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ACHIEVING HOLISTIC GOVERNMENT-TO-GOVERNMENT INTEROPERABILITY IN A DEMOCRATIC EMERGING ECONOMY: THE CASE OF NIGERIA'S PUBLIC SECTOR

Master's Thesis

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Achieving holistic government-to-government interoperability in a democratic emerging economy: the case of Nigeria's public sector

supervised by Dr Eric Blake Jackson

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Abstract

This study explores the challenges and strategic solutions to achieve government-to-government (G2G) interoperability in the Nigerian public sector. Theoretical foundation was based on European Interoperability Framework (EIF), Change Management Theory, and Organizational Governance and Complexity Theory.

Drawing on qualitative research methodology, the researcher gathered data using semi-structured interviews with key stakeholders in the Ministry and agencies coordinating e-governance efforts in Nigeria. Data gathered were subjected to thematic analysis and sentiment analysis. Results indicate major technical and organisational challenges such as fragmented systems, lack of standard data formats, and bureaucratic resistance to cooperation.

The concluding chapter summarizes actionable recommendations for achieving government-to-government interoperability in Nigeria, emphasizing the need for policy reform, strengthened legal frameworks, and the adoption of data exchange infrastructure.

Keywords: Government-to-Government Interoperability, e-Government, Public Sector Reform, Nigeria, Digital Governance, Interoperability Frameworks, Organizational Change, Institutional Fragmentation, Change Management, Whole-of-Government Approach

Annotatsioon

[Thesis title in Estonian]

Tervikliku valitsusvahelise koostalitluse saavutamine demokraatlikus arenevas majanduses: Nigeeria avaliku sektori juhtumiuuring

List of abbreviations

Abbreviation	Full Term
API	Application Programming Interface
BVN	Bank Verification Number
DPI	Digital Public Infrastructure
EIF	European Interoperability Framework
eGDED	eGovernment and Digital Economy Department
EGDI	E-Government Development Index
FMCIDE	Federal Ministry of Communications, Innovation and Digital Economy.
G2B	Government-to-Business
G2C	Government-to-Citizen
G2G	Government-to-Government
GDPR	General Data Protection Regulation
GDSF	Government Digital Service Framework
GTMI	GovTech Maturity Index
ICT	Information and Communication Technology
MDA	Ministry, Department, and Agency
MoU	Memorandum of Understanding
NDPC	National Data Protection Commission
NDPR	Nigeria Data Protection Regulation
Ne-GIF	Nigeria e-Government Interoperability Framework
NDGX	Nigerian data exchange
NG-DPIC	Nigeria Digital Public Infrastructure Centre
NIBSS	Nigerian Inter-Bank Settlement System
NIMC	National Identity Management Commission
NIN	National Identity Number
NII	National information Infrastructure
NITDA	National Information Technology Development Agency
NYSC	National Youth Service Corps
OSI	Online Service Index
PKI	Public Key Infrastructure
SLA	Service Level Agreement
TII	Telecommunication Infrastructure Index
WoG	Whole-of-Government
WoS	Whole-of-Society

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Chapter 1

1. Introduction

1.1 Background

As governments around the world embrace the use of technology for the delivery of citizen centric services, it has become increasingly important for public institutions to function in a connected and coordinated manner. This connection is dependent on their ability to communicate and share information seamlessly among themselves, for the delivery of services (Ikeanyibe et al., 2021).

In the e-governance domain, the concept of interoperability has emerged to address the need for seamless collaboration that supports digital transformation of public institutions. Interoperability, in the context of the European Interoperability Framework (EIF), refers to the "capacity of organizations to interact mutually beneficial, using the exchange of information and knowledge between them, through the business processes they facilitate, using the exchange of data between their ICT systems" (European Commission, 2017).

The EIF viewed Interoperability in public governance from four interconnected layers: technical, semantic, organizational, and legal and each layer is integral to forming a cohesive framework for government agencies to function as an interconnected system (European Commission, 2017). Recognizing the importance of interoperability in digital governance, many governments have adopted structured frameworks to support the integration of digital services across public institutions.

Nigeria, a democratic emerging economy in West Africa, has also recognized the importance of interoperability among public institutions to achieving its digital governance goals and building on similar principles to the EIF, the National information Technology Agency (NITDA formulated the Nigeria e-Government Interoperability Framework (Ne-GIF). Ne-GIF is driven by the Government Enterprise Architecture (GEA), e-Government Master Plan and e-Government Strategy (NITDA,2019).

To further reinforce this commitment, the Federal Government through the Ministry of Communications, Innovation, and Digital Economy recently proposed the Digital Economy and

E-Governance Bill. The proposed legislation outlines the obligations of public institutions to embrace digital technologies and ensure the integration of interoperable government systems for enhanced service delivery and institutional coordination (Federal Ministry of Communications, Innovation, and Digital Economy, 2024).

While the initiative shows strong political will, the real challenge lies in the implementation. Despite the presence of policies, frameworks and legislation, Nigeria still struggles with weak inter-organizational coordination.

Studies have shown that weak connections among Nigeria's public institutions particularly in terms of ICT infrastructure and collaborative structures continue to hold back progress in the realization of organizational agility and the overall success of digital transformation initiatives (Ikeanyibe et al., 2021).

The lack of integrated systems and limited access to a shared government database have made inter-agency collaboration difficult, slowing down processes that require cooperation between multiple MDAs (Ikeanyibe et al., 2021).

In addition to the above, the challenge to interoperable digital transformation is further compounded by the plague of fragmented institutional structures owing to inconsistency in administrative policies of different political regimes (Odeyemi & Abati, 2021).

In the past years political transitions have birthed reforms that are not sustained by succeeding political administration (Ojo & Fadaka, 2022) and this governance dynamics create a unique set of obstacles that hinder the country's efforts to achieve cohesive and effective digital transformation. Therefore, achieving interoperability calls for context specific strategies that will be sustainable even in the event of changes in political regimes.

Previous study on the adoption of Nigeria's interoperability framework suggests that for success to be achieved, there is need for local context adaptation and integration of the framework with a broader Whole-of-Government approach (Altamimi et al., 2023). Addressing Nigeria's interoperability challenges requires more than just technical fixes or new policies but rather, it calls for a holistic approach to digital transformation and policy implementation.

A holistic approach to interoperability involves the application of appropriate interoperability governance. Interoperability governance "refers to decisions on interoperability frameworks, institutional arrangements, organizational structures, roles and responsibilities, policies, agreements and other aspects of ensuring and monitoring interoperability" (European Commission, 2017).

Among the four layers of interoperability, organizational interoperability most directly engages with the core elements of interoperability governance, making it a crucial component of any holistic approach to interoperability.

Organizational interoperability "refers to the way in which public administrations align their business processes, responsibilities and expectations to achieve commonly agreed and mutually beneficial goals" (European Commission, 2017). It focuses on how public institutions align their internal processes, clarify responsibilities, and create structured relationships with one another to enable effective collaboration.

This research explores how Nigeria can overcome interoperability challenges in the public sector. It examines the intersection of governance structures, institutional collaboration, and local context to understand how Nigeria's digital transformation efforts can evolve from fragmented initiatives into a more coordinated and sustainable digital governance framework.

Interoperability has a wide range of applications across Nigeria's operational landscape. When information moves seamlessly across public sector organizations it leads to better governance and enhanced service delivery. This approach guarantees socio-economic development through transparency and resource management. A comprehensive strategy that includes technical infrastructure as well as interoperability governance is therefore required to drive sustainable digital transformation in Nigeria's public sector.

1.2 Problem Statement

Despite several national efforts aimed at digital transformation, public service delivery in Nigeria remains hindered by fragmented institutional systems and weak inter-agency coordination. Ministries, Departments, and Agencies (MDAs) often operate in silos, and they lack capacity to share data or to integrate processes effectively (Ikeanyibe et al., 2021). While frameworks such as

the Nigeria e-Government Interoperability Framework (Ne-GIF) and the proposed Digital Economy and E-Governance Bill demonstrate the government's commitment to modernize public administration, the impact of these initiatives are significantly constrained by the absence of cohesive collaboration mechanisms across government institutions.

At the heart of this challenge is the lack of organizational interoperability, the ability of public institutions to align their internal processes, responsibilities, and expectations to work toward common goals. Organizational factors play a vital role in the success of digital service projects, as transitioning services online often requires rethinking institutional structures and processes to align with the needs of citizens and businesses, while also ensuring integration across various government agencies. (European Commission DG DIGIT Directorate General for Informatics, 2020).

Research shows that the mere existence of technical infrastructure or policy frameworks in Nigeria is not sufficient to guarantee digital transformation if public institutions are not structured and empowered to collaborate (Ikeanyibe et al., 2021). This is related to the unstable political environment of the nation, whereby consecutive governments undermine reforms without continuity, weakening the institutionalization of interoperable systems (Ridwan, 2015). These realities highlight a deeper structural issue that goes beyond technology: the need for a holistic, context-specific approach that integrates governance, institutional reform, and long-term policy alignment.

While existing literature acknowledges the importance of interoperability in digital governance, there is limited research on how government-to government interoperability can be effectively achieved in a democratic emerging economy like Nigeria. In particular, there is a gap in understanding how Ne-GIF can be integrated with a Whole-of-Government strategy to support collaboration, consistency, and resilience in public sector institutions.

The question is how to successfully implement interoperability in heterogeneous public sector organizations where different systems, routines, and cultures are likely to clash. By examining Nigeria's unique governance structure and existing frameworks such as the Ne-GIF, this study aims to present a detailed evaluation of the problems and propose actionable solutions towards achieving Government-to-Government (G2G) interoperability at the Federal Level.

1.3 Research Aim and Objectives

This research aims to explore how Nigeria can achieve Government-to-Government (G2G) interoperability at the federal level through a holistic approach. This approach combines interoperability's technical, semantic, organisational, and legal dimensions to achieve more efficient, transparent, and effective public sector institutions. The research will investigate the key issues and propose solutions to designing Nigeria's harmonious and interoperable public sector system. Below are the specific objectives:

1. To investigate how the political governance structure of Nigeria affects the organizational structure of the federal public sector.
2. To identify technical, semantic, organizational, and legal obstacles impeding public sector interoperability in Nigeria.
3. To investigate how well the Nigeria e-Government Interoperability Framework (Ne-GIF) achieves G2G interoperability.
4. To propose actionable strategies to achieve Government-to-Government (G2G) interoperability through a Whole-of-Government approach in Nigeria’s public sector.

1.4 Research Questions

This research seeks to bridge significant knowledge gaps on how Government-to-Government (G2G) interoperability can be achieved in Nigeria's public sector.

Much of the existing literature predominantly addresses technical and institutional challenges faced by developing nations with established digital infrastructures. In contrast, there is a notable scarcity of research focusing on the unique Government-to-Government interoperability challenges within democratic emerging economies faced with unique political, economic, and institutional challenges.

For instance, Ibor et al. (2023) highlight that in many African Countries, Nigeria included, issues such as weak institutions, low trust in government, and technology-locked systems pose significant barriers to achieving interoperability. These challenges underscore the need for context-specific studies that address the Government-to-Government dimensions of interoperability in such settings.

This research, therefore, aims to fill this knowledge gap by exploring how Nigeria's political governance, technical infrastructure, and organizational processes can be aligned to achieve an interoperable and integrated public sector. Thus, the research seeks to answer the overarching question: How can Nigeria's Federal Government MDAs adopt a holistic approach to achieve Government-to-Government interoperability while navigating the realities of a democratic emerging economy?

RQ1: How is technical interoperability achieved between G2G organizations at the Nigerian federal level?

I. What challenges or barriers hinder interoperability implementation from a technical perspective?

RQ2: Semantic Interoperability: How do federal agencies agree on the shared meaning of data?

I. What tools/frameworks are being leveraged in the Nigerian public sector to foster semantic interoperability?

RQ3. How does Nigeria's political governance model influence the organizational structure of the public sector at the Federal level.

I. What challenges does the organizational structure of the Nigerian public sector present in achieving G2G organizational interoperability?

II. What legal regulations most impact G2G interoperability in the Nigerian public sector?

RQ4 How have best practices or frameworks been successfully used to achieve organizational interoperability in democratic economies?

1. What adaptations and implementation strategies would be effective for the Nigerian public sector?

1.5 Significance of the Study

This research aligns with Nigeria's ambition to become a fully digital economy, and as the country continues to invest in this direction, strengthening interoperability has become essential to turning those efforts into lasting, meaningful progress.

The results of this study will provide an insightful analysis of the country's specific difficulties in achieving Government-to-Government (G2G) interoperability in its public administration. For

instance, while Estonia's success in implementing interoperable e-government systems (such as X-Road and e-Residency) has set the global standard, Nigeria's political and organizational scene remains unique according to its institutionally fragmented systems, political instability, and corruption (Goloshchapova et al., 2023). Understanding these specific challenges and constraints will help to create contextually appropriate and sustainable solutions.

Ultimately, this research will bridge the current academic lacuna, where literature is prevalent on the strategies of more advanced countries towards interoperability, by presenting a critical analysis of Nigeria's unique challenges and practical recommendations. Through its findings, this study will provide data to support the development of a more integrated, efficient, and transparent public administration in Nigeria.

Chapter 2

2. Literature Review

2.1 Introduction

This literature review explores the theoretical underpinnings and empirical research about Government-to-Government interoperability. The primary aim is to critically assess the existing body of research that enhances the understanding of how governmental institutions can achieve seamless integration from the technical, semantics, legal and organizational perspectives.

Firstly, the review will analyze the various dimensions of interoperability, with a particular emphasis on the four layers delineated in the European Interoperability Framework (EIF)- legal, semantics, organizational and technical interoperability.

Furthermore, the theoretical frameworks guiding Government-to-Government interoperability will be discussed. Amongst which are Complexity Theory, which clarifies the difficulties resulting from governmental institutions' dynamic and multifarious character, and Change Management Theory, which provides insights into the processes via which institutions transition to being interoperable. In addition, institutional theory will be considered to look at how policies, institutional structures, and governance models affect the acceptance of interoperability initiatives.

The last section will present case studies and analyses of developed and developing economies to show how institutional and technical obstacles have either effectively supported or hampered interoperability. subsequently, it will identify barriers and opportunities emerging economies, specifically Nigeria, face in pursuing G2G interoperability in the public sector.

Overall, this review attempts to give a thorough summary of the basic ideas, theories, and difficulties in the field, laying a basis for the goals and research questions of this study.

2.2 Theoretical Frameworks

This section elaborates on three prominent theoretical models: European interoperability framework, Change Management Theory, and Organizational Governance and Complexity

Theory. These models offer primary insights into the processes, issues, and strategies central to achieving Government-to-Government interoperability in the public sector.

2.2.1 European interoperability framework

The European interoperability framework outlines 47 recommendations, 12 guiding principles and 4 core layers to improve the governance of public service interoperability activities, establish cross-organizational relationships, streamline processes supporting end-to-end digital services, and last but not the least, to ensure that both existing and new legislation do not compromise interoperability efforts (European Commission, 2017).

According to the EIF, interoperability is "the ability of organizations to interact towards mutually beneficial goals, involving the sharing of information and knowledge between these organizations, through the business processes they support, by means of the exchange of data between their ICT systems" (European Commission, 2017).

The European Interoperability Framework (EIF) defines interoperability through a layered model consisting of four interdependent dimensions: technical, semantic, legal, and organizational. Each layer addresses a distinct aspect of how public services can effectively connect and operate to deliver citizen centric services.

The technical layer encompasses the infrastructure, software systems, communication protocols, as well as the application interfaces that allow different IT systems to connect and communicate. This layer addresses the mechanics of data transmission via APIs, secure networks, and technical standards (European Commission, 2017).

Moving beyond technical mechanics, the semantic layer addresses the need for shared understanding of the data being exchanged. This layer emphasizes both the structure (syntax) and meaning (semantics) of data for the purpose of consistent interpretation, accurate exchange, and effective reuse of information across different systems (European Commission, 2017).

Practically, this involves creating and maintaining common data models, controlled vocabularies, and metadata frameworks. The goal is to ensure that data exchanged between systems retains its intended meaning, independent of linguistic, cultural, or administrative differences. Tools such as

data dictionaries and semantic registries are often recommended to support this layer (European Commission, 2017).

The legal layer provides the regulatory backbone. This covers data protection laws, national statutes, and international agreements governing how data can be accessed, processed, and shared. It also involves proactively reviewing legislation to remove legal obstacles to digital collaboration (European Commission, 2017).

The organizational layer, on the other hand, is about creating coherence between institutional goals and workflows. It uses structured tools such as clearly defined roles, responsibilities, and formal agreements including Service Level Agreements (SLAs) or Memorandums of Understanding (MoUs) (European Commission, 2017).

Figure 1 below shows the interlinked layers of the interoperability framework. The diagram graphically represents the four dimensions -technical, semantic, organizational, and legal emphasizing their interrelationship in developing an interoperable system. Understanding these layers will help public institutions build systems that not only facilitate data exchange but also ensure that the players in the data exchange ecosystem have a unified interpretation of data and information.

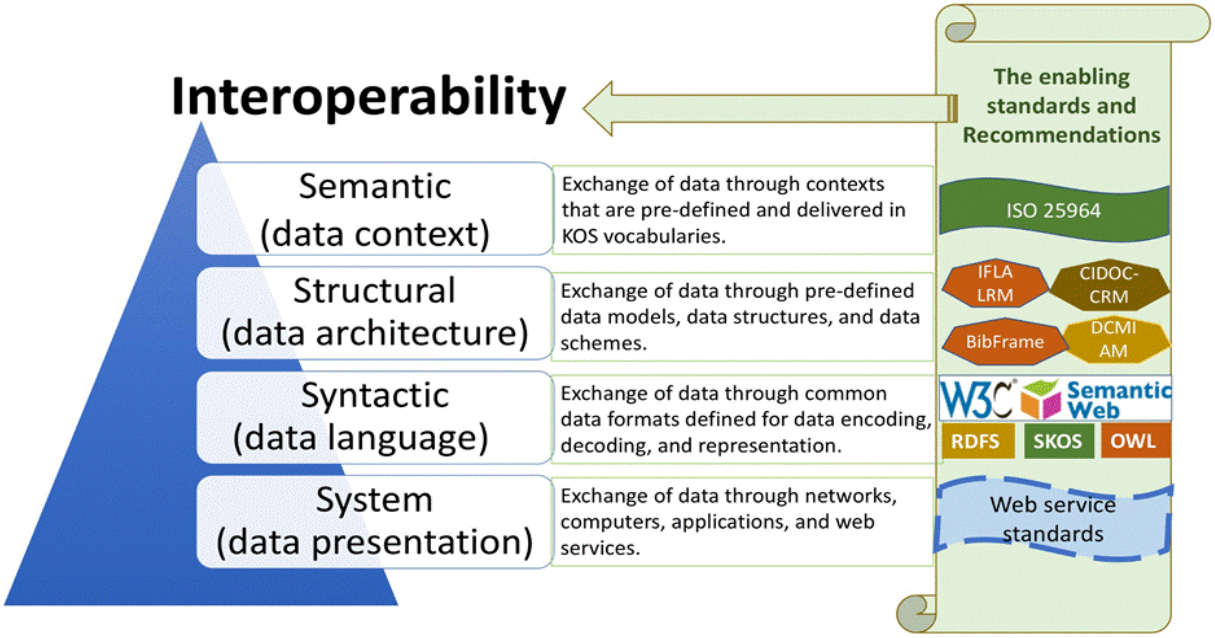

Figure 1: Interoperability Frameworks

2.2.2 Change Management Theory.

The second theory connected to government-to-government interoperability is Change Management Theory. This addresses the challenges encountered by public institutions transforming from traditional siloed administration models to interoperable systems. Practically, the transition frequently demands a complete overhaul of organizational processes, culture and systems. To address the challenges highlighted above, one of the most popular change management models-Kotter's 8-Step Change Model, emphasizes the importance of creating a sense of urgency, forming a strong leadership coalition, and empowering staff to take ownership of the change process (Kotter, 1996).

Moreover, change management plays a vital role in e-government initiatives. It is essential not only for overcoming internal resistance but also for fostering effective collaboration among stakeholders within public institutions (Zhang and Kaur 2024).

The relationship between organizational complexity and change management plays a crucial role in determining whether public institutions can achieve government-to-government interoperability. Research has shown that change management directly influences public service delivery by shaping organizational culture, which acts as a key mediator in this relationship (Sopiah, 2024).

In many public administrations, hierarchical and compartmentalized structures tend to limit data sharing and collaboration across departments. These structural barriers add a layer to the icing of institutional inertia, making it difficult to transition to integrated digital systems.

Effective change management provides a structured strategy for addressing these challenges. It begins with a deliberate commitment from stakeholders to lead organizational transformation. Through coordinated efforts, institutions can reduce resistance and establish the foundation needed to achieve true interoperability (Sopiah, 2024).

2.2.3 Organizational Governance and Complexity Theory

This theory offers valuable understanding of institutional governance models and institutional structures and their impact on organizational ability to achieve interoperability. Public institutions

are inherently complex due to their hierarchical characteristics, regulatory requirements, and pluralistic stakeholders. The complexity is likely to lead to fragmented decision-making, discoordination, and inefficiencies in service delivery. Organizational governance, as Institutional Theory describes it, is concerned with the role of formal structures, rules, and norms in shaping organizational behavior (DiMaggio & Powell, 1983). In interoperability, governance structures need to adapt to promote cooperation among agencies and facilitate the alignment of policies, processes, and technologies.

Complexity theory fills out this image by pointing to the ways in which random interaction between complex systems can potentially make interoperability challenging. For Burns and Stalker (1961), organizations must balance control and flexibility in order to operate with complexity effectively. In Nigeria, where various government institutions conduct business with varying levels of technological support as well as varying levels of political influence (Okundaye et al., 2019), the ability to operate within complexity is crucial if interoperability is to be successful.

Finally, these three theoretical frameworks—Interoperability Frameworks, Change Management Theory, and Organizational Governance and Complexity Theory—form the basis of understanding the opportunities and challenges in achieving interoperability in Nigeria's public organizations. EIF is a generic model for addressing the technical, semantic, organizational, and legal aspects of interoperability (Margariti et al., 2022). Change Management Theory offers methods to handle resistance and guide organizations through the process of embracing more integrated systems. Organizational Governance and Complexity Theory assists in explaining the effects of governance systems and institutional complexity on the interoperability process (Marjerison and Gatto, 2024). Through the incorporation of these frameworks, this research seeks to provide pragmatic insights into how Nigeria can attain a more integrated and effective public administration.

2.3. Comparative Lessons from Successful E-Government Interoperability Initiative: the case of Estonia

The case of Estonia offers practical insights into how a democratic emerging economy can achieve holistic government-to-government interoperability starting with strategic public institutional reforms that are supported by a commitment to digital inclusion and coordination by the central government.

Early 1990s in the aftermath of independence from the Soviet Union Estonia came face to face with new realities: the daunting challenge of rebuilding its public sector institutions and navigating the complexities of an emerging market economy.

Being a post-socialist state bound to undergo systemic transformation, the country had to cross the hurdles of widespread institutional inefficiencies, a fragile governance framework, and low public trust in state institutions. The administrative apparatus inherited from the Soviet era was ill-suited for the demands of a transparent, accountable, and citizen-oriented government and further compounding to the aforementioned was the inherited socio-economic disparity. As noted by Espinosa and Pino (2024), these systemic constraints undermined productivity and exacerbated inequality, making institutional reform not only urgent but foundational to Estonia's broader development strategy.

Estonia embraced e-governance as a long-term development strategy in 1998 and began to transform its institutional landscape through deliberate, future-oriented reforms, in that year, the country's real GDP per capita was lower than the Latin American average (Espinosa and Pino, 2024). Building on the country's resolve to embrace e-governance, a responsive regulatory framework was established in 1998 to provide the institutional foundation for interoperability across public sector institutions.

In the early 2000s the Estonian government invested in building a decentralized, interoperable infrastructure for seamless data exchange across public institutions. This vision gave birth to X-Road: a secure, standardized data exchange infrastructure. In research, X-road is acknowledged as the backbone of Estonia's e-government architecture (Jackson et al., 2021).

In 2022 Estonia achieved a laudable landmark of becoming the first post-transition state to rank among the top 20 countries in global e-government development and digital competitiveness (Breaugh et al., 2023). Estonia also reached development benchmarks comparable to advanced European economies such as Greece surpassing the average performance of Latin American nations by a considerable margin (Szentmihályi, 2023).

Estonia's transformation from a post-Soviet state into a global leader in digital governance demonstrates how deliberate institutional reforms can enable government-to-government interoperability in a democratic emerging economy. Its success underscores the importance of aligning public sector modernization with inclusive governance frameworks and a strong central commitment to digital coordination. While Estonia's context differs from Nigeria's federal structure and scale, the core principles of strategic institutional redesign, secure data exchange, and citizen-centered reform remain universally relevant.

In conclusion, the insights from Estonia's journey to becoming a global leader in digital governance offers valuable lessons for addressing institutional inefficiencies in Nigeria's public sector and for designing a holistic, interoperable governance framework tailored to match the democratic aspirations and development priorities of the country.

2.3.1 X-road: digital infrastructure for G2G interoperability.

Due to its inherent complexity, achieving interoperability requires a collaborative and integrated approach. It brings together multiple dimensions, including database integration, shared data semantics, organizational transformation, streamlined operations, and a strong foundation of binding legal agreements. (Krimmer et al., 2021).

In a bid to address these complexities, several countries have turned to structured frameworks and digital infrastructure solutions that have the capacity to embed both technical and institutional elements. One of the most successfully implemented solutions that follows this approach is Estonia's X-Road.

X-road was developed in 2001 by a public-private consortium. X-Road is an open-source software that enables seamless data exchange and interoperability among Estonian government institutions

(Jackson et al., 2022). In a little over a decade, what began as a national infrastructure project has evolved into a foundational element of Estonia's digital governance model.

Its key components include secure servers, adapter servers, monitoring centers, and equally important X-Road-centric systems like certification and auditing servers. Secure servers handle a number of responsibilities including encryption, log management, and access control. Adapter servers translate queries into formats readable by different software platforms participating in the data exchange ecosystem.

To maintain trust and accountability, x-road architecture also includes monitoring centers for tracking system performance and usage, as well as centralized components like certification authorities and auditing servers. These handle digital certificates, timestamping, and access verification. In its design, the highest standard of confidentiality is maintained as X-road uses national public key infrastructure (PKI), DNS-SEC-secure directories of verified participants, and robust access controls to ensure only authorized entities can communicate. Together, these components form a secure, platform-independent environment where governments, businesses, and citizens can share data efficiently and safely.

X-Road has expanded beyond its original scope and now supports secure data exchange within government agencies and across private sector entities. Today, it facilitates real-time, encrypted communication between information systems through standardized APIs, digital certificates, and a decentralized yet centrally coordinated governance framework. This system has become a model for other nations aiming to build trust-based, interoperable digital ecosystems (Jackson et al., 2022).

Nigeria's Digital Public Infrastructure (DPI) Framework currently in the works by the Federal Ministry of Communications, Innovation and Digital Economy (FMCIDE) has three core pillars: a centralized digital identity system, an integrated payment infrastructure, and lastly, a secure, interoperable data exchange platform. Of these pillars, Nigeria has made significant progress with two which are, the National Identity Number (NIN) which supports citizen identification and verification and the Nigeria Inter-Bank Settlement System (NIBSS) which supports digital payments (Federal Ministry of Communications, Innovation, and Digital Economy [FMCIDE], 2024). However, the third pillar which is a unified data exchange layer, exists as a gap. To address

this, Nigeria is advancing plans to establish the Nigerian Data Exchange (NGDX) through the adoption of the X-Road framework to fit its unique governance and infrastructure landscape.

In summary, Estonia's X-Road offers a compelling blueprint for Nigeria's quest to establish a secure and interoperable data exchange platform under its Digital Public Infrastructure initiative.

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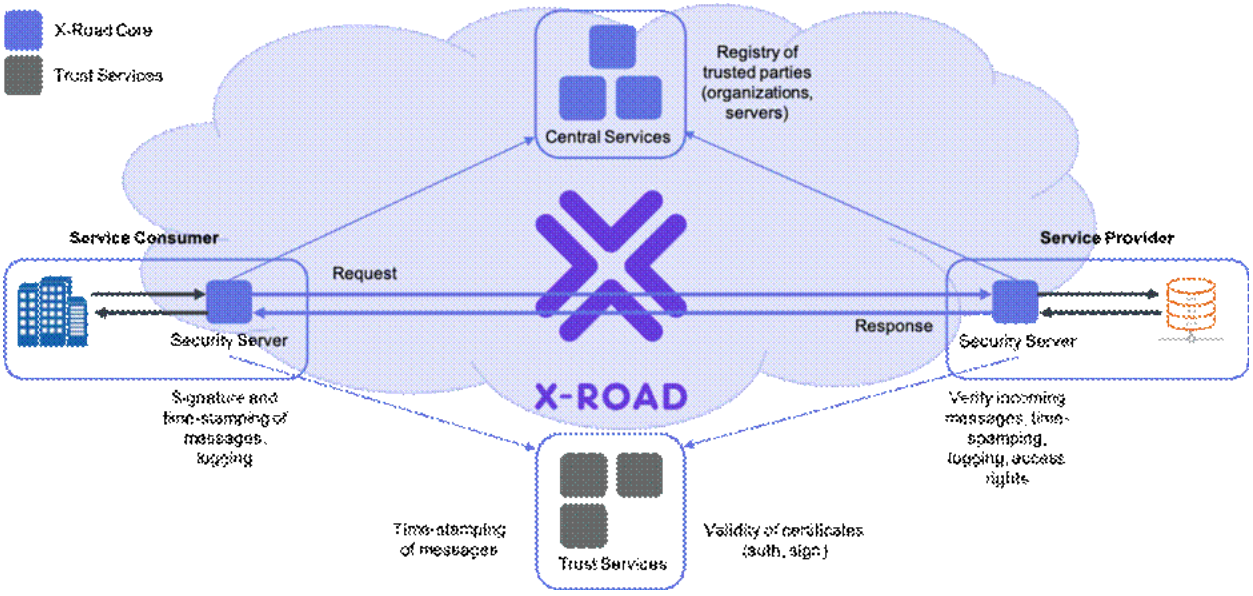

Figure 2: *X-Road messaging model (Kivimäki, 2018).*

2.4 Exploring Government-to-Government Interoperability in South Africa: A Democratic Emerging Economy Perspective

While this research focuses on Nigeria, the inclusion of South Africa serves as a valuable comparative case to deepen the analysis of government-to-government (G2G) interoperability within democratic emerging economies. South Africa and Nigeria share several structural and governance similarities, both countries operate federal or quasi-federal systems, grapple with institutional fragmentation, and are pursuing an ambitious digital transformation agenda of integrating public institutions that are working in silos.

The government of South Africa post-Apartheid have continued to navigate the country's complex socio-political landscape with efforts geared towards reforming public administration through digital governance. A notable step in this direction was the publication of the *National Integrated ICT Policy White Paper* in September 2016, which articulated a vision for an integrated national e-Government strategy (Kotzé & Alberts, 2017). This vision was born from the need for government-to-government (G2G) interoperability to improve cross sectoral collaboration for the delivery of citizen centric services. Over the years, the realization of this objective has been impeded by deeply rooted institutional fragmentation and bureaucratic complexity. As Lidén and Nyhlén (2024) and Cejudo and Michel (2017) observe, the organizational architecture of modern governance, especially in federated or decentralized systems like South Africa's, often complicates coordination and obstructs reform.

South Africa's experience with New Public Management reforms has further exacerbated this issue by fostering sectoral, departmentalized, and fragmented governance approaches. The fruit of these reforms is the proliferation of uncoordinated policies rooted in isolated administrative siloes, thereby complicating efforts to achieve policy coherence (Cejudo & Michel, 2017).

As proposed in literature, the solution to address these silos to improve the functionality of public institutions is the integration of policies (Lidén & Nyhlén, 2024). In addition, scholars and policymakers have advocated for integrative governance approaches such as the New Public Governance paradigm, Whole-of-Government (WoG), and Whole-of-Society (WoS) models (Van der Waldt, 2016; Lidén & Nyhlén, 2024). These frameworks emphasize coordinated planning and address the challenges of siloed public administration.

Despite South Africa's efforts in embracing elements of these models, with initiatives like the *District Development Model* and *Social Compacts* aimed at horizontal and vertical coordination across government entities (Republic of South Africa, 2023). There still exists significant gaps in policy alignment and inter-agency collaboration. The National Planning Commission (2023) highlighted persistent deficits in policy alignment, noting widespread fragmentation and poor coordination across government programs.

South Africa's experience offers insights into the persistent challenges in enhancing G2G interoperability in complex, federated governance systems.

2.5 Disconnected by Design? Federal Structure and the Digital Interoperability Challenge in Nigeria

Since the return to civilian rule in 1999, Nigeria has continued to operate under a presidential democratic system (Ikeanyibe et al., 2021) and as a democratic emerging economy, leadership focus has been on achieving sustainable development through governance reforms. Over the years, the country has adopted various policies that signal a desire for transparent and accountable governance. These efforts have, however, been thwarted by the existence of deep-rooted challenges of weak institutional capacity and inconsistent rule of law (Ezeani, 2021). These limitations which undermine the effectiveness of governance reforms also pose barriers to the modernization of public administration.

Nigeria operates a federal system of government characterized by the vertical distribution of powers among the three tiers: federal, state, and local governments. At the apex is the federal government that saddles the responsibility of overseeing national policy direction, fiscal management, and administrative coordination. Within the federal structure, the public sector is organized hierarchically, with executive authority concentrated in the Presidency and extended through an array of ministries, departments, and agencies (MDAs). Each ministry led by an executive Minister is tasked with overseeing a specific policy domain.

Amongst other positive aspirations, this hierarchical model of leadership is intended to promote clarity in responsibilities, streamline accountability, and ensure uniformity in governance. In practice, however, the above-mentioned ambitions are not often realized, rather, what is seen is bureaucratic rigidity and limited flexibility in decision-making. Ezeani (2005) describes the Nigerian public sector as burdened by excessive hierarchical layering, procedural delays, and a general culture of administrative sluggishness. The highly vertical nature of this model very often than not slows down inter-ministerial coordination and stifles innovation, especially when cross-sectoral collaboration is required.

In addition, Nigeria's federal design, even though it can be considered appropriate for managing a large and diverse population, has the tendency to introduce additional complexity. MDAs often

pursue overlapping mandates with limited alignment, resulting in duplicated efforts and inconsistencies in service delivery. Similarly, inter-agency collaboration is frail and largely restricted to top-level political instructions, with little emphasis on horizontal integration at bureaucratic and operational levels.

Federal ministries in Nigeria often operate in isolation. “Currently, most digital technology platforms utilized in Nigerian public services delivery are siloed and stand-alone solutions that offer limited capability to utilize insights for data to support governance, planning or private sector participation to build solutions” (Federal Ministry of Communications, Innovation and Digital Economy, 2024). Each ministry manages its own databases, digital platforms, and administrative protocols, with minimal interoperability between systems (Oghuvbu et al., 2022). This fragmentation is largely due to a marriage between legacy administrative practices and limited ICT standardization.

Similarly, political transitions in the country have birthed reforms that are not sustained by succeeding political administrations (Ridwan, 2015). The ripple effect of this governance dynamics is that it creates its own unique set of obstacles that hinder the country’s efforts to achieve cohesive and effective digital transformation.

Over the past two decades, Nigeria has introduced several e-government policies and strategic frameworks aimed at addressing the existing challenges to inter-agency collaboration and to optimize public administration. These include the *Nigeria e-Government Master Plan*, the *Nigeria e-Government Interoperability Framework (Ne-GIF)*, the *Government Digital Service Framework (GDSF)* as well as the recent e-governance and digital economy bill. (Federal Ministry of Communications and Digital Economy, 2023; National Information Technology Development Agency [NITDA], 2022).

The Nigeria e-Government Interoperability Framework (Ne-GIF). Ne-GIF was formulated by the National Information Technology Agency (NITDA) and it provides instructions for cross-portfolio service provision by MDAs. It details levels and steps for achieving interoperability, challenges of adoption as well as compliance measures and review processes. The Ne-GIF is applicable to interaction between Government to Government (G2G), Government to Businesses (G2B) and Government to Citizens (G2C) (NITDA, 2019).

Measuring the impact of these frameworks goes beyond policy intent. The Digital Maturity Index of Nigeria as reflected in instruments like the UN E-Government Development Index (EGDI) and the World Bank's GovTech Maturity Index (GTMI) offers an empirical basis for evaluating progress.

In the 2022 UN EGDI report which assesses e-government development across three components: Online Service Index (OSI), Telecommunication Infrastructure Index (TII), and Human Capital Index (HCI). Nigeria had a score of 0.4815, ranking 144th out of 193 countries, placing it in the middle tier of digital maturity. While the country has recorded some progress, particularly in the Online Service Index component, it continues to lag behind its regional peers like Kenya and South Africa even though it has somewhat comparable or even superior policy frameworks (United Nations Department of Economic and Social Affairs, 2022). This result shows that there exists a disconnection between policy formulation and policy implementation in Nigeria.

Similarly, in the 2022 World Bank GovTech Maturity Index Developed by the World Bank, the GTMI evaluates the maturity of digital government initiatives across four pillars: Core Government Systems, Public Service Delivery, Digital Citizen Engagement, and GovTech Enablers. Nigeria was placed in Group C, indicating a moderate level of digital maturity. This classification gives credence to limitations in implementing policies to support provision and uptake of digital services.

Although the existence of frameworks like Ne-GIF demonstrates Nigeria’s strategic foresight, their impact remains uneven due to weak institutional enforcement, fragmented infrastructure, and lack of stakeholder buy-in (NITDA, 2022; World Bank, 2022).

Overall, the digital maturity scores reveal that while Nigeria has laid the foundational policies for e-governance and government-to-government (G2G) interoperability, the outcomes have been modest and inconsistent. The gap between policy and practice exposes the need for improvement in policy coordination across governments, implementation fidelity, as well as cross-agency capacity building.

Achieving G2G interoperability at the Federal level in Nigeria will set the standard that can be replicated at the state and local levels. The importance of interoperability in Nigeria is beyond

administrative efficiency for public service delivery, it has a profound impact on the socioeconomic development of the country (Oghuvbu et al., 2022). It will in no small measure decrease the number of silo platforms deployed by the Government and reduce the cost of running IT systems that are performing duplicate functions.

Chapter 3

3. Methodology

3.1 Introduction

This section presents the researcher’s approach to investigating government-to-government interoperability within Nigeria's public sector. The research uses a qualitative methodology to capture the real-life experiences and perspectives of key stakeholders working in Nigeria’s Federal public institutions. Interoperability across government departments involves complex organizational, semantic, technical, and legal dimensions that affect how systems and data integrate. This research examines the obstacles preventing effective integration and potential pathways forward, tailored explicitly to Nigeria's unique context. The researcher analyzed participants' insights using thematic analysis to identify meaningful patterns in their experiences.

The qualitative approach is suitable for this study because it allows for an in-depth exploration of the socio-cultural, organizational, and contextual barriers that influence the implementation of the Nigeria e-Government Interoperability Framework (Ne-GIF) in public administration. While quantitative methods may overlook the richness of organizational and social dynamics, qualitative research provides a comprehensive understanding of Nigerian government institutions through interviews, policy analysis, and practice-based assessments. These elements are crucial for analyzing the factors supporting or hindering data sharing and inter-agency collaborations within fragmented systems, resistance to change, and inconsistent policy execution (Kotter, 1996).

Thematic analysis is utilized in this study to show implicit themes or structures in qualitative information, making way for intense scrutinization of the employee, policymaker, and stakeholder responses elicited by the interview process. Braun and Clarke (2006) advocate thematic analysis especially because it fits better to reveal a pattern in a large collection of qualitative information, making the choice of study perfect for the analysis. Thematic analysis will enable coding of responses and identification of emerging themes that give insights into systemic challenges and possibilities for enhancing organizational interoperability in Nigeria's public administration.

The study design will be used to find out the best method Nigeria's public sector should adopt and incorporate interoperability frameworks. Interviews and thematic analysis will be used to find out

why Nigeria's public sector has taken so long to be digitally transformed and provide context-dependent, actionable recommendations. The research's primary data collection method, interviews, will gather first-hand information from the key stakeholders, including high-ranking government officials, regarding problems faced and potential means of increased inter-organizational collaboration. The study will also investigate government reports, such as the Ne-GIF (NITDA, 2019), that present keen perspectives on current policies to enhance interoperability.

3.2 Research Philosophy

Research philosophy provides an underlying understanding of the research approach, guiding how the researcher views the world and how this influences the inquiry process. It is necessary to define the philosophical approach as it dictates the methodology used in data collection, analysis, and interpretation. In this study, the research philosophy employed is aligned with interpretivism and constructivism, considering the aim to explore Government-to government interoperability within the Nigerian public sector. The selection of these philosophies is informed by their ability to obtain more in-depth information about complex social phenomena, such as political, organizational, and legal challenges to achieving interoperability in Nigeria as a developing country.

Interpretivism is at the core of this research philosophy. Interpretivists emphasize the necessity to understand the meaning and context of social phenomena and human behavior. This paradigm operates with the belief that reality is socially constructed and modeled through the subjective experiences of individuals in a given setting (Saunders et al., 2019). In organizational interoperability, interpretivism allows the researcher to interpret public sector workers', policymakers', and other stakeholders' experiences, attitudes, and views regarding implementing e-governance initiatives. The objective is to uncover these actors' patterns of meaning attached to interoperability, their challenges in data sharing, and their views on the effectiveness of the Ne-GIF. As the study targets a detailed understanding of the barriers to information sharing and collaboration in Nigeria's public administration, interpretivism offers a firm foundation for examining these complex, contextual variables.

Furthermore, the study is grounded in constructivism, which posits that knowledge is shaped through social interactions and experiences (Crotty, 1998). This perspective aligns with the understanding that organizational interoperability is not a fixed or theoretical concept but one that

evolves through the interactions of people, systems, and governance structures. Through the use of semi-structured interviews and thematic analysis, the researcher seeks to gain insight into the personal knowledge and perceptions of individuals involved in Nigeria's e-governance systems. These perspectives will contribute to a deeper understanding of interoperability challenges within Nigeria's unique socio-political and cultural context.

Additionally, this research incorporates abduction as a reasoning strategy. Saunders et al. (2019) describe abduction as the process of formulating the most plausible explanation of data based on available observations. It enables the researcher to interpret complex and puzzling data by linking emerging themes with established theories and models, such as organizational governance, change management, and interoperability. The abduction employed in this study bridges the theory-practice gap, offering practice-based solutions derived from interview data, with a focus on actionable recommendations for enhancing interoperability in Nigeria’s public sector.

Regarding the methodological approach, this research employs a mono-method qualitative design, as illustrated in the research onion diagram in Figure 3. The strategy emphasizes the use of qualitative methods, including in-depth interviews and thematic analysis, to interpret the perceptions of key stakeholders in Nigerian governance institutions. Focusing on qualitative data allows the study to explore the depth and richness of participants' experiences, shedding light on the challenges and realities of implementing interoperability frameworks in a developing country.

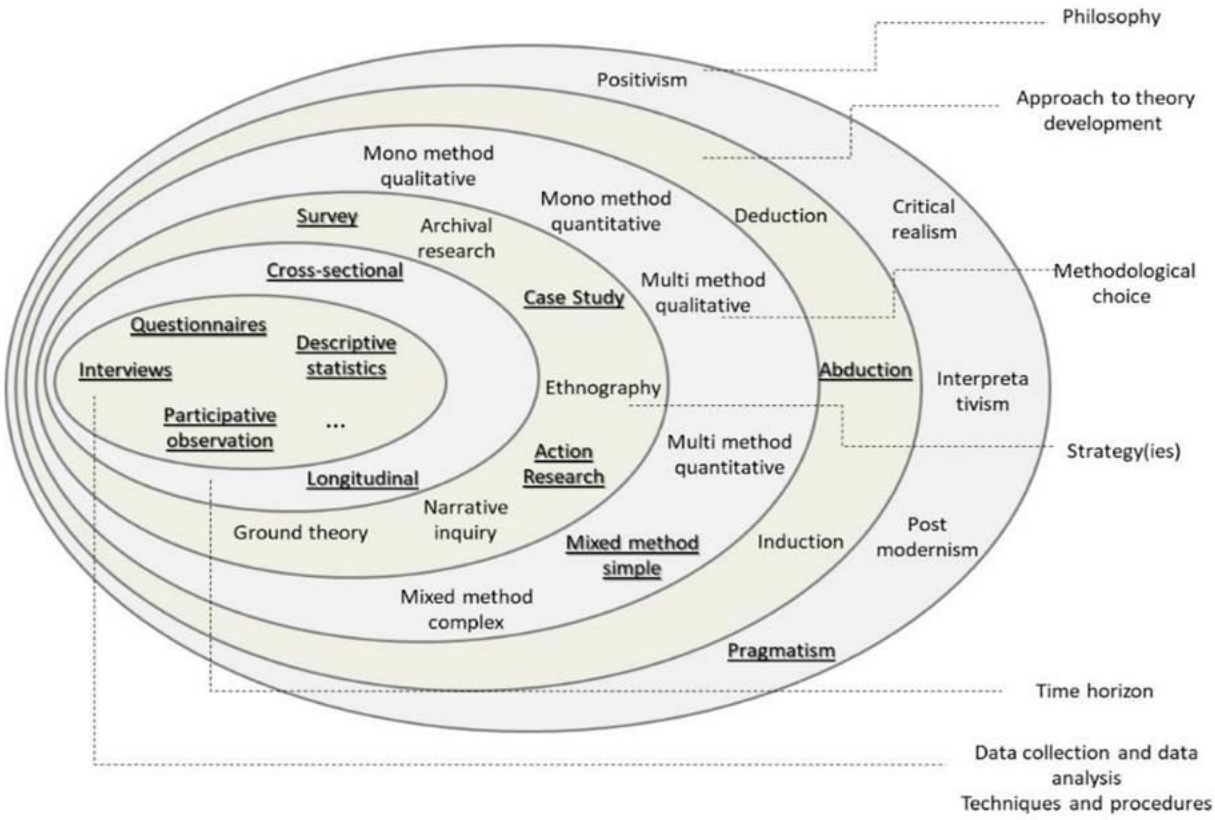

Figure 3: *Sauder's et al., 2019 Research Onions*

Strategically, the study method is based on the case study approach, in which a case study of targeted public sector organizations in Nigeria is conducted in depth to grasp their interoperability issues. Examining real-life surroundings is appropriate using the case study approach since it enables a thorough analysis of the policies, procedures, and systems of e-governance in particular Nigerian departments. This will help the study to provide useful suggestions grounded on the insights from the chosen case studies.

The cross-sectional time horizon of the study means that data will be gathered from many participants at one moment in time. This is common in studies when the researcher wants to capture, in this case, the interoperability issues in the Nigerian public sector as they are at the time. The present study follows interpretivism, constructivism, and abduction as its research philosophy, which fits the qualitative approach to investigate organizational interoperability in the Nigerian public sector. This approach offers a strong basis for comprehending the dynamics of the complicated interoperability framework deployment. It shows how public sector entities might

improve coordination, data sharing, and service delivery. With this method, the study offers context-specific, relevant recommendations for strengthening Nigeria's e-governance systems.

3.3 Research Design

The research design for the study is based on a qualitative strategy, with the intention to understand the complex nature of Government-to-government interoperability within Nigeria's public sector. Qualitative research allows close investigation of people's experiences, perceptions, and challenges, and it is thus strongly suited for investigating the obstacles to interoperability in a socio-politically complex environment like Nigeria. Its aim is not to generalize the findings but to understand the underlying issues and identify actionable suggestions that can inform future policy and practice in e-governance.

The study adopts a case study research design to provide a detailed, context-specific exploration of the interoperability challenges within selected public sector organizations in Nigeria. Case studies can record richer and more detailed data, which allows for gaining an in-depth insight into the challenges that are faced by government agencies in attempting to implement interoperability frameworks. This framework enables the researcher to place focus on specific cases within Nigeria's public administration, analyzing the success and boundaries of projects such as the Nigeria e-Government Interoperability Framework (Ne-GIF) (NITDA, 2019).

Semi-structured interviews are utilized as the primary data collection method, providing the liberty to explore the views of the participants in-depth but with a standardized framework for the interviews. This allows the researcher to enter the depths of participants' experiences with data sharing, business processes, and the integration of various ICT systems. Interviewees will be key stakeholders such as government officials, policy makers, and public sector employees who are involved in or impacted by the digitalization initiative in the public sector. According to Braun and Clarke (2006), semi-structured interviews are particularly appropriate to examine complex phenomena such as organizational change since they offer both the freedom to record unexpected insights and the framework to maintain a focus on research issues.

3.4 Data triangulation

To supplement the interviews, documentary analysis will provide a broader perspective of the research problem. Policy documents such as the Ne-GIF, NITDA SRAP-2.0, and associated policy documents will be reviewed to understand the official stance on interoperability and digital governance. The documents provide background on Nigeria's effort to improve governance through the application of technology and provide insights into the frameworks, strategies, and challenges highlighted at the policy level (NITDA, 2019). Combining interviews with document analysis offers data triangulation, which enhances the study's validity and reliability by cross-verifying findings from various sources (Yin, 2009).

The case study design also supports a cross-sectional time horizon in the sense that data will be collected from the participants in the selected case organizations at a specific point in time. The design is appropriate for determining the current state of interoperability challenges and opportunities in Nigeria's public sector, especially in an emerging field like digital governance (Saunders et al., 2019).

Finally, this study design is thematically driven, where data collected from interviews and documents will be analyzed using thematic analysis. Thematic analysis enables the determination of patterns, themes, and insights that repeat themselves, offering a systematic method of analyzing qualitative data in a flexible but thorough manner (Braun & Clarke, 2006). The subjects will be organized around the principal technical, organizational, legal, and semantic interoperability issues, as developed in the European Interoperability Framework (EIF) (European Commission, 2017).

3.5 Data Collection Method

The data collection fieldwork in the study was conducted through semi-structured interviews with key stakeholders in Nigeria's public sector, and in this regard, issues and opportunities concerning Government-to government interoperability in e-governance were of significant concern. Semi-structured interviews were employed since they offer flexibility to explore the participants' perspective in depth while being consistent across the interviews. This approach allows for the

collection of subtle observations on complex issues such as data-sharing problems, technical and organizational barriers, and the reform potential in digital governance in Nigeria.

The interviews were designed to determine the lived experiences of the respondents and their perceptions of interoperability challenges so that a deeper analysis of the impediments to the effective application of digital governance in Nigeria could be made. Eight respondents were interviewed, representing various ministries and agencies involved in Nigeria's digital transformation. To protect confidentiality of the respondents, the identities of the respondents have been anonymized. Each respondent's role and the organization he/she works for is described in the table below.

Table 1: Interviewee Summary Table

Respondent	**Ministry/Agency**	**Role Description**
Respondent A	Ministry of Communications & Digital Economy	Director, eGovernment and Digital Economy Department (eGDED). Responsible for overseeing digital policy initiatives.
Respondent B	Ministry of Communications & Digital Economy	Senior Adviser, Digital Innovations. Engaged in advising on e-government and digital strategy implementation.
Respondent C	Galaxy Backbone	Director. Focused on providing digital infrastructure and services for Nigerian government entities.
Respondent D	Ministry of Communications & Digital Economy	Special Assistant, Project Management Office. Supports digital projects and policy implementation for the minister's office.
Respondent E	Ministry of Communications & Digital Economy	Special Assistant, Communications. Handles communications strategy for digital projects in the ministry.
Respondent F	Ministry of Communications & Digital Economy	Special Assistant, Legal. Provides legal guidance and support on digital transformation
Respondent G	National Identity Management Commission (NIMC)	Director of IT Infrastructure. Responsible for managing data infrastructure and interoperability within NIMC’s systems.
Respondent H	Ministry of Finance	Digital Transformation Officer. Works on integrating financial systems with e-governance platforms

Interviews were conducted in an open-minded manner in order for the participants to elaborate on their answers and provide additional information. With the participants' agreement, the interviews were digitally recorded, transcribed, and processed. For example, Respondent A compared the informality of the current system under which ministries operate independently and merely for specific projects like the National Identity Management initiative. The interviews were conducted with open-ended questions in four main areas: technical, semantic, organizational, and legal interoperability. Included as part of the questions, the participants were asked about their use of existing systems, interoperability issues, and the possibility of solutions. The sample questions included "How do ministries actually exchange data?" and "What are the key technical challenges in data sharing among ministries?"

The research participants were purposely selected based on their firsthand experience with Nigeria's digital governance infrastructure, including government administrators, policy specialists, and IT experts from various ministries, departments, and agencies (MDAs). The interview data were analyzed using thematic analysis, which allowed for identifying recurring patterns across the four interoperability dimensions (Braun & Clarke, 2006). Thematic analysis began by reading transcripts of interviews and coding data to seek out repeated themes, such as technical barriers and organizational resistance.

Analysis of documents, including reports like the Nigeria e-Government Interoperability Framework (Ne-GIF) and NITDA's SRAP-2.0, was also used to complement the interview data. The ethical practice was given a high priority, keeping participants confidential and adhering to informed consent protocols throughout the data-gathering process.

3.6 Thematic Analysis

Thematic analysis of data collected through semi-structured interviews and documentary analysis is a crucial aspect of this research since it facilitates the derivation of meaningful conclusions into organizational interoperability within Nigeria's public sector. Given that the research is qualitative, the data analysis method employed is thematic analysis, which most appropriately caters to determining patterns and themes in qualitative data. This technique allows the researcher to explore various challenges, experiences, and perceptions of the participants and systematically structure the information in broad thematic categories identified from the transcripts.

Thematic analysis is a flexible and general qualitative research method because it provides a comprehensive approach to textual data analysis, pattern recognition, and the generation of themes (Braun & Clarke, 2006). It involves a structured process beginning with the familiarization phase with the data, during which the researcher becomes immersed in the data by reading and re-reading the interview transcripts. This helps in understanding the context and tone of the answers and noting initial impressions or salient points. In the research, interview transcripts that bear rich accounts of public sector workers' interoperability experiences will be subjected to close reading to produce explicit and implicit responses relating to interoperability barriers and enablers.

Coding is the second step in the thematic analysis process. Here, the researcher will identify worthwhile parts of the interview data related to research questions and objectives. These pieces of content, whether words, phrases, sentences, or paragraphs, will be assigned preliminary codes based on the subject matter of the response by the participant. An example of a code is technical difficulties, institutional opposition, or policy loopholes. Coding aims to reduce the immense amount of data into chewable chunks that symbolize the major issues at stake regarding organizational interoperability in Nigeria's public sector.

Once the initial coding is complete, the researcher will undergo a theme development process. This process collates the codes into larger, more general categories that reflect main themes. Themes may emerge around general issues such as obstacles to data sharing, resistance to change within an organization, or how government structures influence interoperability. These themes will become aware of organizational interoperability factors such as bureaucratic inertia, lack of technical infrastructure, and ad-hoc policies. The thematic analysis allows the researcher to organize these themes in an orderly manner, allowing an orderly exploration of the research issue.

To ensure validity and reliability of the outcomes, this study employs triangulation. Triangulation is a method that involves the utilization of more than one procedure or source of data for verification and cross-checking of results (Denzin, 1978). Data triangulation will, in this study, be used through the comingling of interview data and documentary analysis to confirm and validate the developing themes. The Ne-GIF, SRAP-2.0, and other policy documents related to the e-governance processes in Nigeria will be examined to provide policy context to data obtained from interviews. Triangulation through the contrast of the surfaced themes from the two sources ensures

results are reliable and reflect a greater picture of the challenges and opportunities in improving interoperability in Nigeria's public sector.

Methodological triangulation will also be employed, combining interviews as the primary data collection method with documentary analysis of relevant policy documents. Integrating both primary (interviews) and secondary (documents) data allows the researcher to cross-check findings, ensuring they are not solely based on participants' subjective views but are also consistent with formal government policies and guidelines. This approach enhances the reliability of the findings and provides a deeper understanding of the issues related to organizational interoperability.

To further advance the credibility of findings, the research shall adhere to the guidelines provided by Lincoln and Guba (1985) to be credible, transferable, dependable, and confirmable. These guidelines guide the research analysis process so that it remains explicit, and the interpretations and conclusions that arrived based on the data are adequately supported by evidence. Member checks can also be performed, whereby the participants are asked to review and affirm the accuracy of the findings in relation to the information they have provided in the interview.

The information will be synthesized into themes and sub-sub-themes that directly address the research questions. For example, technical interoperability themes will examine how government systems interact or fail to interact with one another. Organizational themes will examine what happens inside government agencies and how it contributes to or prevents interoperability. Legal and policy issues will discuss how the current frameworks, such as the Ne-GIF and the NDPR, impact the data-sharing culture among public sector organizations.

3.7 Ethical Approval and Consideration

Ethical concerns were at the center of this study to uphold participants' rights and research process integrity. All the participants provided informed consent, and a clear explanation was provided about the aim of the study, their voluntary participation, and the privacy of their responses (Braun & Clarke, 2006). The participants were told they could withdraw from the study at any time without penalty, based on ethical guidelines for qualitative studies (Yin, 2009).

Anonymity was protected by assigning pseudonyms to interviewees (e.g., "Respondent A") and removing identifiable details from transcripts. Data storage was compliant with GDPR and Nigeria's National Data Protection Regulation (NDPR, 2020), using password-protected digital files with restricted access. Ethical concerns, such as unease in articulating bureaucratic inefficiency or corruption, were minimized through the neutral presentation of questions and the employment of non-coercive language (Denzin, 1978).

Further, documentary analysis was limited to publicly available policies (e.g., Ne-GIF, NITDA reports) to avoid breaching confidentiality. The study's ethical framework drew from the European Interoperability Framework's (EIF, 2017) emphasis on trust in data exchange, in a way that findings would in no way be detrimental to participants or institutions. Reflexivity was maintained through acknowledgement of the researcher's positionality and minimisation of bias in data interpretation (Lincoln & Guba, 1985). These measures guaranteed adherence to the principles of autonomy, beneficence, and justice that are necessary to valid and responsible research in public administration.

3.8 Reliability and Validity Test

In qualitative research, reliability and validity are required to ascertain that the findings are credible and dependable and actually represent the experiences of the participants. Qualitative research is not numeric data, but qualitative data based on in-depth interviews and personal feelings. Therefore, trustworthiness has to be ascertained. Various methods are employed in this research to address issues related to reliability and validity.

Reliability in qualitative research refers to whether data stays stable and consistent over time and under persistent conditions. As an indicator of heightened reliability, the current study applies audit trails (Yin, 2009), maintaining systematic records of interviewing, coding, and thematic analysis. Documentation in this way is used to render the data collection and analysis procedures transparent and reproducible. In addition, member checking is employed, where the members can read and confirm if their answers to the interview questions and themes emerging from the interviews are accurate to ensure consistency in interpretation.

Validity, on the other hand, involves the truth and accuracy of research data. To determine validity, the study employs triangulation, where data from interviews and documentary analysis are compared (Denzin, 1978). This cross-verifies results and guarantees that the conclusions drawn from the interviews are supported by official documents like the Nigeria e-Government Interoperability Framework (Ne-GIF) and the corresponding policies. Furthermore, the use of multiple sources of data and methodological triangulation helps in providing a balanced view of the problems confronting government-to-government interoperability within Nigeria's public sector.

3.9 Sentiment Analysis

Sentiment analysis is a method used in qualitative research to identify and quantify subjective information in text data that offers insight into the emotional tone expressed by the respondents. It is used rigorously in social sciences to measure public sentiment, attitude, and opinion about some phenomenon (Pang & Lee, 2008). Sentiment analysis was employed in this study to examine interview responses, and it enabled the researcher to extract the factual content of the participants' opinions and the emotional orientation of the opportunities and challenges of interoperability in the Nigerian public sector. It provided a more advanced dimension to the thematic analysis by identifying emotional undertones in the participants' responses (Liu, 2012).

The sentiment analysis in this research utilized TextBlob, a popular natural language processing program, to identify two significant measures: polarity and subjectivity. Polarity is quantified from -1 (extremely negative) to +1 (extremely positive), and subjectivity identifies how personal or opinionated the response is, ranging from 0 (objective) to 1 (subjective). The study assessed the tone of the response to interoperability issues via sentiment analysis, which gave an understanding of how the participants emotionally responded to the issues and potential solutions for digital transformation within the Nigerian public sector (Pang & Lee, 2008). The sentiment analysis enables researchers to unlock emotional responses that would otherwise not be possible to grasp in purely thematic research and is, therefore, an essential tool for understanding the human aspect of organizational change (Balahur et al., 2013).

Chapter 4

4. Result

4.1 Presentation of Findings

This chapter presents the findings of the thematic analysis of the interview data gathered from the key public sector stakeholders in Nigeria. The study focuses on the challenges and opportunities of Government-to-government interoperability in the Nigerian government system. Five broad themes emerged from the analysis: technical obstacles to interoperability, organizational challenges, legal and regulatory obstacles, change management, and success factors for interoperability.

Thematic analysis was employed to identify patterns and common topics across the interview data, and the overall findings on the barriers and enablers of interoperability in Nigerian public institutions are outlined. The themes are elaborated in terms of the perceptions expressed by public officials, policymakers, and other stakeholders, such as fragmented systems, lack of standardized data formats, bureaucrats' resistance, and leadership instability.

In addition to thematic analysis, semantic analysis was employed to identify the key entities and terminologies associated with each theme. The analysis de-mystified the language of interviewees and allowed for the conceptualization of how interoperability issues are framed in the Nigerian context. Sentiment analysis was performed to identify the overall attitude of the interviewees towards interoperability, categorizing sentiments as positive, negative, or neutral.

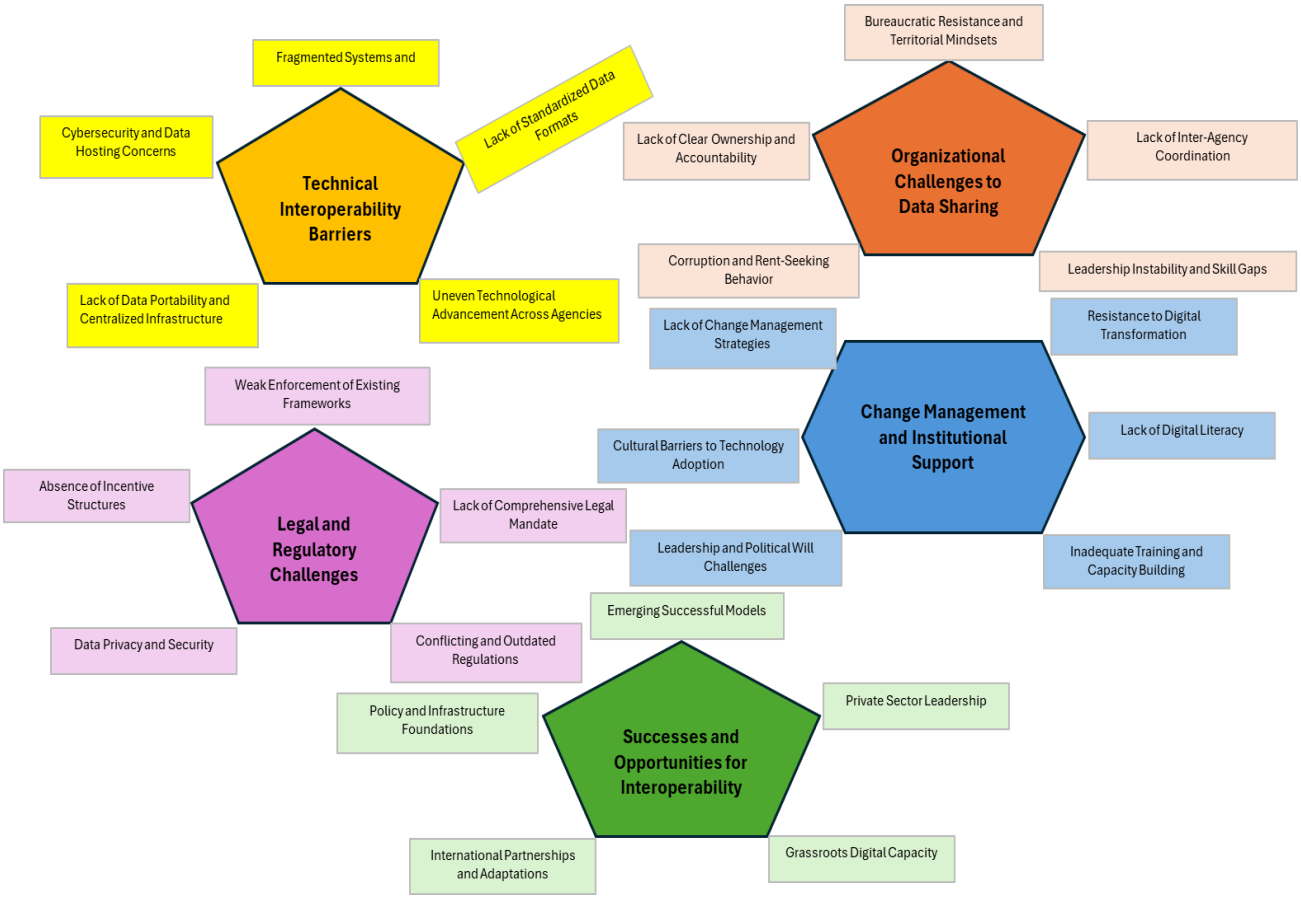

Figure 4.1: *Thematics Analysis summary*

Figure 4.1 visually represents interlinkages among broad themes that surfaced in the research. The diagram illustrates how various challenges, such as technical, organizational, legal, and regulatory issues, are interconnected and how these barriers affect the adoption and utilization of interoperability frameworks in Nigerian public sector organizations.

4.2 Theme 1: Technical Interoperability Barriers.

Nigerian public sector technical interoperability challenges are extensive and intricate. This research explores the most important issues that hamper or delay the unproblematic interoperability of data and systems among government agencies. The results are grouped under five main sub-themes: siloed data and non-integrated systems, lack of data format standards, uneven technological development level among agencies, lack of portability of data and central infrastructure, and data hosting and cybersecurity challenges.

4.2.1 Fragmented Systems and Siloed Data.

One key challenge the participants identified is the fragmented nature of systems within government ministries and agencies. Many ministries operate in silos, with systems that are largely independent and non-integrated. This fragmentation creates significant difficulties in data sharing and interoperability across government departments. According to Respondent C, ministries tend to function as autonomous entities, adhering strictly to their mandates and making it difficult to share data or collaborate effectively. As she emphasized:

- *"Each ministry or MDA in Nigeria generally operates independently, adhering strictly to its own mandate—much like autonomous entities. In practical terms, data sharing and interoperability between federal MDAs is limited and largely informal."*

Moreover, Respondent D discussed the bureaucratic hurdles that arise when attempting to access information stored within these fragmented systems. According to Respondent D, accessing even basic data often requires navigating through layers of bureaucracy. She noted:

- *"What I want to emphasize for now is that data and information are currently collected in silos. As a result, even accessing basic information requires going through layers of bureaucracy."*

Respondent G emphasized the lack of a unified system:

- *"Each MDA operates based on its own understanding of information sharing, resulting in a patchwork of formal and informal mechanisms."*

4.2.2 Lack of Standardized Data Formats.

Another significant barrier identified in the interviews was the lack of standardized data formats across various government agencies. This inconsistency in how data is structured and recorded creates confusion and disrupts efforts to share information across systems. Respondent E shared an example from the health sector, where a health alert was sent using a non-official email address, leading to confusion about its legitimacy. Respondent E remark:

- *"For example, in the health sector, a message about a health alert went out with a Yahoo email address instead of an official domain. This caused a lot of confusion and people questioned its legitimacy."*

Additionally, the divergence in date formats between ministries makes data exchange even more difficult. Respondent F highlighted a common issue with the Date of Birth format across different agencies, explaining:

- *"You go to one agency, and they collect 'Date of Birth' as DD/MM/YYYY, then another uses MM-DD-YYYY, and another just writes it as text. That seems like a small thing, but at scale, that breaks systems."*

4.2.3 Uneven Technological Advancement Across Agencies.

The interviews confirmed a disparity in technological advancement across various government agencies. Although certain agencies like the National Identity Management Commission (NIMC) and financial institutions like banks with BVN have adopted digital platforms for data management, the majority of other agencies still rely on manual paper-based systems. This lack of uniformity in the adoption of digital technology creates further challenges to interoperability. Respondent E explained that even some agencies use physical records, and this creates inefficiency in data retrieval:

- *"Agencies like the National Population Commission or Nigeria Statistics Office might still deal with physical records (like census data) on paper and stored on shelves. This makes data retrieval slow and inefficient."*

Similarly, Respondent D mentioned that some agencies have made significant progress in digitizing their operations, while others are still stuck in outdated practices. As he noted:

- *"Some government agencies are highly digitalized with systems in place to manage data effectively, while others still rely on manual, paper-based processes."*

4.2.4 Lack of Data Portability and Centralized Infrastructure.

The absence of a unified data exchange platform that facilitates seamless transfer of data between Federal ministries was another major barrier identified in the interviews. This lack of centralized infrastructure means that ministries are unable to easily share data with one another, leading to redundant data collection and inefficiency. Respondent C expressed frustration with the lack of a standardized platform for data sharing, stating:

- *"There is no standardized or central data exchange framework that ministries can log into or use for seamless data sharing across the federal government."*

Additionally, Respondent E emphasized the practical difficulties of moving data across different systems, stating:

- *"Without the ability to move data easily from one system to another, the whole vision of a centralized data exchange becomes nearly impossible."*

4.2.5 Cybersecurity and Data Hosting Concerns.

Cybersecurity concerns were also highlighted as a significant barrier to achieving interoperability. Many government systems are hosted outside the country, raising fears about data security. Respondent F raised concerns about data hosted outside the Government Digital Infrastructure (GDV), even though such data is linked to the .ng domain, suggesting that this should ideally be hosted within Nigeria:

- *"Many of these technologies are hosted outside of the Government Digital Infrastructure (GDV), even though they're tied to the .ng domain, which ideally should be hosted within the country."*

Moreover, Respondent E shared concerns about the risk of cyberattacks and data breaches. She stated:

- *"A major concern raised is the fear of cybersecurity risks. People worry about data breaches or cyber-attacks, especially if all the information is stored on one platform."*

Respondent H warned:

- *"Citizens hesitate to engage with digital services without trust in PII protection. Cybersecurity gaps could undermine interoperability efforts."*

4.2.6 Sentiment Analysis for Technical Barriers.

The sentiment analysis of Technical Interoperability Barriers reveals a general slightly positive sentiment towards overcoming the barriers. The polarity score of 0.177 demonstrates that the general sentiment among respondents is somewhat positive, indicating an acknowledgment of barriers but also a sense of optimism regarding the potential for improvement. The subjectivity score of 0.417 indicates a moderate level of subjectivity, indicating that while the responses are opinion-driven, they nevertheless reflect valuable factual insights into the barriers to interoperability. The graphical illustration of the sentiment analysis is in figure 4.2 below

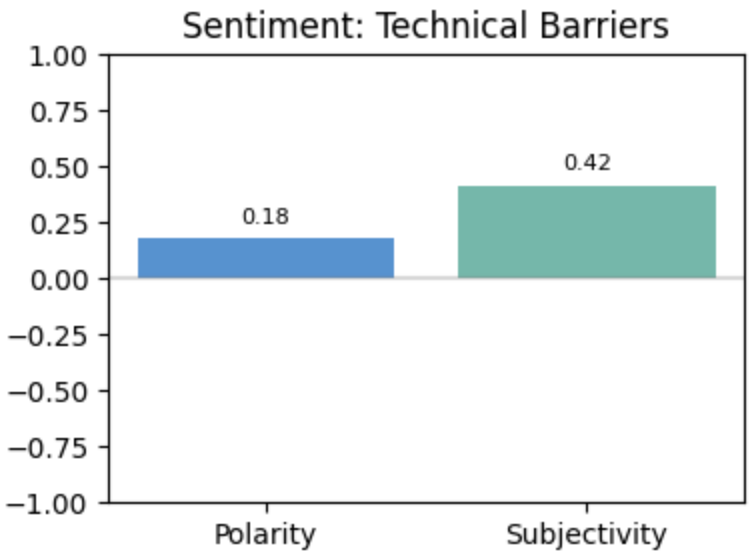

Figure 4.2: *Sentiment Analysis for Technical Interoperability Barriers*

4.3 Theme 2: Organizational Challenges to Data Sharing.

The interview findings reveal strong organizational barriers to information sharing throughout Nigeria's public sector. These challenges are counterproductive to interagency collaboration and disrupt the seamless data and systems integration between government institutions. The results reported here result from a comprehensive thematic analysis of interview answers and reveal bureaucratic resistance, coordination issues, leadership instability, corruption, and lack of clear ownership as the main issues.

4.3.1 Bureaucratic Resistance and Territorial Mindsets.

The territorial mindset in Nigerian agencies and ministries was a repeated argument among interview respondents. Respondents described how the ministries are so protective of their processes and information, afraid that they will lose control or be made obsolete when they make data available to other agencies. Such resistance is strengthened by political tensions as well as the power struggle in the ministry. Respondent D believes that the territorial spirit deters the process of data-sharing:

- *"There's a kind of territorial mindset within each ministry. It's almost like, 'this is our turf, and outsiders can't just come in.' That kind of thinking has been one of the major stumbling blocks to progress on issues like data interoperability."*

Additionally, Respondent E highlighted the political power dynamics that further complicate data-sharing initiatives:

- *"People in power often want to claim the credit for any success during their tenure, which is part of the political dynamics. Unfortunately, this creates a cycle where continuity can be disrupted."*

She also pointed out the tendency of some individuals within the public sector to feel a sense of control over resources, leading to reluctance in enabling others to move forward. Respondent E remarked:

- *"In the public sector, some individuals may feel that they have power over others and can control access to resources or processes. There is a tendency for people to think, 'This is my area; I can stop you from moving forward.'"*

Respondent G described cultural barriers:

- *"Public officials prioritize personal legacy over continuity, shelving projects when leadership changes."*

4.3.2 Lack of Inter-Agency Coordination.

Another significant issue raised in the interviews was the lack of formal mechanisms to enforce collaboration between agencies. While some collaboration takes place at the executive level, it is not consistently translated into action at the departmental or operational level. Respondent C expressed frustration over the lack of a centralized data exchange platform that could facilitate cross-agency cooperation:

- *"Currently, there is no standardized or central data exchange framework that ministries can log into or use for seamless data sharing across the federal government."*

She further elaborated on the lack of institutional mechanisms to foster real, long-term collaboration:

- *"Collaborations often happen at the executive level, and while we do engage, the actual implementation still rests with those individual MDAs. So, within our ecosystem, unfortunately, we haven't quite gotten to that fully collaborative place yet."*

4.3.3 Leadership Instability and Skill Gaps

Leadership instability and the frequent rotation of technical personnel were identified as key barriers to effective data-sharing and interoperability. Respondent C provided an example of how

the constant turnover of key personnel disrupts continuity in initiatives aimed at improving interoperability:

- *"I've been in this role for almost two years now, and in that time, we've had three different ICT directors. Staff postings at the federal level are completely under the purview of the Office of the Head of Civil Service."*

Respondent A noted:

- *"Digital initiatives like the one.gov.ng portal are abandoned or rebooted with each administration, wasting resources."*

Additionally, Respondent C noted that many appointees to key IT leadership positions lack the technical expertise necessary to drive digital transformation:

- *"Often, these individuals come from non-technical backgrounds, depending on how they were posted, and they may not be fully up to speed on digital or technical matters."*

4.3.4 Corruption and Rent-Seeking Behavior.

Corruption and rent-seeking behavior were also identified as significant obstacles to achieving interoperability. Some government officials deliberately obstruct progress to protect their own financial interests or power. According to Respondent B, corruption hampers the implementation of systems that could streamline data exchange:

- *"You can imagine if the governor wants to do something with an MD now and he's doing that thing, but those people - they know that if that is implemented, it's going to affect their immediate cash flow, how they make money. So now, they can find a way to frustrate that stuff so it doesn't see the light of day."*

Respondent F also pointed out how consultants are often hired by different departments, leading to inefficiency, duplication of efforts, and increased complexity in the system:

- *"For pocket gains, different departments bring consultants in, which leads to duplication, inefficiency, and unnecessary complexity."*

4.3.5 Lack of Clear Ownership and Accountability.

A final challenge identified was the lack of clear ownership and accountability for interoperability initiatives. Respondent C emphasized the absence of a single entity with authority and mandate to drive interoperability efforts across all ministries:

- *"We don't have that kind of authority. The staff involved in certain projects might only be part of a committee - and I've personally been part of one."*

She further explained that there are no legal provisions assigning responsibility for interoperability to any specific body:

- *"There's currently no legal provision for this. If you check the law that backs the Office of the Accountant-General, you'll see it gives them posting authority - maybe even recommending who should be deployed to Accounts or Finance departments. But for IT, that doesn't exist."*

4.3.6 Sentiment Analysis for Organizational Barriers.

The tone of Organizational Barriers was rather neutral regarding the organizational challenges of data sharing. The polarity of 0.130 suggests that although the participants acknowledged the barriers, they were not overwhelmingly negative regarding their ability to overcome them. The subjectivity score of 0.453 indicates that quite a bit of personal experience and opinion were voiced in the responses.

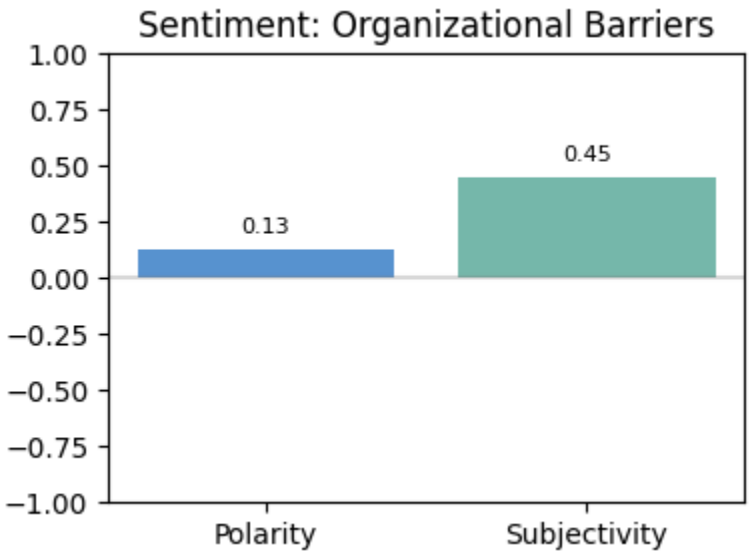

Figure 4.3: *Sentiment Analysis for Organizational Barriers*

4.4 Theme 3: Legal and Regulatory Challenges.

The findings under this category are based on legal and regulatory barriers to achieving interoperability in Nigeria's public sector. Legal and regulatory challenges are critical in adopting and applying interoperability frameworks between government ministries. From poor enforcement of existing frameworks to the lack of overarching legal mandates and conflicting or outdated regulations, these barriers militate against the free integration of systems and data sharing across government agencies. Additionally, data privacy issues, security concerns, and the absence of incentives for compliance further complicate the attainment of full interoperability.

4.4.1 Weak Enforcement of Existing Frameworks.

Despite progressive legislation supporting the creation of digital public infrastructure (DPI), its enforcement is still a critical concern. According to interviews, Nigeria has enacted laws like the National Data Protection Regulation (NDPR). However, these are not uniformly being implemented, and no real sanctions for violation exist. Respondent E indicated that the laws exist, but implementation and enforcement are weak:

- *"From a legal perspective, yes, we do have existing laws that support the implementation of Digital Public Infrastructure (DPI). However, there's still room for growth... having the laws isn't the issue. The real issue is implementation and enforcement."*

Respondent E further emphasized Nigeria's position as a leader in Africa with the introduction of GDPR-inspired regulations but pointed out the failure to effectively enforce data subject rights:

- *"Nigeria is celebrated as one of the first African nations to implement a national data protection law modeled after GDPR. When it comes to setting up the legal frameworks, we've done well. But when it comes to enforcing those data subject rights, that's a different story."*

4.4.2 Lack of Comprehensive Legal Mandate

Another significant barrier to interoperability identified in the interviews is the absence of a clear, overarching legal mandate compelling agencies to adopt interoperability frameworks. The current regulatory environment lacks explicit legal requirements for interoperability, leaving the adoption process voluntary and fragmented across agencies. Respondent E called for a standalone legal pronouncement to ensure full legal backing for interoperability:

- *"There has to be clear, standalone legal pronouncement. It shouldn't just sit under existing regulations or be vaguely implied. It needs to be explicit."*

Respondent G acknowledged progress but there are gaps:

- *"The National Data Strategy (2022) was enacted, but sectoral implementation stalled due to competing priorities."*

Respondent C also highlighted that current regulations do not fully recognize digital actions such as electronic approvals or digital signatures, and there is a need for stronger legal recognition of these practices to advance interoperability:

- *"We don't have laws that give full legal credibility to digital actions - for instance, laws that officially recognize digital signatures or electronic approvals. Some policies are in place, but we need full legislation."*

4.4.3 Conflicting and Outdated Regulations.

The lack of alignment between older regulations and the evolving needs of digital governance was another major issue raised by participants. Existing laws from as far back as the 1990s are no longer sufficient to address the demands of modern digital governance. As Respondent F pointed out, outdated laws need to be updated to reflect the reality of digital transformation:

- *"Some of these laws are outdated, maybe from the 90s... passing a new law, you have to also mention how this law has certain components that supersede x, y, z."*

Additionally, Respondent F mentioned the lack of political will to revisit and update old laws that no longer meet current digital needs, causing confusion in compliance:

- *"There are so many other laws in the past that might refer to contracts or acceptable documents... I don't think there's enough effort or willpower to change every one of those existing."*

4.4.4 Data Privacy and Security Concerns

Data privacy and security concerns were repeatedly mentioned as major obstacles to data sharing and interoperability. Many participants raised the fear of data misuse and the mismanagement of sensitive government data, particularly as digital systems become more integrated. Respondent E highlighted the growing concern over data protection:

- *"That concern - 'How safe is my data?' - is a major one for Nigerians. There's the fear of data being misused, shared without consent, or used against them."*

In this context, Respondent E also emphasized the role of the National Data Protection Commission (NDPC) in ensuring citizens' data rights are not violated:

- *"NDPC ensures that citizens' data rights are not eroded. Rights like: The right to be informed, the right to give or withdraw consent, the right not to have data processed without consent."*

4.4.5 Absence of Incentive Structures.

The Respondents also highlighted the lack of incentive structures to encourage compliance with interoperability frameworks. Without legal mandates or penalties, agencies are not incentivized to implement digital transformation initiatives. Respondent F suggested that government funding should be tied to compliance with interoperability standards to raise the seriousness of digital policy adoption:

- *"If the federal government can say, 'No agency gets their funding or release of allocations until they have complied with A, B, and C,' that would immediately raise the seriousness of digital policy adoption."*

Similarly, Respondent E pointed out the lack of systematic pressure to implement digital transformation:

- *"Without a mandate, people will just sit around talking. No systems, no laptops. You become constrained trying to make real change."*

Respondent H suggested:

- *"Tying funding to compliance with interoperability standards could accelerate adoption."*

4.4.6 Sentiment Analysis for Legal and Regulatory Challenges.

The sentiment analysis for Legal and Regulatory Challenges indicates a neutral to slightly positive sentiment. The polarity score of 0.111 reflects a slightly positive outlook, suggesting that while legal challenges are recognized, there is hope that reforms and improved enforcement can resolve some of these issues. The subjectivity score of 0.392 indicates that the responses were moderately subjective, with interviewees expressing personal opinions on the effectiveness of existing regulations and laws.

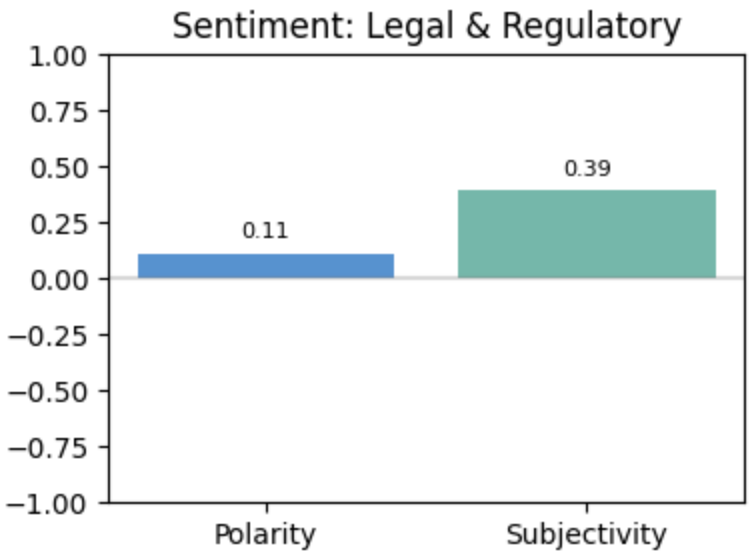

Figure 4.4: *Sentiment Analysis for Legal and Regulatory Challenges*

4.5 Theme 4: Change Management and Institutional Support

Change management is key in ensuring the success of digital transformation projects within Nigeria's public sector. The subject revolves around the issues and obstacles that public sector workers face in embracing digital transformation due to challenges such as resistance to change, digital illiteracy, inadequate training, leadership and political will challenges. The organizational challenges were discovered through the interviews to impede the proper establishment of interoperability and digital governance systems.

4.5.1 Resistance to Digital Transformation

Among the key findings in the interviews was resistance to technological change due to fear of job loss and loss of additional income streams based on hands-on procedures. Public servants fear that embracing digital systems would result in them losing their jobs, particularly in a setting where physical interactions and hands-on procedures have been the norm for decades. The threat of job loss remains a powerful inhibitor, based on Respondent D.

- *"People begin to worry: 'What if this means I lose my job in six months?' or 'If I'm no longer carrying files and papers around, how will I earn the extra money I get from doing that?'"*

Similarly, Respondent E stressed the importance of training in addressing the fear of job loss, noting:

- *"Even when we say technology is an enabler, training is equally important. We need to invest in training programs to help staff understand the new platforms and the advantages they bring."*

Respondent G linked resistance to job insecurity:

- *"Staff fear digital tools may render their roles obsolete, especially in manual processes."*

4.5.2 Lack of Digital Literacy.

One of the challenges frequently mentioned by respondents was the lack of digital literacy among the population and among public servants. The interviews revealed that civil servants are not adequately acquainted with using digital systems and cannot keep pace with new technologies. Respondent B explained how even computer instructors have difficulties imparting basic skills, such as how to operate simple programs such as Excel:

- *"Many computer teachers couldn't teach what was needed - some didn't even know how to use Excel."*

Respondent B also noted that the lack of parental involvement in supporting children's digital education contributes to the problem:

- *"Parents also pose challenges. Many understand digital skills are important, but they expect results without being involved or supporting their children."*

4.5.3 Inadequate Training and Capacity Building.

Capacity building and training were highlighted as essential in facilitating effective digital transformation in the public sector. Without adequate training programs, employees continue to lack the skills needed to run new digital systems, undermining their effectiveness and slowing the shift towards e-governance. Respondent E says that staff that are well-trained are more likely to adopt digital technologies:

- *"The more informed and trained the staff are, the more likely they will embrace the technology."*

Respondent B shared an example of how the government struggled with the lack of skilled personnel when attempting to implement digital processes:

- *"We had to retrain some of them [NYSC members] myself because many good corps members were redeployed or refused to report. The ones that did, some had never written code before."*

4.5.4 Leadership and Political Will Challenges.

The problem of leadership instability and political reluctance was repeatedly brought to attention by interviewees as a hindrance to effective change management. Frequent leadership changes in key government positions cause instability and impede continuous digital transformation efforts. Respondent F spoke about how leadership changes negatively impact long-term projects:

- *"We dealt with four different commissioners over the four or five years we've been on this project. Commissioners can change at any time."*

She further emphasized the importance of political stability and commitment for the successful implementation of digital policies:

- *"When new leadership comes in, everything shouldn't start from scratch or be abandoned."*

Respondent A critiqued:

- *"Projects like the e-Government Master Plan face delays with each political transition, disrupting momentum."*

4.5.5 Cultural Barriers to Technology Adoption.

Cultural reasons also contribute greatly to the impeding of digital technology adoption. Most individuals in Nigeria are resistant to face-to-face communication and are suspicious of digital systems, such as digital signatures and digital approvals. Respondent C noted the widespread suspicion of digital systems:

- *"There's also a perception that digital processes aren't as authentic as face-to-face interactions, such as digitally signed documents or approvals."*

The interviewer (During Respondent C interview) drew on an example from Estonia to illustrate how rural communities were initially resistant to ATMs, fearing they were unsafe:

- *"In Estonia, when ATMs were first introduced, some people from rural areas would take their money from the ATM and go back to the bank with it. They felt the ATM wasn't safe enough."*

4.5.6 Lack of Change Management Strategies.

The absence of a structured change management process was revealed to be a critical issue in implementing digital systems. Respondent E explained that change management is likely to be neglected during the process of new technology implementation within public administration:

- *"Change is hard, and this is especially true with introducing new technologies in the public sector. There is a fear of change sometimes."*

She also stressed the requirement for assurances regarding digital transformation:

- *"These concerns are valid, and we need to address them directly. For example, we need to reassure people that digital platforms and AI are not here to take jobs, but to assist them."*

4.5.7 Sentiment Analysis for Change Management.

The attitude towards Change Management and Institutional Support is generally positive towards the challenges and potential to overcome such hindrances. With a polarity value of 0.115, some recognition of the hindrances and moderate confidence in overcoming them exists. With a subjectivity value of 0.441, the answers are quite subjective in describing the hindrances but show real-world problem areas and practical issues.

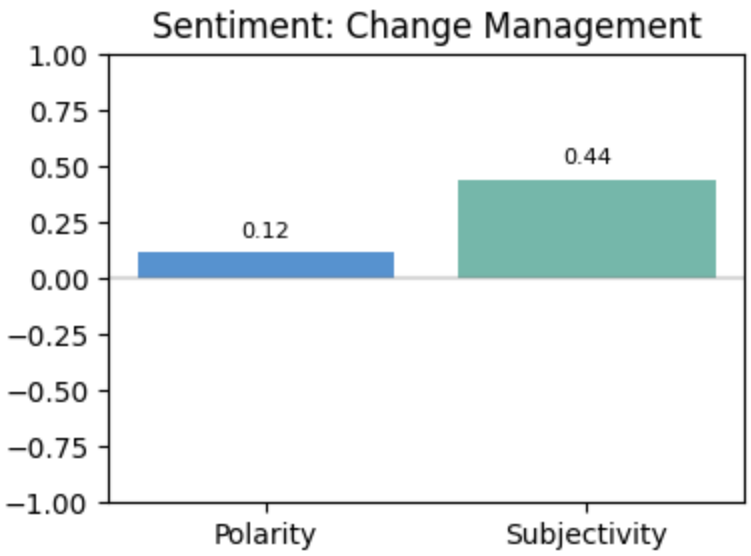

Figure 4.5: Sentiment Analysis for Change Management

4.6 Theme 5: Successes and Opportunities for Interoperability.

The final theme in this study discusses the achievements and opportunities in the Nigerian public sector regarding interoperability and the digitalization that is in place. Despite several barriers having been set up, particularly in the preceding themes, the achievements refer to heartening replicable models across different sectors to facilitate interoperability. The theme also highlights the role of the private sector, bottom-up digital capability, and international partnerships in facilitating the seamless integration of systems across government agencies.

4.6.1 Emerging Successful Models.

Specific initiatives demonstrate that there can be interoperability, even in Nigeria's complex environment. For example, the National Identity Management Commission (NIMC) database has been successfully linked across several ministries and agencies to enable data sharing seamlessly. Respondent C provided a demonstration of good integration:

- *"The National Identity Management Commission (NIMC) database is one of the most successfully integrated platforms. Ministries like the Ministry of Interior can pull identity data from NIMC through publicly available APIs, thanks to existing legal frameworks and mutual agreements."*

Respondent G highlighted NIMC's API success:

- *"Ministries like Interior pull identity data seamlessly, proving interoperability is achievable."*

In addition to NIMC, the Fintech sector in Nigeria has demonstrated leadership in interoperability. Respondent F highlighted the role of financial institutions in setting the pace for interoperability:

- *"Fintech in Nigeria is clearly leading the charge in demonstrating how interoperability can be achieved and scaled effectively."*

These emerging models serve as blueprints for future interoperability frameworks within the public sector.

4.6.2 Private Sector Leadership.

The private sector in Nigeria, particularly the financial sector, has made strides in interoperability, and a model that can be replicated in the public sector exists. One of them is the utilization of the National Identification Number (NIN) in financial transactions, which ensures that interoperability is deeply embedded in banking systems. Respondent F summarized the role played by financial institutions in shaping the interoperability landscape:

- *"The financial sector remains the most advanced in terms of interoperability. It's now nearly impossible to carry out meaningful financial transactions in Nigeria without a NIN."*

Furthermore, institutions like the Nigerian Inter-Bank Settlement System (NIBSS) facilitate real-time identity verification and secure financial transfers, positioning Nigeria's banking sector as a leader in interoperability:

- *"Entities like NIBSS play a central role, offering robust switching systems and APIs that facilitate real-time identity verification and secure financial transfers across banks and platforms."*

4.6.3 Grassroots Digital Capacity.

Grassroots digital capacity also presents significant opportunities for interoperability in Nigeria. Local initiatives show promise in building digital skills, especially among young people. Respondent B expressed confidence in the potential of youth-driven digital projects:

- *"Young people are brilliant. The kind of projects they came up with in that short time was incredible. Lack of opportunity has been their main barrier."*

The success of a pilot digital skills program revealed that the best-performing participants were usually aged 13 to 14, showcasing the immense potential of youth involvement in the digital transformation process:

- *"From last year's pilot, we noticed the best-performing students were usually aged 13 to 14... their enthusiasm is top-notch."*

4.6.4 International Partnerships and Adaptations.

Global collaborations are also key areas for enhancing interoperability in Nigeria. By interacting with global best practices, Nigeria can adopt models of work for local implementation. Respondent C quoted Estonia's X-Road data sharing platform as one of the efforts to improve Nigeria's digital infrastructure:

- *"We're currently testing with the X-Road - that's the data exchange layer used in Estonia - and we're modifying it for the Nigerian context."*

Similarly, Respondent E expressed the inspiration Nigeria draws from Estonia's success in e-governance, noting that their challenges and context were somewhat similar:

- *"Estonia's success inspired us, as their challenges and context were somewhat similar to ours. If they could do it, we believed we could too."*

Respondent G on Estonia's X-Road:

- *"Nigeria's upcoming national data exchange mirrors this model, with pilot sectors like health and education."*

4.6.5 Policy and Infrastructure Foundations.

Policy frameworks and infrastructure investments are foundational to the success of interoperability initiatives. The establishment of Tier III and Tier IV data centers demonstrates Nigeria's commitment to securing government data. According to Respondent E, these investments are essential for ensuring secure digital services:

- *"We now have Tier III data centers - and even a Tier IV data center... these are things we've implemented to make sure government data is well secured."*

Moreover, the recent publication of the Digital Public Infrastructure (DPI) Framework sets the stage for interoperability by outlining key digital systems and processes required for secure and interoperable services:

- *"The Digital Public Infrastructure (DPI) Framework was recently published and outlines foundational digital systems to enable secure and interoperable digital services."*

4.6.6 Sentiment Analysis for Success Factors.

The sentiment analysis of success factors is neutral to mildly positive. The polarity score of 0.139 suggests that despite challenges, optimism regarding the future success of interoperability initiatives exists. The subjectivity score of 0.387 indicates the responses were somewhat subjective, sharing personal experiences with successful models and future possibilities.

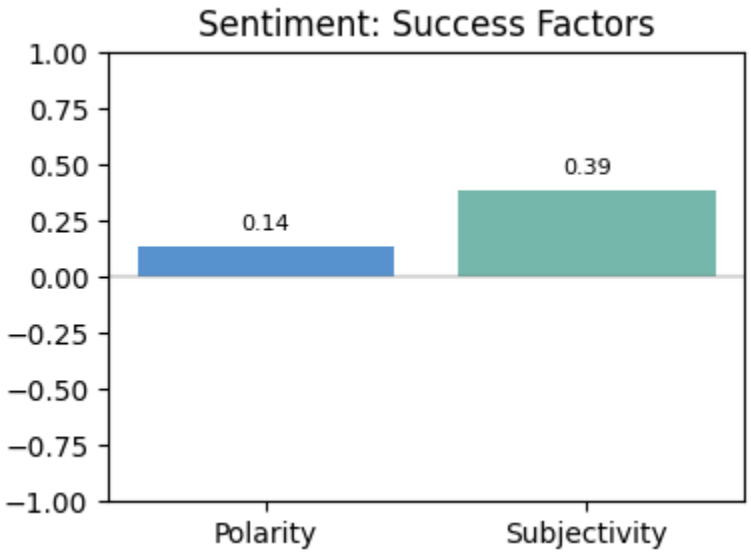

Figure 4.6: Sentiment Analysis for Success Factors

4.7 Synthesis of Key Findings

The integration of key findings is grounded on the thematic analysis results of the interviews with key stakeholders in Nigeria's public sector. The study aimed to explore the possibilities and challenges of organizational interoperability in Nigeria's governing system, such as technical barriers, organizational issues, legal and regulatory barriers, change management, and interoperability success factors. Through triangulation of data from the interviews, sentiment analysis, and policy context, a comprehensive understanding of interoperability opportunities and barriers is achieved.

Technical interoperability barriers were observed to be major obstacles to efficient information sharing between government agencies. System fragmentation, information silos, and lack of standard formats for data were repeatedly brought up as main barriers. These obstacles are evident in the existing digital infrastructure in Nigeria, where ministries and agencies operate in silos, hence causing inefficient data sharing and cost-intensive administration. For instance, Respondent C's note that "ministries tend to work as independent institutions" speaks of the lack of a common digital platform, which is an illustration of the challenges faced in implementing the National Digital Economy Policy and Strategy (2020-2030), which mandates collective digital frameworks across ministries (National Information Technology Development Agency [NITDA], 2020). It also has the complication of varying levels of technological advancement between agencies. It reflects the differences quoted in Nigeria's National Policy on Information Technology, 2012, where harmonized moves towards digital transformation are envisaged.

At the organizational level, bureaucratic resistance and territorial thinking were the two key obstacles remarked upon during the interviews. Some government bureaucrats and public servants were also reluctant to share information due to fears of losing control and matters of power issues. This reluctance is in agreement with the findings of Nigeria's Open Government Partnership (OGP) 2017-2022 report, which notes that attempts at inter-agency coordination remained elusive even as there were policy-level promises. Respondent D and Respondent E's utterances regarding the lack of channels for formal coordination also validate this point. Lack of accountability and ownership, combined with poor inter-ministerial coordination, has also been seen in other criticisms of Nigeria's public sector reforms, including the Public Service Reform Strategy.

Legal and regulatory barriers were found to aggravate technical and organizational difficulties. Two recurring concerns expressed by the interviewees were weak implementation of the current systems and absence of a universal legal mandate for interoperability. Though innovative as it is, Nigeria's National Data Protection Regulation (NDPR) lacks strong enforcement power, which calls into doubt its ability to propel digital revolution. While legislation exists, Respondent F clarified, "the real issue is implementation and enforcement." This result supports strong legal changes to enforce digital and data protection laws since it fits the resilience of the issues of digital governance found in Nigeria's Digital Transformation Policy. Furthermore, adding complexity in

compliance is out-of-date laws incompatible with modern digital regulation, something brought up by the National Assembly's Digital Economy Committee in examining current IT policies.

Another major theme was change management, in which digital change resistance, digital illiteracy, and inadequate training were positioned as main challenges. Political will problems and unstable leadership added to these were also factors. The interviewees bemoaned the frequent leadership changes, especially in the ICT industry, which compromises continuity in digital transformation projects. The Federal Civil Service Reform supports this by implying that unstable leadership prevents good government. Furthermore, underlined in the National Policy on Digital Literacy and Skills is the lack of training and upskilling of civil servants, which underlines the pressing need of providing digital skills to public sector employees so as to improve their performance.

Despite numerous challenges articulated, the study also identifies significant successes and interoperability potential. Great achievements such as the interoperability of the National Identity Management Commission (NIMC) database and the leadership of the financial sector in driving interoperability reflect that the right steps are being taken. This kind of achievement is in line with Nigeria's National Financial Inclusion Strategy, which has also witnessed successful interoperability of digital identity systems across the banking sector. Furthermore, grassroots movements and international partnerships are paving the way for digital transformation, particularly through implementing standards like Estonia's X-Road. Nigeria's collaboration with international organizations to launch a local equivalent of this data-sharing system portends well for scalable interoperability solutions.

Chapter 5

5. Discussion

5.1 Introduction

This chapter provides an interpretation of the research findings in relation to the theoretical framework, literature review, and comparative case analysis presented in earlier chapters. It unpacks the influence of Nigeria's current e-governance trajectory and public sector governance in shaping its ability or struggle to achieve government-to-government (G2G) interoperability within the federal public sector. The discussion also incorporates global lessons, particularly from Estonia's X-Road platform, to explore what strategies Nigeria can adapt to close its interoperability gap.

5.2 Discussion of Key Findings

This study details technical, organizational, legal, and cultural barriers to efficient digital governance. It also identifies a range of issues associated with the unique Nigerian socio-political context.

The technical interoperability challenges identified are disjointed systems, lack of standard data formats, and cybersecurity threats all which mirror experiences from other contexts, especially developing economies. For example, the same lack of integration between government systems and data silos has been observed in the literature on the digitalization of the public sectors of sub-Saharan Africa (Musoni et al., 2023). What is unique in Nigeria's case is however the extent to which poor infrastructure and uneven technological advancements within agencies augment these challenges. This disparity follows Margariti et al. (2022), who argue that inequality in technology adoption hinders the smooth development of digital ecosystems. The focus on technical fragmentation within this research aligns with international accounts of digital government integration Al-Mamary & Alshallaqi, 2023). However, Nigeria's situation highlights the need for centralized, standardized systems for easier data sharing, as emphasized by Respondent A, who discussed ministries' "autonomous operations," reflecting the absence of an integrated system.

Organizational challenges, such as bureaucratic opposition and territoriality, have long been identified as central obstacles to inter-agency collaboration, both in Nigeria and globally. Similar findings are noted in studies on e-governance in other developing nations, where employees resist reforms due to control and power issues (Bryson et al., 2014). Nigeria's case also reveals how entrenched organizational systems, and a lack of formal coordination contribute to inefficiencies, as seen in the Open Government Partnership (OGP) report (2017-2022). Respondent B's comments on the lack of formal inter-ministerial coordination resonate with these observations, acknowledging that while collaboration may occur at the executive level, its execution remains fragmented.

Legislative and regulatory obstacles observed here are consistent with literature outlining the lack of capacity resulting from ineffective regulatory frameworks to promote digital transformation. One main difficulty is the weak implementation of existing laws, including the National Data Protection Regulation (NDPR), as highlighted by respondent A. Nigeria suffers from poor enforcement and the absence of a comprehensive legal mandate for interoperability, despite policy improvements (Ebenibo et al., 2024). Respondent C's comment—"implementation and enforcement are the real issue"—captures the gap between policy intention and execution. This issue aligns with international research indicating that digital legislation often lags behind technological advancements (Rusakova, 2024).

Change management challenges, such as resistance to change and leadership instability, have been established in various public sector reform studies across both developing and developed nations (Alvesson & Sveningsson, 2015). This study adds the specific challenge posed by Nigeria's turbulent political environment, which complicates the digital transformation process. Frequent leadership changes, particularly in key ministries, disrupt continuity in digital initiatives, as noted by Respondent D, who highlighted the detrimental effects of leadership turnover on long-term projects. This instability is also reflected in studies on digitalization within African public sectors (Ademola, 2024), where political will and strong leadership are deemed crucial for sustaining digital reforms. Moreover, the research emphasizes the importance of digital literacy, in line with the National Policy on Digital Literacy and Skills, which advocates for public sector training to implement interoperability frameworks successfully.

Regarding successes and prospects for interoperability, the study refers to the positive example of the National Identity Management Commission (NIMC) and the banking sector, highlighting their effective interoperability. The NIMC's success in managing its database across ministries and agencies underscores the potential of well-designed frameworks and political will to enact them. Similarly, the leadership in interoperability within Nigeria's financial sector mirrors broader trends toward digital transformation in the private sector (Lottu et al., 2023). This observation confirms the view that the private sector often leads interoperability efforts, particularly when the public sector struggles with institutional resistance and fear of change.

5.3 Implications of the Findings

The technical challenges outlined—isolated systems, heterogeneous data formats, and cybersecurity concerns—underscore the need for a centralized, standardized platform to facilitate data exchange. The same findings were provided by Han (2023), who advocate system integration to establish an effective digital framework. The research also shows that lack of uniform data formats across ministries should be addressed by government-led efforts in formulating and enforcing technical standards.

This study demonstrates that leadership empowerment and inter-agency collaboration are critical to overcoming obstacles to digital transformation efforts at the organizational level. Further, change management literature attests to the imperative of a top-down approach, such as capacity building, training, and political will to enable transformation (Kotter, 2021). The leadership position of addressing such dilemmas is further established by facts on how strategic leadership enables organizational flexibility in digital governance (Hardi et al., 2025).

Also, the research reveals the role of effective legal frameworks in facilitating interoperability. Nigeria's legal environment, as of now, albeit better, is still beset by weak enforcement alongside the absence of top-tier legislation mandating interoperability. The same problems are brought to light in research on digital regulation, like that of Opara (2024), which asserts that legal principles tend to trail behind technological innovation, thus preventing progress.

Nigeria can take cue from all over the world, like the instance of the General Data Protection Regulation (GDPR) in the EU, making sure that data protection legislation is enforced strictly under intense scrutiny.

5.4 Adaptations Strategies for Nigeria

One of the first efforts at achieving effective interoperability is to address organizational challenges, including territorial resistance and insufficient coordination among agencies. As a way to mitigate such obstacles, the Nigerian government needs to focus on building a culture of cooperation and mutual trust among public sector agencies. This is echoed by Bryson et al. (2014), who stress the need for effective leadership in order to deliver change and enable cooperation among silos. Having a synchronized strategy, with active involvement of leaders from different ministries in formulating interoperability frameworks, is the basis for long-term achievement. Secondly, as political will is a prime determinant for transcending resistance to digital transformation leaders must demonstrate commitment to the process and ensure continuity in the face of changing leadership dynamics.

On the technical front, Nigeria's NGDX initiative, which plans to adapt X-Road, is a step in the right direction. However, this adaptation must go beyond technology to include legislative mandates, governance mechanisms, and institutional trust.

Similarly, the EU's General Data Protection Regulation (GDPR) provides a model for enforcing data rights and interoperability standards. Nigeria could draw from such international frameworks to improve the regulatory ecosystem.

Additionally, industries' success stories like the National Identity Management Commission (NIMC) and the banking sector provide a clear indication of the scalability of interoperability solutions in Nigeria as these sectors have established the application of private-public partnerships and data exchange platforms, which other segments of the public sector could replicate. Building on these practices, Nigeria should implement a rolling digital governance plan, initially applying it in the most advanced and resilient regions, and gradually further expanding to other spheres of government.

5.5 Recommendations for Practice and Policy

Based on this study's findings, one of the most critical interventions is strengthening Nigeria's institutional and legal structures for interoperability. Nigeria must implement clear, binding laws requiring all ministries to adopt interoperability standards. An interoperability law will set legally enforceable frameworks that demand compliance, define agency roles, and establish accountability mechanisms. Inspired by the European Union's Digital Single Market, Nigeria might gain from the same laws that consolidate the nation's digital governance agenda and reinforce coordination among government agencies (European Commission, 2017).

A second critical suggestion is the reinforcement of inter-agency coordination and cooperation. Organizational silos and territorial thinking remain the big hindrances to interoperable data sharing. Nigeria has to institutionalize official means of working between agencies and ministries to overcome this. Cross-department working parties, alongside strong executive branch leadership, would bring a stronger sense of shared responsibility to interoperability targets. This approach would weaken bureaucratic opposition and encourage dialogue across agencies, furthering the implementation of digital governance initiatives.

To address the persistent issue of project discontinuity and fragmented digital governance caused by leadership transitions, recommendation is that the Nigerian government should establish a legally backed e-government continuity framework and a national register of digital assets. This framework should ensure that all digital transformation and interoperability initiatives, especially those classified as National Information Infrastructure (NII) are assets of the Federal republic of Nigeria and are not tied to individuals or political parties.

Additionally, Nigeria must heavily invest in digital infrastructure and capacity development. Upgrading digital systems, creating centralized data platforms, and establishing standard data formats are required to facilitate seamless data sharing among ministries. At the same time, investment in capacity building through digital literacy and technical skills training for public sector employees will allow the workforce to manage and operate these systems effectively.

5.6 Conclusion

The research explored the most critical opportunities and challenges in Government-to-government interoperability within Nigeria's public sector, focusing on how government structures, institutional collaboration, and legislation affect digital systems integration. Through thematic analysis of interviews with major stakeholders, some interoperability issues were pinpointed as technical fragmentation, organizational resistance, regulatory and legal loopholes, and poor change management plans. However, the study also highlighted growth opportunities, in this case through effective models such as the National Identity Management Commission (NIMC) and the role played by the financial sector in helping spur interoperability.

The findings highlight the need for a clear legal requirement to guide interoperability initiatives, as well as the requirement to facilitate inter-agency collaboration and improve digital infrastructure. At the same time, investment in human capacity and the application of public-private partnerships are both necessary to shatter the existing silos.

This thesis contributes to the body of knowledge on digital governance in Nigeria, offering recommendations for practice and policy. Resolving the systemic problems identified will enable Nigeria's public sector to establish a more coordinated, effective, and sustainable digital governance system that improves service delivery, transparency, and accountability. The findings of this research provide a solid foundation for future studies and initiatives aimed at enhancing government-to-government interoperability within Nigerian public administration.

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