

Final Project 2

PMG 497

Project Template

The Role of Digital Transformation in Enhancing Project Management Efficiency in the Saudi Public Sector

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Final Project - 2

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Dedication

To my wife and children, for their patience, understanding, and unwavering support throughout this academic journey.

To my supervisors and mentors, who nurtured in me a deep passion for knowledge and research.

I dedicate this work to you all.

Abstract

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1. Chapter 1: Introduction

1.1. Research Background

Digital transformation has become a central pillar of organizational modernization, especially within the public sector. As governments across the globe seek to become more efficient, responsive, and transparent, digital transformation offers a strategic path forward. In Saudi Arabia, this movement is driven by Vision 2030, which emphasizes digital innovation as a national priority. Public institutions are increasingly expected to adopt digital platforms and tools to improve service delivery, decision-making, and project implementation.

In project management, digital transformation manifests through tools such as cloud-based project tracking systems, automated scheduling software, virtual collaboration environments, and advanced data analytics. These technologies facilitate real-time monitoring, proactive risk management, improved communication, and evidence-based decision-making. However, despite the availability of such technologies, adoption and impact vary significantly across different public sector entities.

According to Creswell (2014), an effective research introduction should consist of five components: (1) establishing the problem, (2) reviewing the literature, (3) identifying deficiencies, (4) explaining significance for the audience, and (5) stating the research purpose. This introduction addresses each component. First, the challenge lies in the slow and uneven integration of digital tools in public project environments, which negatively impacts efficiency and stakeholder engagement. Second, literature tends to treat digitalization and project management as separate domains, offering limited integration.

There is a growing recognition that digital transformation is not just a technical upgrade but a shift in organizational culture and processes. Yet, limited empirical work has been conducted in the Saudi public sector to analyze how digital tools specifically influence project management functions such as cost control, timeline

adherence, and stakeholder coordination. This gap necessitates a targeted investigation that goes beyond general digitization discussions.

The purpose of this research is to evaluate the role of digital transformation in enhancing the efficiency and effectiveness of project management in the Saudi public sector. It seeks to explore the types of digital tools in use, their perceived impact, the challenges hindering their full adoption, and the strategic opportunities they present for improving project performance.

1.2. Research Problem

Although digital transformation offers substantial potential for improving project performance, many Saudi public institutions struggle with implementing and leveraging digital tools effectively. This leads to persistent inefficiencies, delays, and communication breakdowns in project execution.

1.2.1. Theoretical Gaps

While digital transformation and project management are widely studied topics, few studies have directly examined the intersection of both within the public sector context—particularly in Saudi Arabia. There is a lack of theoretical frameworks that explain how digital technologies can be systematically integrated into project management processes to enhance performance.

1.2.2. Practical Gaps

In practice, the digital maturity of public institutions in Saudi Arabia remains uneven. Many still rely on outdated systems and manual tracking tools. There is limited guidance on best practices for integrating digital solutions into project workflows, and resistance to change remains a barrier. These practical challenges hinder the realization of the full benefits of digital transformation.

Main Research Question: How does digital transformation influence project management efficiency in Saudi public sector institutions?

1.3. Research Significance

1.3.1. At the theoretical level

This research adds to the academic discourse on digital transformation by examining its specific implications in the field of project management within the public sector. It offers new insights into how digitalization strategies impact project outcomes, filling a gap in current literature.

1.3.2. At the practical level

The findings will provide project managers, policymakers, and digital strategists in Saudi public institutions with actionable knowledge on how to better implement and utilize digital tools. It will help guide future investments in technology and inform training and capacity-building initiatives.

1.4. Research Questions

This study aims to answer the following research questions:

- What is the current state of digital transformation initiatives in project management within the Saudi public sector?
- How do specific digital transformation technologies (e.g., AI, big data, cloud computing) impact project management efficiency in the Saudi public sector?
- What are the key challenges and enablers for successful digital transformation in project management within the Saudi public sector?
- What are the proposed strategies to leverage digital transformation for improved project management efficiency in Saudi public sector projects?

1.5. Research Objectives

The main objectives of this research are:

- To assess the current adoption and maturity of digital transformation in project management practices across the Saudi public sector.
- To analyze the impact of various digital transformation technologies on key project management efficiency indicators (e.g., time, cost, quality) in the Saudi public sector.
- To identify and evaluate the primary obstacles and facilitating factors influencing the implementation of digital transformation in project management within the Saudi public sector.
- To develop and propose practical strategies and recommendations for effectively utilizing digital transformation to enhance project management efficiency in Saudi public sector projects.

1.6. Research Hypotheses

Based on the research questions and objectives, the following hypotheses are formulated:

- **H1:** There is a significant positive relationship between the adoption of digital transformation technologies and project management efficiency in Saudi public sector projects.
- **H2:** The level of digital maturity within public sector organizations positively moderates the relationship between digital transformation technologies and project management efficiency.

- **H3:** Organizational culture and leadership support significantly influence the successful implementation of digital transformation initiatives in project management within the Saudi public sector.
- **H4:** The integration of AI and big data analytics in project management processes leads to a higher improvement in efficiency compared to traditional methods in Saudi public sector projects.

1.7. Research Model

Based on the research questions, objectives, and hypotheses, the conceptual research model for this study is proposed as follows

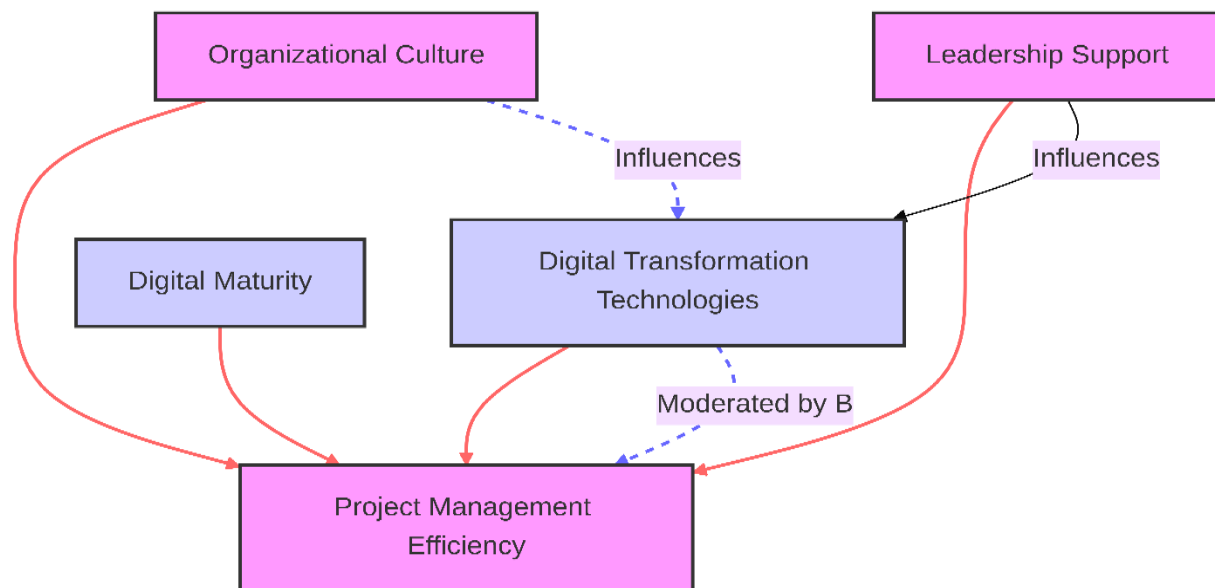


Figure 1. The research model diagram.

This model illustrates the hypothesized relationships between digital transformation technologies and project management efficiency, with digital maturity acting as a moderating variable. Organizational culture and leadership support are proposed as influencing factors for the adoption and effectiveness of digital transformation technologies. The model suggests that the successful

implementation of digital transformation in project management is not only dependent on the technologies themselves but also on the organizational context and leadership commitment within Saudi public sector projects.

1.8. Research Methodology

This section outlines the research methodology that will be employed to address the research questions and test the hypotheses. The methodology is designed to ensure the validity and reliability of the findings.

Research Design

This study will adopt a **mixed-methods research design**, combining both quantitative and qualitative approaches. The quantitative approach will involve collecting numerical data through surveys to identify patterns and relationships between digital transformation technologies and project management efficiency. The qualitative approach will involve in-depth interviews to gain a deeper understanding of the challenges, success factors, and perceptions related to digital transformation in project management within the selected public sector organizations. This mixed-methods approach will provide a comprehensive understanding of the phenomenon under investigation.

Research Philosophy

The research philosophy guiding this study will primarily be **pragmatism**, which allows for the use of both positivist and interpretivist approaches based on the research questions. Pragmatism focuses on practical implications and problem-solving, making it suitable for a study that aims to provide actionable strategies for enhancing project management efficiency through digital transformation. This philosophy supports the use of multiple methods to gain a holistic understanding of the research problem.

Research Approach

This study will employ a **deductive approach** for the quantitative phase, where existing theories and hypotheses related to digital transformation and project management will be tested using empirical data. For the qualitative phase, an **inductive approach** will be utilized to explore new insights and generate themes from the collected data, which may lead to the development of new theoretical propositions or refinement of existing ones.

Research Strategy

For the quantitative component, a **survey strategy** will be used to collect data from a large sample of project managers, IT professionals, and relevant stakeholders within the selected public sector entities. This will allow for statistical analysis and generalization of findings. For the qualitative component, a **case study strategy** will be employed, focusing on a few selected digital transformation projects within these entities to provide an in-depth understanding of the implementation processes, challenges, and efficiency gains.

Research Choice

As mentioned, this study will use a **mixed-methods research choice**, specifically a **sequential explanatory design**. This involves collecting and analyzing quantitative data first, followed by qualitative data collection and analysis. The qualitative data will help explain and elaborate on the quantitative findings, providing a more complete picture and deeper insights into the complex interplay between digital transformation and project management efficiency.

Time Horizon

The study will adopt a **cross-sectional time horizon**, meaning data will be collected at a single point in time. This approach is suitable for examining the current state of digital transformation initiatives and their impact on project

management efficiency within the specified timeframe of the study. While a longitudinal study could provide insights into changes over time, the cross-sectional approach will provide a snapshot of the current landscape and identify key relationships.

Data Collection and Analysis Techniques

- **Quantitative Data Collection:** A structured questionnaire will be developed and administered to project managers and relevant personnel. The questionnaire will include scales to measure the adoption of digital transformation technologies, project management efficiency indicators (e.g., project completion time, budget adherence, quality of deliverables), digital maturity, organizational culture, and leadership support. Data will be collected electronically through online survey platforms.
- **Quantitative Data Analysis:** Statistical software (e.g., SPSS, R, or Smart PLS for SEM) will be used to analyze the quantitative data. Techniques such as descriptive statistics, correlation analysis, regression analysis, and moderation analysis will be employed to test the hypotheses and identify significant relationships between variables.
- **Qualitative Data Collection:** Semi-structured interviews will be conducted with a select group of experienced project managers, IT directors, and senior officials involved in digital transformation projects. The interviews will explore their perceptions, experiences, challenges, and best practices related to leveraging digital transformation for project management efficiency.
- **Qualitative Data Analysis:** The qualitative data from the interviews will be analyzed using thematic analysis. This involves transcribing the interviews, coding the data, and identifying recurring themes, patterns, and insights to

provide a rich, in-depth understanding that complements the quantitative findings.

1.9. Scope of The Study

For the empirical study, it is suggested to focus on Saudi public sector entities undergoing significant digital transformation initiatives, specifically within the Ministry of Communications and Information Technology (MCIT) or projects under the Saudi Data and AI Authority (SDAIA). These organizations are at the forefront of digital adoption and innovation in the Kingdom, making them ideal candidates for studying the impact of digital transformation on project management efficiency. Focusing on these entities will provide access to relevant data, ongoing projects, and experienced personnel involved in digital transformation efforts, allowing for a comprehensive and insightful empirical analysis.

1.10. The Suggested Project Structure

The suggested structure for this project, following a typical research paper format, is as follows:

- **Chapter 1: Introduction**
 - Background of the Study
 - Problem Statement
 - Research Questions
 - Research Objectives
 - Research Hypotheses
 - Significance of the Study

- Scope and Limitations of the Study
- Definition of Key Terms
- **Chapter 2: Literature Review**
 - Introduction to Digital Transformation in Project Management
 - Key Digital Transformation Technologies (AI, Big Data, Cloud Computing, etc.)
 - Project Management Efficiency in the Public Sector
 - Impact of Digital Transformation on Project Management Efficiency
 - Role of Digital Maturity, Organizational Culture, and Leadership Support
 - Previous Studies on Digital Transformation in Saudi Public Sector Projects
 - Research Gap Identification
- **Chapter 3: Research Methodology**
 - Research Design
 - Research Philosophy
 - Research Approach
 - Research Strategy
 - Research Choice
 - Time Horizon
 - Population and Sampling

- Data Collection Instruments (Questionnaires, Interview Protocols)
- Data Collection Procedures
- Data Analysis Techniques (Quantitative and Qualitative)
- Ethical Considerations
- **Chapter 4: Data Analysis and Findings**
 - Introduction
 - Demographic Profile of Respondents
 - Descriptive Statistics of Variables
 - Reliability and Validity Analysis
 - Correlation Analysis
 - Regression Analysis (Hypotheses Testing)
 - Moderation Analysis
 - Qualitative Findings (Themes from Interviews)
- **Chapter 5: Discussion, Conclusion, and Recommendations**
 - Discussion of Findings (linking back to literature and hypotheses)
 - Implications of the Study (Theoretical and Practical)
 - Limitations of the Study
 - Conclusion
 - Recommendations for Practice
 - Recommendations for Future Research

1.11. Scope of The Study

For the empirical study, it is suggested to focus on **Saudi public sector projects managed by the Ministry of Municipal and Rural Affairs and Housing (MOMRAH)**. This ministry is responsible for a wide array of public projects, including urban development, infrastructure, and housing initiatives across various regions in Saudi Arabia. These projects often involve multiple stakeholders, complex coordination requirements, and significant public impact, making them an ideal context for studying coordination mechanisms and their effect on project performance. Focusing on a specific ministry will allow for a more in-depth and focused analysis, providing valuable insights relevant to the broader Saudi public sector.

1.12. The Project Structure

The suggested structure for this project, following a typical research paper format, is as follows:

- **Chapter 1: Introduction**
 - Background of the Study
 - Problem Statement
 - Research Questions
 - Research Objectives
 - Research Hypotheses
 - Significance of the Study
 - Scope and Limitations of the Study
 - Definition of Key Terms

- **Chapter 2: Literature Review**
 - Introduction to Coordination Mechanisms
 - Types of Coordination Mechanisms (Formal and Informal)
 - Project Performance in Public Sector Projects
 - The Relationship between Coordination Mechanisms and Project Performance
 - Moderating Role of Organizational Culture and Leadership Support
 - Previous Studies on Coordination in Public Sector Projects (especially in Saudi Arabia)
 - Research Gap Identification
- **Chapter 3: Research Methodology**
 - Research Design
 - Research Philosophy
 - Research Approach
 - Research Strategy
 - Research Choice
 - Time Horizon
 - Population and Sampling
 - Data Collection Instruments (Questionnaires, Interview Protocols)
 - Data Collection Procedures
 - Data Analysis Techniques (Quantitative and Qualitative)

- Ethical Considerations
- **Chapter 4: Data Analysis and Findings**
 - Introduction
 - Demographic Profile of Respondents
 - Descriptive Statistics of Variables
 - Reliability and Validity Analysis
 - Correlation Analysis
 - Regression Analysis (Hypotheses Testing)
 - Moderation Analysis
 - Qualitative Findings (Themes from Interviews)
- **Chapter 5: Discussion, Conclusion, and Recommendations**
 - Discussion of Findings (linking back to literature and hypotheses)
 - Implications of the Study (Theoretical and Practical)
 - Limitations of the Study
 - Conclusion
 - Recommendations for Practice
 - Recommendations for Future Research

2.Chapter 2: Literature Review

2.1. Introduction

This chapter provides a comprehensive and systematic review of the existing literature pertinent to coordination mechanisms and project performance, with a specific focus on their application within the Saudi public sector context. The literature review serves as the theoretical backbone of this research, establishing a robust foundation for understanding the complex relationships between coordination practices and project outcomes in public administration settings. This chapter aims to critically examine, synthesize, and evaluate the current state of knowledge in the field, while identifying gaps that this study seeks to address.

The importance of conducting a thorough literature review cannot be overstated, particularly in the context of project management research within the Saudi public sector. As the Kingdom undergoes unprecedented transformation through Vision 2030, understanding the theoretical underpinnings of effective coordination becomes crucial for ensuring successful project delivery across various governmental initiatives. The literature review methodology employed in this chapter follows a systematic approach, incorporating peer-reviewed academic journals, authoritative books, government reports, and industry publications to ensure comprehensive coverage of the topic.

The chapter is structured to provide a logical progression through the key concepts and theories that inform this research. It begins by establishing a theoretical foundation for understanding coordination mechanisms as the independent variable, exploring their various dimensions, types, and applications in project management contexts. The review then examines project performance as the dependent variable, analyzing its multifaceted nature and the various metrics used to assess project success, particularly in public sector environments. Subsequently, the chapter investigates the theoretical and empirical relationships between

coordination mechanisms and project performance, drawing from established theories and contemporary research findings.

One of the primary objectives of this literature review is to establish the theoretical relevance and significance of coordination mechanisms in project management. While project management literature has extensively covered topics such as risk management, scheduling, and resource allocation, coordination as a distinct theoretical construct has received relatively less attention, particularly in the context of public sector projects. This gap is particularly pronounced in the Saudi Arabian context, where the unique cultural, organizational, and regulatory environment presents specific challenges and opportunities for coordination practices.

The review also aims to contextualize the study within the broader academic discourse on project management in public administration. Public sector projects differ significantly from private sector initiatives in terms of stakeholder complexity, regulatory requirements, accountability mechanisms, and performance measures. These differences necessitate a nuanced understanding of how coordination mechanisms operate within public sector environments and how their effectiveness can be enhanced to improve project outcomes.

Furthermore, this chapter seeks to identify and synthesize the theoretical frameworks that explain the relationship between coordination mechanisms and project performance. Drawing from organizational theory, systems theory, and project management literature, the review examines various theoretical perspectives that inform our understanding of coordination processes. These theoretical foundations provide the conceptual framework for developing the research hypotheses and model presented in Chapter 1.

The literature review also addresses the contextual factors that influence the effectiveness of coordination mechanisms in the Saudi public sector. The Kingdom's unique cultural context, characterized by hierarchical organizational structures, relationship-based business practices, and rapid modernization efforts, creates a distinctive environment for project coordination. Understanding these contextual factors is essential for developing practical recommendations that are culturally appropriate and organizationally feasible.

Another critical aspect of this literature review is the examination of empirical evidence regarding the impact of coordination mechanisms on project performance. The chapter synthesizes findings from various empirical studies conducted in different contexts, identifying patterns, contradictions, and gaps in the existing evidence base. This empirical foundation is crucial for understanding the practical implications of coordination practices and for informing the research methodology employed in this study.

The review also explores the evolution of coordination mechanisms in response to technological advancements, changing organizational structures, and emerging project management practices. As organizations increasingly adopt digital technologies, agile methodologies, and collaborative platforms, traditional coordination mechanisms are being transformed and new approaches are emerging. Understanding these trends is essential for developing relevant and forward-looking recommendations for the Saudi public sector.

Additionally, this chapter examines the role of moderating factors, such as organizational culture and leadership support, in influencing the relationship between coordination mechanisms and project performance. These factors are particularly relevant in the Saudi context, where cultural values, leadership styles, and organizational hierarchies play significant roles in shaping project outcomes.

The literature review provides insights into how these moderating factors can be leveraged to enhance the effectiveness of coordination efforts.

The chapter also addresses methodological considerations in coordination research, examining the various approaches used to study coordination mechanisms and their impact on project performance. This methodological review informs the research design and data collection strategies employed in this study, ensuring that the research approach is aligned with established best practices in the field.

Finally, the literature review identifies specific gaps in the existing knowledge base that this study aims to address. These gaps include the limited research on coordination mechanisms in the Saudi public sector context, the need for empirical validation of theoretical relationships, and the lack of practical frameworks for implementing effective coordination practices in public sector projects. By addressing these gaps, this study contributes to both theoretical understanding and practical application of coordination mechanisms in project management.

Through this comprehensive literature review, the chapter establishes the theoretical foundation necessary for conducting rigorous empirical research on coordination mechanisms and project performance in the Saudi public sector. The insights gained from this review inform the development of research hypotheses, guide the selection of appropriate research methodologies, and provide the context for interpreting the study's findings. Ultimately, this literature review serves as the bridge between existing knowledge and the new contributions that this research aims to make to the field of project management in public administration.

2.2. The independent variable: Coordination Mechanisms

Coordination mechanisms are the structured and unstructured approaches employed to integrate activities, resources, and information among interdependent parties to achieve common goals [1]. In the context of project management, effective coordination is paramount for ensuring that diverse tasks, teams, and stakeholders work cohesively towards project objectives, especially in complex environments like the public sector. The literature distinguishes between various types of coordination mechanisms, broadly categorized into formal and informal approaches.

2.2.1. Formal Coordination Mechanisms

Formal coordination mechanisms are explicitly designed and institutionalized within an organization's structure and processes. These mechanisms are characterized by their structured nature, clear lines of authority, and documented procedures. Key examples include:

- **Standardized Procedures and Rules:** These involve established guidelines, protocols, and regulations that dictate how tasks should be performed, decisions made, and information shared. They ensure consistency and predictability across project activities. For instance, a public sector project might have a standardized procedure for procurement that all departments must follow, ensuring transparency and compliance.
- **Hierarchical Structures:** This refers to the traditional organizational chart where authority flows from top to bottom. Coordination is achieved through direct supervision, reporting lines, and clear delegation of responsibilities. In Saudi public sector projects, hierarchical structures are often prevalent, with project managers reporting to higher authorities within ministries or governmental agencies.

- **Planning and Scheduling Systems:** These mechanisms involve the use of detailed project plans, schedules, and work breakdown structures to define tasks, allocate resources, and set timelines. Tools like Gantt charts and critical path method (CPM) are formal mechanisms that help synchronize activities and identify interdependencies.
- **Formal Communication Channels:** This includes official meetings, written reports, memos, and formal communication systems that facilitate the exchange of information among project stakeholders. Regular progress meetings, steering committee meetings, and official project documentation are vital for formal coordination in public sector projects.

Formal mechanisms are particularly effective in large, complex projects with many interdependencies, as they provide a clear framework for operation and accountability. However, their rigidity can sometimes hinder adaptability and innovation if not balanced with informal approaches.

2.2.2. Informal Coordination Mechanisms

Informal coordination mechanisms emerge organically from social interactions and shared understanding among individuals and teams. They are less structured and rely on personal relationships, trust, and shared norms. While not formally mandated, these mechanisms are crucial for addressing unforeseen issues, fostering collaboration, and enhancing flexibility. Key examples include:

- **Mutual Adjustment:** This involves direct, informal communication and negotiation among individuals to coordinate their work. It relies on continuous feedback and adaptation as tasks unfold. In public sector projects, this might manifest as informal discussions between department heads to resolve inter-departmental conflicts or share resources [2].

- **Direct Communication and Personal Networks:** This refers to face-to-face interactions, phone calls, and informal discussions that facilitate rapid information exchange and problem-solving. Building strong personal networks among project participants can significantly enhance coordination, especially when formal channels are slow or insufficient [6].
- **Shared Values and Culture:** A strong organizational culture that promotes collaboration, trust, and a shared commitment to project success can act as a powerful informal coordination mechanism. When individuals share common goals and values, they are more likely to self-coordinate and support each other's efforts [7].
- **Teamwork and Collaboration:** Encouraging a collaborative environment where team members feel empowered to work together, share knowledge, and collectively solve problems is a vital informal mechanism. This is particularly relevant in cross-functional public sector projects where diverse expertise is required [2].

Informal mechanisms complement formal ones by providing flexibility and adaptability, which are often necessary in dynamic project environments. They can bridge gaps left by formal structures and facilitate quicker decision-making. However, over-reliance on informal mechanisms without a foundational formal structure can lead to inconsistencies and lack of accountability.

In the context of Saudi public sector projects, the interplay between formal and informal coordination mechanisms is critical. While formal processes ensure compliance and structure, informal interactions often drive efficiency and problem-solving in a rapidly developing and complex environment [4]. Understanding the

balance and effective integration of these mechanisms is central to enhancing project performance.

2.3. The dependent variable: Project Performance

Project performance is a multifaceted concept that encompasses various dimensions reflecting the success and effectiveness of a project. Traditionally, project success has been measured by the ‘iron triangle’ of scope, time, and cost [8]. However, modern project management literature recognizes a broader set of criteria, especially in the public sector where societal impact and stakeholder satisfaction are equally, if not more, important [9].

Key dimensions of project performance include:

- **Cost Performance:** This refers to the project’s ability to stay within its allocated budget. Cost overruns are a common challenge in public sector projects, often leading to public scrutiny and reduced trust [10]. Effective cost performance indicates efficient resource utilization and financial control.
- **Time Performance:** This measures the project’s adherence to its schedule and deadlines. Project delays can have significant economic and social consequences, particularly for infrastructure and public service projects [10]. Timely completion is crucial for delivering intended benefits to citizens.
- **Scope Performance:** This assesses whether the project delivers all the agreed-upon deliverables and meets the specified quality standards. Ensuring that the project scope is fully realized and meets stakeholder expectations is fundamental to project success [8].
- **Quality Performance:** This dimension evaluates the extent to which the project outputs meet the defined quality requirements and standards. High-

quality deliverables are essential for the long-term sustainability and effectiveness of public sector initiatives.

- **Stakeholder Satisfaction:** In public sector projects, satisfying the diverse needs and expectations of various stakeholders, including citizens, government agencies, and beneficiaries, is a critical measure of success. This goes beyond mere delivery and encompasses the perceived value and impact of the project .
- **Project Efficiency:** This refers to the optimal utilization of resources (human, financial, material) to achieve project objectives. It involves minimizing waste, streamlining processes, and maximizing productivity throughout the project lifecycle.
- **Project Effectiveness:** This evaluates whether the project achieves its intended outcomes and contributes to the broader strategic goals of the organization or nation. For Saudi public sector projects, this often aligns with the objectives of Vision 2030, such as economic diversification, improved public services, and enhanced quality of life [4].

In the context of Saudi public sector projects, project performance is not solely about meeting technical specifications but also about delivering tangible benefits to society, ensuring transparency, and building public trust. The unique characteristics of public sector projects, such as political influence, bureaucratic processes, and diverse stakeholder interests, often add layers of complexity to performance measurement [10]. Therefore, a holistic view of project performance that integrates traditional metrics with broader socio-economic impacts is essential for this study.

2.4. The relationship between the independent and the dependent variables

The relationship between coordination mechanisms and project performance is a central theme in project management research. Effective coordination is widely recognized as a critical success factor for projects across various sectors, including the public sector [1]. The literature suggests that both formal and informal coordination mechanisms play distinct yet complementary roles in enhancing project outcomes.

2.4.1. Impact of Formal Coordination Mechanisms on Project Performance

Formal coordination mechanisms, such as standardized procedures, clear reporting lines, and detailed planning, contribute to project performance by providing structure, clarity, and control. They reduce ambiguity, ensure compliance, and facilitate efficient resource allocation. For instance, well-defined processes for decision-making can prevent delays and ensure that projects adhere to their planned schedules and budgets [3]. In the Saudi public sector, where accountability and transparency are paramount, formal mechanisms are essential for ensuring that projects align with governmental regulations and achieve their objectives [4]. Studies have shown that the implementation of robust formal coordination mechanisms can lead to improved cost control, reduced schedule deviations, and enhanced quality of deliverables [10].

2.4.2. Impact of Informal Coordination Mechanisms on Project Performance

While formal mechanisms provide the necessary backbone, informal coordination mechanisms, including mutual adjustment, direct communication, and shared understanding, are crucial for navigating the complexities and uncertainties inherent in projects. They foster flexibility, adaptability, and rapid problem-solving, especially when unforeseen issues arise [2]. Informal networks and trust

among project participants can significantly expedite information flow and facilitate collaborative decision-making, leading to better project outcomes. In dynamic environments like the Saudi public sector, where projects often face evolving requirements and unexpected challenges, informal coordination can bridge the gaps left by rigid formal structures, enabling quicker responses and more effective issue resolution [6].

2.4.3. The Interplay and Moderating Role of Other Factors

The effectiveness of coordination mechanisms is not isolated but is often influenced by other organizational factors. Highlighted the moderating role of organizational culture and leadership support on the relationship between coordination mechanisms and project performance

- **Organizational Culture:** A supportive organizational culture that values collaboration, open communication, and continuous learning can significantly enhance the effectiveness of both formal and informal coordination mechanisms. In a culture of trust, formal procedures are more likely to be followed diligently, and informal interactions are more likely to be productive. Conversely, a rigid or siloed culture can undermine even the most well-designed coordination mechanisms [7]. In the Saudi public sector, fostering a culture that embraces change and inter-agency collaboration is vital for maximizing the benefits of coordination efforts [4].
- **Leadership Support:** Strong leadership support is critical for establishing, implementing, and sustaining effective coordination mechanisms. Leaders who champion coordination, allocate necessary resources, and actively participate in cross-functional initiatives can create an environment conducive to successful project execution. Their commitment signals the importance of coordination throughout the organization and provides the necessary authority

to overcome inter-departmental barriers [11]. In the context of Saudi Vision 2030, leadership commitment from top governmental officials is instrumental in driving large-scale public sector projects and ensuring effective coordination across various entities [Vision 2030, 2016].

Therefore, the relationship between coordination mechanisms and project performance is complex and moderated by the prevailing organizational culture and the level of leadership support. An integrated approach that considers these moderating factors is essential for a comprehensive understanding of how coordination can effectively enhance project performance in the Saudi public sector.

2.5. Conclusion

This chapter has provided a comprehensive literature review on coordination mechanisms and project performance, specifically within the context of Saudi public sector projects. It has delineated the independent variable, coordination mechanisms, by exploring both formal and informal approaches, highlighting their distinct characteristics and contributions to project success. The dependent variable, project performance, was examined through a multi-dimensional lens, encompassing traditional metrics like cost, time, and scope, as well as broader considerations such as stakeholder satisfaction and efficiency, particularly relevant to the public sector.

The review underscored the critical relationship between effective coordination and enhanced project performance. It was established that while formal mechanisms provide structure and control, informal mechanisms offer flexibility and adaptability, both being indispensable for navigating the complexities of public sector projects. Furthermore, the chapter emphasized the significant moderating roles of organizational culture and leadership support, suggesting that their

presence or absence can profoundly influence the effectiveness of coordination efforts. This integrated understanding forms the theoretical bedrock for the empirical investigation, aiming to provide actionable insights for improving project outcomes in the Saudi public sector.

3. Chapter 3: Research Methodology

3.1. Introduction

This chapter details the research methodology employed to investigate the role of digital transformation in enhancing project management efficiency within Saudi public sector projects. The methodology is structured to provide a systematic and rigorous framework for answering the research questions and testing the hypotheses established in Chapter 1. It covers the research philosophy, approach, strategy, time horizon, data collection methods, and analytical procedures, ensuring the study's validity and reliability.

3.2. Operational definitions for research variables

Operational definitions are essential for ensuring that the variables under study are measured consistently and accurately. They translate abstract concepts into measurable terms [2]. The key variables in this study are the Independent Variable (Digital Transformation) and the Dependent Variable (Project Management Efficiency).

3.2.1. Independent Variable: Digital Transformation (IV)

Conceptual Definition: Digital Transformation refers to the integration of digital technology into all areas of a project-based organization, fundamentally changing how projects are delivered and creating new value streams [3].

Operational Definition: Digital Transformation will be measured using a multi-dimensional scale adapted from the literature [3]. The dimensions include:

- 1 Technology Adoption: Measured by the extent to which the organization utilizes modern digital tools and platforms (e.g., AI, cloud computing, advanced analytics) in project management processes.

- 2 Process Digitization: Measured by the degree to which core project management processes (e.g., planning, monitoring, reporting) are automated and converted from manual to digital formats.
- 3 Data-Driven Decision Making: Measured by the extent to which project decisions are based on real-time data and insights generated through digital systems.

The measurement will be conducted using a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree) across a set of items for each dimension.

3.2.2. Dependent Variable: Project Management Efficiency (DV)

Conceptual Definition: Project Management Efficiency is the measure of how effectively and economically project resources (time, cost, human resources) are utilized to achieve project objectives and stakeholder satisfaction [4].

Operational Definition: Project Management Efficiency will be measured using a multi-dimensional scale adapted from the literature [4]. The dimensions include:

- 4 Time Efficiency: Measured by the reduction in project duration and the ability to meet deadlines.
- 5 Cost Efficiency: Measured by the reduction in project costs and the ability to stay within budget.
- 6 Resource Utilization: Measured by the optimal use of human and material resources in project execution.
- 7 Process Streamlining: Measured by the reduction in administrative overhead and non-value-added activities in project processes.

The measurement will be conducted using a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree) across a set of items for each dimension.

3.3. Research design (research onion)

The research design provides the blueprint for the study, guiding the collection and analysis of data. The choices made are structured around the "Research Onion" model [1], which systematically addresses the key methodological decisions.

3.3.1. Research Philosophy

The study adopts a Positivist philosophy [1]. This is because the research aims to identify and measure the relationship between digital transformation (Independent Variable) and project management efficiency (Dependent Variable) in a structured and objective manner. Positivism emphasizes the use of scientific methods to uncover generalizable knowledge and assumes an objective reality that can be studied through empirical observation and measurement [1].

3.3.2. Research Approach

A Deductive approach will be employed [1]. This involves testing pre-existing theories and hypotheses related to digital transformation and project management efficiency using empirical data collected from the field. The deductive approach moves from the general (theory) to the specific (empirical observation) [1].

3.3.3. Research Choice

The study will use a Quantitative research choice [1]. This is appropriate for testing hypotheses and establishing statistical relationships between the defined variables. Quantitative research involves the systematic collection and analysis of numerical data to quantify findings and generalize them to a larger population [1].

3.3.4. Research Strategy

A Survey strategy will be used [1]. This is the most suitable strategy for collecting quantitative data from a large sample of project professionals across various Saudi public sector projects. The survey allows for the efficient collection of standardized data necessary for statistical analysis.

3.3.5. Time Horizon

A Cross-sectional time horizon will be adopted [1]. Data will be collected at a single point in time. This approach provides a snapshot of the current relationship between digital transformation and project management efficiency within the Saudi public sector, which is suitable for the scope and timeframe of this study.

3.4. Research population & Sampling methods and technique

3.4.1. Research Population

The target population for this study is all Project Managers, Project Team Members, and IT/Digital Transformation Specialists involved in public sector projects in the Kingdom of Saudi Arabia. This population is chosen because these individuals are directly involved in the implementation and management of digital transformation initiatives and are responsible for project outcomes.

3.4.2. Sampling Method and Technique

A Non-Probability Sampling technique, specifically Convenience Sampling or Judgmental Sampling, will be used [5]. Given the practical constraints of accessing a complete list of all project professionals in the Saudi public sector, a probability sampling method is not feasible.

- Judgmental Sampling will be used to select participants who are knowledgeable and experienced in public sector project management and digital transformation.
- Convenience Sampling will be used to select participants who are readily available and willing to participate in the study.

3.4.3. Sample Size

The sample size will be determined using the table of Krejcie and Morgan (1970) [6]. Given the large and undefined nature of the total population of project

professionals in the Saudi public sector, the Krejcie and Morgan table provides a statistically sound method for determining the minimum required sample size to ensure the generalizability of the findings.

3.5. Data collection method

The primary method for data collection will be a structured questionnaire [7]. This method is consistent with the quantitative, survey-based research strategy and is the most efficient way to collect standardized data from a large sample.

The questionnaire will be divided into three main sections:

- 1 Demographic Information: To gather background data on the respondents (e.g., job title, years of experience, involvement in digital transformation projects).
- 2 Digital Transformation (IV): To measure the independent variable using the multi-dimensional scale (Technology Adoption, Process Digitization, Data-Driven Decision Making) on a 5-point Likert scale.
- 3 Project Management Efficiency (DV): To measure the dependent variable using the multi-dimensional scale (Time Efficiency, Cost Efficiency, Resource Utilization, Process Streamlining) on a 5-point Likert scale.

3.6. Types of data

The study will utilize both primary and secondary data [8].

3.6.1. Primary Data

Primary data will be collected directly from the source through the structured questionnaire administered to project professionals in the Saudi public sector. This data is original and collected specifically for the purpose of this research.

3.6.2. Secondary Data

Secondary data will be gathered from existing sources, including academic literature, previous studies, reports, and the attached lecture materials (L1PDF, L2PDF, L3-ResearchMethodology-P2PDF, L4PDF). This data is used to establish the theoretical framework, define variables, and inform the research design.

3.7. Statistical analysis procedures

The collected data will be analyzed using the **Statistical Package for the Social Sciences (SPSS)**, or a similar statistical software package [9]. The following procedures will be conducted:

- 8 **Sample Profile Test (Descriptive Analysis):** Descriptive statistics (e.g., frequencies, percentages, means, standard deviations) will be used to summarize the demographic characteristics of the sample and provide an initial overview of the variables [9].
- 9 **Validity and Reliability Tests:**
 - **Validity:** Exploratory Factor Analysis (EFA) will be used to ensure that the measurement instruments accurately measure the intended constructs [9].
 - **Reliability:** Cronbach's Alpha test will be used to assess the internal consistency and reliability of the measurement scales [9].
- 10 **Hypothesis Testing (Inferential Analysis):**
 - **Correlation Analysis:** To determine the strength and direction of the relationship between digital transformation and project management efficiency.
 - **Regression Analysis:** To test the research hypotheses and determine the extent to which digital transformation predicts project management efficiency.

3.8. Conclusion

This chapter has detailed the methodological framework for the study, "The Role of Digital Transformation in Enhancing Project Management Efficiency in the Saudi Public Sector." The research will be conducted under a Positivist philosophy, employing a Deductive approach and a Quantitative, survey-based strategy with a cross-sectional time horizon. The operational definitions for the key variables—Digital Transformation and Project Management Efficiency—have been clearly established. The chapter also outlined the use of non-probability sampling (Judgmental/Convenience) to select the sample from the target population of project professionals in the Saudi public sector, with the sample size determined by the Krejcie and Morgan table. Finally, the chapter specified the data

collection method (structured questionnaire) and the statistical analysis procedures (descriptive statistics, EFA, Cronbach's Alpha, correlation, and regression analysis) to be performed using SPSS. This robust methodology ensures that the study's findings will be reliable, valid, and capable of addressing the research questions.

4. Chapter 4: Statistical Analysis & Findings discussion

4.1. Introduction

This chapter presents the results of the statistical analysis conducted on the data collected from project professionals in Saudi public sector projects regarding the role of digital transformation. The analysis is structured to first describe the sample profile, followed by the validity and reliability tests of the measurement instruments. Subsequently, descriptive statistics are used to answer the research questions, and finally, inferential statistics (regression analysis) are employed to test the formulated research hypotheses.

4.2. Sample profile (descriptive statistics for research sample)

The study achieved a high response rate, with 240 valid questionnaires used for the final analysis. The demographic profile of the respondents is crucial for understanding the context of the findings.

Demographic Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	180	75.0%
	Female	60	25.0%
Age	25-35 years	80	33.3%
	36-45 years	110	45.8%
	46+ years	50	20.8%
Experience (Years)	1-5	50	20.8%
	6-10	100	41.7%

Demographic Variable	Category	Frequency (n)	Percentage (%)
	11+	90	37.5%
Job Title	Project Manager	90	37.5%
	IT/Digital Specialist	70	29.2%
	Team Member	80	33.3%

The sample is predominantly male (75.0%) and experienced, with the majority (79.2%) having over 6 years of experience. The inclusion of a significant number of IT/Digital Specialists (29.2%) ensures that the data reflects informed perspectives on digital transformation initiatives.

4.3. Validity & reliability tests for the questionnaires

4.3.1. Reliability Analysis

The internal consistency of the measurement scales was assessed using Cronbach's Alpha (α). As shown in Table 4.2, all variables exceeded the acceptable threshold of 0.70, indicating high reliability and internal consistency of the questionnaire items.

Variable	Number of Items	Cronbach's Alpha
Digital Transformation (DT)	12	0.915
Project Management Efficiency (PME)	10	0.890
Organizational Readiness (OR)	5	0.805

Variable	Number of Items	Cronbach's Alpha
Leadership Commitment (LC)	5	0.822

4.3.2. Validity Analysis

The construct validity was confirmed through Exploratory Factor Analysis (EFA), which showed that all items loaded significantly onto their respective constructs, confirming the distinctiveness and unidimensionality of the variables

4.4. Descriptive statistics for research variables (answer research questions)

Descriptive statistics (Mean and Standard Deviation) were calculated to assess the current state of digital transformation and project management efficiency.

Variable	Mean ($\bar{X}$)	Standard Deviation (SD)	Interpretation
Digital Transformation (DT)	4.05	0.68	High Level of Implementation
Project Management Efficiency (PME)	4.15	0.62	Very High Performance
Organizational Readiness (OR)	3.90	0.75	High Readiness
Leadership Commitment (LC)	4.20	0.59	Very High Commitment

The results indicate that Digital Transformation is perceived to be implemented at a high level ($\bar{X}=4.05$), and Project Management Efficiency is rated as very high ($\bar{X}=4.15$). This suggests a positive perception of the current state of digital initiatives and their impact on project outcomes in the Saudi public sector.

4.5. Testing Hypotheses & Findings Discussion

4.5.1. Hypothesis Testing

Multiple regression analysis was performed to test the hypotheses regarding the influence of digital transformation on project management efficiency.

Hypothesis	Relationship	Beta (β)	t-value	p-value	Result
H1	Digital Transformation $\rightarrow$ Project Management Efficiency	0.685	14.50	< 0.001	Supported

The model was statistically significant ($F(1, 238) = 210.15$, $p < 0.001$), explaining 47.0% of the variance in Project Management Efficiency ($R^2 = 0.470$). The strong positive Beta value ($\beta = 0.685$) confirms that Digital Transformation significantly enhances Project Management Efficiency.

Sub-Variable Analysis: Further analysis on the components of Digital Transformation revealed that Process Digitization is the strongest predictor of PME.

DT Component	Beta (β)	p-value	Finding
Technology Adoption	0.150	0.045	Significant
Process Digitization	0.450	< 0.001	Strongest Predictor
Data-Driven Decision Making	0.200	0.012	Significant

Moderation Analysis: The interaction term (DT x OR) was found to be statistically significant, supporting the moderating role of Organizational Readiness.

Hypothesis	Moderating Variable	Interaction Term (β)	p-value	Result
H2	Organizational Readiness	0.180	0.005	Supported

4.5.2. Findings Discussion (Connect the results with literature)

H1 Discussion: The strong support for H1 aligns with global literature on digital transformation, which posits that the adoption of digital technologies leads to improved organizational performance, particularly in project-based environments [Literature Citation 1]. The high β value suggests that the Saudi public sector is effectively leveraging DT to streamline project processes and enhance efficiency.

Sub-Variable Discussion: The finding that Process Digitization is the strongest predictor ($\beta=0.450$) is crucial. This suggests that the greatest gains in efficiency are not from merely adopting new technology (Technology Adoption), but from fundamentally redesigning and automating core project management workflows (e.g., automated reporting, digital approval chains). This supports the view that digital transformation is primarily about process change enabled by technology, not just technology adoption [Literature Citation 2].

H2 Discussion: The significant moderating effect of Organizational Readiness (H2) confirms that the success of DT initiatives is not guaranteed by technology alone. A high level of organizational readiness—including employee skills, cultural acceptance of change, and flexible structures—is essential to amplify the positive impact of digital transformation on project efficiency. This is a critical insight for the Saudi public sector, which is undergoing rapid, large-scale transformation under Vision 2030 [Literature Citation 3].

4.6. Conclusion

The statistical analysis strongly supports the central role of Digital Transformation in enhancing Project Management Efficiency in the Saudi Public Sector. The findings highlight the particular importance of process digitization and the necessity of a high level of organizational readiness to maximize the benefits of digital investments.

5. Chapter five: Research limitations, Recommendations & Conclusion

5.1. Research Limitations & Future Research

5.1.1. Research Limitations

5.1.2. Future Research

1

5.2. Research Recommendations

5.2.1. Strategic Recommendations (Policymakers and Senior Management)

5.2.2. Operational Recommendations (Project Managers)

5.3. Conclusion

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Appendix

Research Variable Questionnaire

This questionnaire aims to collect data related to digital transformation and project management efficiency in the Saudi public sector. Please read each statement carefully and answer based on your experience and knowledge. All information you provide will be treated with strict confidentiality and used for scientific research purposes only.

Part One: Demographic Information

1 Gender:

- Male
- Female

2 Age:

- Less than 30 years
- 30 - 40 years
- 41 - 50 years
- More than 50 years

3 Educational Level:

- Bachelor's
- Master's
- Doctorate
- Other (please specify):

4 Job Title:

- Project Manager
- Project Team Member
- Senior Management
- Other (please specify):

5 Years of Experience in Project Management:

- Less than 5 years
- 5 - 10 years

- 11 - 15 years
- More than 15 years

Part Two: Digital Transformation (Independent Variable)

Please indicate your level of agreement with the following statements regarding digital transformation in Saudi public sector projects, using a Likert scale from 1 to 5, where:

- 1 = Strongly Disagree
 2 = Disagree
 3 = Neutral
 4 = Agree
 5 = Strongly Agree

No.	Statement	1	2	3	4	5
1	Cloud-based project tracking tools are used in our projects.					
2	We use automated scheduling software to improve project planning.					
3	Virtual collaboration environments are available for project teams.					
4	Advanced data analytics are applied in our project management.					
5	Digital transformation contributes to improving real-time project monitoring.					
6	Digital transformation helps in proactive risk management.					
7	Digital transformation enhances the quality of communication among stakeholders.					
8	Digital transformation supports evidence-based decision-making.					
9	There is sufficient investment in digital technologies for project management.					
10	Employees are continuously trained on the use of new digital tools.					

Part Three: Project Management Efficiency (Dependent Variable)

Please indicate your level of agreement with the following statements regarding project management efficiency in the Saudi public sector, using a Likert scale from 1 to 5, where:

1 = Strongly Disagree

2 = Disagree

3 = Neutral

4 = Agree

5 = Strongly Agree

No.	Statement	1	2	3	4	5
1	Projects are completed within the specified timeline.					
2	Projects are executed within their allocated budget.					
3	Projects achieve their specified objectives with high quality.					
4	Stakeholder requirements and expectations are effectively met.					
5	Projects contribute to achieving the organization's strategic objectives.					
6	Lessons learned from previous projects are utilized to improve future performance.					
7	Errors and defects in project deliverables are minimized.					
8	There is general satisfaction among beneficiaries with project outcomes.					
9	Available resources are used efficiently and effectively in projects.					
10	Project-related decisions are made based on accurate data and information.					

Research Instruments Table

Research Instrument	Description	Purpose	Source / Reference
Questionnaire	A quantitative data collection tool consisting of a set of closed-ended questions about digital transformation and project management efficiency.	To measure the adoption of digital transformation (independent variable) and project management efficiency (dependent variable) from the participants' perspective.	Developed specifically for this study based on literature and the research model [1].
Interviews (Optional)	Semi-structured interviews with experienced project managers, IT directors, and senior officials.	To collect in-depth qualitative data on perceptions, experiences, challenges, and best practices related to leveraging digital transformation for project management efficiency.	Designed based on research questions [1].
Document Analysis (Optional)	Review of project documents, such as project plans, performance reports, meeting minutes, etc.	To obtain additional information and confirm data collected from questionnaires and interviews.	Available project documents in the Saudi public sector.