

Toward an AI-Driven National Reference
Architecture for Saudi Arabia (NORA)

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Chapter 1: Introduction and Research Context

1.1 Introduction

Digital transformation has become a priority for governments aiming to improve efficiency, transparency, and quality of services. In the government sector, digital transformation extends beyond isolated technology initiatives and involves advanced ecosystems. These ecosystems define policies, procedures, information systems, data, and infrastructure. This results in achieving effective coordination and governance.

Enterprise Architecture (EA) is well known to be the key instrument for managing this technological complexity. It provides a framework that describes how goals, processes, data flow, and components are aligned to support digital transformation. Over time, EA has evolved to serve as a governance capability that supports strategic alignment, data driven decision-making, and coherence, particularly within mega organizations and government-sector environments.

In Kingdom of Saudi Arabia, government Enterprise Architecture framework is directed by the National Overall Reference Architecture (NORA), issued by the Digital Government Authority (DGA). NORA operates as the national architectural reference framework for digital-government initiatives. NORA has supported architectural discipline, but the growth of digital-government ecosystems challenges the effectiveness of this approach.

1.2 Background

1.2.1 Enterprise Architecture and Governance Evolution

Enterprise Architecture (EA) appeared as a methodology to document and archive technical requirements and infrastructure details. After that, many technical and practical studies proved that EA could have a critical role in succeeding in the technology sector within an organization.

Current studies present EA as a capability that supports coordination between strategy, governance, and technology. Mature organizations in EA utilized this area in healthier decision-making, alignment between business goals and technology investments, and improved agility framework. Therefore, EA is not just technical documentation methodology but works as governance mechanism that aligns between organizations plan, business prioritization, budgeting, and initiatives.

In government-sector, the role of EA becomes even more significant in terms of governance. In this scenario, EA serves as an essential tool that enforces digital transformation initiatives to remain aligned with government values, policies, and mandates.

1.2.2 National Overall Reference Architecture (NORA)

The National Overall Reference Architecture (NORA), issued by the Digital Government Authority (DGA), introduced Saudi Arabia's framework for governing Enterprise Architecture (EA). It defines six interrelated architectural layers—Business, Application, Data, Technology, Integration, and Security, where combining them leads to a structured foundation for digital transformation initiatives.

It provides guidance for architectural documentation, system integration, and digital governance across the organizations. It achieves this goal by establishing common architectural principles and standards that aims to reduce fragmentation, duplication of digital solutions, and encourage consistency across the organization.

NORA's framework is static, due to that nature of governance activities, which can be carried out through predefined standards, documentation, and regular assessments. This limits the dynamic nature of the framework in the digital transformation environment, increases risks and continuous performance changes.

1.2.3 Emerging Pressures on Architectural Governance

Government ecosystems are becoming more intelligent and complex due to rapid cultural needs, technological change and the adoption of cloud platforms, shared data, and smart systems. Upcoming Enterprise Architecture framework must focus on improving the mechanism utilized in monitoring, risk management, and decision-making, and their digitization within the government EA framework.

Frameworks such as NORA operate under defined government regulatory and accountability, raising crucial questions about how AI can be integrated without compromising transparency, human oversight, and governance.

1.3 Problem Statement

Although the National Overall Reference Architecture (NORA) provides a comprehensive structural foundation for governing Enterprise Architecture, its governance mechanisms lack dynamic rhythm, AI, and document driven. The framework focuses on predefined architectural layers, standards, and compliance requirements, but offers limited support for continuous monitoring, data driven decision-making, or intelligence-assisted activities.

Saudi government digital ecosystems keep growing and complexity, relying on traditional governance practices can increases architectural risks, manage interdependencies, and respond effectively to emerging operational and strategic challenges. Therefore, traditional governance models may struggle to deliver timely visibility into architectural performance and compliance.

Modern enterprise architecture paper emphasizes the importance of intelligent governance mechanisms to strengthen the framework. As a result, there is limited academic guidance on how these mechanisms could be applied within a national reference architecture operating under government-sector regulations.

This gap encourages the need for conceptual research that explores how AI mechanisms could enhance NORA architectural framework, while maintaining the principles of accountability, transparency, and government regulations of Saudi government sector.

1.4 Research Objectives

The primary objective of this research is to explore how AI can be conceptually integrated into the National Overall Reference Architecture (NORA) to strengthen architectural governance within the Saudi government sector.

This objective is supported by the following specific aims:

1. Examine the architectural structure and governance foundations of NORA.
2. Identifying governance limitations within NORA.
3. Analyzing Enterprise Architecture and digital government focusing on AI governance mechanisms.
4. Developing a conceptual perspective for implementing intelligent governance mechanisms within NORA framework.

1.5 Research Scope

This study presents a theoretical, conceptual and design-oriented scope and does not involve software development, system implementation, or experimental data collection. The focus is on architectural governance only.

The research is limited to the Saudi government sector, with NORA acting as the primary architectural reference framework. other frameworks are implemented to support theoretical analysis and comparative insight.

1.6 Structure of the Research Proposal

The structure of this research is divided into three parts:

- Chapter 1: this chapter contains research context, background, problem statement, objectives, and scope.
- Chapter 2: this chapter presents a literature review on Enterprise Architecture, national reference architecture, and integrating AI in governance mechanisms.
- Chapter 3: in this chapter we will investigate the research methodology, expected outcomes, and project timeline.

Chapter 2: Literature Review

2.1 Enterprise Architecture as a Strategic Governance Capability

Enterprise Architecture (EA) has shifted from being technical documentation practice toward a strategic governance capability. At the beginning, EA efforts were concerned with documenting and mapping IT systems and infrastructure to reduce redundancy and enhance standardization. This offered structured documents but offered limited support for technology strategy and digital transformation.

Recent studies introduced EA as a framework that aligns organizational strategy, governance, and technology initiatives. Through looking into this we can say that EA contributes not only to technical documentation but also to data driven decision making. Ross, Weill, and Robertson describe EA as a “foundation for execution,” highlighting its impact in establishing shared understanding across organizational units and minimizing uncertainty in both strategic and operational decisions.

Governance plays an important role in enabling EA. It defines how strategic decisions are made, enforced, and adapted over time, involving decision rights, accountability arrangements, compliance mechanisms, and feedback. Studies always link mature EA governance environments with prioritization of digital transformation, resources allocation, and organizational agility.

Schmidt and Müller (2020) demonstrate that EA maturity has a direct influence on the organization ability to adopt emerging digital technologies, such as artificial intelligence (AI). Their findings imply that EA offers the required stability to manage digital initiatives while

preparing the organization to be ready for adopting emerging technology. This represents EA as a means between technological changes and governance.

2.2 Enterprise Architecture in Government-Sector Digital Transformation

Although EA frameworks apply across public and privates' sectors, their involvement within government sector is defined by clear conditions. Government sectors operate under legal obligations and increase accountability requirements that influence how digital transformation initiatives are managed. Unlike private-sector, government sector must provide a balanced framework that offers efficiency and innovation with transparency, equity, and public value.

This extends EA beyond technical alignment to become a tool of governance. It provides support in enabling interoperability and facilitates the development of services and digital platforms. Also, EA assists in compliance with government regulations and strategies.

Janssen and Estevez highlight that effective governance is based on architectural coherence. Without a defined architectural foundation, digital initiatives face risks of redundancy, inconsistency, and failure. EA provides the required mechanisms to address these challenges.

2.3 National Reference Architectures as Governance Instruments

National reference architectures NORA form a distinct type of Enterprise Architecture framework designed to operate across multiple government sector in Saudi Arabia. Unlike enterprise architecture, NORA framework focuses on interoperability, consistency, and alignment with Saudi 2030 Vision objectives.

The National Overall Reference Architecture (NORA), issued by the Saudi Digital Government Authority, reflects this through six architectural layers and governance principles to provide consistency and compliance (Digital Government Authority, 2024). While NORA provides strong guidance, its governance mechanisms are largely fixed and focus on documentation and periodic assessments.

As digital environments become more interconnected and complex, the study suggests that such a fixed model may struggle to provide timely evidence, particularly when supporting shared platforms and AI enhanced systems.

2.4 Artificial Intelligence in Enterprise Architecture Governance

Recent studies in Enterprise Architecture have started to examine how AI can support governance. Most studies define AI as a tool for automating governance tasks, analyzing data, and supporting decision-making.

Bakar, Ali, and Khan (2024) review how AI techniques can be applied within established EA frameworks such as TOGAF and Zachman, particularly in areas related to automation, analytics, and compliance. They claim that AI can improve traceability, overall business alignment, and governance. However, their work remains largely theoretical and focuses on private sector.

Engin et al. (2025) study was built on this discussion by introducing EA governance models that incorporate AI-driven agents into architectural decision processes. The main goal of these agents is to act as tools to support impact analysis, dependency identification, and risk assessment, to enhance transparency and decision making. Despite these contributions, the study was theoretical and lacks evidence in real life environments.

Overall, the study focuses on the capability benefits of AI-enabled governance while also revealing a clear gap between conceptual models and their practices.

2.5 Intelligent Governance and Adaptive Oversight

Intelligent governance means the approach that controls data, analytics, automation, and data driven decision-support mechanisms to enhance overall progress. Within architectural governance, such concept leads to continuous audit / compliance monitoring cycles, risk identification, and more data driven decision-making.

This point of view aligns with recent discussions on algorithmic and data-driven governance in government sector. Recent studies suggested that intelligent systems provide an assistant to people to make accurate decisions by offering useful perceptions at the right time, without negotiating clarity and responsibility.

At the same time, the adoption of intelligent governance techniques in government sector raises concerns related to transparency and accountability. Government sectors are required to maintain explainable and auditable decision-making processes, especially when automated systems are involved. This means it is very important for keeping humans involved in decision-making, with intelligent systems acting as support tools rather than replacements.

2.6 Enterprise Architecture as a Dynamic Capability

Adaptability to change and dynamic capability theory provides an understanding on how organizations can adopt and support technological change. Dynamic capabilities enable government sector to listen to and feel emerging opportunities, seize them, and provide the human and non-human resources accordingly.

Wang and Zhao (2025) introduced EA framework as a dynamic capability that supports generative AI, but it must be scalable and sustainable. The introduced framework focuses on continuous alignment, adaptability, and governance flexibility. From their point of view, EA is not a static framework but an evolving capability that enables learning and transformation within the organization.

Applying this concept to NORA framework can present additional challenges due to the nature of the framework that promotes stability, consistency, and regular audit sessions across government sector. Therefore, careful consideration of governance structures, decision rights, and accountability mechanisms must be addressed and documented in the new framework.

2.7 Governance Limitations of Static Architectural Frameworks

Fixed governance models are managed by approved and adapted standards, static compliance methods, and audit cycles. While these features provide control and consistency, they limit evolving and adapting to the changes in the digital world.

The literature of this study highlights some recurring limitations associated with fixed governance models, that include dependencies visibility, overhead risks, delayed responses, and challenges in scaling governance models as ecosystems. These challenges are critical in national digital ecosystems, where architectural new adaptations in one part of the government sector may have cascading effects across multiple once.

2.8 Research Gap and Positioning

The above literature provides theoretical support for the integration of artificial intelligence (AI) into NORA / EA framework. Existing studies define the potential of AI adaptability to increase decision quality and strengthen architectural oversight.

However, this paper mostly focuses on private-sector organizations or international contexts and offers limited guidance for NORA framework. There remains a significant gap in understanding how AI technology can be theoretically integrated into NORA framework.

This paper places itself at the intersection of EA governance, AI, and NORA frameworks. By focusing on NORA as a case, this research contributes a theoretical foundation that can inform future experimental studies and policy-driven architectural evolution within the Saudi government sector.

Chapter 3: Research Methodology

3.1 Research Paradigm and Philosophical Positioning

This research is constructively built, that can provide an understanding complex organizational and governance phenomena rather than measurement through practical testing. This study focuses on governance practices and design choices that are shaped by external factors and changes depending on context.

This study focuses on providing a conceptual theoretical understanding that can provide guidance for future research. This methodology provides an alignment with common practices in EA, digital government, and data governance research.

3.2 Research Design

3.2.1 Conceptual and Design-Oriented Research Approach

This study uses a conceptual, design-oriented approach based on Design Science Research (DSR), which focuses on practical matters through the design of conceptual frameworks.

In this case, the problem lies in the heavy reliance on static, document-based governance within national reference architectures such as NORA. The document proposes a conceptual governance perspective that illustrates how automation, analytics, and decision support can be embedded within NORA's architectural layers.

This approach ensures relevance by addressing real governance challenges in national digital government initiatives, while consistency is maintained through systematic use of theories.

3.2.2 Justification for Non-Empirical Design

This document eliminates experimental data collection, such as surveys, interviews, or system implementation. We went with this option for the following reasons:

1. The aim of this paper is to provide conceptual integration rather than system performance or user perceptions.
2. NORA framework operates under strict regulations making experimentation impractical for the scope.

3.3 Data Sources

This research relies exclusively on the following sources:

- The Digital Government Authority's Guideline for the National Overall Reference Architecture (NORA).
- Journals related to Enterprise Architecture, digital government, and artificial intelligence governance.
- International standards and frameworks such as TOGAF.
- Conceptual and theoretical studies address enterprise architecture governance.

3.4 Methodological Procedure

The research follows the following stages:

Stage 1: Architectural and Governance Analysis

The first stage investigates NORA's architectural governance by examining its six architectural layers introduced by the DGA. This stage goal is to clarify how governance currently operates without the introduction of AI.

Stage 2: Literature Synthesis and Thematic Analysis

Secondly, in Chapter 2 identifying frequent themes related to Enterprise Architecture governance, AI adaptive governance mechanisms, and governance challenges in government sector situations.

Stage 3: Gap Identification and Conceptual Mapping

Based on chapter 2, governance drawbacks are mapped against intelligent governance capabilities. This mapping highlights how NORA framework could be enhanced through AI.

Stage 4: Conceptual Framework Development

In the final stage, we developed a conceptual governance perspective showing how AI can be integrated into NORA architectural layers. The framework highlights governance roles, decision making, and control mechanisms that strengthen current practices.

3.5 Validation Strategy

By looking into the nature of the study, validation is carried out through analytical and theoretical evaluation only. The framework is validated by ensuring logical consistency with established enterprise architecture and ensuring the alignment with Saudi government-sector governance regulations. This approach follows an accepted validation for such research.

3.6 Ethical Considerations

Although this study is conceptual, ethical factors remain valuable. The research obeys principles of academic writing, with all sources properly cited using APA style. The research stays away from exaggerated statements about integrated EA framework with AI systems and stresses the importance of human involvement in government sector and national governance.

3.7 Expected Outcomes

This research aims to clarify governance limitations in NORA Framework and propose a conceptual framework for AI architectural governance.

By providing scenario-based visions into improved decision-making and sets the groundwork for future research and policy initiatives in the Saudi enterprise architecture governance.

3.8 Research Timeline (Gantt Chart)

Task	Week 1	Week 2	Week 3	Week 4–5
Literature Review				
Problem & Objectives Refinement				
Methodology Design				
Writing & Synthesis				
Final Editing & Formatting				

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