	High
PRM7	The use of resources is monitored effectively, and their efficient utilization in the project is ensured	3.87	0.82	5	1	High

Source: Developed by the Author Using SPSS Output

4.2.2.2 Quality of Infrastructure Projects

The Quality of infrastructure projects (QIP) was assessed across three dimensions: process, design, and organizational quality. These dimensions reflect the extent to which municipal infrastructure projects are implemented according to proper procedures, accurate designs, and effective organizational support.

Table 4.6 presents the answer to the second question: **"What is the level of quality of infrastructure projects in the municipalities of Southern Hebron Governorate?"** The overall mean score for infrastructure project quality was 3.94, with a standard deviation of 0.53, indicating a high level of

infrastructure project quality across the municipalities in the study. Among the three sub-dimensions, process quality recorded the highest mean score (M = 3.98, SD = 0.56), suggesting that respondents perceived implementation procedures, quality monitoring, and compliance with specifications as relatively strong. This was followed by organizational quality (M = 3.93, SD = 0.56), which also reflected a high level of support, coordination, and staff capability.

The lowest mean was recorded for design quality (M = 3.90, SD = 0.66). Although it was the lowest among the three dimensions, it still fell within the high level. This indicates that design-related practices were generally viewed positively, but they may require more attention than process and organizational aspects.

Table 4.6: Descriptive Statistics of Quality of Infrastructure Projects

	Construct and Items	Mean	Standard Deviation	Max.	Min.	Interpretation
QIP	**Quality of Infrastructure Projects**	**3.94**	**0.53**	**5**	**2**	**High**
PQ	Process Quality	3.98	0.56	5	2	High
DQ	Design Quality	3.90	0.66	5	2	High
OQ	Organizational Quality	3.93	0.56	5	2	High

Source: Developed by the Author Using SPSS Output

4.2.2.2.1 Process Quality

Process quality was assessed to examine the efficiency and effectiveness of the procedures through which municipal infrastructure projects are

implemented according to contract requirements, technical specifications, quality plans, coordination mechanisms, and continuous monitoring. This construct included seven items related to the operational side of project quality.

As shown in Table 4.7, the overall mean score for process quality was 3.98 with a standard deviation of 0.56, indicating a high level of process quality in municipal infrastructure projects. The highest mean was recorded for PQ1 "Work is carried out in accordance with the contract requirements and technical specifications" (M = 4.12, SD = 0.63), suggesting strong perceived compliance with contractual and technical requirements. This was followed by PQ3 "The quality of materials used in the project is checked" (M = 4.04, SD = 0.77) and PQ5 "There is effective coordination between project stakeholders to ensure understanding of work requirements and to avoid errors during implementation" (M = 4.01, SD = 0.79).

The lowest mean was recorded for PQ6 "Lessons learnt from previous projects are applied to improve the quality of implementation in current projects" (M = 3.84, SD = 0.76). Although this item was still interpreted as high, it indicates that using lessons learned from previous projects may be relatively less developed than direct compliance with contract requirements and material quality checks.

Table 4.7: Descriptive Statistics of the Process Quality Construct

	Construct and Items	Mean	Standard Deviation	Max.	Min.	Interpretation
PQ	**Process Quality**	**3.98**	**0.56**	**5**	**2**	**High**

PQ1	Work is carried out in accordance with the contract requirements and technical specifications.	4.12	0.63	5	3	High
PQ2	Comments and defects in project implementation are addressed promptly and effectively.	3.94	0.76	5	1	High
PQ3	The quality of materials used in the project is checked.	4.04	0.77	5	1	High
PQ4	Contractors adhere to the approved quality plans during project implementation.	3.97	0.78	5	1	High
PQ5	There is effective coordination between project stakeholders to ensure understanding of work requirements and to avoid errors during implementation.	4.01	0.79	5	1	High
PQ6	Lessons learnt from previous projects are applied to improve the quality of implementation in current projects.	3.84	0.76	5	2	High
PQ7	Project performance is monitored on an ongoing basis.	3.95	0.82	5	1	High

Source: Developed by the Author Using SPSS Output

4.2.2.2.2 Design Quality

Design quality was assessed to determine the extent to which municipal infrastructure project designs, drawings, documents, and technical specifications are prepared clearly and accurately prior to implementation. This construct also reflects whether designs are reviewed for errors, aligned

with available technical capabilities, involve relevant stakeholders, and comply with technical, environmental, and public safety requirements.

As shown in Table 4.8, the overall mean design quality score was 3.90, with a standard deviation of 0.66, indicating a high level of design quality in municipal infrastructure projects. The highest mean was recorded for DQ1, "Project documents and drawings are prepared clearly and accurately before being put into implementation" (M = 4.05, SD = 0.84). This suggests that respondents generally perceived the project documentation and drawings as clear and well-prepared before implementation.

Both DQ2 and DQ6 recorded the same mean score (M = 3.99), indicating a high level of agreement on reviewing project documents for errors and on the compliance of designs with technical, environmental, and public safety requirements. The lowest mean was for DQ4, "Stakeholders are involved in the design and study phase of municipal projects" (M = 3.65, SD = 0.95). Although this item was still considered high, it was weaker than the other design quality items, suggesting that stakeholder involvement during the design stage may need further improvement.

Table 4.8: Descriptive Statistics of the Design Quality Construct

	Construct and Items	Mean	Standard Deviation	Max.	Min.	Interpretation
DQ	**Design Quality**	**3.90**	**0.66**	**5**	**2**	**High**
DQ1	Project documents and drawings are prepared clearly and	4.05	0.84	5	1	High

	accurately before being put into implementation					
DQ2	Project documents and drawings are checked to ensure they are free from any technical or computational errors	3.99	0.89	5	1	High
DQ3	Designs and projects are compatible with the technical capabilities and equipment available to the municipality or contractors	3.87	0.84	5	1	High
DQ4	Stakeholders are involved in the design and study phase of municipal projects	3.65	0.95	5	1	High
DQ5	Project outputs comply with the technical specifications and requirements defined before implementation	3.85	0.77	5	1	High
DQ6	Designs and documents comply with technical, environmental, and public safety requirements	3.99	0.81	5	1	High

Source: Developed by the Author Using SPSS Output

4.2.2.2.3 Organizational Quality

Organizational quality was assessed to examine the extent to which the municipality provides the organizational support needed to achieve project quality. This construct included four items related to senior management support, staff skills and expertise, communication among project stakeholders, and effective dispute resolution during project implementation.

As shown in Table 4.9, the overall mean score for organizational quality was 3.93 with a standard deviation of 0.56, indicating a high level of organizational quality in municipal infrastructure projects. The highest mean was recorded for OQ3 “Coordination and communication between project stakeholders regarding project quality is effective” (M = 4.05, SD = 0.66), suggesting that communication and coordination are perceived as relatively strong aspects of organizational quality. This was followed by OQ2 “Staff possess the necessary skills and expertise to deliver projects to the required standard” (M = 4.00, SD = 0.67), which indicates that respondents generally viewed municipal staff as capable of supporting project quality. The lowest mean was recorded for OQ1 “Senior management supports the implementation of quality policies and procedures in projects” (M = 3.82, SD = 0.71). Although this item was still interpreted as high, it was slightly weaker than the other organizational quality items.

Table 4.9: Descriptive Statistics of the Organizational Quality Construct

	Construct and Items	Mean	Standard Deviation	Max.	Min.	Interpretation
OQ	**Organizational Quality**	**3.93**	**0.56**	**5**	**2**	**High**
OQ1	Senior management supports the implementation of quality policies and procedures in projects	3.82	0.71	5	2	High
OQ2	Staff possess the necessary skills and expertise to deliver projects to the required standard	4.00	0.67	5	2	High
OQ3	Coordination and communication between project stakeholders	4.05	0.66	5	2	High

	regarding project quality is effective					
OQ4	Disputes arising between project stakeholders are resolved effectively to ensure the continuity of work	3.86	0.82	5	2	High

Source: Developed by the Author Using SPSS Output

4.3 Structural Model Evaluation

The structural model evaluation aims to assess relationships among the study constructs and to determine whether the proposed model provides sufficient statistical evidence to test the study hypotheses. In this stage, the relationship between Project Management Knowledge Areas and the Quality of Infrastructure Projects was examined using PLS-SEM. The evaluation included several procedures: checking multicollinearity using VIFs, assessing the model's explanatory power with the coefficient of determination (R^2), examining effect size (f^2), and testing the significance of path coefficients via bootstrapping. These procedures were used to ensure that the structural model was appropriate and that the direct relationships between the constructs could be interpreted reliably. Based on these results, the main hypothesis and sub-hypotheses were evaluated, followed by a subgroup analysis to assess the stability of the main relationship across job-title and years-of-experience groups.

4.3.1 Multi-Collinearity Test

Before evaluating the structural relationships among the study constructs, multicollinearity was assessed using the Variance Inflation Factor (VIF). This step is important because high collinearity among predictor constructs can compromise the accuracy and stability of the estimated path coefficients. In PLS-SEM, VIF values below 5.00 generally indicate that multicollinearity is not a serious concern, and lower values provide stronger evidence that the structural paths can be interpreted reliably (Sarstedt et al., 2022).

As shown in Table 4.10, all VIF values were 1.00, well below the recommended threshold. This indicates no evidence of problematic multicollinearity in the structural model. Therefore, the path coefficients can be interpreted without concern that high correlations among predictor constructs distorted the results.

Table 4.10: Collinearity Assessment using VIF.

Paths	**VIF**
Project Management Knowledge Areas → Project Procurement Management	1.000
Project Management Knowledge Areas → Project Resource Management	1.000
Project Management Knowledge Areas → Project Schedule Management	1.000
Project Management Knowledge Areas → Quality of Infrastructure Projects	1.000
Quality of Infrastructure Projects → Design Quality	1.000
Quality of Infrastructure Projects → Organizational Quality	1.000
Quality of Infrastructure Projects → Process Quality	1.000

Source: Developed by the Author Using Smart-PLS Output

4.3.2 Coefficient of Determination (R^2)

The coefficient of determination (R^2) was used to assess the explanatory power of the structural model. R^2 indicates the proportion of variance in each endogenous construct explained by its predictor constructs. R^2 ranges from 0 to 1, with higher values indicating stronger explanatory power. Following common guidelines, R^2 values of 0.02, 0.15, and 0.35 may be interpreted as weak, moderate, and strong explanatory power, respectively (Cohen, 1988; Sarstedt et al., 2022).

As shown in Table 4.11, the dependent construct, quality of infrastructure projects, had an R^2 of 0.640, indicating that project management knowledge areas explained 64.0% of the variance in infrastructure project quality. This indicates that project management knowledge areas play a strong role in explaining the quality of infrastructure projects in the surveyed municipalities.

Table 4.11: Result of R^2

Endogenous Constructs	R-square	Degree of explanation
Quality of Infrastructure Projects	0.640	Strong

Source: Developed by the Author Using Smart-PLS Output

4.3.3 Effect Sizes (f^2)

Effect size (f^2) was used to assess the relative contribution of each predictor construct to the explained variance of the endogenous construct. In PLS-SEM, f^2 values show how much an endogenous construct's R^2 changes when a specific predictor is included in the model. According to Cohen's guidelines,

f^2 values of 0.02, 0.15, and 0.35 indicate small, medium, and large effects, respectively (Cohen, 1988; Sarstedt et al., 2022).

As shown in Table 4.12, all reported f^2 values were above 0.35, indicating large effect sizes. The effect of project management knowledge areas on the quality of infrastructure projects was large ($f^2 = 1.778$), indicating that these knowledge areas made a strong contribution to explaining quality. Similarly, project management knowledge areas had large effects on their dimensions: project procurement management ($f^2 = 3.418$), project resource management ($f^2 = 4.264$), and project schedule management ($f^2 = 3.427$).

The results also showed that the quality of infrastructure projects had large effects on its quality dimensions, especially process quality ($f^2 = 5.877$) and design quality ($f^2 = 5.342$), followed by organizational quality ($f^2 = 1.600$). These results confirm that the model relationships have strong practical relevance and that both project management knowledge areas and project quality contain important first-order constructs for measuring them.

Table 4.12: Result of effect size (f^2)

Paths	**f^2**	**Effect Size**
Project Management Knowledge Areas → Project Procurement Management	3.418	Large
Project Management Knowledge Areas → Project Resource Management	4.264	Large
Project Management Knowledge Areas → Project Schedule Management	3.427	Large
Project Management Knowledge Areas → Quality of Infrastructure Projects	1.778	Large
Quality of Infrastructure Projects → Design Quality	5.342	Large
Quality of Infrastructure Projects → Organizational Quality	1.600	Large

Quality of Infrastructure Projects → Process Quality	5.877	Large

Source: Developed by the Author Using Smart-PLS Output

4.3.4 Path Coefficient Significance Testing and Hypotheses Testing

At the final stage of the structural model assessment, the significance of the hypothesized structural paths was evaluated using bootstrapping in SmartPLS with 5,000 resamples. This procedure was used to obtain the path coefficient, standard deviation, t-value, and p-value for each hypothesized relationship. The analysis was organized into two parts: first, testing the study's main hypothesis; and second, testing the sub-hypotheses related to the direct effects of the three project management knowledge areas on the quality of infrastructure projects.

4.3.4.1 The Impact of Project Management Knowledge Areas on the Quality of Infrastructure Projects

This section displays the result of the main hypothesis, which states that **"There is a statistically significant impact of project management knowledge areas on the quality of infrastructure projects in Hebron's municipalities."**

As shown in Table 4.13, the path from PMKA to QIP was positive and statistically significant ($\beta = 0.800$, STDEV = 0.050, $t = 15.945$, $p < 0.001$). This indicates that a stronger application of project management knowledge areas is associated with higher-quality infrastructure projects in the municipalities of South Hebron Governorate. Therefore, the main hypothesis was supported. On the other hand, increasing the application of project

management knowledge area practices by 1 degree in municipalities will lead to a 0.800 degree increase in the quality of infrastructure projects.

Table 4.13: Main Hypothesis Testing Based on Bootstrapped Structural Path Coefficient

Hypothesis	Structural Path	Coefficient β	STDEV	t-value	p-value	Decision
H1	PMKA → QIP	0.800	0.050	15.945	< 0.001	Supported

Note. β = path coefficient; STDEV = standard deviation; PMKA = Project Management Knowledge Areas; QIP = Quality of Infrastructure Projects. The hypothesis was considered supported when $p < 0.05$. **Source:** Developed by the Author using SmartPLS output.

Figure 4.1 displays the result of the main hypothesis.

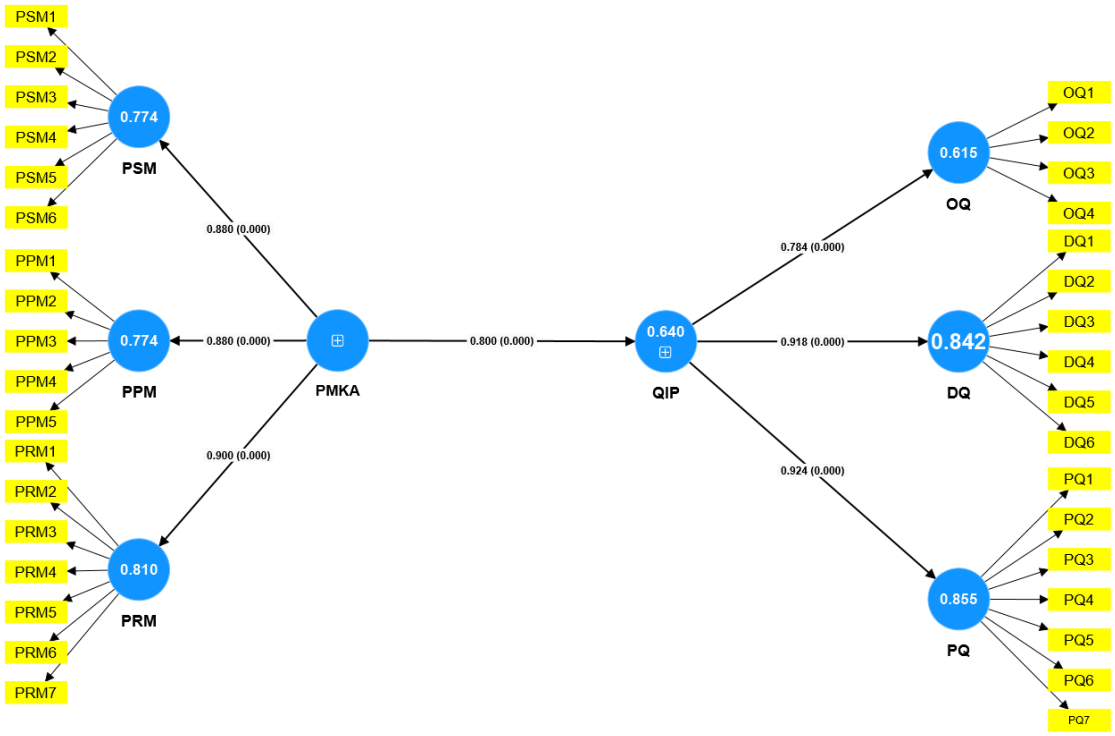

Figure 4.1: Result of path analysis; values in the inner model represent the path coefficient (p-value); values in the outer model represent the p-value.

4.3.4.2 The Impact of Project Management Knowledge Areas dimensions on the Quality of Infrastructure Projects

The sub-hypotheses examined the direct effects of project schedule management, project resource management, and project procurement management on the quality of infrastructure projects. These paths were tested to determine which specific project management knowledge areas significantly contribute to the quality of infrastructure projects through three sub-hypotheses that state:

1. **“There is a statistically significant impact of project schedule management on the quality of infrastructure projects in the municipalities of Southern Hebron Governorate”.**
2. **“There is a statistically significant impact of project procurement management on the quality of infrastructure projects in the municipalities of Southern Hebron Governorate”.**
3. **“There is a statistically significant impact of project resource management on the quality of infrastructure projects in in the municipalities of Southern Hebron Governorate”.**

As shown in Table 4.14, project procurement management had a positive and statistically significant effect on the quality of infrastructure projects ($\beta = 0.449$, STDEV = 0.081, $t = 5.541$, $p < 0.001$). This indicates that procurement-related practices, including procurement planning, supplier and contractor selection, contract management, and procurement monitoring, significantly contribute to improving the quality of infrastructure projects. Accordingly, the hypothesis related to PPM was supported.

Project resource management also had a positive and statistically significant effect on the quality of infrastructure projects (β = 0.284, STDEV = 0.113, t = 2.503, p = 0.012). This finding suggests that better planning, allocation, provision, and monitoring of human and physical resources are significantly associated with higher infrastructure project quality. Therefore, the hypothesis related to PRM was supported.

In contrast, project schedule management showed a positive but statistically non-significant effect on infrastructure project quality (β = 0.184, STDEV = 0.119, t = 1.551, p = 0.121). Although the coefficient was positive, the p-value exceeded the 0.05 significance level. Therefore, the PSM-related hypothesis was not supported. This indicates that schedule management did not have a statistically significant direct effect on infrastructure project quality when the other project management knowledge areas were included in the same model.

Overall, the sub-hypotheses were partially supported. PPM was the strongest predictor of infrastructure project quality, followed by PRM, whereas PSM was not statistically significant.

Table 4.14: Sub-Hypotheses Testing Based on Bootstrapped Structural Path Coefficients

Hypothesis	Structural Path	Coefficient β	STDEV	t-value	p-value	Decision
H1.1	PSM → QIP	0.184	0.119	1.551	0.121	Not supported
H1.2	PPM → QIP	0.449	0.081	5.541	< 0.001	Supported
H1.3	PRM → QIP	0.284	0.113	2.503	0.012	Supported

Note. β = path coefficient; STDEV = standard deviation; PSM = Project Schedule Management; PRM = Project Resource Management; PPM = Project Procurement Management; QIP = Quality of Infrastructure

Projects. A hypothesis was considered supported when $p < 0.05$. Source: Developed by the Author using SmartPLS output.

4.3.5 The Impact of Project Management Knowledge Areas on the Quality of Infrastructure Projects: Cross-respondents ' Professional Characteristics

After testing the main and sub-hypotheses, a multi-group analysis was conducted to examine whether the main structural relationship between project management knowledge areas and quality of infrastructure projects remained stable across selected respondent characteristics. The multi-group analysis focused on two variables: job title and years of experience.

This analysis served as an additional robustness check and a formal test for statistically significant differences between groups. Therefore, the results indicate whether the main relationship remained statistically significant in each group and provide direct evidence that the groups differ significantly from one another.

4.3.5.1 Multi-Group Analysis by Job Title

This section displays the result of the second hypothesis, which states **"There is a statistically significant difference in the impact of project management knowledge areas on the quality of infrastructure projects in the municipalities of Southern Hebron Governorate across job title groups."**

The multi-group analysis by job title examined whether the impact of project management knowledge areas on the quality of infrastructure projects

remained significant among heads of department/projects and engineers. The results showed no statistically significant difference in the impact of project management knowledge areas on the quality of infrastructure projects in the municipalities of southern Hebron Governorate across job title groups (path difference = 0.038, t = 0.327, p = 0.654), thereby not supporting the second hypothesis. This result indicates no significant differences in the opinions of engineers and project managers regarding the impact of project management knowledge domains on infrastructure project quality, as the difference in path coefficients between the two groups was not statistically significant. This suggests that both groups view the impact of project management on infrastructure project quality similarly.

In addition, the PMKA–QIP path was positive and statistically significant in both groups. Among heads of departments/projects, the coefficient was $\beta = 0.832$ ($p < 0.001$), and among engineers, $\beta = 0.794$ ($p < 0.001$). These findings indicate that the positive relationship between project management knowledge areas and infrastructure project quality was stable across the two job-title groups. The coefficient was slightly higher among heads of departments/projects, suggesting that respondents in supervisory or managerial positions perceive the contribution of project management practices to project quality more strongly. The subgroup-specific results are presented in Table 4.15.

Table 4.15: Multi-group Specific Results for the Main Path by Job Title

Group	n	Structural Path	Coefficient β	p-value	Interpretation
Head of department/projects	32	PMKA → QIP	0.832	< 0.001	Significant
Engineers	57	PMKA → QIP	0.794	< 0.001	Significant

Note. β = path coefficient; PMKA = Project Management Knowledge Areas; QIP = Quality of Infrastructure Projects. P-values < 0.05 indicate statistical significance—source: Developed by the Author using SmartPLS output.

4.3.5.2 Multi-Group Analysis by Years of Experience

This section displays the result of the third hypothesis, which states **"There is a statistically significant difference in the impact of project management knowledge areas on the quality of infrastructure projects in the municipalities of southern Hebron Governorate across years of experience groups."**

The multi-group analysis by years of experience tested whether the impact of project management knowledge areas on infrastructure project quality remained significant across levels of professional experience. The results showed no statistically significant differences in the impact of project management knowledge areas on the quality of infrastructure projects in the targeted municipalities across professional experience groups, thereby not supporting the third hypothesis. This result indicates no significant differences in participants' opinions about the impact of project management knowledge domains on infrastructure project quality across experience levels, as the pairwise differences in path coefficients between groups were not statistically

significant. This suggests that the groups view the impact of project management on infrastructure project quality similarly.

Table 4.16: Path Coefficient Difference Cross Years of Experience Groups Using Multi-group Analysis

	Path difference	**p-value**
10–14 years - 5–9 years	0.152	0.249
10–14 years - Less than 5 years	-0.069	0.292
10–14 years - 15 years and above	0.217	0.234
5–9 years - Less than 5 years	-0.221	0.063
5–9 years - 15 years and above	0.065	0.874
15 years and above -Less than 5 years	0.286	0.059

The multi-group analysis by years of experience examined whether the relationship between Project Management Knowledge Areas and Quality of Infrastructure Projects remained significant across levels of professional experience. The results showed that the PMKA–QIP path was positive and statistically significant across all experience groups. The strongest coefficient was observed among respondents with less than 5 years of experience ($\beta = 0.940$, $p < 0.001$), followed by those with 10–14 years of experience ($\beta = 0.871$, $p < 0.001$), those with 5–9 years of experience ($\beta = 0.719$, $p < 0.001$), and those with 15 years or more ($\beta = 0.654$, $p = 0.012$).

These findings indicate that the positive relationship between project management knowledge areas and infrastructure project quality was maintained across all experience categories. Although the coefficient was lowest among respondents aged 15 years and older, it remained statistically

significant. The variation in coefficient size may reflect differences in how respondents at different levels of experience evaluate project management practices. Less-experienced respondents may view formal project management knowledge areas as more central to project quality, whereas more-experienced respondents may also rely on accumulated practical experience and field judgment.

Table 4.17: Multi-group-Specific Results for the Main Path by Years of Experience

Group	n	Structural Path	Coefficient β	p-value	Interpretation
Less than 5 years	17	PMKA → QIP	0.940	< 0.001	Significant
5–9 years	30	PMKA → QIP	0.719	< 0.001	Significant
10–14 years	31	PMKA → QIP	0.871	< 0.001	Significant
15 years and above	17	PMKA → QIP	0.654	0.012	Significant

Note. β = path coefficient; PMKA = Project Management Knowledge Areas; QIP = Quality of Infrastructure Projects. P-values < 0.05 indicate statistical significance—source: Developed by the Author using SmartPLS output.

4.4 Discussion of Results

4.4.1 Discussion of the First Question

To answer the question, "To what extent do municipalities of Southern Hebron Governorate apply the project management knowledge areas in their infrastructure projects?"

The descriptive results showed that the level of Project Management Knowledge Areas (PMKA) was high overall. This indicates that the municipalities included in the study generally apply project management practices at a high level. These results are consistent with the study of **Al-**

Ghunaimat (2022), Shomali & Nassar (2021), and Dahleez & Anbar (2017). The researcher attributes this similarity in findings to the increasing professional experience among employees and the heightened awareness of the importance of planning and effective management for attaining project success.

- In this study, **Project Procurement Management (PPM)** recorded the highest score. This demonstrates that procurement practices are generally well applied in municipal infrastructure projects. The researcher attributes this outcome to the ongoing oversight and supervision of procurement and supply operations by the Ministry of Local Government and its directorates. This result is consistent with **Al-Ghunaimat (2022)** study, which targeted Local Authorities and recorded the highest application of procurement practices**.** The researcher explains this similarity in results by noting the focused attention given to procurement management by Local Authorities, which rely heavily on contracts, the provision of materials, and suppliers for their projects.
- The **Project Schedule Management (PSM)** comes in second place, but it still recording a high-level application. This indicates that scheduled practices are generally well applied in municipal infrastructure projects. The researcher justifies this result by noting that municipalities usually work with construction firms to implement infrastructure projects within a set timeframe. If the project schedule is delayed (excluding circumstances beyond the contractor's control), the contractor must settle a financial obligation in accordance with the pre-defined contract. The result is consistent with findings by **Al-Ghunaimat (2022)** and **Dahleez & Anbar (2017).** The researcher attributes these outcomes to the fact that

target samples adopting clear procedures for schedule planning and monitoring practices before and during project implementation

- The **Project Resources Management (PRM)** comes in the last position, but still recording a high level of application. This indicates that resources practices are generally well applied in municipal infrastructure projects. This might be justified by the nature of infrastructure projects in municipalities requires careful resource management and the adoption of more disciplined practices in resource allocation, given their limited availability and high cost. This result is consistent with the study by **Dahleez & Anbar (2017),** but not with the study by **Al-Ghunaimat (2022),** which reported an average percentage. The difference may be attributed to the level of administrative and technical expertise of the project team and the disparity in available resources among the targeted groups.

4.4.2 Discussion of the Second Question

To answer the question, "What is the level of quality of infrastructure projects in municipalities of Southern Hebron Governorate?"

- The descriptive analysis also showed that the Quality of Infrastructure Projects (QIP) level was high. This finding suggest that respondents perceived municipal infrastructure projects as high quality, particularly in implementation procedures, compliance with specifications, coordination, and monitoring. Among its dimensions, Process Quality (PQ) recorded the highest mean score, followed by Organizational Quality (OQ) and Design Quality (DQ). This result is attributed to municipalities' reliance on clear regulatory and supervisory procedures

for project quality and on contracting companies to implement infrastructure projects within the terms of the contract, thereby enhancing adherence to quality standards during the planning and implementation phases.

4.4.3 Discussion of the Main Hypothesis

“There is a statistically significant impact of project management knowledge areas on the quality of infrastructure projects in the municipalities of southern Hebron Governorate?"

- Project management knowledge areas positively affected the quality of infrastructure projects. This indicates that a stronger application of project management knowledge areas is associated with higher-quality infrastructure projects in the municipalities of South Hebron Governorate. This result may be attributed to municipalities' adherence to administrative and regulatory procedures for monitoring projects and coordinating with contractors, which is an influential factor in the quality of infrastructure projects. This result is supported by **Shomali & Nassar (2021) and Dahleez & Anbar (2017)**.

4.4.3.1 Discussion of the First sub-hypothesis

“There is a statistically significant impact of project schedule management on the quality of infrastructure projects in the municipalities of southern Hebron Governorate.”

- Project Schedule Management showed a positive but statistically non-significant effect on infrastructure project quality. This indicates that schedule management did not have a statistically significant direct effect

on infrastructure project quality when the other project management knowledge areas were included in the same model. This may be explained by the fact that the targeted municipalities may prioritize the quality of infrastructure projects and their conformity to the requirements over on-time completion, particularly in infrastructure projects that entail accuracy in technical precision and long-term sustainability. In other words, municipalities may overlook some delays in project implementation in exchange for the required quality.

4.4.3.2 Discussion of the Second sub-hypothesis

"There is a statistically significant impact of project procurement management on the quality of infrastructure projects in the municipalities of southern Hebron Governorate."

- Project procurement management had the strongest positive effect on infrastructure project quality. This indicates that procurement-related practices, including procurement planning, supplier and contractor selection, contract management, and procurement monitoring, significantly contribute to improving the quality of infrastructure projects. This result is attributed to the effectiveness of the procurement and contracting procedures imposed by the Ministry of Local Government on municipalities, which compel them to contract with suitable suppliers and construction firms in accordance with the contract terms. This contributes to providing materials and services that meet the required specifications, which is directly reflected in improved infrastructure project quality. This is supported by **Jama & Mohamud (2024)**. Accordingly, the Findings of this result is somewhat consistent to the study by **Shomali & Nassar (2021) and Dahleez & Anbar (2017)**.

4.4.3.3 Discussion of the Third sub-hypothesis

"There is a statistically significant impact of project resources management on the quality of infrastructure projects in the municipalities of southern Hebron Governorate."

- Project Resources Management had a positive and statistically significant effect on the quality of infrastructure projects. This finding suggests that better planning, allocation, provision, and monitoring of human and physical resources are significantly associated with higher infrastructure project quality. The result is attributed to the fact that municipalities attach greater importance to contractors with the required resources in the selection process to execute projects efficiently. Where the municipality plays a supervisory role to ensure the optimal use of project resources. This, in turn, leads to proper resource allocation and accurate execution, thereby higher project quality. This result is consistent with **Shomali & Nassar (2021).**

4.5 Summary

This chapter presented the study's empirical findings. It began with the respondents' profile, followed by the descriptive statistics for the study constructs and their related dimensions. The descriptive results showed that the level of Project Management Knowledge Areas (PMKA) was high overall. Among its dimensions, Project Procurement Management (PPM) recorded the highest mean score, followed by Project Schedule Management (PSM) and Project Resource Management (PRM). This indicates that the municipalities included in the study generally apply project management practices at a high level, particularly in procurement-related procedures.

The descriptive analysis also showed that the Quality of Infrastructure Projects (QIP) level was high. Among its dimensions, Process Quality (PQ) recorded the highest mean score, followed by Organizational Quality (OQ) and Design Quality (DQ). These findings suggest that respondents perceived municipal infrastructure projects as high quality, particularly in implementation procedures, compliance with specifications, coordination, and monitoring.

The chapter also presented the evaluation of the structural model using PLS-SEM. The multicollinearity assessment showed that the VIF values were within the acceptable range, indicating that collinearity was not a concern in the structural model. The coefficient of determination results showed that the model had strong explanatory power for the variance in Quality of Infrastructure Projects. The effect size results also supported the relevance of the structural relationships examined in the model.

The path coefficient analysis supported the main hypothesis. Project management knowledge areas positively affected the quality of infrastructure projects. At the sub-hypothesis level, the findings showed partial support. Project procurement management had the strongest positive effect on infrastructure project quality, followed by project resource management. However, project schedule management showed a positive but statistically non-significant effect on the quality of infrastructure projects. Therefore, the hypotheses related to procurement and resource management were supported, whereas the hypothesis related to schedule management was not.

The multi-group analysis showed that the impact of project management knowledge areas and the quality of infrastructure projects remained positive and statistically significant across job title and years-of-experience groups. Specifically, the PMKA–QIP relationship was significant among both heads of department/projects and engineers. It was also significant across all years-of-experience categories. These findings provide the basis for the discussion, conclusions, and recommendations presented in the next chapter.

CHAPTER FIVE

Results, Conclusion, and Recommendations

5.1. Introduction

5.2. Findings

5.3. Conclusion

5.4. Recommendations

5.1 Introduction

This study examined how project management knowledge areas affect the quality of infrastructure projects in the municipalities of South Hebron Governorate. The project management knowledge areas included three main dimensions: Project Schedule Management, Project Procurement Management, and Project Resource Management. The quality of infrastructure projects was assessed through three dimensions: Process Quality, Design Quality, and Organizational Quality.

The study adopted a quantitative explanatory cross-sectional design. Data were collected using a structured questionnaire distributed to employees involved in municipal infrastructure projects, including engineers, heads of departments or project-related units, administrative staff, and other relevant staff. A total of 103 questionnaires were distributed among the accessible municipalities, and 95 valid questionnaires were returned and used in the final analysis. The data were analyzed using descriptive statistics and Partial Least Squares Structural Equation Modeling through SmartPLS.

This chapter presents the study's main findings and offers the overall conclusion based on the empirical results in Chapter Four.

5.2 Findings

The study showed that the municipalities included in the analysis generally apply project management knowledge areas at a high level. Among the three project management dimensions, Project Procurement Management recorded the highest level, followed by Project Schedule Management and Project Resource Management, respectively. This indicates that procurement-related procedures, such as procurement planning, supplier and contractor selection, contract management, and procurement monitoring, are relatively more established in municipal infrastructure project work.

The findings also showed that the quality of infrastructure projects was perceived to be high overall. Among the quality dimensions, Process Quality recorded the highest level, followed by Organizational Quality and Design Quality. This suggests that respondents viewed municipal infrastructure projects as relatively strong in terms of implementation procedures, compliance with technical specifications, coordination among project stakeholders, and quality monitoring.

The measurement model results indicated that the study instrument had acceptable reliability and validity. Cronbach’s alpha and composite reliability values were within acceptable ranges, and the convergent validity results supported the constructs' adequacy. These results indicate that the questionnaire items were suitable for measuring the intended constructs of project management knowledge areas and infrastructure project quality.

The structural model evaluation indicated that multicollinearity was not a concern, as the VIF values were within acceptable limits. This means that the predictor constructs did not overlap excessively and that the structural model was appropriate for hypothesis testing.

The coefficient of determination showed that Project Management Knowledge Areas explained a strong proportion of the variance in Quality of Infrastructure Projects. The R^2 value for QIP was 0.640, meaning that Project Management Knowledge Areas explained 64.0% of the variance in infrastructure project quality. This finding indicates that project management knowledge areas play a strong role in explaining the quality of municipal infrastructure projects.

The path coefficient results supported the study's main hypothesis. Project Management Knowledge Areas had a positive and statistically significant effect on Quality of Infrastructure Projects ($\beta = 0.800$, $p < 0.001$). This means that stronger application of project management knowledge areas is associated with better infrastructure project quality in the surveyed municipalities.

Regarding the sub-hypotheses, Project Procurement Management had the strongest positive and statistically significant effect on Quality of Infrastructure Projects ($\beta = 0.449$, $p < 0.001$). This finding indicates that procurement management is the most influential project management area in improving infrastructure project quality.

Project Resource Management also had a positive and statistically significant effect on Quality of Infrastructure Projects ($\beta = 0.284$, $p = 0.012$). This result

indicates that proper planning, allocation, provision, and monitoring of human, material, and technical resources contribute significantly to improving the quality of infrastructure projects.

Project Schedule Management showed a positive but statistically non-significant effect on Quality of Infrastructure Projects ($\beta = 0.184$, $p = 0.121$). Therefore, the hypothesis related to schedule management was not supported. This indicates that schedule management alone did not have a statistically significant direct effect on infrastructure project quality when procurement and resource management were included in the same model.

The multi-group analysis showed that the impact of Project Management Knowledge Areas and Quality of Infrastructure Projects is positive and statistically significant across job-title groups, suggesting that the main study finding was stable across these two professional groups.

The multi-group analysis by years of experience also showed that the impact of Project Management Knowledge Areas and Quality of Infrastructure Projects is positive and statistically significant across all experience categories.

5.3 Conclusion

This study concluded that Project Management Knowledge Areas have a significant positive effect on the Quality of Infrastructure Projects in the municipalities of South Hebron Governorate. The empirical results showed that the more effective application of project management knowledge areas is associated with higher infrastructure project quality. This confirms the importance of strengthening project management practices in municipal infrastructure projects.

More specifically, the study concluded that Project Procurement Management is the strongest predictor of infrastructure project quality. This means that the quality of infrastructure projects depends heavily on clear procurement planning, transparent supplier and contractor selection, proper contract management, and continuous monitoring of procurement implementation. In the context of municipal infrastructure, procurement appears to be a central mechanism for improving project quality.

The study also concluded that Project Resource Management has a significant positive effect on infrastructure project quality. This highlights the importance of ensuring the availability of qualified personnel, appropriate equipment, necessary materials, and effective monitoring of resource use during project implementation. Without adequate resource management, even well-designed projects may face difficulties in achieving the required quality standards.

In contrast, Project Schedule Management did not show a statistically significant direct effect on infrastructure project quality. Although schedule

management remains an important project management practice, the results suggest that time-related planning and control may not be sufficient on their own to improve project quality when procurement and resource management are modeled together. This may indicate that quality improvement in municipal infrastructure projects is more strongly influenced by procurement efficiency and resource availability than by scheduling practices alone.

The study further concluded that the primary relationship between Project Management Knowledge Areas and the Quality of Infrastructure Projects was stable across job title and years-of-experience groups. This suggests that the importance of project management knowledge areas was recognized across different professional positions and experience levels. However, the subgroup analysis was treated as an additional robustness check rather than a formal test of group differences.

5.4 Recommendations:

- An effective and integrated procurement system should be adopted to enhance transparency and the efficiency of procurement and supplier management, and ultimately improve the quality of infrastructure project implementation.
- The Targeted Municipalities should use technology and software programs to manage project schedule, while maintaining flexibility in setting schedules so that can be modified to suit the surrounding environment.
- Conduct future studies to examine the absence of the significant effect of project schedule management on project quality in the targeted municipalities, and explore factors that may affect this relationship.
- Municipalities of the Southern Hebron Governorate should prioritize providing sufficient resources for each project, particularly technical resources.
- Before starting any project, the targeted municipalities should verify that all necessary material, technical resources, and human resources are available. This ensures that the project succeed and maintain public needs.
- It is necessary for specialized bodies and experts from inside and outside Palestinian municipalities in the Southern region of Hebron Governorate to develop training courses for all engineers and project head departments. These courses should emphasize the importance of achieving high-quality outcomes, identifying the key factors that enhance project quality, and

clarifying effective methods for maintaining high standards in infrastructure projects.

- Increase awareness among project management staff in targeted municipalities by conducting training workshops on best practices and introducing tools and techniques aligned with international project management standards to ensure quality.
- Municipalities of the Southern Hebron Governorate must strengthen implementation of the well-known knowledge areas for managing infrastructure projects by assigning a team member with strong project management knowledge and experience.
- Ensure full coordination among municipal departments and clearly allocate responsibilities and powers to minimize issues that hinder effective project management implementation.
- Palestinian municipalities must have independent decision-making and operate with flexible administrative and financial decentralization. The central government should maintain minimum oversight to ensure transparency and prevent financial waste.

The Ministry of Local Government should establish a higher-level committee be responsible for ensuring and monitoring the quality of municipal projects to achieve the aforementioned recommendations.

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Appendix 1

The Questionnaire

بسم الله الرحمن الرحيم

Dear Respondent,

Greetings;

The researcher is conducting a study entitled 'The Impact of Project Management Knowledge Domains on the Quality of Infrastructure Projects in the Municipalities of South Hebron'; this forms part of the requirements for a Master's degree in Management Sciences at Palestine Polytechnic University.

Your participation in answering the questions provided will therefore be of great assistance in ensuring the success of this study. Therefore, please be so kind as to answer all sections of the attached questionnaire accurately and objectively, as your opinions are vital in enabling the researcher to reach accurate conclusions and achieve the intended scientific objective. Please be aware that your responses will be treated with complete confidentiality and will be used solely for scientific research purposes.

Yours sincerely,

Researcher: Shaima Swaity

Supervisor: Dr. Marwan Jaloud

Part 1: Demographic and Employment Details

Please tick (X) the box next to each statement that applies to you.

1. Gender

☐ **Male** ☐ **Female**

2. Age group:

- ☐ **Under 30**
- ☐ **30–under 40**
- ☐ **40–under 50**
- ☐ **50 and over**

3. Educational level

- ☐ **Diploma**
- ☐ **Bachelor's degree**
- ☐ **Postgraduate**

4. Job title

- ☐ **Engineer**
- ☐ **Head of Department or Section Other projects**
- ☐ **others: ——————**

5. Number of years' experience at the municipality

- ☐ **Less than 5 years**
- ☐ **From 5 to less than 10 years**
- ☐ **From 10 to less than 15 years**
- ☐ **15 years or more**

6. Name of municipality: .....

Part Two: This section deals with your assessment of the extent to which project management standards are applied in the municipalities of Southern Hebron. Please tick the box that best reflects your opinion:

	The Statement	**Strongly disagreed**	**Disagreed**	**Neutral**	**Agree**	**Strongly Agree**
The First Dimension: Project schedule management: this encompasses all activities necessary to complete the project within the estimated timeframe.						
1	A clear schedule is drawn up for the project implementation phases					
2	The activities required for the project are identified, along with their durations					
3	Work is carried out within the planned timeframe without delay					
4	The estimated time required to complete the project is commensurate with its financial value					
5	Corrective action is taken when delays occur in the project schedule					
6	The time required to complete the project is managed effectively					
The second dimension: Project procurement management: This includes the acquisition of goods or services and the management of contracts and purchase orders issued by project members						

1	The project's procurement requirements are identified and a clear procurement plan is drawn up					
2	Suppliers are selected according to clear and transparent criteria					
3	Contractors are selected in accordance with established criteria					
4	Contracts are managed and the performance of project suppliers is monitored					
5	Procurement implementation is monitored to ensure that suppliers comply with the terms of the contract and the required specifications					
The third dimension: Project resource management (human resources, including personnel and expertise; and physical resources, including equipment, tools and technologies)						
1	A clear plan for project resource management is drawn up before the project commences					
2	The requirements for human resources with the necessary expertise and skills are identified before the project begins					
3	It is ensured that the equipment and materials supplied to the project meet the required conditions and specifications					
4	Suitable human resources are					

	available to carry out the planned project activities					
5	Appropriate technical equipment is available to carry out the planned project activities					
6	The required materials are delivered to the project site in a timely manner					
7	The use of resources is monitored effectively and their efficient utilization in the project is ensured					

Part 3: This section concerns your assessment of the quality of infrastructure projects in the municipalities of South Hebron. Please tick the box that best reflects your opinion:

	The Statement	**Strongly disagreed**	**Disagreed**	**Neutral**	**Agree**	**Strongly Agree**
Dimension 1: Quality of Operations: This reflects the efficiency and effectiveness of the operations and procedures through which the project is implemented in accordance with specified standards						
1	Work is carried out in accordance with the contract requirements and technical specifications					
2	Comments and defects in project implementation are addressed promptly and effectively					
3	The quality of materials used in the project is checked					
4	Contractors adhere to the approved quality plans during					

	project implementation					
5	There is effective coordination between project stakeholders to ensure understanding of work requirements and to avoid errors during implementation					
6	Lessons learnt from previous projects are applied to improve the quality of implementation in current projects					
7	Project performance is monitored on an ongoing basis					
Dimension 2: Design Quality: This reflects the ability of the project design and its technical specifications to meet the project's requirements and needs accurately and clearly prior to implementation						
1	Project documents and drawings are prepared clearly and accurately before being put into implementation					
2	Project documents and drawings are checked to ensure they are free from any technical or computational errors					
3	Designs and projects are compatible with the technical capabilities and equipment available to the municipality or contractors					

4	Stakeholders (the local community, service departments) are involved in the design and study phase of municipal projects					
5	Project outputs comply with the technical specifications and requirements defined prior to implementation					
6	Designs and documents comply with technical, environmental and public safety requirements					
Dimension 3: Organizational Quality: This reflects the extent to which the organization is able to support the achievement of project quality and the functional role of individuals within the organization in fostering an integrated quality culture						
1	Senior management (the Municipal Council) supports the implementation of quality policies and procedures in projects					
2	Staff possess the necessary skills and expertise to deliver projects to the required standard					
3	Coordination and communication between project stakeholders regarding project quality is effective					
4	Disputes arising between project stakeholders (the client, contractors, designers,					

	workers, etc.) are resolved effectively to ensure the continuity of work					

Thank you for your cooperation

Appendix 2

أداة الاستبانة

بسم الله الرحمن الرحيم

السيد المستجيب/ السيدة المستجيبة

تحية طيبة وبعد؛

تقوم الباحثة بإجراء دراسة بعنوان (أثر المجالات المعرفية لإدارة المشاريع على جودة مشاريع البنية التحتية لبلديات جنوب الخليل)؛ وذلك استكمالاً لمتطلبات الحصول على درجة الماجستير في تخصص العلوم الإدارية من جامعة بوليتكنك فلسطين.

وبذلك، فإن مشاركتكم بالإجابة على الأسئلة الواردة تمثل دعما مهما لإنجاح هذه الدراسة، لذا؛ يرجى التكرم بالإجابة عن جميع الفقرات في الاستبانة المرفقة بدقة وموضوعية، وذلك لأهمية آرائكم في وصول الباحث إلى نتائج دقيقة وتحقيق الغاية العلمية المنشودة، علماً بأن اجاباتكم سيتم التعامل معها بسرية تامة، ولن تستخدم إلا لأغراض البحث العلمي فقط.

وتقبلوا منا الاحترام والتقدير

الباحثة: شيماء سويطي

المشرف: د. مروان جلعود

الجزء الأول: البيانات الديموغرافية والوظيفية

يرجى وضع إشارة (X) أمام كل عبارة، بما ينطبق عليك.

1. **النوع الاجتماعي**

☐ ذكر ☐ أنثى

2. **الفئة العمرية:**

☐ أقل من (30) سنة

☐ من (30) – أقل من (40) سنة

☐ من (40) – أقل من (50) سنة

☐ (50) سنة فأكثر

3. **المستوى التعليمي**

☐ دبلوم ☐ بكالوريوس ☐ دراسات عليا

4. **المسمى الوظيفي**

☐ مهندس ☐ رئيس دائرة أو قسم مشاريع

☐ أخرى: _____

5. عدد سنوات الخبرة في البلدية

☐ أقل من (5) سنوات

☐ من (5) – أقل من (10) سنوات

☐ من (10) – أقل من (15) سنة

☐ (15) سنة فأكثر

6. اسم البلدية: .....

7. حجم مشاريع البنية التحتية التي تنفذها البلدية (يمكنك اختيار أكثر من إجابة):

☐ مشاريع صغيرة (تكلفتها أقل من 100,000 شيكل)

☐ مشاريع متوسطة (من 100,000–500,000 شيكل)

☐ مشاريع كبيرة (أكثر من 500,000 شيكل)

8. حجم مشاريع البنية التحتية التي تعمل عليها البلدية في الغالب؟ (اختر إجابة واحدة):

☐ مشاريع صغيرة (تكلفتها أقل من 100,000 شيكل)

☐ مشاريع متوسطة (من 100,000–500,000 شيكل)

☐ مشاريع كبيرة (أكثر من 500,000 شيكل)

الجزء الثاني: يتعلق هذا الجزء بتقييمك لمدى تطبيق معايير إدارة المشاريع في بلديات جنوب الخليل، لذلك يرجى التكرم بوضع إشارة (X) في الخانة الأقرب لرأيك:

	العبارة	موافق بشدة	موافق	محايد	غير موافق	غير موافق بشدة
البعد الأول: إدارة جدول المشروع؛ وتشمل جميع الأنشطة اللازمة لإنجاز أعمال المشروع وفق الوقت المقدر له.						
1	يتم وضع خطة زمنية واضحة لمراحل تنفيذ المشروع					
2	يتم تحديد النشاطات اللازمة للمشروع مع تحديد مدتها					
3	يتم الالتزام بتنفيذ الأعمال ضمن الوقت المخطط دون تأخير					
4	يتناسب تقدير الوقت اللازم لإنجاز المشروع مع قيمته المالية					
5	يتم اتخاذ إجراءات تصحيحية عند حدوث تأخير في الجدول الزمني للمشروع					
6	يتم إدارة الوقت اللازم لإنجاز المشروع بشكل فعال					

البعد الثاني: إدارة مشتريات المشروع: وتشمل الحصول على السلع أو الخدمات وإدارة العقود وأوامر الشراء الصادرة عن أعضاء المشروع						
1	يتم تحديد احتياجات المشروع من المشتريات وإعداد خطة واضحة لعمليات الشراء					
2	يتم اختيار الموردين وفق معايير واضحة وشفافة					
3	يتم اختيار المقاولين وفق المعايير الموضوعة					
4	يتم إدارة العقود ومتابعة أداء موردين المشروع					
5	يتم مراقبة تنفيذ المشتريات والتأكد من التزام الموردين بشروط العقد والمواصفات المطلوبة					
البعد الثالث: إدارة موارد المشروع (الموارد البشرية، وتشمل الأفراد والخبرات؛ والموارد المادية، وتشمل المعدات والأدوات والتقنيات)						
1	يتم إعداد خطة واضحة لإدارة موارد المشروع قبل البدء في تنفيذ المشروع					
2	يتم حصر الاحتياجات من الموارد البشرية من ذوي الخبرة والمهارات قبل البدء بالمشروع					
3	يتم التأكد بأن المعدات والمواد الموردة إلى المشروع تحقق الشروط والمواصفات المطلوبة					
4	تتوفر موارد بشرية ملائمة لتنفيذ أنشطة المشروع المخطط لها					
5	تتوفر معدات تقنية ملائمة لتنفيذ أنشطة المشروع المخطط لها					

6	يتم توريد المواد المطلوبة إلى موقع المشروع في الوقت المناسب					
7	يتم متابعة استخدام الموارد بشكل فعال والتأكد من استغلالها بكفاءة في المشروع					

الجزء الثالث: يتعلق هذا الجزء بتقييمك لمستوى جودة مشاريع البنية التحتية في بلديات جنوب الخليل، لذا يرجى التكرم بوضع إشارة (X) في الخانة الأقرب لرأيك:

	العبارة	موافق بشدة	موافق	محايد	غير موافق	غير موافق بشدة
البعد الأول: جودة العمليات: تعبر عن مدى كفاءة وفعالية العمليات والإجراءات التي يتم من خلالها تنفيذ المشروع وفق المعايير المحددة						
1	يتم تنفيذ الأعمال وفقا لمتطلبات العقد والمواصفات الفنية					
2	يتم معالجة الملاحظات والعيوب التنفيذية في المشاريع بشكل فوري وفعال					
3	يتم فحص جودة المواد المستخدمة في المشروع					
4	تلتزم الجهات المنفذة بتطبيق خطط الجودة المعتمدة أثناء تنفيذ المشروع					
5	يتم التنسيق بين أطراف المشروع بشكل فعال لضمان فهم متطلبات العمل وتفادي الأخطاء أثناء عملية التنفيذ					

6	يتم تطبيق الدروس المستفادة من المشاريع السابقة في تحسين جودة التنفيذ للمشاريع الحالية					
7	يتم متابعة أداء المشروع بشكل مستمر					
البعد الثاني: جودة التصميم: تعبر عن قدرة تصميم المشروع ومواصفاته الفنية على تلبية متطلبات واحتياجات المشروع بشكل دقيق وواضح قبل التنفيذ						
1	يتم إعداد وثائق ومخططات المشروع بشكل واضح ودقيق قبل طرحها للتنفيذ					
2	يتم التحقق من خلو وثائق ومخططات المشروع من أي أخطاء فنية أو حسابية					
3	تتوافق التصاميم والمشاريع مع الإمكانيات التقنية والمعدات المتاحة في البلدية أو لدى المقاولين					
4	يتم إشراك أصحاب العلاقة (المجتمع المحلي، الدوائر الخدمية) في مرحلة التصميم والدراسة للمشاريع البلدية					
5	تتوافق مخرجات المشروع مع المواصفات والمتطلبات الفنية التي تم تحديدها قبل التنفيذ					
6	تتوافق التصاميم والوثائق مع الشروط الفنية والبيئية والسلامة العامة					
البعد الثالث: جودة المنظمة: تعبر عن مدى قدرة المؤسسة على دعم تحقيق جودة المشروع والدور الوظيفي للأفراد داخل المؤسسة نحو ثقافة جودة متكاملة						
1	تدعم الإدارة العليا (المجلس البلدي) توظيف سياسات وإجراءات الجودة في المشاريع					

2	يمتلك الموظفون المهارات والخبرات اللازمة لتنفيذ المشاريع بالمستوى المطلوب					
3	التنسيق والتواصل بين أطراف المشروع فعال حول جودة المشاريع					
4	يتم حل النزاعات في حال بروزها بين أطراف المشروع (الجهة المالكة، المقاولين، المصممين، العمال، ...) بطريقة فعالة تضمن استمرارية العمل					

شاكرة لكم حسن تعاونكم

Appendix 3

List of Judges

#	Name	College Name
1.	Dr. Marwan Jaloud	Palestine Polytechnic University
2.	Dr Ahmad Abu Alrub	Palestine Polytechnic University
3.	Lecturer Dina Al-qudsi	Palestine Polytechnic University
4.	Dr. Fadel Eidah	Al-Quds Open University
5.	Dr. Maryam Fasfous	Bethlehem University
6.	Lecturer Neal Abu Arqoub	Al-Quds Open University

Abstract in Arabic

هدفت هذه الدراسة إلى فحص أثر مجالات المعرفة في إدارة المشاريع على جودة مشاريع البنية التحتية التي تنفذها البلديات في جنوب محافظة الخليل. اعتمدت الدراسة المنهج الكمي التفسيري المقطعي، حيث تم توزيع استبانة على 95 مهندسًا بلديًا ورئيسًا لأقسام المشاريع. وتم تحليل البيانات باستخدام الإحصاءات الوصفية والاستدلالية ونمذجة المعادلات الهيكلية بالمربعات الصغرى الجزئية (PLS-SEM) من خلال برنامج Smart-PLS4. أظهرت النتائج أن مجالات المعرفة في إدارة المشاريع تؤثر إيجابًا على جودة مشاريع البنية التحتية، حيث كان لإدارة مشتريات المشروع التأثير الإيجابي الأقوى، تليها إدارة موارد المشروع. في المقابل، أظهرت إدارة جدول المشروع تأثيرًا إيجابيًا، ولكنه غير ذي دلالة إحصائية، على جودة مشاريع البنية التحتية. أوصت الدراسة بزيادة الوعي بين موظفي إدارة المشاريع من خلال عقد برامج وورش عمل تدريبية حول أفضل ممارسات إدارة المشاريع لضمان الجودة، وضمان التنسيق الكامل بين أقسام البلدية، وتحديد المسؤوليات والصلاحيات بوضوح للحد من المشكلات التي تعيق التنفيذ الفعال لإدارة المشاريع.