



A DATA GOVERNANCE FRAMEWORK FOR THE PUBLIC SECTOR IN UGANDA:
A CASE STUDY OF CENTRAL GOVERNMENT MINISTRIES

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By Silas Ngabirano

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Approval of the Thesis

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This thesis by Silas Ngabirano. has been approved by the committee members below, who recommend it be accepted by the faculty of Unicaf University in Zambia in partial fulfilment of requirements for the degree of

Doctor of Philosophy (PhD)

Thesis Committee

Dr Maria Emmanouilidou, supervisor

Dr Nathan Musonda, chair

Dr Annabella Dorothy Habinka Basaza, external examiner

Dr Ernest Ampadu, internal examiner

Abstract

A DATA GOVERNANCE FRAMEWORK FOR THE PUBLIC SECTOR IN UGANDA:

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Silas Ngabirano

Unicaf University in Zambia

Data is a vital enterprise resource for decision-making, policy creation, and productivity enhancement. Although Uganda's public sector has made significant investments in digitising services, data governance has received less attention. Moreover, most existing studies on data governance focus on single organisations, leaving a gap in multi-institutional perspectives. This study, therefore, investigated data governance practices in a multi-institutional setting within the Ugandan public sector.

Based on the pragmatist philosophy, the research employed an exploratory sequential mixed-methods design. In the first phase, qualitative data were collected through purposive sampling from six officials representing six different government ministries and analysed using content analysis. In the second phase, quantitative data were gathered from 102 officials across 22 ministries, selected through stratified sampling, and analysed using the Statistical Package for the Social Sciences (SPSS).

The four research questions of this study were responded to by the qualitative stage findings, where it was established that i) in addition to the antecedents of governance of data, as posited by Abraham et al.'s (2019) cross-functional framework, the requirements for effective data governance include data governance principles; ii) the organisational provisions identified included data scope management and governance mechanisms; iii) key challenges identified included a)

insufficient policy and regulatory instruments, b) low ICT adoption, c) Infrastructure inadequacies, d) financial constraints, and e) human resource shortages.

Analysis of the quantitative data using Statistical Package for the Social Sciences (SPSS) was used to test three hypotheses, where the results revealed The results of the regression analysis conducted to test the three hypotheses revealed the following: i) Data Governance Antecedents significantly explained 15.2% of the variance in Data Governance Principles; ii) Data Governance Antecedents accounted for 14.2% of the variance in Data Governance Mechanisms; and iii) Organisational Culture explained only 3.1% of the variance in Data Quality, a relationship that was not statistically significant. This study contributes to the literature by advancing an understanding of data governance from a multi-institutional perspective in a developing country context, highlighting systemic challenges and requirements that inform both practice and policy.

Keywords: Data Governance, Public Sector Data Governance, Data Governance Framework, Data Quality

Declaration

I declare that this thesis has been composed solely by me and that it has not been submitted, in whole or in part, in any previous application for a degree. Except where stated otherwise by reference or acknowledgement, the work presented is entirely my own.

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Dedication

I dedicate this thesis to my beloved children, Rodney Ngabirano and Susan Ninsiima, and to my dearest spouse, Patricia Kwarakunde. Your unwavering love, encouragement, and belief in me have been my greatest sources of strength and motivation throughout this academic journey. Whenever I fell short, I remembered your trust in my abilities, and I dared not disappoint you. I am profoundly blessed to have each of you in my life; you are my priceless treasures and the heartbeat behind this achievement.

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List of Abbreviations

ACRONYM	MEANING
AI	Artificial Intelligence
CobiT	Control Objectives for Information and Related Technologies
CMMI	Capability Maturity Model Integration
CSF	Critical Success Factors
DAMA	Data Management Association
DPO	Data Protection Office
DCAM	Data Capability Assessment Maturity
DGI	Data Governance Institute
DMBOK	Data Management Body of Knowledge
e-GIF	e-Government Interoperability Framework
GDPR	General Data Protection Regulation
ITIL	IT Infrastructure Library Framework
MDM	Master Data Management
MoICT&NG	Ministry of Information, Communications Technology and National Guidance
NITA-U	National Information Technology Authority - Uganda
OECD	Organisation for Economic Cooperation and Development
PKI	Primary Key Infrastructure
RO	Research Objective
RQ	Research Question
SD	Standard Deviation
TOGAF	The Open Group Architecture Framework

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CHAPTER 1: INTRODUCTION

Globally, Governments continue to embrace initiatives to improve governance and the well-being of citizens, and to promote service delivery. One key initiative to improve governance is Open Governance, a leadership paradigm grounded in principles of transparency, integrity, accountability, and stakeholder engagement, facilitated by technology and innovation (Janssen et al., 2017; OECD, 2023). Open Governance provides principles and practices for making government information, processes, and decision-making transparent, accessible, and participatory (Janssen et al., 2017). The benefits of Open Governance include the following: i) increased transparency through making public data, documents, and processes accessible to Citizens, ii) Increased Citizens' Participation through engagement and involvement in decision-making processes, iii) Increased accountability through holding Government officials, and institutions accountable for their actions and decisions; and iv) Better collaboration, through fostering cooperation and partnership between Government, Citizens, and other stakeholders. It is vital to note that data is critical for planning, setting up, and implementing Open Governance initiatives.

Similarly, another important illustration of an international political intervention to enhance public governance, well-being, and service delivery is the Sustainable Development Goals -SDGs (Al-Salim et al., 2022; NDPIV, 2025; Omweri, 2024; Ssekakozi, 2024; UN, 2025). The Sustainable Development Goals (SDGs) foster good governance by embedding principles of transparency, accountability, inclusivity, and effectiveness into national and local policy frameworks. For example, decision-makers require high-quality data to successfully implement and monitor progress on the SDGs (NDPIV, 2025; Omweri, 2024; UN, 2025). However, empirical research indicates that evaluating the success of activities aimed at

achieving Sustainable Development Goals is negatively affected by a shortage of reliable data (Al-Salim et al., 2022; Mugellini et al., 2021; UN, 2025). Some proposed interventions for alleviating the challenge of the unavailability of good-quality data include strengthening governance capacities, improving the data literacy of stakeholders (e.g., decision-makers, data consumers, data generators, data regulators, and data owners), and applying innovative methods to produce and use data while addressing the multifaceted challenges of sustainable development (Al-Salim et al., 2022; Ssekakozi, 2024).

At the African level, the African Union's Agenda 2063, launched in 2013, aims to guide Africa's socio-economic transformation over the next 50 years (AUC, 2022). It emphasizes the responsible use of data, ethical practices, and strong governance (UNEACA, 2022). Data governance is crucial for achieving Agenda 2063's objectives by ensuring access to high-quality data for policy development, supporting digital transformation, and innovation (AUC, 2022).

On the technology side, more countries are implementing digital transformation programs globally to advance the adoption of digital technologies across all facets of life (Kraus et al., 2021; NDPIV, 2025). Implementing efficient and reliable data governance is essential for facilitating digital transformation (Hanson et al., 2020; NDPIV, 2025), enabling organisations and nations to utilise data to mitigate operational risks, improve decision-making, and foster innovation (Kraus et al., 2021; Ndulu et al., 2023). This study is relevant, as the Government of Uganda launched a digital transformation roadmap in 2023 to facilitate the transition to a digital economy (MoICT, 2024). In particular, the study aims to contribute to improved data governance, a crucial component for advancing digital transformation.

In a digitalized economy, data is a critical resource and a transformative tool that propels organisations and nations into prosperity (Ademuyiwa & Adeniran, 2020). High-quality data must be available in order to perform essential tasks such as making decisions based on evidence (Chen, 2021; Herselman et al., 2019; Olaitan et al., 2019); policy formulation (van Ooijen et al., 2019); enhancing organisational productivity (Otto, 2011); and adherence to legal and regulatory conditions (Ademuyiwa & Adeniran, 2020; Cave, 2017; Randhawa, 2019). Relatedly, the emergence of fourth-industrial technologies heavily dependent on data, such as Machine Learning, blockchain technologies, and robotics, has further highlighted the necessity for good data governance (Fadler et al., 2021; Micheli et al., 2020; Rehman & Al-Raqom, 2020; Yebenes & Zorrilla, 2019).

In the recent past, the volumes of data held by organisations have grown exponentially (Alhassan et al., 2016), while simultaneously playing a critical role as an enterprise asset (Ladley, 2019; Dahlberg & Nokkala, 2015; Korhonen et al., 2013). For example, in 2023, projections indicated that the global volume of data processed would increase from 120 to 181 zettabytes by 2025, signifying an impressive 50% growth within just two years (Kumar, 2025). It is, therefore, crucial to realise that managing and safeguarding data is equally important as managing other corporate assets, such as physical Information Technology (IT) tools, machinery, and land (Lis & Otto, 2020; van Ooijen, 2019). Therefore, given the importance and fundamental role of quality data, this study explored data governance practices in Uganda's public sector.

Although there is no single, globally recognised index that ranks countries solely on the quality of their data governance, this study utilises the Global Data Barometer, which includes related indicators, to compare Uganda's data governance performance with that of international and regional countries. The Global Data Barometer, which assesses countries across four pillars- data governance, capability, availability, and use - was most recently evaluated in 2024 where, the global average data governance score was 36.82%, with developed countries (e.g., Germany, the Netherlands, France) scoring 70–80%, driven by strong legal frameworks, institutional capacity, and civic engagement (GDB, 2024). The average for developing countries is between 20% and 35%, with challenges in enforcement, infrastructure, and public awareness. In particular, the regional average data governance score for Africa is around 30%, attributed to many African nations having adopted data protection laws but with weak implementation. However, the East African Regional average score stands at 27.5%, with countries like Uganda, Kenya, and Rwanda having active Data Protection Offices and legislation, but weak enforcement and inadequate infrastructure. Uganda's Global Data Barometer score is 36%, a performance slightly above the African average but below global standards. This good performance is attributed mainly to the enactment of the Data Protection and Privacy Act (2019) and the establishment of the Data Protection Office. However, weaknesses such as low public awareness, inadequate technical infrastructure, and minimal use of data for civic or policy purposes adversely affect performance. (GDB, 2024).

Uganda has enacted the Data Protection and Privacy Act (Uganda, 2019), the Digital Uganda Vision (DUV, 2020), and is in the final stages of developing the National Data Strategy (UN Global Pulse, 2024) to establish legal standards, consolidate ICT policies, and create a coordinated, robust, and inclusive data ecosystem. Despite these advancements, Uganda

continues to face persistent implementation challenges, including the fragmentation of information systems, poor interoperability, limited institutional capacity, and technical deficiencies that hinder effective data governance (CIPESA, 2024; Muhumuza & Baguma, 2023; NITAb, 2022).

This study applies systems theory (Bertalanffy, 1968) to analyse Uganda's data governance, highlighting the interdependence of stakeholders, institutions, policies, and technologies. As an open system, data governance relies on coordination, feedback, and adaptability, where disruptions in one subsystem can affect the entire system. Effective data governance requires systemic alignment, institutional coherence, stakeholder engagement, and infrastructure readiness, while also considering external influences such as donor priorities, global standards, and technological advancements.

1.1 PROBLEM STATEMENT

The global increase in the automation of public services has intensified the demand for comprehensive data governance to guarantee data quality, security, accessibility, and regulatory compliance. Despite the substantial investments in digitizing services, the Ugandan Government has largely overlooked data governance as a critical activity (Ademuyiwa & Adeniran, 2020).

While Uganda's Global Data Barometer score is 36% (GDB, 2024), a performance slightly above the African average, this is mainly due to the enactment of the Data Protection and Privacy Act (2019) and the establishment of the Data Protection Office. Uganda's global data governance ranking remains below global standards, primarily due to the absence of a

national data governance framework, resulting in fragmented data management approaches (Ouma, 2024; NITAb, 2022; Saturday et al., 2023). For example, in 2022, Uganda's Ministry of Information, Communications Technology, and National Guidance identified key shortcomings in the national data ecosystem, including limited data sharing, data fragmentation, data silos, and a lack of trust among stakeholders (Ouma, 2024; UN Global Pulse, 2024).

Furthermore, the Ugandan Government has instituted a variety of regulatory provisions to support the governance of data; for example, the enactment of the Data Protection Legislation (Muhangi, 2019; Mukuki & Assenga, 2024; NITAb, 2022; Uganda, 2019) and the creation of the Data Protection Office (Uganda, 2019). However, these tools are generic in nature, and their practical implementation has been largely inadequate; hence, there is a need to operationalise them through a Data Governance Framework (Daigle, 2021; Muhumuza & Baguma, 2023; Saturday et al., 2023). Relatedly, the Ugandan Government is implementing several technological initiatives, such as the e-Government Interoperability Framework (e-GIF, 2021), to facilitate data sharing, which in turn requires an overarching data governance framework. Therefore, from a practitioner's standpoint, a comprehensive investigation of the national data governance practices is critical for identifying systemic gaps and proposing evidence-based recommendations for improvement.

From a scholarly perspective, it is essential to note the scarcity of research on the governance of data in multi-institutional settings (Jagals & Karger, 2021; Lis & Otto, 2020; Abraham et al., 2019), a field that is constantly evolving due to rapid technological developments (Alhassan et al., 2016; Gelhaar et al., 2021; Korhonen et al., 2013). According

to the literature examination, most studies on data governance have been conducted within a single organisation (Berman, 2017; Cheong & Chang, 2007; Hagmann, 2013; Panian, 2010). While an increasing amount of research is being done on inter-organisational data governance and data governance ecosystems (Gelhaar et al., 2021; Lis & Otto, 2020; Nokkala, 2020), research on public sector governance of data for emerging economies remains limited (Benfeldt et al., 2020; Masilela & Nel, 2021). In the case of Uganda, most research (Kabanda & Okello, 2020; Lwanga, 2022; Mugisha & Nalwoga, 2020) tends to be sector-specific, lacking systematic cross-sectoral comparative analysis that could reveal institutional enablers or barriers to effective data governance. Furthermore, to avoid the fallacies of previous studies that investigate partial components of data governance (Alhassan et al., 2019; Al-Ruithe, 2018; Otto, 2011b; Weber et al., 2009; Wende & Otto, 2007), this study sets itself apart by innovatively applying the systems theory, which helps to investigate a phenomenon in its entirety (Akoka & Comyn-Wattiau, 2019).

Thus, the industry needs and research gaps discussed above validate the need for research being conducted on the emerging public sector data governance field in a developing country like Uganda. This oversight highlights the potential value of examining data governance activities in the public sector to identify gaps and propose improvements.

Ultimately, the results of this study will significantly contribute to a better understanding of how public sector data governance is implemented in the Ugandan public sector, providing valuable insights for practitioners and scholars.

1.2 RESEARCH PURPOSE, AIM, AND OBJECTIVE

1.2.1 Research Purpose

This mixed-methods research sought to investigate the practice of governance of data within a multi-institutional context, specifically focusing on the perspective of a developing country such as Uganda.

1.2.2 Research Aim

This research aimed to contribute to a better understanding of data governance and provide actionable insights into ICT-enabled data governance strategies for organisations and scholars.

1.2.3 Specific Objectives

This research sought to accomplish the following four objectives in order to attain the research aim effectively:

First, examining the requirements for effective data governance. This was accomplished by conducting a thorough literature review and analysing current theoretical frameworks to adopt or expand one as the study's conceptual foundation (Alhassan et al., 2016; Berman, 2017).

Second, evaluating the existing data governance practices. This was achieved through a qualitative investigation into the extant data management practices in Ugandan public sector organisations.

Third, understanding the desired data governance practices. This was achieved through a qualitative inquiry into the existing data governance challenges and risks in Ugandan public sector organisations, followed by an assessment of the desired mitigation measures.

Fourth, investigating the effect of organisational culture on data governance. A mix of quantitative and qualitative methods was employed to determine whether there is a substantial correlation between the quality of data stored in the Government Entities and employees' positive attitudes toward data governance.

Overall, the study used a sequential mixed-methods exploratory approach. Qualitative and quantitative data on data governance practices, challenges, and risks were collected from sampled Ugandan Government Ministries. The findings were analysed, and the results were collated with the literature review results to propose a contextualised data governance framework for the public sector in Uganda.

1.3 RESEARCH SIGNIFICANCE AND NATURE

This subsection discusses the importance of conducting this research and its philosophical foundation.

1.3.1 Research Significance

This study aims to improve the understanding of data governance theory and practice in public sector institutions of developing countries. The findings highlight key data

governance challenges and contribute to a comprehensive framework, proposing strategies to improve governance practices. These contributions are intended to support policymakers, public institutions, researchers, and individual stakeholders in the development and implementation of data governance initiatives. The following subsection discusses the impact of this research on key stakeholders.

1.3.1 Significance for Policymakers

The results of this study will help policymakers enhance the legal and regulatory environment for data governance. This study assesses the effectiveness of Uganda's current data governance initiatives, identifies implementation gaps, and provides recommendations for enhancing regulatory compliance and aligning these practices with industry and international best practices. Consequently, the results of this research shall furnish policymakers with the necessary insights to formulate suitable data governance regulatory instruments for Uganda and other countries encountering similar circumstances. Following is an analysis of the significance of such research for some of the key stakeholders in making policies:

First, the Parliamentary ICT Committee. This committee is responsible for national ICT policy oversight and legislation, and it is envisaged that this study will a) provide the committee with empirical evidence to guide the development and review of laws relating to data privacy, security, sharing, and ethical use; b) support informed decisions when allocating budgets for national ICT and data infrastructure projects; and c) enhance parliamentary oversight over ministries and agencies dealing with citizen data.

Second, the ICT Sector Regulators. These include the Ministry of ICT and National Guidance, the National Information Technology Authority (NITA), and Uganda Communications Authority (UCC). The ICT regulators shall utilise the research findings to a) develop or refine a national data governance policy, and to establish data standards across the government and private sectors; b) support the formulation of cohesive strategies for digital services, data interoperability, and innovation ecosystems; c) inform legally compliant and ethical mechanisms for data sharing between public institutions and private entities; and d) provide insights on data sovereignty and cross-border data flows, especially in the context of cloud storage, data localization, and international partnerships.

Third, the Ministry of Public Service. This Ministry is mandated with managing the human resource policies, systems, and structures for the public service of Uganda. This research will support this ministry by a) highlighting the need for public sector workforce planning and job creation in data-centric roles such as Data Stewards, Data Architects, and Data Custodians; b) supporting civil service reform strategies that position data as a critical asset, requiring updated skills, organisational structures and financing; and c) contributing to interagency coordination by helping define roles and responsibilities in data governance across different public institutions, thus reducing duplication and inefficiencies; and d) demonstrating the need for capacity building in data governance..

Fourth, the Statistical Data Regulator (Uganda Bureau of Statistics). – This study will aid in a) enforcing the importance of standardizing data collection, classification, and validation across government institutions; b) establishing protocols for integrating administrative data with survey and census data to improve national statistics; c) informing

open data policies that balance the need for open government data with privacy and security requirements; and d) supporting the ethical use of data.

Research on data governance has significant implications for numerous policymakers, particularly in the context of digital transformation, data-driven decision-making, and public sector efficiency.

1.3.2 Significance for Government Institutions

The results of this research shall be used by government organisations to draw lessons for enhancing public service delivery. Effectively managing data improves decision-making, resource allocation, and service delivery across public sector organisations. The research findings highlight data management inadequacies and suggest solutions to optimise operations, minimise risks, and enhance inter-organisational data exchange.

In particular, this study will help public sector organisations to: a) understand the vulnerabilities that could impact information security, enabling the development of appropriate mitigations; b) implement solutions that ensure interoperability and data portability across entities and digital systems thus reducing duplication, improving resource use, and streamlining data sharing across entities; c) support informed decision-making based on real-time and high-quality information due to advancements in data governance; and d) promote transparency, accountability, and compliance with data privacy laws, strengthening citizen confidence in government systems; and e) support National Development Goals such as digital transformation and progress toward an attainment of the Sustainable Development Goals

(SDGs); and f) improve risk management towards data breaches, misuse, and inefficiencies in service delivery.

1.3.3 Significance for the Academia

The results of this research will enrich the scholarly discourse by enhancing the understanding of multi-institutional public sector data governance, particularly within the context of a developing economy such as Uganda. This research contributes to the academic discourse surrounding data governance within a multi-institutional Ugandan public sector context. Thus, this research makes a substantial addition to the academic works on the governance of the data phenomenon. It sets itself apart by applying a pragmatic philosophy that uses the emerging systems theory and the Abraham et al. (2019) cross-functional framework to investigate the data governance phenomenon. The analysis of this study's results further identifies gaps that are then used to propose areas for future research.

1.3.4 Broader Impact

This study functions as a strategic tool for national development by equipping key stakeholders with contextually grounded insights into data governance. The proposal of a localized data governance framework facilitates the establishment of robust, inclusive, and adaptable governance ecosystems that can effectively address the evolving requirements of the digital age. The research bridges policy, practice, and theory - enhancing public sector efficacy, informing institutional reforms, and promoting a data-driven governance culture. Ultimately, individuals/citizens, service users, and data subjects will benefit from enhanced transparency, accountability, and efficiency in public service provision.

1.3.2 Study Nature

This research was premised on an abductive research approach, which began by inducing data governance concepts using a qualitative approach, followed by a deductive approach. The earlier derived concepts were then evaluated using a quantitative approach (Mitchell & Education, 2018). The selection of this approach was motivated by the fact that the theoretical frameworks in the domain of data governance are not yet mature (Alhassan et al., 2016; Korhonen et al., 2013), and hence, the abductive approach offered a pragmatic method for creatively developing an appropriate Data Governance Framework.

Furthermore, this study benefited from the mixed methods approach by counterbalancing the weaknesses of the qualitative and the quantitative approaches while maximizing their benefits (Cresswell, 2014; Flick, 2017; Mitchell & Education, 2018). This counterbalancing effect was achieved by employing a sequential exploratory mixed methods study design, which enabled the validation and application of concepts derived from the qualitative data collected in the initial phase, subsequently quantitatively evaluated in the second phase. Hence, this design enabled the validation of the in-depth qualitative data gathered from a small sample of Government employees by a larger sample using quantitative techniques.

Although this study does not involve the design or technical implementation of an ICT system, it is grounded in the field of information and communication technologies (ICTs), with a strong interdisciplinary integration from management and governance studies. The study examines data governance, an essential element of the wider enterprise ecosystem

encompassing institutions, standards, regulations, and the strategic management of digital data across multiple public sector organisations.

The following factors contribute to the strong ICT-based foundation of this study, namely i) the study's focus on Uganda's governance and policy frameworks surrounding the use of digital data and ICT infrastructure, specifically in the public sector; ii) the focus on technological aspects of data governance such as information management systems, ICT infrastructure and devices; iii) the use of ICT policies, regulations, and frameworks and iv) the application of the Systems Theory to examine the interactions between the data governance subsystems (e.g., technological, institutional, and human subsystems) within Uganda's national data governance architecture.

However, because it draws from the fields of management, public administration, and ICT, the study is inherently multidisciplinary. It investigates issues fundamental to management studies, including leadership, institutional coordination, stakeholder management, regulatory compliance, and strategic governance. A more detailed examination of how digital technologies are integrated into governance processes and how they are managed within complex institutional and policy contexts is enabled by the intersection of these fields.

Through the integration of ICT and management perspectives, this study adds to the growing body of knowledge on information systems management, ICT for Development (ICT4D), and digital public governance. It also provides theoretical and practical insights for development practitioners, ICT professionals, and policymakers.

1.4 RESEARCH QUESTIONS AND RESEARCH HYPOTHESES

This research's questions and hypotheses were formulated through abductive reasoning, informed by the researcher's experience, situational observations, and a literature review, which revealed a general deficiency in knowledge regarding data governance.

The main research question of this study is “*What are the key components of data governance that are most suitable for the Ugandan public sector?*”. To answer this main research question, this study focuses on identifying the essential components of data governance, aims to inform the development of a practical framework, and is contextualized with Uganda's public sector, facilitating the analysis of current practices, identifying gaps, and proposing solutions.

Specifically, this mixed-methods study addresses four research questions in the qualitative phase and tests three interrelated hypotheses in the quantitative phase. Following is a presentation of these research questions and hypotheses.

1.4.1 Research Questions

This research aimed to address the following four questions, as outlined below.

First, what are the requirements for effective data governance? This question sought to establish the dimensions of a Data Governance Framework. To determine the need for data governance in the Ugandan public sector, primary data were gathered throughout the qualitative and quantitative phases, supplemented with secondary data from government documents and literature reviews.

Second, what organisational provisions have been established to manage data resources? This question aimed to establish Uganda's current public sector data governance provisions and investigate the constructs that contribute to effective data management, including people, processes, technologies, structures, and policies.

Third, what challenges do government employees face while managing data in Uganda? This question was intended to identify the prevailing public sector data management challenges within a single organisation or across multiple organisations, serving as the basis for proposing an appropriate framework to address them.

Fourth, what is the effect of organisational culture on data governance in the Ugandan Public Sector? This question aimed to investigate the relationship between the respondents' attitudes, beliefs, and behaviour regarding data management activities and data quality.

1.4.2 Research Hypotheses

This research tested three hypotheses on constructs of data governance premised on the adopted conceptual framework (i.e., the Abraham et al. (2019) cross-functional Data Governance Framework) and the literature reviewed. The constructs tested in the hypotheses are Data Governance, i) Guiding Principles, ii) Antecedents, iii) Mechanisms, and iv) Organisational Culture (Abraham et al., 2019; Alhassan et al., 2019; Were & Moturi, 2017). Therefore, during the quantitative phase, this study sought to establish the validity of the hypotheses, as presented in Table 1.

Table 1:*Research Hypotheses*

Code	Hypothesis
H ₀₁ :	Data Governance Antecedents have no significant effect on Data Governance Principles.
H ₀₂ :	Data Governance Antecedents have no significant effect on Data Governance Mechanisms.
H ₀₃ :	Organisational Culture has no significant effect on Data Quality.

The hypotheses are derived from the cross-functional data governance framework proposed by Abraham et al. (2019), which serves as the conceptual foundation of this study, and the reviewed literature. In contrast, the Data Governance Principles construct is derived from the literature reviewed and was introduced to extend the framework of Abraham et al. within this study.

1.5 CHAPTER SUMMARY

The initial chapter introduces the research by discussing the foundational aspects of the data governance phenomenon from an international and local perspective. It relates data governance to its dependence on digital technologies. The chapter subsequently outlines the problem statement, highlighting the insufficient public investment in data governance relative to investments in ICTs, the scarcity of scholarly research on data governance from the viewpoint of a developing country, and the relevance of the study concerning the present Political, Economic, Social, Technological, Legal, and Environmental climate in Uganda. This chapter examines the study's objective of exploring data governance practices within a multi-institutional context in Uganda, a developing country. The objective of the study was to deepen

the comprehension of the data governance concept and provide meaningful insights for professionals and academics.

Further, the study's four specific objectives presented in this chapter can be summarised as i) determining the prerequisites for effective data governance, ii) investigating how data governance is being conducted, iii) analysing the desired data governance practices, and iv) evaluating the effect of organisational culture on the governance of data.

The chapter then presents the research methodology as a hybrid technique designed to use the advantages of combining qualitative and quantitative methodologies while minimising their respective shortcomings.

The next section presents the envisioned importance of the research in enhancing the theoretical understanding of data governance in the public sector of a developing country, as well as within a multi-organisational setting. It is argued that the concept of data governance is under-researched, despite its importance. Additionally, this study analyses and tests the validity of the Abraham et al. (2019) cross-functional data governance framework. The results from this study are used to propose an agile contextualised data governance framework for the public sector in Uganda, intended to support complex data-driven services, innovations, and public sector reforms. Furthermore, this research enhances data governance by proposing recommendations for application, including policy priority areas, operational activities, and future research areas that require further investigation for effective data governance, based on the research findings and the literature reviewed.

Lastly, the chapter discusses four research questions aligned with the research objectives: i) What are the requirements for effective data governance? ii) What organisational provisions have been established to manage data assets? iii) What challenges do government employees face while managing data in Uganda? iv) What is the effect of organisational culture on data governance in the Ugandan Public Sector?

Additionally, this research tested three hypotheses during the quantitative phase, using data governance constructs based on the adopted conceptual framework and the literature reviewed. The objective of the study was to establish the validity of the null hypotheses of the following hypotheses, namely i) H_{01} : Data Governance Antecedents have no significant effect on Data Governance Principles, ii) H_{02} : Data Governance Antecedents have no significant effect on Data Governance Mechanisms, and iii) H_{03} : Organisational Culture has no significant effect on Data Quality.

The chapter concludes with a presentation of the layout of the remainder of the dissertation report, as outlined in subsection 1.6.

1.6 REPORT LAYOUT

The remainder of this dissertation report is arranged into four chapters. Chapter 2 reviews the literature on data governance, beginning with a discussion of the study's theoretical background. Subsequently, it provides an overview of data governance from the perspective of its definition, elements, scope, attributes, motivations, and barriers. The chapter also discusses data governance frameworks and their implementation. It additionally offers a comprehensive

examination of data governance within the public sector viewed through global, regional, and national lenses. It concludes with a summary of the chapter.

Chapter 3 begins by outlining the study's objective and the specific problem this research aims to address. It then articulates the overarching philosophical approach of the study. Subsequently, the research methodology and conceptual basis are discussed. After that, the research population and sample selection methodology are discussed. The subsequent section addresses the research tools used for data gathering. After that, the operational variables utilised in this research are defined. An in-depth analysis of the ethical issues addressed in this study is presented next. Subsequently, a discussion on the approach used to gather and analyse the data for this research is presented. Lastly, a summary of the research tools and materials used in this research is presented at the end of Chapter 3.

Chapter 4 presents the findings and their analysis in a systematic manner, aligning them with the research questions and hypotheses. This chapter begins with a statement that illustrates the validity, reliability, and trustworthiness of the study's results. Subsequently, the chapter presents the findings and their interpretation from the qualitative phase, organised according to the four research questions on which this study is based. Later, the results of the quantitative phase and their analysis are presented in line with the research hypotheses. This is followed by the triangulation of the qualitative and quantitative findings to enhance the validity and credibility of the results from the two phases of this study. The results of this study are then used to develop a proposed public sector data governance framework. The chapter concludes with an overview of the study's findings and their interpretation.

Chapter 5 presents the implications, recommendations, and conclusions of this study, drawing on evidence from the analysis of findings and the reviewed literature. This chapter begins by giving an introduction that aligns the research results with the research aim, questions, and hypotheses. The next section examines the operational implications obtained from the study's findings. This is followed by a discussion of proposals that various stakeholders could adopt based on the research findings. Following this, the chapter presents proposals for prospective research that other scholars may undertake.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

This chapter evaluates existing scholarly and practitioner literature on data governance in relation to the study's objectives. It commences with an exploration of the study's theoretical and conceptual frameworks. It subsequently provides a comprehensive overview of the data governance concept, encompassing its definition, components, scope, characteristics, motivations, and challenges. The chapter also reviews the existing literature on the development and implementation of industry- and scholarly-based data governance frameworks. It also provides an extensive analysis of data governance in the public sector from global, regional, and national perspectives. It ends with a summary of the chapter.

The objective of this chapter is to critically evaluate existing scholarly and practitioner literature, identify knowledge gaps, inform the design and methodology of the current study, and provide a basis for interpreting and contextualising the study's findings.

A systematic search of academic databases, including ProQuest, ScienceDirect, and Google Scholar, was conducted using the keyword “Data Governance.” The results were filtered to include only peer-reviewed English-language publications whose titles contained the specific word “Data Governance” and were published in the last 13 years (i.e., 2025 - 2011). The search query returned a combined total of 1,800 resources. After that, the search results' abstracts were analysed to determine their relevance to this study. Additionally, other sources were identified through cited papers and targeted searching for key papers from data

governance experts and practitioner communities. The relevant materials used were further categorised into thematic areas developed from the abstracts, as presented in Table 2.

Table 2:

Categorisation of Papers Reviewed

Thematic Area/Category		Resources	Quantity
i.	Systematic literature review papers	Abraham et al., 2019; Alhassan et al., 2018; Al-Ruithe et al., 2019; Al-Ruithe et al., 2018; Benfeldt, 2017; Jagals & Karger, 2021; Niemi, 2015; Ramadhan et al., 2021	8
ii.	Single organisational/general data governance	Berman, 2017; Cheong and Chang, 2007; Dong, 2016; Fu et al., 2011; Hagmann, 2013; Korhonen, 2014; Otto, 2011a; Otto, 2011b; Otto et al., 2007; Panian, 2010; Pierce et al., 2008; Vilminko-Heikkinen et al., 2016; Weber et al., 2009; Zhang and Yuan, 2016	15
iii.	Designing data governance frameworks	Aisyah and Ruldeviyani, 2018; Azizatun Nafi'ah, 2021; Begg & Cairn, 2011; Brahmantara et al., 2021; Dahlberg & Nokkala, 2015; Guetat and Dakhli, 2015; Guetat and Dakhli, 2015; Khatri and Brown, 2010; Pansara, 2023	8
iv.	Multi-organisational/ecosystem data governance	Gelhaar et al., 2021; Lis & Otto, 2020; Karkošková, 2023; Lefebvre & Legner, 2024	3
v.	Data governance for emerging technologies (e.g., blockchain, machine learning, and big data)	Al-Badi et al., 2018; Fadler et al., 2021; Micheli et al., 2020; Paskaleva et al., 2017; Rehman and Al-Raqom, 2020; Yebenes and Zorrilla, 2019	6
vi.	Governance of Data in the Public Sector	Benfeldt et al., 2020; Herselman et al., 2019; Masilela and Nel, 2021; Mullon and Ngoepe, 2019; OECD, 2019; Thompson et al., 2015; Van Ooijen et al., 2019; Were and Moturi, 2017	8
vii.	Practice-oriented publications	Borokini & Saturday, 2021; Buff, 2016; Cupoli et al., 2014; DAMA, 2017; Martijn & Jonker, 2015; Mosley et al., 2010; NASCIO, 2008; NASCIO, 2009, NASCIO, 2009b; PwC, 2019	10
viii.	Systems Theory	Akoka and Comyn-Wattiau, 2019; Chatterjee et al., 2021; Lai & Huili Lin, 2017; Lefebvre & Legner, 2024; Mele et al., 2010; Montuori, 2011; Teece, 2020	7

Thematic Area/Category	Resources	Quantity
ix. PhD Dissertations	Al-Ruithe, 2018; Barker, 2016; Cave, 2017; Nguyen, 2016; Nokkala, 2020; Randhawa, 2019	6
x. Data Governance Books	Coronado, 2014; Gülseçen, 2020; Ladley, 2019; Otto & Österle, 2015; Mahanti, 2021	4
Total		75

2.2 THEORETICAL AND CONCEPTUAL FRAMEWORK

This section discusses the theoretical foundations that support the study within the larger context of existing scholarly discourse. It highlights the conceptual relationships between the present study and previous theoretical and empirical contributions, thereby providing the philosophical basis and rationale for selecting and integrating the theoretical and conceptual frameworks that support this study.

2.2.1 Theoretical Framework

This study followed the systems theory developed by Ludwig von Bertalanffy in the 1940s and had early applications in biological studies. Systems theory describes the features of a system, including its relationships, structure, and interdependence (Lai & Huili, 2017; Lefebvre & Legner, 2024; Mele et al., 2010; Montuori, 2011). It attempts to explain and develop hypotheses on the characteristics of complex systems that are only discernible in the whole system but not in its subsystems alone (Lai & Huili, 2017). In particular, this study applied the open systems theory to investigate the relationships between the data governance elements and the environment in which they operate (Mele et al., 2010). In terms of application, systems theory is widely utilised in management studies (Chikere, 2015; Kats & Rosenzweig, 1972; Teece, 2020), but its application in information systems and data governance studies is limited (Akoka & Comyn-Wattiau, 2019; Liaw et al., 2014; Mayer-Schonberger, 2010).

2.2.1.1 Basis for Choice of Systems Theory

The primary reason for selecting systems theory as the theoretical foundation for this study is that it is a good fit for the definition of data governance. For example, the Institute of Data Governance defines data governance as: -

A system of decision rights and accountabilities for information-related processes, executed according to agreed-upon models which describe who can take what actions with what information, and when, under what circumstances, using what methods (Thomas, 2006, p. 3).

Thus, data governance is a suitable concept to examine using systems theory, as it is a comprehensive system comprising interrelated and interdependent subsystems that conform to a predetermined structure (Akoka & Comyn-Wattiau, 2019). For example, the interrelated and interdependent subsystems of a data governance system include policies, people, processes, and technology, which interact in an organisational environment to influence the outcome of a data governance initiative (Buff, 2016). Furthermore, a fundamental principle of systems theory posits that a system is considered complete only when it encompasses all sub-components that interact comprehensively with each other (Montuori, 2011). This suggests that performance failures in any subsystem, such as people or processes, can adversely affect data governance.

It is important to recognise that several initial efforts in data governance were unsuccessful due to a lack of a holistic perspective, as they concentrated solely on isolated elements of data governance (Alhassan et al., 2019; Al-Ruithe, 2018; Otto, 2011b; Weber et al., 2009; Wende & Otto, 2007). For example, Alhassan et al. (2019) highlight that most data governance studies focus on the defining stage activities (i.e., the planning stage), while

overlooking implementation and monitoring activities in their scope. Additionally, some scholars and practitioners (Otto, 2011b; Weber et al., 2009; Wende & Otto, 2007) view data governance mainly from the perspective of data quality management. Hence, systems theory is appropriate as it offers a holistic approach to data governance by emphasising the inter-relationships between data governance elements and incorporating environmental factors. Therefore, to succeed, a data governance initiative should operate as an open system adaptable to the evolving business environment in which it operates (Buff, 2016).

Informed by the systems theory's holistic principle (von Bertalanffy, 1968), the qualitative and quantitative phases of the study were organised according to the dimensions of the Abraham et al. (2019) framework, which were envisioned as subsystems. These subsystems were examined in terms of their dynamic interactions and their cumulative contributions to maintaining the coherence, functionality, and adaptability of an overarching data governance initiative. The combination of qualitative and quantitative insights adhered to recognised principles of mixed-methods research design (Creswell, 2014), thereby guaranteeing methodological precision and theoretical coherence.

2.2.1.2 Use Cases of the Systems Theory

The systems theory has not yet been widely applied in data governance studies. The literature review established that Akoka and Comyn-Wattiau (2019) developed a big data governance evaluation model based on a systems theory approach. To support their methodology, Akoka and Comyn-Wattiau (2019) describe the phenomenon of data management as a system artefact composed of goals connected to the procedures and structures

in a particular setting. In another study, the systems theory was successfully used to validate the results of a study on the National Pension Services of South Korea (Kim & Cho, 2018).

Relatedly, Lefebvre and Legner (2024), applied systems thinking in a data governance study using the Viable System Model, which illustrates a system's ability to adapt to changing environments. This research involved focus groups with seventeen multinational firms and emphasised that data governance functions through interconnected sub-systems at operational, managerial, and strategic levels. The findings suggest that achieving balance among these levels is crucial for effective data governance, highlighting a growing interest in systems theory as a theoretical framework for data governance studies. However, there is an apparent need to rigorously apply the systems theory in more studies to validate it as an appropriate model for evaluating extensive data governance initiatives.

2.2.1.3 Limitations of Systems Theory

A significant limitation of the systems theory is the assumption that all variables have an equal effect on the overall system (Lai & Huili, 2017; Montuori, 2011). Depending on the prevailing conditions, some variables are likely to have a more or less significant effect than others. Furthermore, Berman (1996) argues that systems theory necessitates a global perspective of the entire system, which is impractical in certain situations. For example, there is an element of spontaneity in immature data governance systems, where informal methods are often used, making them unpredictable.

Additionally, although systems theory is beneficial in analysing complex systems, its application can be challenging, especially in cases where the system is dynamic or has many

subsystems (Lai & Huili, 2017; Lefebvre & Legner, 2024; Montuori, 2011). This is due to the length and complexity of the variables that would need to be analysed, which complicates the analysis.

2.2.1.4 Rival Theories

This subsection discusses other theoretical frameworks that scholars have used in related studies on data governance, explaining why each was not chosen for this study.

In a related study, Randhawa (2019) applied the servant leadership theory to establish that leadership plays a significant role in implementing a practical data governance framework. This study's shortcoming is that it unfairly prioritised leadership while ignoring all the other elements of data governance, such as technology and procedures. Table 3 summarizes other theoretical frameworks previously used to study the concept of data governance.

Table 3:

Summary of Theories Applied in Data Governance Studies

Name	Short Description	Shortcoming
Contingency Theory	It suggests that a “one size fits all” framework for implementing data governance does not exist. Instead, it prescribes the best approach as being contingent upon internal and external factors (Weber et al., 2009).	This approach is criticised for lacking a solid theoretical foundation, making it challenging to comprehend and apply in real-life situations.
Institutional Theory	It contends that organisational decisions are influenced by goals and factors that include social, cultural, and legitimacy concerns. Cave (2017) utilised institutional theory in a	While institutional theory provides valuable insights into how organisational norms and regulatory influences shape data governance practices, it is limited in explaining the

Name	Short Description	Shortcoming
	qualitative case study to explore strategies for implementing data governance practices.	technological, dynamic, and multi-actor characteristics of contemporary data ecosystems.
Theory of Planned Behaviour	In an exploratory sequential mixed-methods study of researchers' data management practices at the University of Vermont, Berman (2017) employed the theory of planned behaviour to investigate how researchers' attitudes and beliefs influence their intentions and behaviour regarding data management.	The shortcoming of this approach is that behaviour cannot be comprehensively used to explain other dimensions of data governance, such as technology or environmental factors.
Collective Action Theory	Benfeldt et al. (2020) view data governance as a process focused on guiding a group towards achieving data quality and hence use the collective action theory to investigate data governance problems in local government organisations.	The primary shortcoming of collective action theory is that it focuses solely on the goal. However, data governance encompasses multiple dimensions, including principles, policies, and technologies.
McKinsey 7S Model	Nel and Masilela (2021) examined how the South African Government institutionalises data security oversight mechanisms to safeguard information within public entities. Their research employed the McKinsey model, which comprises seven constructs: Staff, Skills, Structure, Systems, Style, Strategy, and Shared Values.	The main shortcoming in the McKinsey Seven-S model is that it only considers the seven variables, omitting other important variables, such as the impact of external environmental factors, that could affect the internal performance of data governance.

Above all, it is essential to note that most data governance studies reviewed are not grounded in theory but instead use the case study approach to generate theory from practice (Alhassan et al., 2019; Cheong & Chang, 2007; Otto, 2011a). The case study approach is appropriate for investigating issues with limited previous research findings (Bhattacharjee, 2012; Cheong & Chang, 2007; Cresswell, 2014).

2.2.2 Conceptual Framework

A conceptual framework organises and logically demonstrates how the concepts associated with the issue being investigated relate to one another (Green, 2014). The conceptual framework adopted in this study outlines the relationships between the core data governance concept and its constructs, providing a foundation for answering the research questions and testing the hypotheses.

While following the systems theory approach, this study adopted the cross-functional data governance model for managing data as a crucial enterprise asset developed by Abraham et al. (2019) as its conceptual framework. The selection of the Abraham et al. (2019) model as the conceptual framework for this study was guided by abductive reasoning, considering both its alignment with the theoretical foundation of systems theory and its practical suitability for addressing the research objectives. This approach ensured that the framework was both theoretically sound and practically applicable for use in the context of the study.

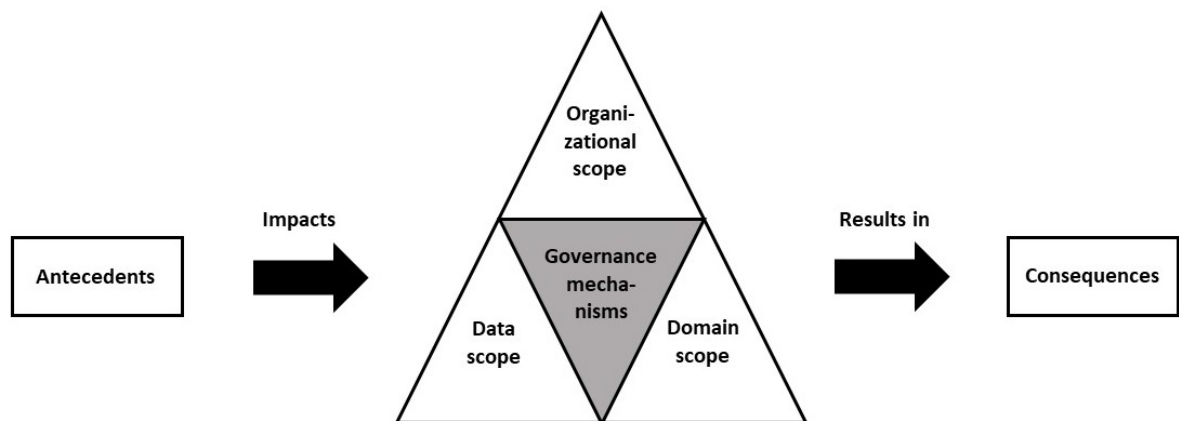
The Abraham et al. (2019) model, adopted as the conceptual framework for this study, was developed through a rigorous process that involved reviewing 145 academic and practitioner articles published from 2001 to 2019, identifying, and synthesising key data governance concepts. The results were then used to extend the Khatri and Brown (2010) data governance framework. The new framework introduced a significant data antecedents dimension and expanded the scope parameter to encompass data architecture, data storage, and infrastructure, in addition to the previous decision domains of Khatri and Brown (Abraham et

al., 2019). Figure 1 presents the Abraham et al. (2019) cross-functional data governance framework adopted in this study.

The Abraham et al. (2019) cross-functional data governance model is a relatively new model that is well-cited in scholarly work (Azizatun Nafi'ah, 2021; Brous et al., 2020; Lis & Otto, 2020) but has not yet been widely applied as a conceptual framework. For example, a Google Scholar search returned 115 publications referencing Abraham et al. (2019). However, only one study by Azizatun Nafi'ah (2021) employed the cross-functional data governance model proposed by Abraham et al. (2019).

Figure 1:

Conceptual Framework



Source: Abraham et al. (2019)

The adapted conceptual framework is composed of four dimensions, namely i) data governance antecedents, ii) scope, iii) mechanisms, and iv) consequences as discussed below.

First, Data Governance Antecedents - This dimension refers to the actions and conditions that need to be in place for effective data governance. They are categorised into two groups, namely i) internal antecedents, such as the organisational data management strategies, and ii) external antecedents, such as the statutory legal and regulatory instruments.

Second, Data Governance Scope - The scope dimension is subdivided into three subconstructs, namely, i) *Organisational scope*, which is categorised as either single or multi-organisational; ii) *Data Scope*, which refers to the range and types of data resources managed in an entity such as ordinary data (e.g. transactional data, master data and reference data etc.) plus new data types (e.g. unstructured big data, machine generated data etc.), and iii) *Decisions Domain Scope*, which refers to decision areas relevant to data governance processes (Khatri & Brown, 2010).

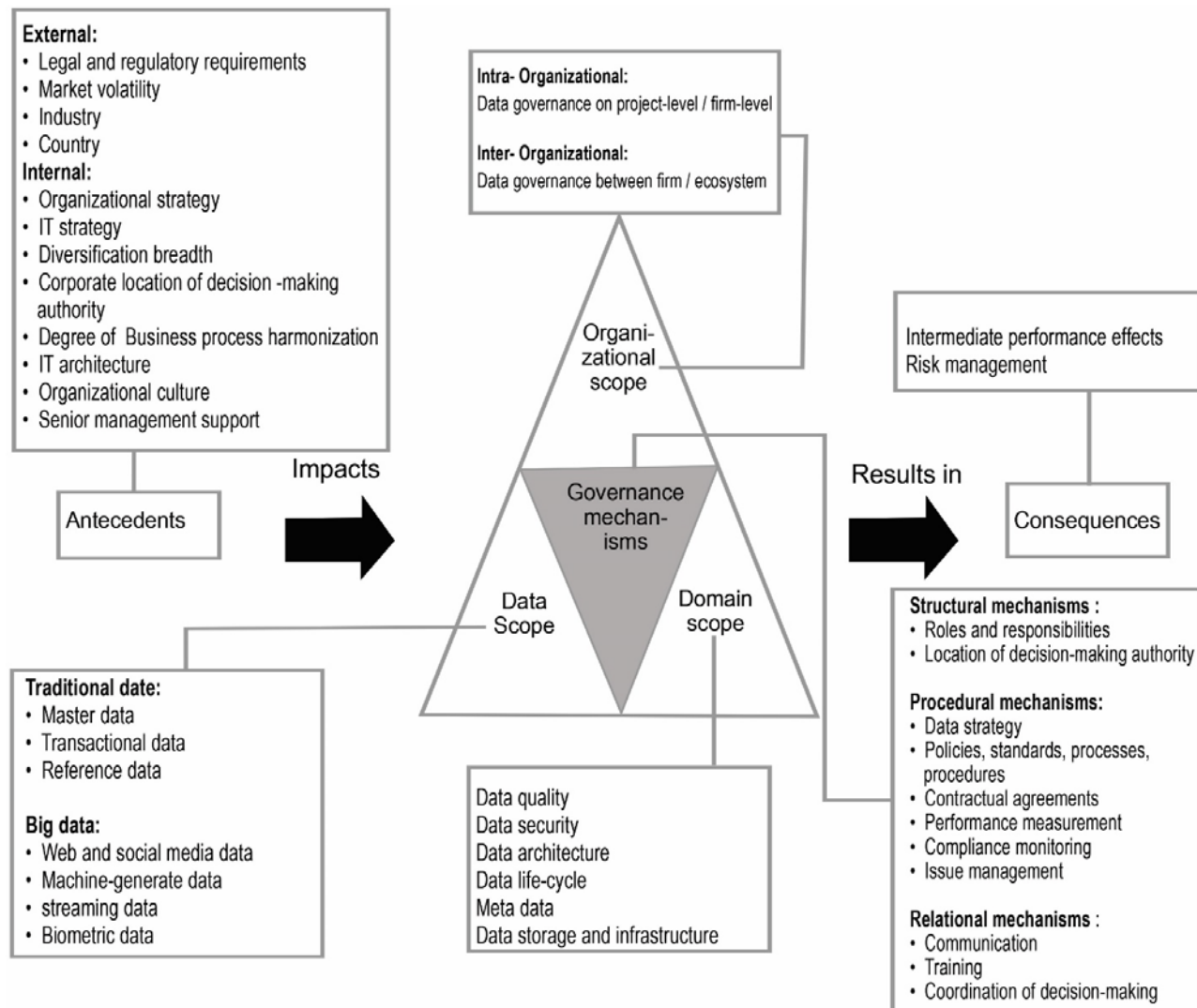
Third, Governance Mechanisms – which is subdivided into three categories, namely i) Structural Data Governance Mechanisms, which concerns the organisational structures for data governance; ii) Procedural Data Governance Mechanisms, which involves ensuring the use of accurate and efficient processes for data governance activities, such as data entry, storage, and sharing; and iii) Relational Data Governance Mechanisms, which involves collaboration among all stakeholders through effective communication, capacity building, and coordination.

Fourth, Consequences, which is concerned with the outcomes of implementing a data governance initiative, namely i) short-term performance effects and ii) long-term risk management. While data governance is intended to produce positive results by mitigating organisational risks, such as adherence to regulatory and legal requirements, it may

inadvertently raise other challenges (Lardley, 2019). For example, implementing data governance may initially lead to poor organisational performance due to stringent requirements and the need to take up new skills (Lardley, 2019).

Overall, Figure 2 illustrates the detailed relationship between the four dimensions of the Abraham et al. (2019) cross-functional framework. In summary, the antecedents have an impact on the scope and mechanisms of data governance, which in turn result in consequences that may lead to a successful or failed initiative.

It is pertinent to note that this study builds upon the cross-functional data governance framework proposed by Abraham et al. (2019), conceptualising data governance principles as an overarching construct that transcends antecedent factors and exerts a universal influence on the effectiveness of data governance.

Figure 2:*Detailed Conceptual Framework*

Source: Abraham et al. (2019)

2.2.3 Alternative Conceptual Frameworks

This subsection discusses the alternative conceptual frameworks used in other related data governance studies, explaining the basis of rejecting them in this study.

Whilst this study chose to adapt Abraham et al.'s (2019) cross-functional data governance framework as its conceptual framework, a plethora of data governance conceptual frameworks have been applied by other scholars in their studies. For example, Ladley (2019) employed the Zachman Enterprise Architecture framework as a conceptual framework. When applied as a conceptual framework for data governance research, the Zachman Framework offers a structured approach for explaining how data-related responsibilities, processes, and artefacts are distributed in an organisation (Ladley, 2019; Zachman, 2023). The suitability of the Zachman Framework for empirical data governance research stems from its comprehensive structural and systemic perspective, which provides a holistic, enterprise-wide view (Ladley, 2019; Khatri & Brown, 2010). However, the lack of empirical orientation limits the applicability of the Zachman Framework in data governance studies, as it is more descriptive and taxonomic rather than analytical or predictive, thus lacking testable propositions. Additionally, its complexity and abstraction render its adaptation cumbersome, especially in resource-constrained public institutions (van der Linden et al., 2018). Furthermore, considering that the framework was originally developed for enterprise architecture management, it lacks specific aspects for data governance (van der Linden et al., 2018).

Table 4 summarises other conceptual frameworks that scholars have applied in previous data governance studies. The table highlights the title of the study, the conceptual framework

used, the strengths and weaknesses observed in the study, and a brief comparison with Abraham et al. (2019).

Table 4:

Analysis of Potential Alternative Conceptual Frameworks

Conceptual framework	Study (title; year; setting)	Strengths	Weaknesses	Comparison with Abraham et al. (2019)
Khatri & Brown (2010) decision-domains model	Were & Moturi (2017). <i>Toward a data governance model for the Kenya health professional regulatory authorities</i> . A study in Kenya, the health regulator.	Provided clear and practical decision domains for conducting the study.	Limited capture of policy/ecosystem antecedents and cross-boundary issues; needed augmentation for regulatory context.	The Khatri and Brown (2010) framework provides measurable governance domains that match the mechanisms proposed by Abraham et al. (2019); however, it lacks the antecedents construct that explains the contextual and organisational factors affecting adoption.
	Begg & Caira (2011). <i>Exploring the SME Quandary: Data Governance in Practice in the SME Sector</i>	Provided a usable baseline for awareness mapping among non-technical SME leaders.	Scalability limits: required translation and simplification; limited evidence of adoption.	
Otto's morphological typology (centralised, federated, decentralised, hybrids).	Otto (2011), <i>A Morphology of the Organisation of Data Governance</i> (Multiple organisations; mini cases)	An empirically grounded typology for comparative analysis that explained organisational variance.	High-level typology required operationalisation; a small mini-case sample limits generalisability.	Otto (2011) addresses organisational configuration within Abraham's "organisational scope" but lacks Abraham's full antecedent, mechanisms, and outcome synthesis.
Lifecycle/governance program constructs (practical Data	Elliott et al (2013), <i>Data Warehouse Governance</i>	Illustrated governance program features that improve	Mostly descriptive; limited formal	DAMA/DGI program elements provide measurable practices that

Conceptual framework	Study (title; year; setting)	Strengths	Weaknesses	Comparison with Abraham et al. (2019)
Governance Framework elements; DAMA/DGI themes).	<i>Programs in Healthcare</i>	healthcare Data Warehouse reliability	theoretical testing.	Abraham's framework can situate at the mechanism level.
Multi-level governance approach: empirical longitudinal case study; ecosystem and public-sector governance constructs.	Paparova (2023), <i>Data governance spaces: The case of a national digital service</i> . (National digital service)	Longitudinal empirical evidence of Data Governance evolution in the national context; strong contextual insight on policy & institutional antecedents.	Focused single-country case—generalisability limited.	Closely aligns with Abraham's emphasis on antecedents, scopes, and mechanisms in public sector ecosystems.

The analysis of other conceptual frameworks used in previous data governance studies demonstrates the robustness and suitability of the Abraham et al. framework as a conceptual foundation for this study. In general, Abraham et al.'s (2019) cross-functional data governance framework offers a more expansive conceptual framework for contextualising data governance within multi-organisational settings. Therefore, this study utilised Abraham et al.'s (2019) cross-functional framework as its conceptual foundation due to its comprehensiveness and relevance to modern data contexts.

2.2.4 Relationship between the Theoretical and Conceptual Framework

A theoretical framework establishes the overarching theoretical basis for research by applying established theories to explain a research phenomenon (Cresswell, 2014; Imenda, 2014; Saunders et al., 2009; Varpio et al., 2020). Conversely, a conceptual framework offers a specific depiction of the interrelations among key concepts within the study, serving as a guide for the research within the context of the selected theory (Ngulube et al., 2015; Varpio et al.,

2020). A conceptual framework is built upon the theoretical framework by applying the theory to the specific research question being addressed (Ngulube et al., 2015).

Systems theory provides an extensive framework for understanding the interrelations among various elements within an organisation (Whitchurch & Constantine, 2009). The Abraham et al. (2019) cross-functional data governance framework emphasises a holistic administration and control of data assets. Systems theory offers a foundational framework for data governance, facilitating a comprehensive and pragmatic analysis of data flow among multiple public organisations, engaging diverse stakeholders, and assessing its impact on overall organisational processes.

Abraham et al. (2019) developed the cross-functional data governance framework to address a gap in the holistic views of data governance. It offers a systematic approach that views data governance from the dimension of four subsystems, namely, i) governance mechanisms, ii) scope, iii) antecedents, and iv) consequences. As demanded by systems theory, the four subsystems of the Abraham et al. (2019) cross-functional framework operate in a holistic and structured manner with defined dynamic interactions that complete the data governance process.

The relationship between Abraham et al.'s (2019) cross-functional data governance framework and the systems theory is that both provide a holistic view of the research phenomenon. In particular, the relationship between systems theory and data governance is evident in four perspectives as discussed below.

First, the holistic view perspective: Systems theory encourages viewing data not as isolated components but as part of a more extensive system within the organisation, highlighting the need to consider how data is used across various organisations and by different departments (Beall, 2024; Lai & Huili, 2017; Lefebvre & Legner, 2024).

Second, feedback loops: Systems theory emphasises the importance of feedback loops in data governance for identifying and fixing data quality issues, monitoring compliance, and improving data management practices (Lai & Huili, 2017; Lefebvre & Legner, 2024; Montuori, 2011). For example, systems theory supports the standardisation of data governance and harmonisation of communication activities across departments or organisations.

Third, subsystems interdependencies: By understanding how different subsystems within an organisation interact, data governance strategies can be designed to address the dependencies between data sources and ensure consistency across the entire data ecosystem (Beall, 2024; Lefebvre & Legner, 2024; Varpio et al., 2020). For example, systems theory helps in identifying and analysing data flows across organisations to detect bottlenecks, redundancies, and data quality issues.

Fourth, Systems Complexity: In complex organisations with diverse data sources, systems theory provides a structured approach to analysing and managing data governance, considering the potential impacts of changes on various system components (Beall, 2024; Whitchurch & Constantine, 2009). For example, systems theory can be applied to establish clear data ownership and stewardship roles across different organisations to ensure accountability and responsible data management.

As Luft et al. (2022) assert, theoretical frameworks provide a mechanism for explaining and interpreting the phenomenon under investigation, while conceptual frameworks explain the assumptions about the phenomenon being researched. In this study, systems theory is employed to provide an overarching framework for understanding the phenomenon of data governance. The conceptual framework serves as a blueprint for conducting the research, identifying the constructs, their interrelationships, and the constraints (Imenda, 2014).

2.2.5 Relationship between the Conceptual Framework and the Research Hypotheses

The three hypotheses tested in this study are derived from the cross-functional data governance framework proposed by Abraham et al. (2019), which serves as the conceptual foundation of this study. This framework posits that data governance antecedents influence both the scope and mechanisms of data governance, which, in turn, result in specific consequences of data governance. However, this study aimed to extend this framework by proposing that, beyond the antecedents, there are core data governance principles that play a pivotal role in shaping the overall effectiveness of data governance practices.

For the case of the first hypothesis H_{01} : *Data Governance Antecedents have no significant effect on Data Governance Principles*, where data governance principles are a dependent variable and data governance antecedents are the independent variable, the results of this hypothesis shall be used to extend the Abraham et al. (2019) cross-functional data governance framework.

The second hypothesis, H_{02} : *Data Governance Antecedents have no significant effect on Data Governance Mechanisms*, where data governance mechanisms is the dependent variable and data governance antecedents is the independent variable, is used to validate the Abraham et al. (2019) cross-functional data governance framework itself because this study identifies antecedents and mechanisms as the most critical constructs of data governance.

According to the Abraham et al. (2019) cross-functional data governance framework, organisational culture is identified as one of the components for internal antecedents. However, this study proposes that organisational culture should be elevated to a higher level as one of the key constructs of data governance. Therefore, the third hypothesis, H_{03} : *Organisational Culture has no significant effect on Data Quality*, was intended to confirm that organisational culture has a very significant effect on data governance and should be elevated to the level of the other four key constructs, namely antecedents, scope, mechanisms and consequences.

2.3 DATA GOVERNANCE OVERVIEW

This section first establishes a conceptual foundation by defining data governance, followed by an examination of its key elements, scope, and value. It then analyses existing literature on data governance motivations and barriers, as well as the impact of socio-ethical considerations. The insights derived from this literature review subsequently inform the interpretation and evaluation of the primary data collected and analysed in this study.

2.3.1 Definition of Data Governance

Although researchers and practitioners have produced many definitions of data governance, a universally accepted standard definition remains elusive (Abraham et al., 2019; DAMA, 2017; MDM, 2015; Panian, 2010). To establish a clear understanding of the data governance concept and adopt an appropriate definition for this study, some standard definitions were reviewed as presented in Table 5.

Table 5:

Analysis of Common Definitions of Data Governance

Definition	Reference	Common keywords
<i>“Organisations and their personnel defining, applying and monitoring the patterns of rules and authorities for directing the proper functioning of, and ensuring the accountability for, the entire lifecycle of data and algorithms within and across organisations”.</i>	Brous et al., 2020, p. 2	Rules and authorities
<i>“Data governance specifies a cross-functional framework for managing data as a pivotal enterprise asset. It specifies decision rights and accountabilities for an organisation’s decision-making about its data. Furthermore, data governance formalises data policies, standards, and procedures and monitors compliance”.</i>	Abraham et al., 2019, p. 8	Framework, decision rights, and accountabilities; cross-functional alignment with organisational objectives; and Data being a vital resource.
<i>“The exercise of authority and control (planning, monitoring, and enforcement) over the management of data assets”.</i>	Data Management Association - DAMA-DMBOK (DAMA, 2017, p. 71)	Authority and control, Data being a vital resource.
<i>“The formal orchestration of people, process, and technology to enable an organisation to leverage data being an enterprise asset”.</i>	Master Data Management Institute (MDM, 2015, p.1)	People, processes, technology, and data. Consideration of data as an enterprise asset.
<i>“Company-wide framework for assigning decision-related rights and duties in order to</i>	Otto, 2011, p. 47	Framework, decision rights, and accountabilities, Data as

Definition	Reference	Common keywords
<i>be able to adequately handle data as a company asset”.</i>		a vital resource, company-wide.
<i>“Data governance is defined as the processes, policies, standards, organisation, and technologies required to manage and ensure the availability, accessibility, quality, consistency, auditability, and security of data in an organisation”.</i>	Panian, 2010, p. 1	Policies, standards, structures, technologies, procedures, guidelines, data quality, Company-wide.
<i>“Data Governance specifies the framework for decision rights and accountabilities to encourage desirable behaviour in the use of data. To promote desirable behaviour, data governance develops and implements corporate-wide data policies, guidelines and standards that are consistent with the Organisation’s mission, strategy, values, norms and culture”.</i>	Weber et al., 2009, p. 7	Framework, decision rights, and accountabilities, desirable behaviour, enterprise-wide regulatory and legal provisions, alignment with organisational objectives and culture.
<i>“Data Governance is a system of decision rights and accountabilities for information-related processes, executed according to agreed-upon models which describe who can take what actions with what information, and when, under what circumstances, using what methods”.</i>	Institute of Data Governance (Thomas, 2006, p. 3)	Accountabilities, decision powers, and a system

A critical analysis of the various definitions of data governance reveals that it is a multidisciplinary concept whose definitions are influenced by the study domain, motivations, and objectives (Thomas, 2006). For example, Information Technology scholars tend to define data governance with respect to technological attributes such as data integrity, security, and accessibility (Panian, 2010; Zhang & Yuan, 2016), while management-leaning scholars emphasise organisational structures, policies, and strategies (Nguyen, 2016; Were & Moturi, 2017).

However, despite the multidimensional aspects of the data governance concept, the majority of definitions share common attributes. As analyzed in Table 5, some of the most typical attributes in the various definitions of data governance include i) a system (Thomas, 2006, p. 3), ii) authority and control of data (Abraham et al., 2019), iii) decision rights and accountabilities (Otto, 2011b; Thomas, 2006; Weber et al., 2009) and iv) treatment of data as an enterprise asset (DAMA, 2017; MDM, 2015; Otto, 2011b; Weber et al., 2009). Further, the presence of common attributes in the various definitions of data governance can be attributed to the consideration that governance of data evolved from data-related concepts, such as data quality management, data security, data administration, and data management systems (Begg & Caira, 2011).

However, as Martijn and Jonker (2015) argue, data governance roles and duties alone are insufficient to ensure sustainable data quality. Data governance must be augmented by other elements of data management to form a holistic and comprehensive data management framework (Abraham et al., 2019; Martijn & Jonker, 2015). For example, Weber et al. (2009, p. 7) introduce aspects of culture by defining data governance as *“the framework for decision rights and accountabilities to encourage desirable behaviour in the use of data.”* Relatedly, the definitions of data governance are criticised for overlooking environmental factors that may prevail in organisations (Weber et al., 2009) and the multi-organisational or inter-organisational data governance contexts (Brous et al., 2020; Yebenes & Zorrilla, 2019). Additionally, most of these definitions do not comprehensively address the application of new technologies, such as cloud computing, big data, or the Internet of Things (Al-Badi et al., 2018; Al-Ruithe et al., 2019; Brous et al., 2020; Yebenes & Zorrilla, 2019). This study employs a

conceptual framework that addresses these missing concepts to help bridge the gaps in the definition of data governance.

2.3.2 Data Governance Elements

Understanding the elements that characterise and describe data governance is essential for a holistic view. This subsection, therefore, discusses the scope and relationships of data governance elements. At a basic level, data governance comprises two dimensions: data and governance. This subsection attempts to provide a clear understanding of these two dimensions.

2.3.2.1 Definition of Data

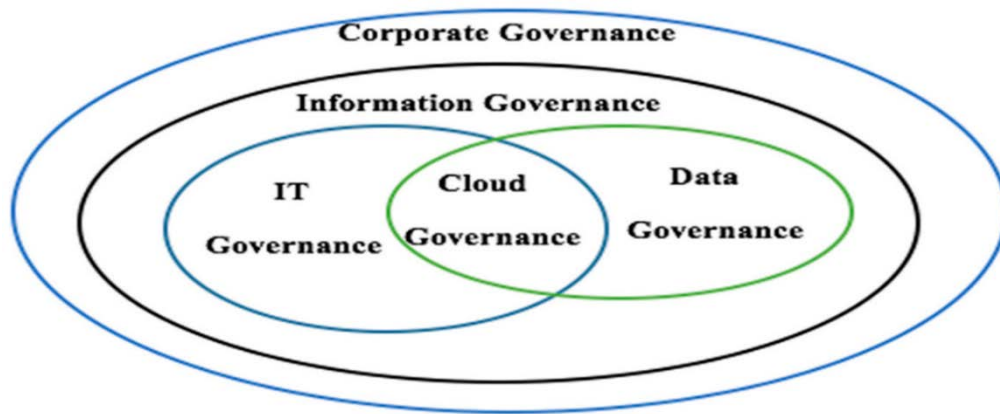
Most scholars define data as raw facts represented in various formats, such as text, numbers, graphics, images, sound, or video, while information is defined as processed data (Dahlberg & Nokkala, 2015; Otto et al., 2007; Weber et al., 2009). While these two phenomena have distinct definitions, some scholars use "data" and "information" interchangeably (Dahlberg & Nokkala, 2015; Niemi, 2015; Otto et al., 2007). The reason for the interchangeability of the two phenomena is that the boundary between data and information is very difficult to discern. This is further complicated by the ever-evolving information technologies that have distorted the lines between data and information by introducing complex data types, such as spatial, multi-media, and unstructured data (Paskaleva et al., 2017).

From a data governance perspective, the critical action undertaken on the data element is data management, whose primary objective is to realise data quality (Alhassan et al., 2018; Barker, 2016; Ladley, 2019). Furthermore, maintaining high-quality data is essential for

achieving several objectives, including regulatory compliance, profit generation, and informed decision-making (Otto et al., 2007; Thomas, 2006).

2.3.2.2 Governance

Generally, governance is an overarching activity that ensures set principles and rules are followed (Alhassan et al., 2018; Khatri & Brown, 2010). The governance concept is broken into diverse sub-categories, as presented in Figure 3.

Figure 3:*Enterprise Information Management Taxonomy*

Source: Al-Ruithe et al. (2018)

However, this sub-classification is inexhaustible; for example, other emerging related sub-classifications of Governance include Internet Governance, Big Data Governance, Cloud computing Governance, and Information Security Governance, among others (Al-Badi et al., 2018).

Relatedly, the terms "*information governance*" and "*data governance*" are also often used interchangeably. While these concepts may share common attributes, they are fundamentally different. Proponents of information governance, which differs from data governance, contend that it provides an overall strategic framework for managing all forms of content, whereas data governance restricts itself to managing information at the data or lowest level (Bennett, 2017; Hangmann, 2013). Regarding hierarchy, information governance is a subset of corporate governance whose objective is to maximise the value of information while

minimising the costs and risks of holding it. Similarly, data governance is a sub-component of information governance whose objective is the maintenance of data quality (Abraham et al., 2019; Bennett, 2017; Mullon & Ngoepe, 2019). Kooper et al. (2011), as cited in Zhang and Yuan (2016, p. 2), contend that data governance focuses on data assets, whereas information governance concerns data interactions.

Conversely, scholars (Godinez et al., 2010; Hagmann, 2013) who argue that data governance is equivalent to information governance agree that there are blurred lines between data and information. However, data transforms into information over its lifecycle, as presented in Figure 4 (DAMA, 2009). However, it is argued that the processes for managing data or information at any stage of its lifecycle are not markedly distinct (DAMA, 2009).

Figure 4:

Data Lifecycle Phases Identified by the Data Management Association



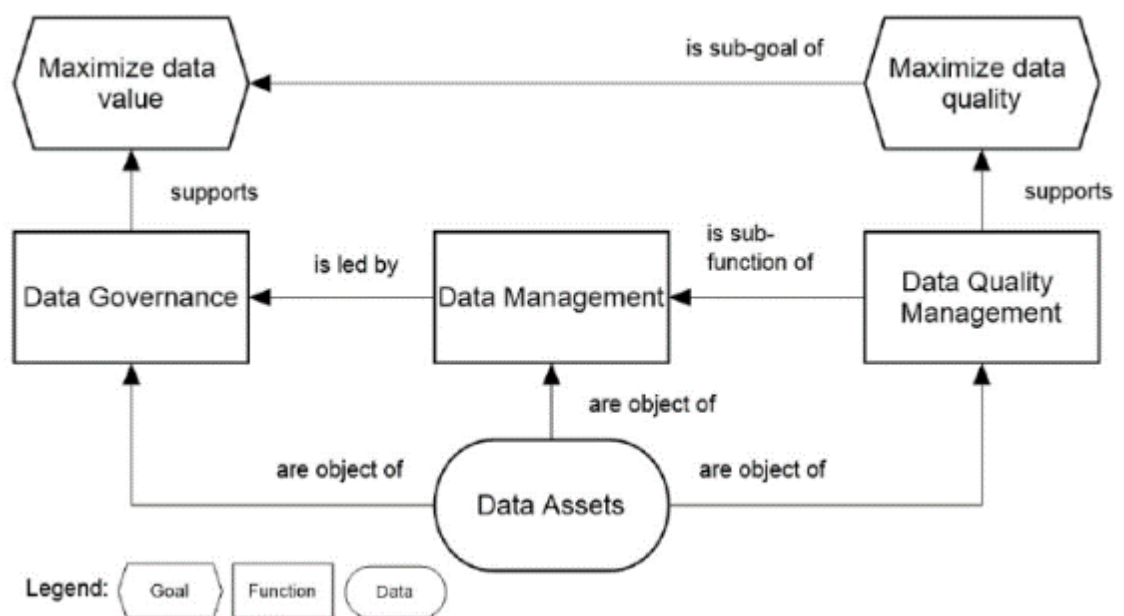
Source: DAMA (2009)

Similarly, there are misconceptions about the relationship between data governance and data management. The practitioner community often uses the terms “data governance” and “data management” interchangeably (Dahlberg & Nokkala, 2015; Niemi, 2015; Otto et al., 2007). However, some scholars (Mahanti, 2018; Martijn & Jonker, 2015; Olavsrud, 2021)

contend that data governance is a data management function, while others insist that data management is a component of data governance (Fu et al., 2011; Khatri & Brown, 2010; Ladley, 2019; Otto, 2011b; Wende, 2007). For example, Ladley (2019) asserts that data management represents short-term operational activities whose long-term combined outcome leads to data governance. Furthermore, the Body of Knowledge for Data Management (DMBOK) framework identifies data management as a suite of functions that are applied during the lifecycle of data but under an overarching data governance framework (Brackett et al., 2009; DAMA, 2009), which is supported by Otto and Österle (2015) who contend that data governance is preceded by data management as presented in Figure 5.

Figure 5:

Relationship between Quality, Management, and Governance of Data



Source: Otto and Österle (2015)

The professional organisation responsible for the collection of Knowledge regarding the governance and administration of data (DMBOK) defines data management as “*the development, execution, and supervision of plans, policies, programs, and practices that deliver, control, protect, and enhance the value of data and information assets throughout their lifecycles*” (DAMA, 2017, p. 21). Data management primarily focuses on defining the data element, including how it is stored, structured, and transmitted. Conversely, the Body of Knowledge for Data Management (DMBOK) defines data governance as “*the exercise of authority and control (planning, monitoring, and enforcement) over the management of data assets*” (DAMA, 2017, p. 71).

Relatedly, it is also essential to distinguish between Master Data Management, a methodology for referencing critical or shared data resources, and Data Governance, a system for overseeing the management of data throughout its lifecycle (Ladley, 2019; Vilminko-Heikkinen et al., 2016). Hence, master data management is a component of data governance. Above all, this study views data governance as an overarching, high-level planning and control concept that encompasses all data management activities (Al-Ruithe, 2018).

2.3.3 Scope of Data Governance

The scope of data governance is as varied as its definition. For example, Ladley (2019) contends that data governance scope is dependent on three factors, namely i) organisational business model, which is based on the type of organisation, organisational hierarchy, or operating environment; ii) type of content being governed, its location or prioritization; and iii) degree of the federation, which is concerned with the extent of content sharing. However, Alhassan et al. (2018) consider the scope of data governance to follow three phases, namely i)

the definition phase, ii) the implementation phase, and iii) the monitoring phase. While most studies approach data governance from the perspective of a single organisation (Berman, 2017; Cheong & Chang, 2007; Hagmann, 2013; Panian, 2010), there is an increasing number of studies using a multi-organisation or ecosystem approach (Gelhaar et al., 2021; Lis & Otto, 2020; Paskaleva et al., 2017; Yebenes & Zorrilla, 2019). Data Governance in a multi-organisation or ecosystem perspective involves significant data sharing and exchange between autonomous organisations, thus introducing new complexities, such as difficulties in determining data ownership or responsibility centres (Gelhaar et al., 2021; Lis & Otto, 2020; Tomusange et al., 2017). Furthermore, several scholars (Masilela & Nel, 2021; Mullan & Ngoepe, 2019; Van Ooijen et al., 2019) have studied data governance at a national level. For example, Mullan and Ngoepe (2019) developed a national information governance framework that defines data governance principles, recommends policy and regulatory instruments, and identifies critical success factors and key attributes required for implementing a national data governance framework.

Most data governance research has been conducted to date within a single company (Berman, 2017; Cheong & Chang, 2007; Hagmann, 2013; Panian, 2010). However, more studies are being conducted on inter-organisational data governance or data governance ecosystems (Gelhaar et al., 2021; Jagals & Karger, 2021; Lis & Otto, 2020; Nokkala, 2020). Although the data governance practices in the two viewpoints are different, they share some similarities. For example, from an intra-organisational perspective, the data governance actions are inward-looking and are mainly geared towards actions such as setting up organisational structures, internal governance controls enforcement, and internal resource management (Alhassan, 2016; Otto, 2011b; Weber et al., 2009), while the significant actions in an inter-

organisation perspective are geared towards data interoperability (Al-Ruithe et al., 2018; Nokkala, 2020). Data Governance in a multi-organisational setting requires more collaboration, unlike in the traditional single-organisation setting, which is more reliant on rule-setting (Al-Ruithe et al., 2018; Alhassan, 2016; Jagals & Karger, 2021; Nokkala, 2020).

2.3.4 The Value of Data

After demonstrating the relationship between data governance and data management, it is necessary to discuss data as an essential resource.

Over time, organisations primarily focused on information systems rather than on data that drives the applications (Dahlberg & Nokkala, 2015; Panian, 2010; Khatri & Brown, 2010). However, since the early 2000s, organisations began considering data as an essential resource in its own right (Khatri & Brown, 2010; Ladley, 2019; Ramadhan et al., 2021; Sweden, 2008), rather than a by-product of information systems (Alhassan et al., 2018; Otto, 2011b). Additionally, organisations realised that data outlasts applications following a massive replacement of legacy systems in the early 2000s (Sweden, 2008). Currently, data is considered one of the most valuable assets of modern organisations, as it plays a critical role in ensuring they maintain their competitive edge, helps reduce costs, and contributes to regulatory compliance (Niemi, 2015; Panian, 2010; Ramadhan et al., 2021). There is consensus among scholars that one of the primary motivations of data governance is considering data as a critical resource (Alhassan et al., 2018; Ladley, 2019; Otto, 2011b). Consequently, acknowledging the value proposition of information is crucial for effectively executing any Data Governance scheme (Lardley, 2019; Olavsrud, 2021; Panian, 2010).

As Panian (2010) illustrates, data constitute descriptions or analyses of an institution's business transactions, employee, supplier, or customer records, as well as organisational performance records, among other things, which are essential for its continued operation. As a result, the intrinsic value of data being a critical resource is primarily influenced by what it represents and the need to share data across multiple technological platforms or reuse data among different business processes, both inside and between organisations (Nokkala, 2020; Panian, 2010; Yebenes & Zorrilla, 2019).

As Lardley (2019) asserts, the success of a data governance initiative can be assessed by how an organisation treats its data compared to other resources, such as machinery and capital. Hence, like any other organisational assets, data management requires established policies, processes, monitoring, and roles/responsibilities (Khatri & Brown, 2010; Otto, 2015; Weber et al., 2009). While data is increasingly recognised as a valuable enterprise asset, many organisations have yet to realise its full business value due to poor or a lack of data governance practices (Guetat & Dakhli, 2015; Panian, 2010).

2.3.5 Motivations for Governance of Data

Although data governance is driven by a variety of motivations, maintaining data quality is one of the most often mentioned motivators (Alhassan et al., 2018; Heine et al., 2020; Ladley, 2019; Liaw et al., 2014; Otto et al., 2007). For example, Otto (2011) identifies six drivers of data governance, namely i) ensuring regulatory compliance, ii) supporting decision-making, iii) improving customer satisfaction, iv) increasing operational efficiency, v) supporting business integration, and vi) maintaining or improving data quality. Chalker (2014) identifies seven business drivers of data governance as i) maintaining compliance, ii)

centralising oversight and control, iii) improving operational effectiveness, iv) improving data quality, v) improving the efficiency of data origination and maintenance of data, vi) satisfying market demands for appropriate information, and vii) sharing of accurate data with external stakeholders. Common among the motivation drivers identified by Otto (2011) and Chalker (2014) is the improvement or maintenance of data quality.

While organisations strive to maintain a competitive advantage by optimising, reengineering, and digitising their business processes to provide their clients and staff with the best experience, this is only possible through the availability of high-quality data (Belghith et al., 2021). Therefore, data governance is crucial in ensuring that high-quality data is available for executing business processes (Chen, 2021).

The data and analytical services market is growing exponentially, increasing profits for data-reliant companies such as Facebook (Meta) and Google (Belghith et al., 2021). Increasingly, organisations now view data as a production factor alongside land, labour, and capital (Haryadi et al., 2017). Data has become crucial in creating innovative products and services following the advent of digital technologies. For example, autonomous vehicles rely on machine-learning algorithms that use annotated data, sensors, and cameras for navigation (Alanazi, 2023). Therefore, data governance is essential for advancing new technologies that rely on high-quality data.

2.3.6 Barriers to Data Governance

Researchers have consistently identified multiple barriers to effective data governance, which can be categorised as i) Organisational, ii) Technical, iii) Legal and Regulatory, iv)

Cultural and Human, v) Financial, and vi) Trust and Transparency barriers. Table 6 presents an analysis of common data governance barriers.

Table 6:

Analysis of Common Data Governance Barriers

Barrier	Description	Impact on Data Governance
i. Organisational Barriers	A lack of leadership commitment, unclear roles, and the absence of institutional coordination weaken governance accountability and enforcement mechanisms.	Weak governance structures reduce oversight and hinder the establishment of coherent data policies and decision-making frameworks (Al-Ruithe, Benkhelifa, & Hameed, 2019; Were & Moturi, 2017).
ii. Technical Barriers	Fragmented data systems, poor data quality, and a lack of interoperability across platforms create operational silos.	Data inconsistencies and system incompatibilities impede integration, access, and effective data utilisation (Al-Ruithe et al., 2019; Janssen et al., 2020; Nielsen et al., 2018).
iii. Legal and Regulatory Barriers	Unclear data ownership, privacy restrictions, and divergent compliance requirements across jurisdictions.	Legal uncertainty discourages data sharing and innovation while increasing organisational risk and compliance burdens (Bassi & Alves-Souza, 2023; Ladley, 2019).
iv. Cultural and Human Barriers	Low data literacy, resistance to change, and a weak data stewardship culture across departments.	Poor awareness and negative attitudes toward data governance reduce adoption and adherence to governance standards (Bassi & Alves-Souza, 2023; Daneshmandnia, 2019).
v. Financial Barriers	Inadequate funding for governance tools, staff training, and infrastructure development.	Resource shortages limit capacity-building efforts and sustainability of governance initiatives (Al-Ruithe et al., 2019; Bassi & Alves-Souza, 2023).
vi. Trust and Transparency Barriers	Lack of confidence in data integrity, privacy, and ethical use.	Low trust discourages data sharing, both internally and externally, undermining governance objectives (Ladley, 2019).

In general, there appears to be a consensus on what constitutes the barriers to data governance, and similarly, there should be a convergence of minds on the solutions for mitigating these challenges.

2.3.7. Impact of Socio-ethical Issues on Data Governance

Data is ubiquitous and crucial for service delivery, policy development, and product creation (Andrew, 2023). As the scale and scope of data use expand, data governance presents substantial socio-ethical issues that necessitate meticulous attention during the development and implementation of data governance initiatives (Edquist & Rowshankish, 2022).

One of the most important socio-ethical considerations for data governance is protecting individuals' privacy. Combining data ethics with data protection laws makes things fairer, less biased, and upholds stakeholders' trust (Schubert & Barrett, 2024). Similarly, fair and inclusive data use needs governance systems that ensure transparency, accountability, and responsiveness through socio-ethical data governance (Edquist & Rowshankish, 2022; OECD, 2019). Therefore, data governance must synchronise policy interventions with socio-ethical considerations to foster equity and inclusivity in data utilisation.

In addition to procedural safeguards, data governance should adopt a social justice paradigm that mitigates the bias and inequity inherent in data-driven systems (Edquist & Rowshankish, 2022). For example, biases that occur during data annotation and algorithmic design can perpetuate discrimination in automated decision-making systems (Fadler & Legner, 2021; Janssen et al., 2020). As such, identifying and addressing human and algorithmic biases in data governance is crucial for protecting data subjects and ensuring fairness.

In general, the socio-ethical aspects of data governance are crucial for ensuring that data practices are fair, responsible, and transparent to everyone. Ethical data governance enhances the quality of data, safeguards the rights of data subjects, and strikes a balance between privacy and utility (Andrew, 2023; Edquist & Rowshankish, 2022).

2.4 DATA GOVERNANCE FRAMEWORKS OVERVIEW

This section discusses existing data governance frameworks, considering their strengths and weaknesses. It also analyses traditional data governance frameworks versus emerging big data governance frameworks. It concludes with a discussion of Data Governance Capability Maturity Models.

2.4.1 Definition of Data Governance Framework

A Data Governance Framework is “*a set of processes that ensures that important data assets are formally managed throughout the enterprise*” (Al-Badi et al., 2018, p. 2). Specifically, a data governance framework is a collection of procedures, policies, functions, and standards that organisations employ to guarantee that their data is safe, correct, consistent, and used effectively (Ladley, 2019; Lefebvre & Legner, 2024). A Data Governance Framework aims to establish clear responsibilities for data management and promote the trustworthy and ethical use of data across the entity (Al-Ruithe, 2019; Ladley, 2019).

Data Governance is a multidisciplinary and multidimensional concept that has led to most frameworks proposed over time having many differences, which can be explained by the

different approaches used, definitions, and objectives (Al-Ruithe et al., 2019; Weber et al., 2009). For example, some frameworks are based on IT governance models (Khatri & Brown, 2010; Otto & Österle, 2015; Wende & Otto, 2007), while others focus on organisational structures, data principles, and the data lifecycle (Cheong & Chang, 2007). Despite the differences, many data governance frameworks share some common attributes that include i) the scope or focus of the framework on variables such as data quality, data availability, and data privacy, ii) data quality management, iii) functions and duties such as data custodianship, iv) compliance with regulatory and legal provisions such as data protection laws, and iv) performance appraisal (Al-Ruithe et al., 2019; Ladley, 2019; Otto & Österle, 2015; Wende & Otto, 2007).

Therefore, because there is no one-size-fits-all method for developing a data governance framework (Weber et al., 2009), it is vital to identify and analyse the most appropriate components and themes for developing a generic contextualised public sector data governance framework, as presented in Chapter 4.

2.4.2 Practitioner Data Governance Frameworks

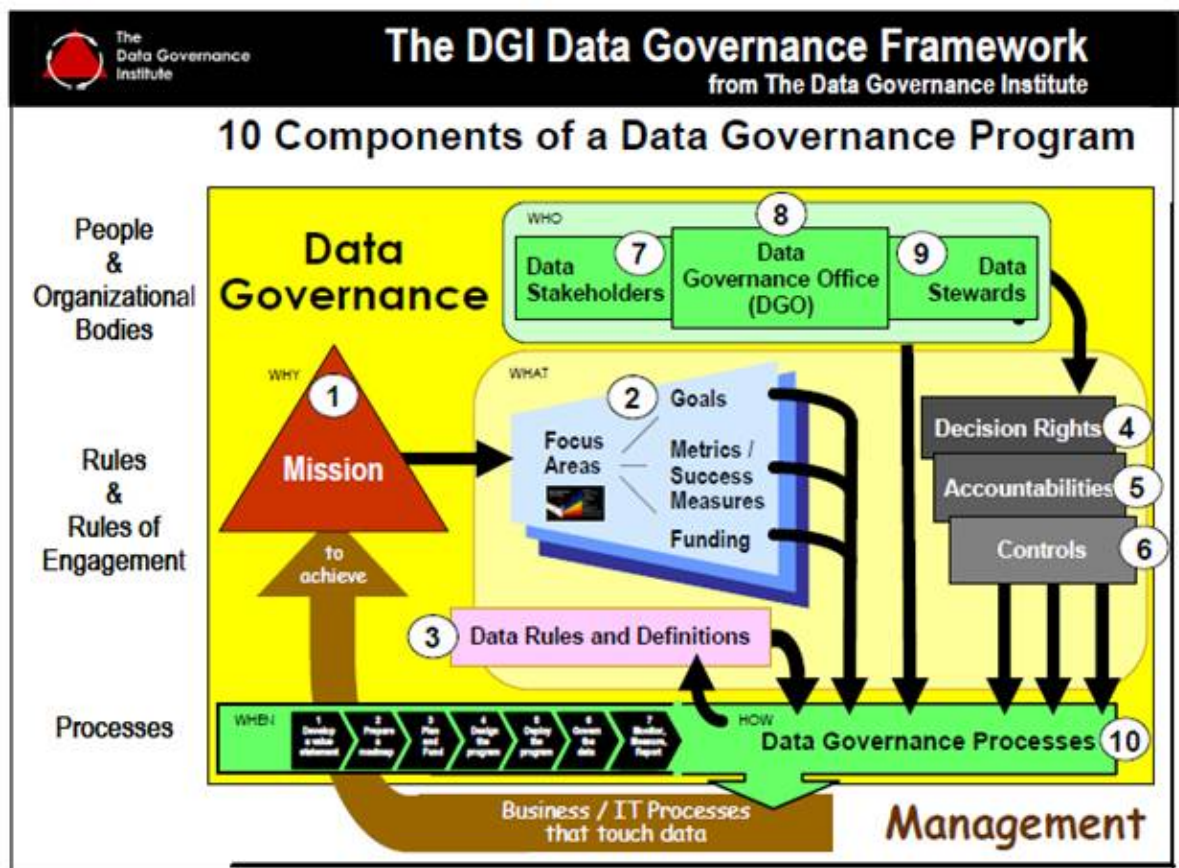
Organisational data governance frameworks used in practice may differ significantly depending on various parameters, such as the institution's size, sector, and data management requirements (Al-Ruithe, 2019; Ladley, 2019; Otto et al., 2007). The next subsection discusses examples of generic frameworks for data governance that organisations use in real life.

2.4.2.1 Framework from the Data Governance Institute (DGI)

The Data Governance Institute (DGI) Framework is one of the most widely used frameworks in enterprises (DGI, 2024). It comprises ten major components, which are divided into three categories, namely i) People and Organisational Structures, ii) Rules and Terms of Engagement, and iii) Processes (DGI, 2024), as illustrated in Figure 6.

Figure 6:

DGI Data Governance Framework



Source: DGI (2024)

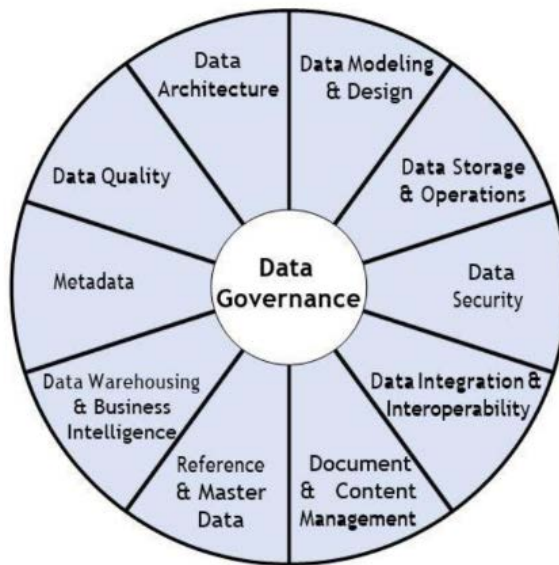
The strength of this framework is that i) it emphasises the alignment of data governance goals with the organisation's strategic objectives and performance indicators, ii) it promotes collaboration and accountability, and iii) it is adaptable for use across diverse sectors (DGI, 2024; Mahanti, 2021). The main weakness of the DGI Framework is its complexity and heavy resource requirements, which may impede its adoption by smaller organisations (Mahanti, 2021).

All things considered, the Institute of Data Governance's framework is a popular and dynamic framework that provides businesses with a solid foundation upon which to establish and maintain effective data governance operations. However, some entities, especially those with constrained resources or limited experience in data governance, may find it challenging to manage due to its complexity and reliance on specific tools from the Institute of Data Governance.

2.4.2.2 Data Management Body of Knowledge (DMBOK)

The Data Management Association (DAMA) created and continuously updates the Data Management Body of Knowledge (DMBOK), which is a standard for data management practices that is globally recognised (DAMA, 2017). The DMBOK framework puts data governance at the centre of the larger data management ecosystem. It establishes rules, standards, and best practices to ensure that data resources are well-managed and controlled (Aisyah et al., 2018; Begg & Caira, 2011; Belghith et al., 2021; Ganjhu, 2023; Steenbeek, 2019).

The DMBOK views data management as a "wheel" comprising nine knowledge domains that collectively support the primary function of data governance (DAMA, 2017). These areas collectively form the technical, operational, and strategic foundations for managing data within an organisation (Ganjhu, 2023), as illustrated in Figure 7.

Figure 7:*DAMA-DMBOK Functional Framework*

Source: DAMA (2017)

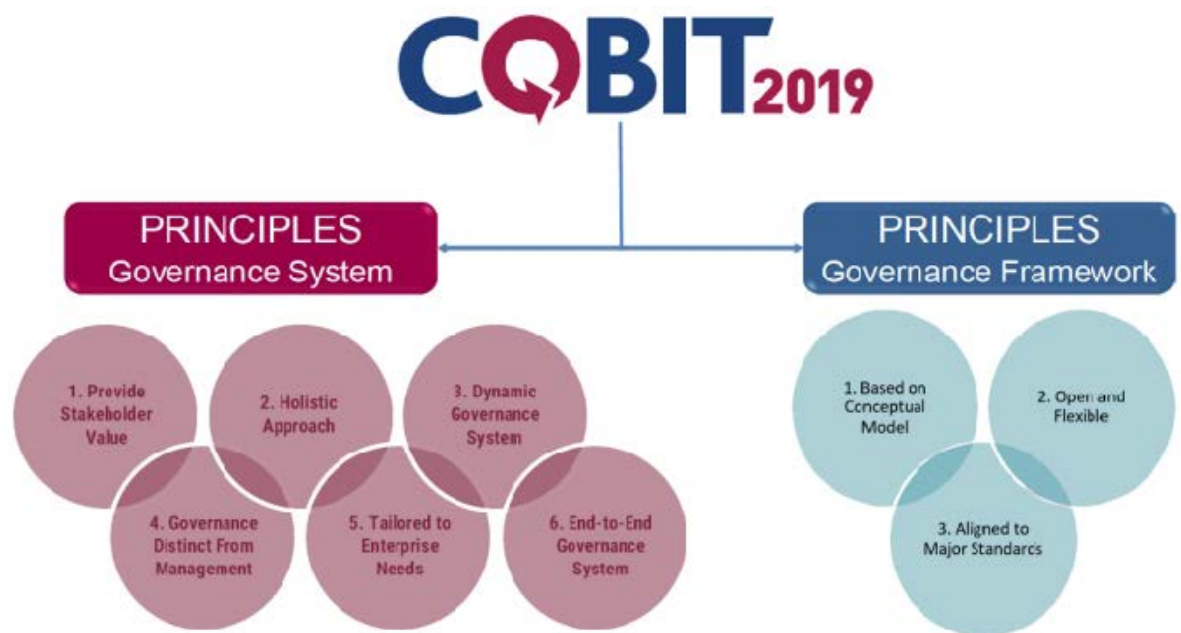
The strength of the DMBOK framework lies in its provision of a maturity assessment model, which functions as a tool to evaluate data governance capabilities (Belghith et al., 2021; Brackett et al., 2009; Cuppoli, 2014). Despite this strength, implementing DMBOK effectively requires sustained commitment, resources, and expertise (Begg & Caira, 2011; Ganjhu, 2023). In practice, DMBOK is widely used by professionals to establish and maintain effective data governance practices (Aisyah et al., 2018; Begg & Caira, 2011; Belghith et al., 2021; Steenbeek, 2019).

2.4.2.3 COBIT Framework

The COBIT framework, created by ISACA, provides a governance and management structure for enterprise information systems, integrating IT processes, such as data governance, with organisational strategy (Olatain et al., 2019; Otto et al., 2007). Its principles, which incorporate aspects of control, performance, risk, and compliance, contribute significantly to effective data governance. Figure 8 provides a visual representation of the COBIT framework.

Figure 8:

COBIT Framework



Source: ISACA (2019)

The key strengths of COBIT relevant to data governance include (i) *the strategic alignment of governance activities with an organisation's overarching goals and objectives*, ensuring that data governance initiatives directly support business outcomes rather than

functioning as isolated technical exercises (Olatain et al., 2019); ii) *risk management*, where COBIT offers a proactive, agile and structured approach for identifying, assessing, and mitigating risks (Otto et al., 2007); iii) *performance appraisal and continuous improvement*, it provides metrics and indicators to evaluate the efficiency and effectiveness of data governance processes (Olatain et al., 2019; Otto et al., 2007); iv) *compliance and legal adherence* - helps organisations meet their regulatory, statutory, and contractual obligations related to data management (Olatain et al., 2019).

The primary weakness of the COBIT Framework in data governance is its overarching focus on IT governance, which diminishes attention to specific data governance needs (Otto et al., 2007). Initially intended for managing enterprise IT processes, COBIT provides limited guidance on data management compared to specialised frameworks such as DMBOK or DGI, which offer more comprehensive guidance. Another shortcoming of the COBIT framework is the limited scholarly literature on its practical implementation in data governance (Zhang & Fever, 2013). As such, organisations may find it challenging to locate appropriate case studies and best practices to benchmark against. Relatedly, practitioners often find navigating and implementing the framework effectively challenging due to its complex language and structure (Zhang & Fever, 2013). Overall, COBIT is a valuable instrument for improving data governance. It offers an organised approach to controlling data risks, harmonising data governance with business goals, and ensuring regulatory compliance.

2.4.2.4 PwC Enterprise Data Governance Framework

The Price Waterhouse Coopers (PwC) framework underlines the importance of a Data Governance strategy built after defining business goals and metrics (PwC, 2019; PwC, 2021).

It emphasises Enterprise Data Management and prioritises building systems to manage metadata, data integration, and data analytics (PwC, 2021).

As illustrated in Figure 9, the PwC Data Governance Framework has four layers: i) the Strategic Layer, which outlines the governance strategy and vision; ii) the Stewardship and Core Layer, focusing on daily data management tasks like information security and metadata management to maintain quality and integrity; iii) the Enablers, which address change management and user adoption; and iv) the Data Lifecycle Management Layer, encompassing processes related to managing data throughout its lifecycle.

Figure 9:

PwC Data Governance Framework

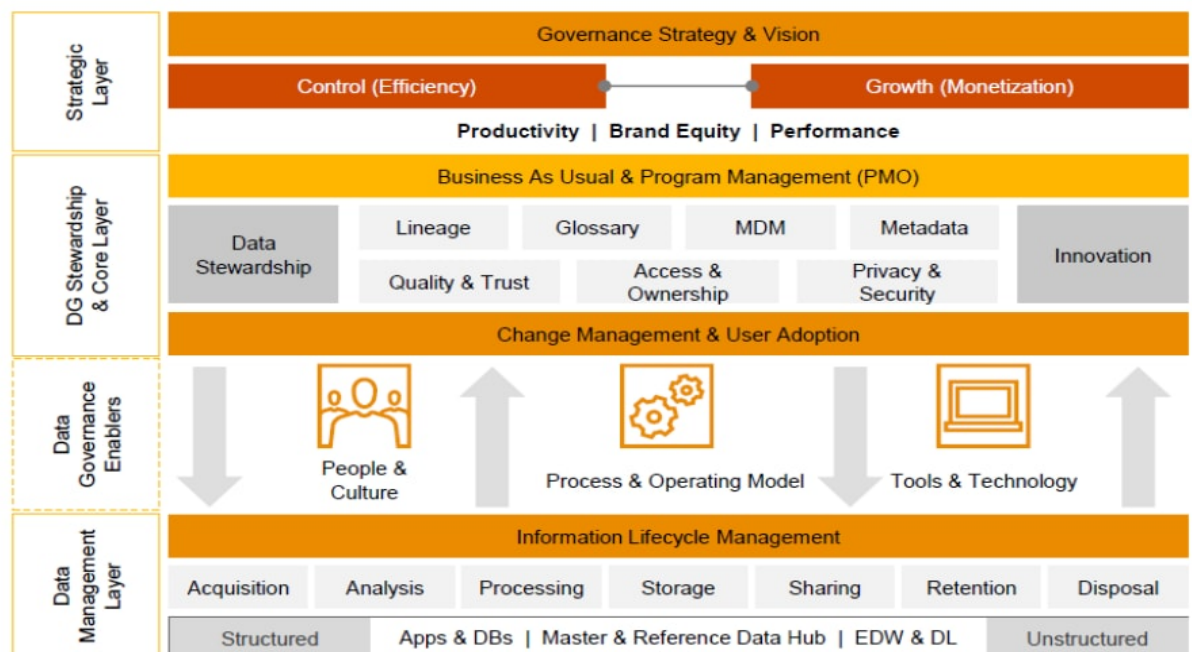


Figure 1: PwC's Data Governance Framework

Source: PwC (2021)

As part of lifecycle management, the framework recommends that organisations do the groundwork for streamlining and managing the data flow until it is archived or disposed of.

The PWC framework encourages organisations to set up a tailored governance solution after identifying gaps in the ecosystem and assessing maturity levels. This approach is a significant step forward in fostering adaptability and enhancing Data Governance at the grassroots level.

2.4.2.5 McKinsey Data Governance Framework

This McKinsey 7S model comprises of seven variables: i) Staff - optimum and competent human resources, ii) Structure - an optimized establishment, iii) Systems - consistent procedures and workflows, iv) Shared Values - commonly accepted rules and norms, v) Style - organisational culture, vi) Skills - requisite capability and knowledge), and vii) Strategy - alignment with organisational goals (Masilela & Nel, 2021; McKinsey, 2024). The 7S mode provides a holistic data governance approach to harmonise strategic, structural, and cultural aspects, thereby enhancing the management of data as a critical asset (Alhassan et al., 2018; Cheong & Chang, 2007; Masilela & Nel, 2021).

A significant strength of the 7S Model lies in its comprehensive and integrative approach. It integrates all seven elements, ensuring that data governance is not limited to technical and compliance requirements, but is embedded within all organisational activities (Alhassan et al., 2018; Manyika et al., 2016). It is also valuable for change management and

maturity assessment, enabling organisations to diagnose weaknesses and improve their governance capacity systematically (Cheong & Chang, 2007; Manyika et al., 2016).

However, the model lacks specific operational guidelines for implementing technical aspects of data governance, such as data quality, metadata management, or compliance controls (Otieno et al., 2022). *Its qualitative nature* makes evaluation subjective and difficult to measure quantitatively (Alhassan et al., 2018). Furthermore, it does not explicitly address *technological or regulatory complexities*, such as cybersecurity or data privacy legislation, which are central to contemporary data governance (Masilela & Nel, 2021). Consequently, the 7S model must often be complemented by more prescriptive frameworks, such as COBIT, DGI, or the DAMA-DMBOK frameworks, to ensure operational completeness.

Above all, according to researchers such as Al-Ruithe (2019), Ladley (2019), Wende and Otto (2007), and Weber et al. (2009), the diverse character of organisations, cultures, operating environments, and regulatory regimes renders the attainment of a universal data governance framework impractical. Conversely, some other scholars (Dyché, 2007; Wende & Otto, 2007) contend that published frameworks provide a solid basis for developing data governance for any organisation. Therefore, apart from developing a contextualised, unique Data Governance Framework, one may adopt or customise an existing industry-standard framework. It is primarily for this reason that this research benchmarked the Abraham et al. (2019) cross-functional data governance framework.

2.4.2.6 Comparative Analysis of Key Industry Data Governance Frameworks

Table 7 presents a comparative analysis of the strengths and weaknesses of several well-known data governance frameworks. However, it is important to recognise that the strengths and weaknesses of data governance frameworks are inherently context-dependent; their impact, applicability, and relevance may vary depending on specific organisational requirements or implementation objectives.

Table 7:

Comparative Analysis of Data Governance Frameworks

Framework	Strengths	Weaknesses
The Data Governance Institute (DGI) Framework	Practical and implementation-focused; Well-structured roles, responsibilities, and processes; Suitable for organisations starting from scratch	Lacks the depth of broader frameworks like DAMA-DMBOK; Less focus on analytics and emerging technologies.
DAMA-DMBOK (Data Management Body of Knowledge)	Comprehensive and industry-recognised; Covers a wide range of data management functions; Provides a strong foundation for governance policies and roles.	Lacks implementation guidance; Overwhelming to adapt due to its broad scope.
COBIT (Control Objectives for Information and Related Technologies)	Strong focus on aligning IT and business goals; Offers detailed control objectives; Well-suited for regulatory compliance.	More focused on IT governance than data governance specifically; Smaller organisations find challenges adapting to it.
DCAM (Data Management Capability Assessment Model)	Assessment-based, enabling benchmarking- Tailored for financial institutions; Encourages maturity-based implementation	Industry-specific (primarily finance); Limited flexibility for non-financial organisations.

Framework			Strengths	Weaknesses
EDM (Cloud Capabilities)	Council's Data Management	CDMC	Cloud-focused governance model. Endorsed by major cloud providers; Strong emphasis on security and privacy	Still emerging; not yet widely adopted; Primarily cloud-oriented, it may not suit on-premises environments
IBM Council	Data Maturity Model	Governance	Maturity-based framework allows gradual adoption; Focuses on risk management and compliance; Provides strategic and operational levels of governance	Vendor-specific influences- Less detailed than DAMA-DMBOK in certain areas

2.4.2.7 Key Determinants for Data Governance Success

This study analysed the critical success factors highlighted in previous academic research that are fundamental to the effective governance of data. The findings from this literature analysis are subsequently utilised to assess the primary data results as discussed in Chapter 4. This comparative analysis informed the response used to address Research Question 4 (i.e., RQ4: “*What challenges do government employees face when managing data in Uganda?*”).

The analysis of the literature on critical success factors for data governance led to the classification of these factors into three overarching dimensions, namely i) Strategic, ii) Operational, and iii) Cultural factors, as summarised in Table 8.

Table 8:

Summary of Data Governance Critical Success Factors

Dimension	Critical Success Factors	Impact	Supporting Literature
Strategic Factors	Executive Sponsorship and Leadership Commitment	Ensures data governance has organisational authority, visibility, and resources for implementation.	Alhassan et al., 2016; Khatri & Brown, 2010; Mahanti, 2018
	Strategic Alignment with Business Goals	Links data governance initiatives to core organisational strategy, creating measurable business value.	Ateş & Garip, 2023; Alhassan et al., 2016; Khatri & Brown, 2010
	Policies, Standards and Procedures	expectations met through documented policies and repeatable processes.	Alhassan et al., 2016; Khatri & Brown, 2010; Mahanti, 2018
	Compliance and Risk Management	Aligns data governance with external regulations and internal risk controls to reduce exposure.	Brous et al., 2020; Alhassan et al., 2016
Operational Factors	Defined Roles, Responsibilities and Governance Structures	Establishes clear ownership and accountability across business and technical functions.	Alhassan et al., 2016; Brous et al., 2020
	Incremental Approach to Data Governance	Addresses the adoption and complexity challenges.	Brous et al., 2020; Mahanti, 2018; Muhumuza & Baguma, 2023
	Data Quality Management	Implements continuous monitoring and remediation to ensure the fitness of data for decision-making.	Ateş & Garip, 2023; Brous et al., 2020
	Technology and Tools Support	Enables scalability and efficiency via metadata management, lineage, and cataloguing systems.	Alhassan et al., 2016; Ateş & Garip, 2023; Brous et al., 2020; Muhumuza & Baguma, 2023
	Performance Measurement and Maturity Assessment	Uses KPIs and maturity models to track progress and inform governance improvement initiatives.	Alhassan et al. (2016); Ateş & Garip, 2023; Brous et al., 2020
Cultural and Human Factors	Stakeholder Engagement and Collaboration	Fosters cross-functional cooperation and organisational buy-in for governance initiatives.	Alhassan et al., 2016; Tsavatewa, 2023
	Skills, Training and Change Management	Builds awareness, competence, and stewardship culture across the organisation.	Ateş & Garip, 2023; Brous et al., 2020; Tsavatewa 2023

Overall, this classification demonstrates that effective data governance depends on the seamless integration of strategic leadership, operational, and cultural elements. Strategic elements provide direction and oversight, operational elements establish the structures and processes through which governance is implemented, and cultural elements promote sustainability by embedding governance practices into organisational behaviour. Research shows that organisations that are well-integrated across these areas tend to have more mature governance and better data-driven decision-making skills (Alhassan et al., 2016; Brous et al., 2020; Mahanti, 2018). This aligns with the concepts of interrelationship and interdependence in systems theory.

2.4.3 Scholarly Frameworks of Data Governance

Over the years, various scholars have proposed data governance frameworks based on their research findings (Al-Badi et al., 2018; Cheong & Chang, 2007; Niemi, 2015; Ladley, 2019; Lefebvre & Legner, 2024; Yebenes & Zorrilla, 2019). This study conducted a comparative analysis of scholarly data governance frameworks proposed by researchers in previous studies.

The comparative analysis was based on the framework's characteristics, scope, design approach, conceptual framework, and strengths/weaknesses. The results of the comparative analysis are summarised in Table 9.

Table 9:*Comparative Assessment of Scholarly Data Governance Frameworks*

Author(s)	Scope	Framework Approach	Conceptual Framework	Strengths	Weaknesses
Thomas (2006), the Institute of Data Governance Framework.	Stewardship structure (people and organisational bodies), Policies (standards and principles), and processes.	Proposes a methodology for designing an institutional data governance program.	Based on IT governance concepts and industry best practices in data governance.	A universal data governance framework applicable across various domains.	Requires rigorous testing and validation
Cheong & Chang (2007). The need for data governance.	Stewardship Structure, Policies, Processes, and Technology.	Data Governance structure, together with policies and procedures for managing data effectively.	Extends the Frameworks of the Institute of Data Governance (Thomas, 2006).	Identifies the data stewardship structures and roles.	The scope of the study from which this framework was developed was limited to the management members, moreover, from one company, and overreliance on IT resources.
Otto et al. (2007). - Towards a	Data quality management	Business Process Reengineering (data	Deduced from IT Infrastructure	i) Aligns data management to the	The scope is limited to data

Author(s)	Scope	Framework Approach	Conceptual Framework	Strengths	Weaknesses
corporate data quality management framework.		quality strategy, organisation, and information systems) plus two data management aspects (data governance and execution).	Library (ITIL) and the Control Objectives for Information and Related Technology (CobiT) Information Technology frameworks.	organisational business objectives; ii) integrates data governance into the organisational structure.	quality management
Weber et al., 2009.	This paper explains that standardised contingency strategies are inadequate for data governance.	It focuses on data quality management through roles (executive sponsor, chief steward, data custodian, and technical data officer), decision areas (or tasks), and responsibility assignments, which form a responsibility assignment matrix.	Extends concepts from Information Technology governance and organisational theory.	i) Caters for innovative data governance approaches; ii) a flexible model that demonstrates the fit between contingencies and the company-specific configuration of the model	i) Does not provide adequate guidelines; ii) Attempts to map Information Technology governance to data governance, which are not an exact fit; iii) Does not provide for performance appraisal
Khatri and Brown (2010).	Aligns governance information data with	It uses five pillars, namely i) principles, ii) quality, iii) metadata, iv)	Adapts an Information Technology governance	Creates synergies between data governance and	Faulted for overdependence on IT processes

Author(s)	Scope	Framework Approach	Conceptual Framework	Strengths	Weaknesses
	technology governance.	accessibility, and v) lifespan.	framework developed by Weill and Ross (2004)	Information Technology governance	
Cupoli et al., 2014 Data Management Association - Body of Knowledge for Data Management version 2 (DAMA-DMBOK2) Framework	11 knowledge areas (data quality, data architecture, data modelling and design, data storage and operations, data security, data integration and interoperability, documents and content, reference and master data, data warehousing and business intelligence, metadata and data governance)	Each knowledge area has the following attributes: Definition of the knowledge area; Goals of the Knowledge Area; Process to be conducted; Inputs for carrying out the processes; Supplier Roles that provide inputs to the processes; Roles for performing the Process; Stakeholders that have an interest in the processes; Technology tools used for executing the processes; Deliverables produced by the processes; Consumers of the deliverables; Metrics for measuring the performance of the processes.	Based on IT governance concepts and best practices in the data management industry.	i) Based on industry best practices; ii) collectively developed by leading data governance industry practitioners.	Requires rigorous testing and validation
Al-Badi et al. (2018). Exploring	Establish an organisational	Adopts principles of information governance	Based on the ISO 8000 data	Tested against ISO 8000 standard criteria and met	Requires rigorous

Author(s)	Scope	Framework Approach	Conceptual Framework	Strengths	Weaknesses
governance frameworks for big data	framework, discern pertinent stakeholders, delineate the big data scope, formulate regulatory instruments, rationalize computational processes, assess and oversee quality, archive the data, and facilitate communication and management of data.	guidelines (i.e., organisation, metadata, privacy, data quality, business process integration, master data integration, and information lifecycle management).	governance framework.	87% of the standard's requirements.	validation in scholarly works

In general, the existing frameworks provide a strong foundation for designing and developing data governance for any organisation (Khatri & Brown, 2010; Otto & Österle, 2015; Wende & Otto, 2007). This is partly why this study adopted the conceptual model of the Abraham et al. (2019) cross-functional framework.

2.4.4 Data Governance Capability Maturity Models

The data governance maturity models are tools used to assess and measure the level of data governance implementation in an organisation (Begg & Caira, 2011) or compare the status of data governance across multiple organisations (Steenbeek, 2019). The Software Capability Maturity Model (CMM) was initially developed in 1986 by the Carnegie Mellon Software Engineering Institute to help define and measure the stages of software development. This model established the foundation for the notion of Capability Maturity Models for evaluating Data Governance (Chrissis & Weber, 1993).

Maturity assessment frameworks for the governance of data are used for i) defining the desired situation, ii) assessing implementation gaps between the current and the desired situation, iii) producing baseline results to guide process improvement, and iv) specifying the industry-best practice benchmarks (Begg & Caira, 2011; Belghith et al., 2021; Steenbeek, 2019).

Limited academic research has been undertaken in the area of data governance maturity models (Belghith et al., 2021; Steenbeek, 2019). Therefore, this study shall mainly review some of the popular data governance capability maturity models from the practitioner's community, namely including i) the Data Management Book of Knowledge from DAMA (Data

Management Association), ii) the Data Management Capability Assessment Model, iii) the CMMI's Model for assessment of Data Management Maturity, and iv) the Approach to a Comprehensive Knowledge Environment (MIKE2.0).

These data governance maturity models shall be evaluated using a meta-model developed by Belghith et al. (2021), which analyses the functional scope of the model and approach to identify or categorise the data management-related functions.

2.4.4.1 DAMA-DMBOK2 Data Management Maturity Model

The Body of Knowledge for Data Management (DMBOK) Data Management Maturity Model, developed by the Data Management Association, is one of the most widely used frameworks in the industry (Begg & Caira, 2011; Belghith et al., 2021; Steenbeek, 2019). The model views data management as the composition of eleven knowledge areas, namely i) data quality, ii) data architecture, iii) data modelling and design, iv) data storage and operations, v) data security, vi) data integration and interoperability, vii) documents and content, viii) reference and master data, ix) data warehousing and business intelligence, x) metadata, and xi) data governance) interconnected by business functions. The model has six assessment levels, namely, i) *Level 0 – No capability*, where there is no organized data governance in place; ii) *Level 1 – Initial/Ad hoc*, where some minimal data governance efforts exist; iii) *Level 2 – Repeatable*, where formal data governance has commenced with roles, processes and tools in place; iv) *Level 3 – Defined*, where data viewed as a critical resource and business enabler; v) *Level 4 – Managed*, where proper data governance is in place and is measured; vi) *Level 5 – Optimization*, where the data governance is highly predictable and metrics to measure data quality and management are fully utilized. DAMA - DMBOK2 presents five assessment

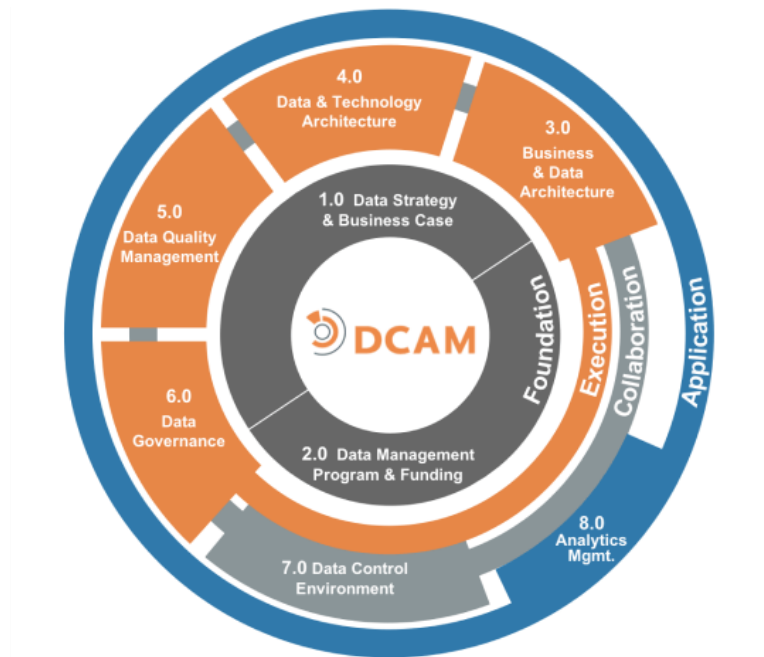
methods, namely assessment of i) activities or processes, ii) tools, iii) standards, iv) people, and v) resources. These assessment criteria are applied to each knowledge area to evaluate performance. However, the DAMA-DMBOK2 maturity model is faulted for not providing a detailed methodology for conducting the assessments (Steenbeek, 2019).

2.4.4.2 Data Management Capability Assessment Model (DCAM)

The Data Management Capability Assessment Model (DCAM) is an extensive framework that offers organisations a structured mechanism for assessing their data management activities against business objectives and a mechanism for improvement (Caballero & Piattini, 2023; EDM-Council, 2020). As presented in Figure 10, the Model is comprised of eight elements that are arranged in four levels, namely i) Foundation Level, ii) Execution Level, iii) Collaboration Level, and iv) Application Level.

Figure 10:

The Capability Assessment Model for Data Management (DCAM)



Source: EDM (2024)

The Data Capability Assessment Model has six maturity levels, as presented in Table 10.

Table 10:

DCAM Data Capability Assessment Maturity Levels

Stage	Name	Description
Level 1	Non-initiated	Capabilities are disorganised, and there is ad hoc data management.
Level 2	Conceptual	Initial data governance planning has commenced. Data management practices are instance-based.

Level 3	Developmental	The engagement of stakeholders has commenced. Data management procedures align with business goals.
Level 4	Defined	The organisation has attained the capacity for sound data management, which stakeholders have endorsed. Stakeholders are taking an active role.
Level 5	Achieved	Stakeholders have adopted data management capabilities that are embedded into their operations, and adherence is enforced.
Level 6	Enhanced	Data management capabilities are fully integrated into the organisation's business processes and culture.

Source: EDM-Council (2020)

DCAM's strengths include i) providing an extensive and methodical arrangement for evaluating data management, ii) aligning the assessment with the business goals, and iii) offering a mechanism for measuring risk management and compliance.

First, the Comprehensive and Structured Approach. This framework provides an exhaustive and methodical approach that helps organisations establish a robust data governance assessment function. Its structure provides organisations with a comprehensive view of their data governance activities, enabling them to easily identify areas of strength and weakness for improvement.

Second, Alignment with Business Goals. One of DCAM's fundamental tenets is harmonising data governance with an entity's business goals. By evaluating the role of data in supporting strategic initiatives, leadership, and operational procedures, DCAM helps companies ensure that their data management practices enhance their bottom line. According to research conducted by Deloitte (2020), organisations are increasingly required by their

leaders to match their data strategy with business results, and frameworks such as DCAM can assist in achieving this alignment.

Third, Focus on Data Governance. DCAM places significant emphasis on data governance, establishing clear policies, processes, and ownership structures. This focus ensures that data is regarded as a vital resource for the business, establishing clear accountability for its accuracy, accessibility, and security. Data quality, regulatory compliance, and successful operations are at the heart of DCAM's implementation emphasis; PwC's (2021) study highlighted the need for dynamic data governance in these areas.

Fourth, Risk Management and Compliance. DCAM contains specific data risk management and compliance components, facilitating the identification, assessment, and mitigation of risks associated with data due to increasing regulatory obligations surrounding data privacy and protection legislation. According to Gartner (2022), risk and compliance are now the top issues for executives in data management, and the DCAM frameworks can help ensure that data management initiatives adhere to ethical and legal standards.

The limitations of DCAM include i) Complexity and resource intensiveness, ii) Lack of detailed implementation methodology, iii) Steep initial learning curve, and iv) Limited adaptability to rapid technological changes.

First, Resource intensiveness and Complexity. Operationalising DCAM consumes many resources and is a stringent process, particularly for smaller organisations with limited data management capabilities. To successfully implement DCAM, organisations must invest

in specialised tools, training, and personnel to meet the requirements defined by the framework (Forrester, 2021). Without adequate human resources and tools, realising the full benefits of the framework can be difficult.

Second, there is a steep initial learning curve. The framework presents a steep initial learning curve for organisations unfamiliar with formal data management practices. DCAM's detailed components require expertise to understand and apply effectively, which may pose a barrier for companies just beginning their data management journey. McKinsey (2020) reports that organisations with nascent data management capabilities may require consulting support or extensive internal training to grasp the full breadth of DCAM and implement it effectively.

Third, there is a shortage of in-depth implementation methodology guides. For example, the Knowledge Body for the Maturity Model of Data Management (DAMA, 2017) and the Model for Assessing Data Management Capability are faulted for not providing a detailed methodology for conducting the assessments (EDM-Council, 2020; Steenbeek, 2019).

Fourth, limited adaptability to rapid technological changes. Although DCAM provides a strong foundation for data management assessment, it may require regular updates to address emerging technologies, such as blockchain, Machine Learning, and Big Data. As these technologies become more prevalent in data management practices, the model may need to be updated to provide more explicit guidance on their integration. A report by Capgemini (2021) suggests that as organisations adopt more sophisticated technologies, frameworks like DCAM must evolve to address new AI-related challenges.

The DCAM framework is popularly used in large enterprises with Complex Data Needs and Organisations with Stringent Regulatory Compliance Requirements.

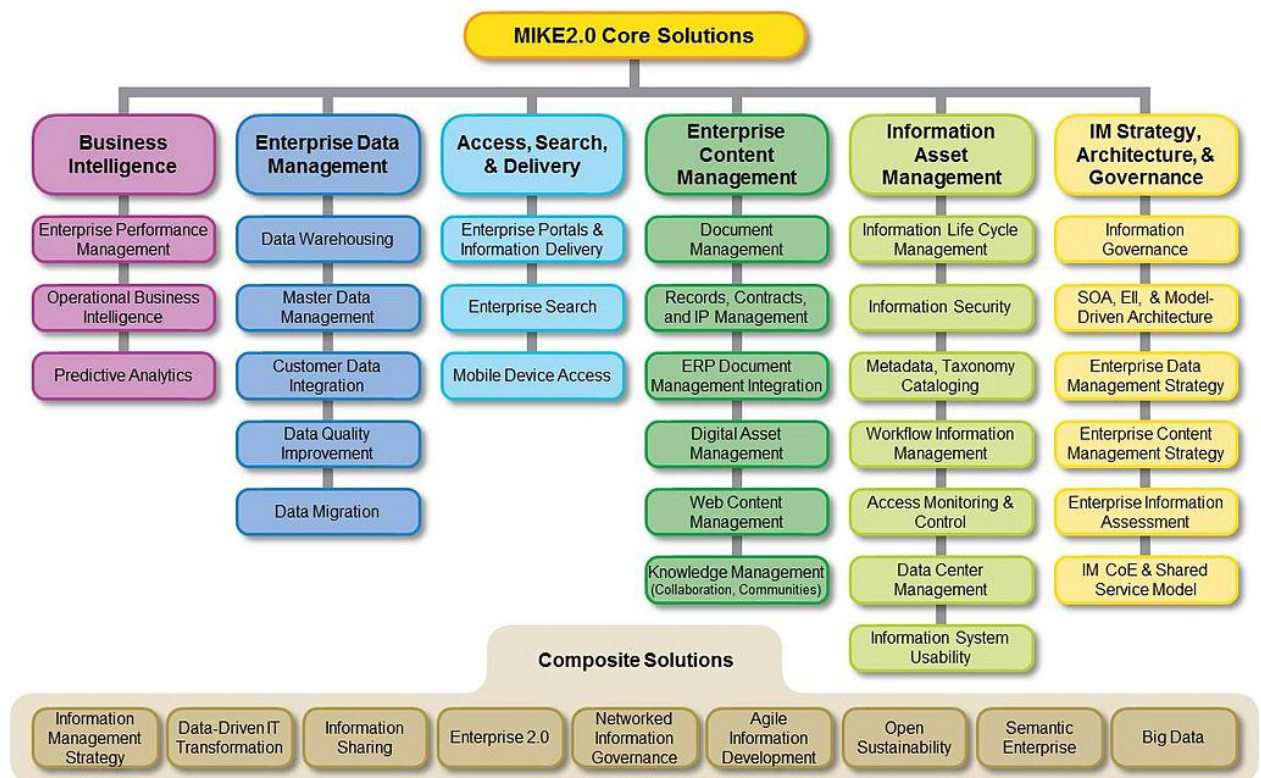
DCAM is most suitable for large enterprises that handle large data volumes across multiple departments, establishments, or geographical areas. Data governance and quality are essential for ensuring consistency and reliability across distributed teams in these organisations. A case study by KPMG (2021) demonstrates that large enterprises use DCAM to *"create a centralised governance structure, improve data quality, and drive analytics across different business units."*

Industries heavily regulated, such as healthcare, utilities, and telecommunications, benefit from DCAM's focus on compliance. The framework helps these organisations ensure that their data management practices meet industry-specific data privacy, security, and retention regulations. EY's (2022) research shows that organisations in regulated industries *"use DCAM to build a comprehensive compliance strategy, mitigating the risk of data breaches and non-compliance."* For example, DCAM is widely used in the telecommunications, banking, and insurance sectors, where adherence to regulations, data quality standards, and risk management are critical factors. Financial services providers such as banks, investment firms, and insurance companies adopt DCAM to guarantee that their governance of data activities are in harmony with stringent regulations and standards like Data Protection and financial reporting requirements. An Accenture report (2022) highlights that *"DCAM has become the de facto standard for financial institutions to manage data risk and regulatory compliance."*

DCAM provides vital guidance for institutions seeking to improve their data management activities by harmonising business goals with data governance requirements. Its strengths lie in its comprehensiveness, focus on governance, and emphasis on risk management. However, it can be resource-intensive and may require adaptation to address emerging technologies. DCAM is particularly valuable for large organisations and those operating in highly regulated industries, helping them establish a mature and effective data management program.

2.4.4.3 Method for an Integrated Knowledge Environment Maturity Model

The Method for an Integrated Knowledge Environment (MIKE) was developed in 2006 as an open-source methodology for managing information and assessing information management capability levels (McClowry, 2010). It encompasses the information lifecycle management processes, including information generation, access, presentation, usage, security, storage, and disposal (Harris, 2022; McClowry, 2010).

Figure 11:*MIKE2.0 Framework*

Source: Bergman (2010)

The MIKE2 framework enables the design of a data governance implementation and maturity assessment plan with five-stage implementation phases, as presented in Table 11.

Table 11:*MIKE Maturity Assessment Phases*

Phase	Name
1.	Business Assessment and Strategy Definition Blueprint
2.	Technology Assessment and Selection Blueprint

3.	Information Management Roadmap and Foundation Activities
4.	Design Increment
5.	Design Increment

Source: Bergman (2010)

In terms of measuring information management maturity, the methodology offers assessment tools, information standards, organisational structures, and roles and duties (Bergman, 2010; Harris, 2022; McClowry, 2010), which include the following:

SAFE (Service-oriented Architecture Framework for Enterprise): A conceptual architecture designed to address the requirements of highly federated organisations, data management initiatives with a target business objective, and simplifying choices for information integration and management (Bergman, 2010; Harris, 2022; McClowry, 2010).

Task List. The task list outlines the activities required for information management, backed by the information development approach and tightly integrated with the Service-oriented Architecture Framework for Enterprise (SAFE) (Harris, 2022; McClowry, 2010).

Supporting Assets. These are the lowest-level assets of the overall approach, complementing the methodology with additional resources. The MIKE framework has several supporting resources, including implementation templates, tools and technique papers, capability statements, software assets, and guidelines applicable at each stage (Bergman, 2010; McClowry, 2010).

Collaboration Platform. The framework provides an open-source collaboration platform that enables stakeholders to generate and distribute content, network, and search for supportive content. The MIKE2 framework is also resourced with an Integrated Content Repository that facilitates the consolidation and management of diverse content sources (Bergman, 2010).

The primary strength of the MIKE2.0 framework is that it supports an incremental expansion and learning approach, allowing for adaptability and flexibility in its application. This is further enhanced by its participatory community-driven development and continuous framework refinement. However, while one of this framework's strengths is its openness, it is also its main weakness (Bergman, 2010). For this framework to remain relevant through increased public awareness, dynamic upgrades, and widespread adoption, the practitioner community must be heavily involved (Bergman, 2010); however, we could not obtain evidence of the framework's continued upgrades.

Overall, the MIKE2.0 Information Maturity Model is a comprehensive, freely available framework for assessing an organisation's maturity in information management. It is because of its modular design, adaptable structure, and focus on information governance that it is an invaluable resource for entities seeking to establish effective information management practices (Bergman, 2010; Harris, 2022; McClowry, 2010).

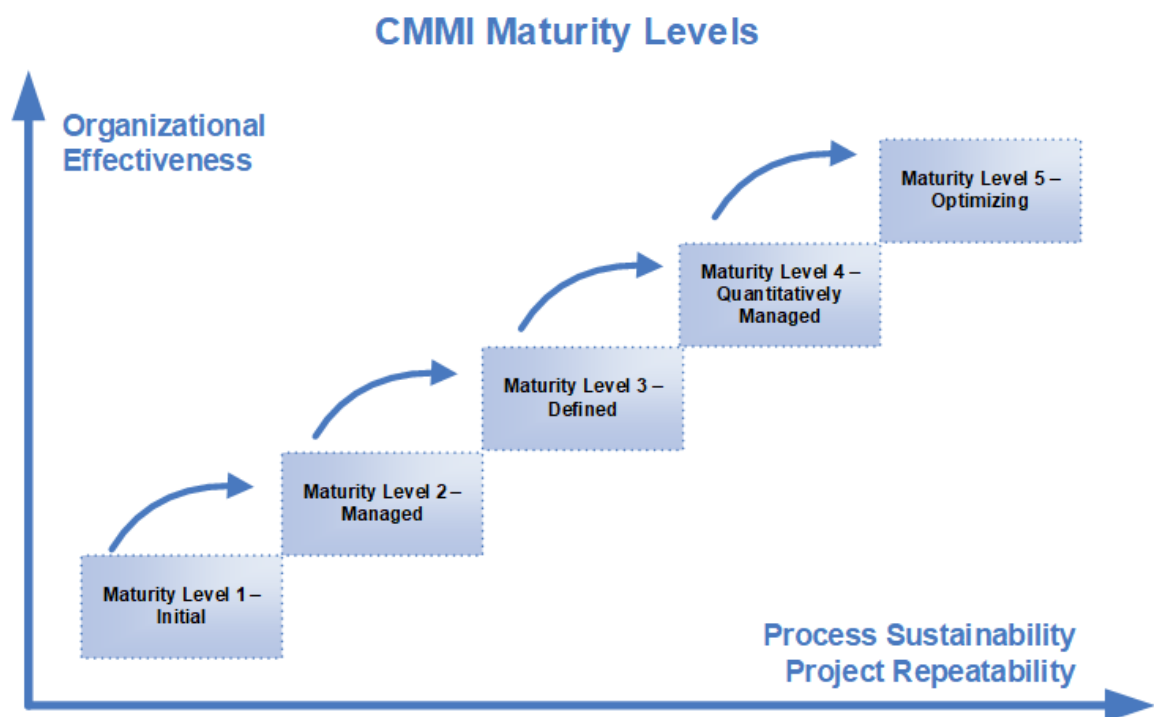
2.4.4.4 CMMI Data Maturity Management Model (DMM)

The Maturity Management Model for Data (DMM) is an integrated framework that offers a methodical approach to managing, measuring, and improving an entity's data and

human resources management capabilities (CMMI-Institute, 2014; Fleckenstein & Ferrante, 2018). It defines maturity levels and provides guidelines for advancing data governance. This framework is utilised by entities seeking to systematically evaluate and improve their data governance processes (Fleckenstein & Ferrante, 2018). Its primary purpose is to assist entities in utilising data as a critical asset, ensuring alignment between data practices and business objectives (CMMI-Institute, 2014). CMMI DMM is widely applied across industries to evaluate data governance maturity (CMMI-Institute, 2014).

Figure 12:

CMMI Maturity Levels



Source: CMMI-Institute (2014)

As presented in Figure 12, the CMMI DMM framework comprises five maturity levels and five process areas. Each level provides progressively more sophisticated data management practices. The five defined levels of maturity are i) *Level 1 - Initial/Performed*, where data management practices are informal and inconsistent; ii) *Level 2 - Managed*, where data management is defined by formal documentation and repeatable processes; iii) *Level 3 – Defined Stage*, where data management procedures are uniformly utilized within the entity, iv) *Level 4 - Quantitatively Managed*, where data management is measured and monitored systematically; v) *Level 5 - Optimizing*, where data management procedures are subject to constant innovation and improvement.

The five process areas on data, namely i) Strategic Leadership, ii) Management, iii) Completeness and Integrity, iv) Procedures, and v) Platform and architecture, address key organisational data management components. The model links data governance with the entity's strategic objectives, progressively allowing organisations to improve data quality, management, and operations.

The CMMI DMM Framework provides practitioners with several benefits that include the following: -

First is the Comprehensive Assessment of Data Management. The CMMI Maturity Framework for Data Management offers an extensive mechanism for assessing the maturity of data management in several dimensions, including data security and integrity. Its systematic arrangement guarantees that all critical perspectives of data management are covered, enabling organisations to develop cohesive strategies that address gaps in current practices. For example,

the holistic nature of data maturity models provides organisations with a comprehensive assessment of their capabilities for data governance (Al-Ruithe, 2018). It provides practical insights for enhancing data governance, quality, and risk management.

Second, Focus on Governance and Quality. One of CMMI DMM's significant strengths is its strict focus on upholding good data quality and effective governance. Efficient governance guarantees that data is reliable, readily available, and secure, while data quality efforts guarantee that it is trustworthy for decision-making. In this regard, Otto (2011a) highlights that data governance frameworks, such as those integrated into CMMI DMM, significantly enhance the reliability of data management systems and improve adherence to regulatory requirements and quality standards within an entity.

Third, Incremental Improvement. The maturity levels enable entities to enhance their data operations and control procedures incrementally. Each level provides clear benchmarks for improvement, facilitating entities' prioritisation of their investments and efforts based on their current capabilities. Becker et al. (2009) emphasise that maturity models, such as CMMI-DMM, effectively guide organisations through incremental improvements. They argue that the staged approach provides clear development targets, facilitating focused investment in data infrastructure and governance.

Fourth, Alignment with Business Objectives. One of the CMMI-DMM's fundamental principles is its emphasis on harmonising data management with organisational mission-critical objectives. This ensures that data management practices align with strategic objectives, particularly in terms of operational efficiency, improved customer service, and regulatory

compliance. For instance, Lahrman et al. (2011) emphasise that harmonising data governance with business strategy leads to more meaningful and measurable improvements, as organisations can directly track how changes in data practices support key business outcomes.

Despite the numerous strengths, the CMMI DMM Framework has several limitations, and these include the following: -

First, it can be a costly venture. Implementing the CMMI DMM model may consume many resources. For example, it may demand considerable expenditure on employees for specialised training on the framework, acquisition of new technologies, and process re-engineering.

Second, Complexity and Learning Curve. The model is complex, especially for organisations with little experience in formal data management practices. The detailed nature of CMMI DMM may present a steep learning curve, requiring external consultants or extensive internal training to understand and fully implement the framework.

Third, Limited Flexibility for Rapid Technological Changes. While CMMI DMM provides a robust structure, its emphasis on formal governance and incremental improvement may lack the flexibility to respond quickly to new technologies like blockchain, quantum computing, and cloud computing platforms. Organisations operating in rapidly changing technological environments may find the model too rigid for agile innovation.

This Data Management Maturity Model offers a systematic and comprehensive approach to improving data management practices within organisations. Its strengths lie in its focus on governance, quality, and alignment with business goals, providing organisations with clear pathways for continuous improvement. However, its complexity, resource-intensive nature, and limitations in responding to rapid technological changes are notable challenges. CMMI DMM is particularly effective in financial services, healthcare, and government industries, where data management maturity is critical for regulatory compliance and operational efficiency.

2.4.4.5 Criticism of Maturity Models

Data Governance Maturity Measurement frameworks face several criticisms, including a lack of scientific rigour, Resource and Cost Intensiveness, complexity, and a steep learning curve, as well as limited flexibility for rapid technological changes.

First, lack of scientific rigour. One of the significant criticisms of maturity models is that they are highly informal and ad hoc. For example, they are criticised for lacking rigorous scientific testing and validation during their development (Steenbeek, 2019). Practitioners have developed them based on specific industry experiences, which may not be universally applicable (McSweeney, 2015). Furthermore, the maturity levels proposed by these models are criticised for lacking detailed validation to justify their structures and activities (McSweeney, 2015; Steenbeek, 2019). For example, quantifying the maturity level scoring objectively is not easy. To overcome the lack of scientific rigour in the development of these industry frameworks, there is a need for more scholarly works that investigate the design and utilisation of the frameworks for the governance of data maturity levels.

Second, Resource and Cost Intensiveness. Implementing the maturity models can be resource-intensive, requiring substantial investments in technology, staff, and process enhancements. For smaller organisations or those with limited data management capabilities, achieving higher maturity levels may not be feasible without substantial financial and technical resources. For example, Wendler (2012) notes that while large enterprises can adequately implement data maturity models, smaller organisations may struggle with the resource demands of frameworks like CMMI DMM, particularly at higher maturity levels. The situation is further exacerbated by the fact that most maturity measurement frameworks are proprietary, except for the MIKE Framework, which is open-source (Bergman, 2010; Harris, 2022; McClowry, 2010).

Third, there is complexity and a steep learning curve. The maturity assessment models are complex by design, requiring continuous training and capacity building for practitioners to apply them effectively, especially for organisations with limited experience in formal data management practices. The detailed nature of these frameworks presents a steep learning curve, requiring external consultants or extensive internal training to understand and fully implement the framework. According to Rabbi et al. (2015), the complexity of implementing maturity models, especially in less mature organisations, is a significant barrier to adoption. They recommend that organisations approach the model incrementally, ensuring the availability of adequate resources and expertise for attaining the required maturity levels.

Fourth, limited flexibility for rapid technological changes. While the frameworks provide a robust structure, their focus on formal governance and incremental improvement may

lack the flexibility to respond quickly to emerging technologies, such as blockchain, machine learning, quantum computing, and big data platforms. Organisations operating in rapidly changing technological environments may find the model too rigid for agile innovation. Al-Hujran et al. (2018) argue that data maturity models must evolve to address the challenges posed by disruptive technologies. They recommend incorporating more flexible and adaptive processes to handle the rapidly evolving pace of data analytics and machine learning technology.

2.4.5 Critique of Data Governance Frameworks

Despite their strengths, existing data governance frameworks have shortcomings, including a lack of rigorous testing and empirical validation, excessive reliance on traditional information technology governance practices, and customisation shortcomings, as analysed below.

First, lack of rigorous testing and empirical validation: Most data governance frameworks developed by the practitioner community, such as those by the Institute of Data Governance and the Data Management Association, are criticised for lacking rigorous scholarly testing (Alhassan et al., 2018; Niemi, 2015; Steenbeek, 2019). However, a few studies have undertaken partial validation efforts (Aisyah & Ruldeviyani, 2018; Brahmantara et al., 2021; Dahlberg & Nokkala, 2015).

Secondly, excessive reliance on traditional information technology governance practices: Early data governance frameworks were primarily based on IT governance models, such as the Information Technology Infrastructure Library (ITIL) and the Control Objectives

for Information and Related Technology (COBIT), as well as the framework proposed by Weill and Ross (2004). However, these traditional models are not fully attuned to data governance (Al-Badi et al., 2018; Al-Ruithe et al., 2016). As a result, these frameworks need significant revision and adaptation to meet the changing technological landscape and data governance requirements.

Third is the customisation shortfall. A requirements analysis is crucial for evaluating the prevailing status of data management before establishing any interventions for its governance, thereby enabling the creation of a contextualised framework (Begg & Caira, 2011). However, some existing data governance frameworks lack provisions for gathering data governance requirements and customisation before they are applied (Ladley, 2019; Steenbeek, 2019; Weber et al., 2009). As a result, custom-designed frameworks that include practical details on how data governance should be implemented in line with organisational aspirations are required.

Overall, to address these shortcomings, the proposed framework in this study aims to identify mechanisms for overcoming the limitations of existing data governance frameworks.

2.4.6 Recent Advances in Frameworks for Data Governance

Several recent technological developments have significantly affected the design and operationalisation of frameworks for data governance, including i) the continual adoption of artificial intelligence (AI), ii) adherence to privacy requirements, iii) data quality requirements, iv) prevalence of decentralised data governance, v) real-time data governance, vi) data ethics

and transparency, vii) increasing data democratisation, viii) adoption of cloud computing technology, and ix) integrated data governance frameworks as discussed in detail below.

First, the continual adoption of artificial intelligence (AI): More than before, Data Governance Frameworks must be repurposed to incorporate requirements for managing AI and machine learning datasets. These new technologies significantly change data processing tasks, enhance predictive analytics, and improve data quality management. For example, AI can help identify data inconsistencies, such as duplicates and errors, thereby minimising physical effort and ensuring data accuracy (Alation, 2024; Castor, 2024).

Second, ensuring adherence to privacy requirements: With the increasing adoption of emerging technologies, data governance strategies are shifting to prioritise compliance with evolving data-centric legal and regulatory frameworks. This involves implementing robust data governance practices to mitigate vulnerabilities related to cybercrime, such as unauthorised data access and manipulation (Alation, 2024; Castor, 2024; Knight, 2024).

Third, data quality management: Data governance heavily depends on data quality management. Data quality management is becoming more effective due to the utilisation of increasingly sophisticated technologies and AI-driven platforms to enhance data cleansing, matching, and validation procedures (Alation, 2024; Castor, 2024).

Fourth, decentralised data governance models are increasingly prevalent. The practice of overseeing data governance at lower administrative units, rather than centralising authority at higher administrative levels, is becoming more prevalent (Abraham et al., 2019; Alation,

2024; Khatri & Brown, 2010; Knight, 2024). These models allow flexibility and autonomy within business units while maintaining organisational standards. This approach supports federated structures and agility in meeting data governance standards (Alation, 2024; Knight, 2024).

Fifth, real-time data governance: Traditionally, data governance has involved sequential iterations through the data collection, data entry, processing, storage, and reporting stages (Ladley, 2019; Weber et al., 2009). Increasingly, dynamically aggregated real-time processes have replaced traditional management processes (Alation, 2024; Knight, 2024). Therefore, contemporary data governance initiatives must be designed with enhanced agility to facilitate real-time synchronous data processing capabilities (Alation, 2024; Knight, 2024).

Sixth, data ethics and transparency: Data governance initiatives are increasingly reliant on moral principles and standards. To increase stakeholder confidence, data stewardship must be accountable, transparent, and responsible (Knight, 2024). For example, understanding the history, processing, and use of data is essential for effective data lineage and metadata management, which in turn contribute to data compliance and integrity (Alation, 2024).

Seventh, increasing data democratisation: Making data available to a larger audience within an organisation is known as "data democratisation" (Micheli et al., 2020). Strong governance ensures the secure and responsible democratisation of data, enabling universal access to and usage of data (Alation, 2024; Knight, 2024; Castor, 2024). There is an increasing need for agile, open and secure data governance procedures (Micheli et al., 2020; Tiropanis, 2022).

Eighth, the uptake of cloud computing technology: The integration of cloud-based solutions is becoming more prevalent in data governance. This requires contemporary data governance initiatives to be secure, scalable, and flexible to achieve cost-effective data management (Alation, 2024; Castor, 2024; Knight, 2024).

Ninth, integrated data governance frameworks. Data governance frameworks are becoming increasingly detailed, describing who can access what data, when, where, and with what type of data. These frameworks comprise methods for guiding data analysis tasks, arranging organisational data, and assessing progress (Knight, 2024). For example, multi-stakeholder collaboration is becoming crucial in data governance to ensure that cross-functional teams and data governance councils execute data governance activities that align with organisational objectives (Castor, 2024; Alation, 2024; Knight, 2024).

These trends reflect the evolving nature of data governance, emphasising digitisation, moral behaviour, legal/regulatory compliance, and the strategic use of data as a critical organisational resource.

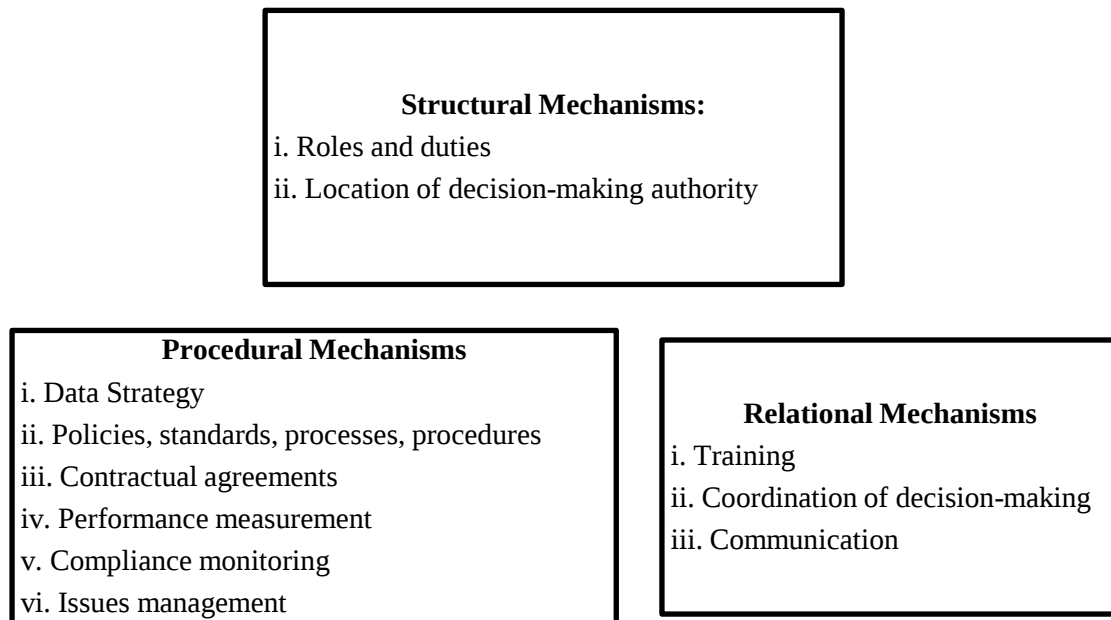
2.5 DATA GOVERNANCE IMPLEMENTATION

This section discusses the implementation aspects of data governance initiatives, including the mechanisms for implementation, the prerequisite conditions (antecedents) that enable them, the resulting outcomes (consequences), and the processes involved in operationalising data governance.

2.5.1 Mechanisms of Data Governance

The mechanisms of data governance concern the overall data governance approach. This section discusses the major data governance approaches encountered across the literature reviewed.

At an organisational level, organisations employ various approaches to data governance influenced by the prevailing business environment, regulatory and legal provisions, or organisational quality assurance mechanisms (Mullon & Ngoepe, 2019). Given the multidimensional nature of the data governance concept, various approaches can be employed to implement data governance. For example, the DAMA data governance framework (DAMA, 2017) has four processes, namely, i) development of guiding principles and strategic plans, ii) establishment of operational procedures, processes, decision-making mechanisms, and continuous monitoring, iii) communication coordination, and iv) data management activities control. Following a systematic literature review on data governance, Abraham et al. (2019) decompose all these data governance processes into i) Structural, ii) Procedural, and iii) Relational Data Governance Mechanisms, as presented in Figure 13.

Figure 13:*Data Governance Mechanisms*

Source: Abraham et al. (2019)

2.5.1.1 Structural Mechanisms

As categorised by Abraham et al. (2019), the structural data governance mechanism covers two significant dimensions, namely i) functions and duties related to data governance and ii) the level of supervision. Several scholars endorse the usage of top-down data governance structures with roles, responsibilities, and decision-making attributed to both organisational and individual levels, as presented in Table 12 (Abraham et al., 2019; Cheong & Chang, 2007; Coronado, 2014; Otto, 2011a).

Table 12:*Analysis of Structural Mechanism Levels*

Level	Purpose	Examples
Strategic Level	Responsible for driving policy, alignment of data governance strategy with business goals and funding the data governance activities	Data Governance Council or Steering Committee
Tactical Level	Responsible for the supervision of routine data governance activities	Data governance implementation committees, data managers, and data stewards
Operational Level	Responsible for generating the data or using the data	Data consumers or data users are spread across the organisation, oftentimes with interchangeable roles

Source: Abraham et al. (2019)

At the topmost level or strategic level is a Data Governance Council, sometimes named a Data Governance Steering Committee, which is often comprised of a multi-skilled team of top managers charged with establishing the most effective guidance for data governance and harmonising it with the enterprise objectives (Cheong & Chang, 2007; Korhonen et al., 2014).

Most scholars position the Data Governance Committees, Data Managers, or Data Stewards at the implementation or tactical level below the strategic level (DAMA, 2017; Korhonen et al., 2014; Thomas, 2006). Typically, the individual organisation determines the team name, composition, and duties of the tactical-level implementation team. For example, the tactical layer includes data stewards or domain subject experts who supervise the stakeholders' adherence to data standards or policies (Cheong & Chang, 2007). At the lowest tier of the data governance structure are the actors responsible for the routine operational

governance of data activities, such as data generation by data producers and owners and data usage by data consumers (Korhonen et al., 2014).

While the top-down structural approach is the most popular in the literature reviewed, data governance can also be implemented through a bottom-up approach. Otto (2011b) examined the implementation of data governance in two telecom firms and found that one company employed a bottom-up approach, while the other used a top-down approach. The results of this study indicate that the organisation of data governance is contingent upon both prevailing external factors (e.g., the legal and regulatory environment, as well as the social and business competition environment) and internal factors (e.g., organisational structure, organisational culture, and human capital). Therefore, although the two companies were from the same sector and had similar requirements, the choice of approach suggests that there is no one-size-fits-all structural approach (Weber et al., 2009).

2.5.1.2 Procedural Mechanisms

According to Abraham et al. (2019), procedural governance mechanisms aim to ensure effective data management through the right processes and procedures. The procedural mechanisms comprise i) enabling environment, ii) processes and procedures, iii) contractual agreements, iv) performance metrics, v) compliance monitoring, and vi) management of issues. The following subsections (2.5.1.2.1 to 2.5.1.2.6) discuss each of these elements.

2.5.1.2.1 *Enabling Environment*

Abraham et al. (2019) present the elements of the enabling environment individually as i) *Data Strategy*, which is a blueprint for the data governance initiative that outlines the overall

direction and expected outcomes (Cheng et al., 2017; DAMA, 2017; Guetat & Dakhli, 2015); ii) *Data Governance Policies*, which are statements of priority action or decision areas that set the business rules for data management (Alhassan et al., 2019; Brous et al., 2016); and iii) *Standards*, which are benchmarks against which the initiatives will be measured (Alhassan et al., 2019; Mahanti, 2018). In practice, the presentation of data governance strategies, policies, and standards varies, with some organisations preferring to present each individually or all combined (DAMA, 2017).

2.5.1.2.2 *Data Processes and Procedures*

Clear and well-organised processes are essential to implementing any data governance initiative (Alhassan et al., 2019). In reality, managing data throughout its lifecycle involves utilising data governance processes alongside several synchronised work techniques (Alhassan et al., 2019; Al-Ruithe et al., 2018). Examples of data governance processes include methods for developing policies and standards, maintaining data integrity, and assigning responsibilities (Abraham et al., 2019; Thomas, 2006). Relatedly, processes are comprised of discrete procedures, which are unique techniques and steps used to accomplish a task (DAMA, 2017; Thomas, 2006). For example, there are specific procedures for accounting for work done, developing a data governance initiative or rectifying errors.

2.5.1.2.3 *Contractual Agreements*

The amount of data shared between various organisations and beyond national borders is constantly increasing, which necessitates the establishment of contractual agreements between organisations or countries at the international level (Abraham et al., 2019).

2.5.1.2.4 *Performance Metrics*

Performance metrics encompass measurement procedures designed to assess the effectiveness of the data governance program (Al-Ruithe et al., 2018; Ladley, 2019; Otto, 2011b). The metrics may be obtained through surveys, continuous progress monitoring, or compilation of periodic reports (Ladley, 2019). Examples of data governance performance metrics include information management maturity measurement (Ladley, 2019).

2.5.1.2.5 *Compliance Monitoring*

Compliance monitoring is an essential aspect of data governance, ensuring adherence to legal, policy, and operational requirements while aligning with organisational objectives (Lardley, 2019). This entails continuous monitoring of stakeholders, governance practices, and data management instruments to maintain accountability and transparency across the data lifecycle (DAMA, 2017; Pansara, 2023). Empirical evidence suggests that inadequate monitoring mechanisms frequently lead to the failure of data governance initiatives, underscoring the importance of systematic compliance assessment (Brous et al, 2020; Lardley, 2019; Pansara, 2023).

2.5.1.2.6 *Issues Management*

Issue management concerns procedures for addressing data errors and related issues (DAMA, 2017). It covers procedures for logging errors, classifying issues, and assigning or escalating issues to the right persons for fixing and reporting on issues handled (DAMA, 2017; Lardley, 2019).

2.5.1.3 Relational Mechanisms

Relational data governance mechanisms emphasise collaboration among data governance stakeholders (Abraham et al., 2019). Scholars have established that the lack of collaboration between data governance stakeholders negatively affects the outcomes of data governance initiatives (Abraham et al., 2019; Lardley, 2019; Nielsen, 2018). According to the Abraham et al. (2019) classification, the activities under the relational data governance mechanisms are i) communication, ii) training, and iii) coordination of decision-making as discussed in the next subsection.

2.5.1.3.1 Communication

Communication plays a crucial role in continually raising awareness of data governance requirements and operations among stakeholders (Abraham et al., 2019; Cheong & Chang, 2007). Awareness is critical for inculcating a shared vision amongst the data governance actors (DAMA, 2017; Lardley, 2019), promoting executive sponsorship (Khatri & Brown, 2021; Thomas, 2006; Weber et al., 2009), and spurring change management (DAMA, 2017; Guetat & Dakhli, 2015; Lardley, 2019; NASCIO, 2008; Otto, 2012). There is a need to develop a comprehensive communication plan that identifies the most effective communication channels and tools to create appropriate content for data governance actors (Hagmann, 2013; NASCIO, 2008; Thomas, 2006). However, most scholars (Azizatun Nafi'ah, 2021; Cave, 2017; Hagmann, 2013; Herselman et al., 2019) view communication with respect to human actors, and yet this is also an important requirement with respect to data sharing between information systems or devices (Paskaleva et al., 2017; Yebenes & Zorrilla, 2019).

2.5.1.3.2 *Training*

Data governance requires actors to have specialist knowledge and skills, hence the need for training (Cheong & Chang, 2007). Additionally, as Randhawa (2019) asserts, continuous training enables the data governance actors to easily understand the data policy and implementation requirements. Furthermore, training aids in creating a positive mindset and attitude amongst stakeholders towards managing data as a critical corporate asset (Cheong & Chang, 2007; Weber et al., 2009). Several Scholars (Muhumuza & Baguma, 2023; Omweri, 2024; Saturday et al., 2023) have demonstrated the adverse effect of the lack of training on data governance initiatives.

2.5.1.3.3 *Coordination of Decision Making*

According to Abraham et al. (2019), coordination of decision-making refers to the process of ensuring that decisions made across different data governance activities are not mutually counteractive. It is essential to recognise that various types of decisions are made at different levels of the data governance structures, specifically through structural or procedural mechanisms (Khatri & Brown, 2010; Otto, 2011b). For example, the Data Governance Council determines strategic issues, while the Data Management Committee is responsible for operational decisions (DAMA, 2017; Thomas, 2006). While the structure of decision-making is contingent on the organisational structure, most scholars (Cheong & Chang, 2007; Otto, 2011b; Weber et al., 2009) agree that most decisions are taken at the apex and less at the bottom, as presented in Figure 14.

Figure 14:*Coordination of the Decision-Making Pyramid*

Source: Anthony (1965)

To enhance the smooth coordination of decision-making, business executives make long-term decisions, such as identifying data governance objectives and formulating data governance principles at the strategic level (Lardley, 2019; NASCIO, 2008). The tactical level involves middle managers, such as data stewards, making shorter-term decisions for data governance activities, whereas the operational layer has fewer decisions made by operations staff, including data clerks (DAMA, 2017; Guetat & Dakhli, 2015; NASCIO, 2008). Various scholars distinguish between hierarchical, functional, and centralised/decentralised data governance decision-making (NASCIO, 2008; Otto, 2011b; Wende & Otto, 2007).

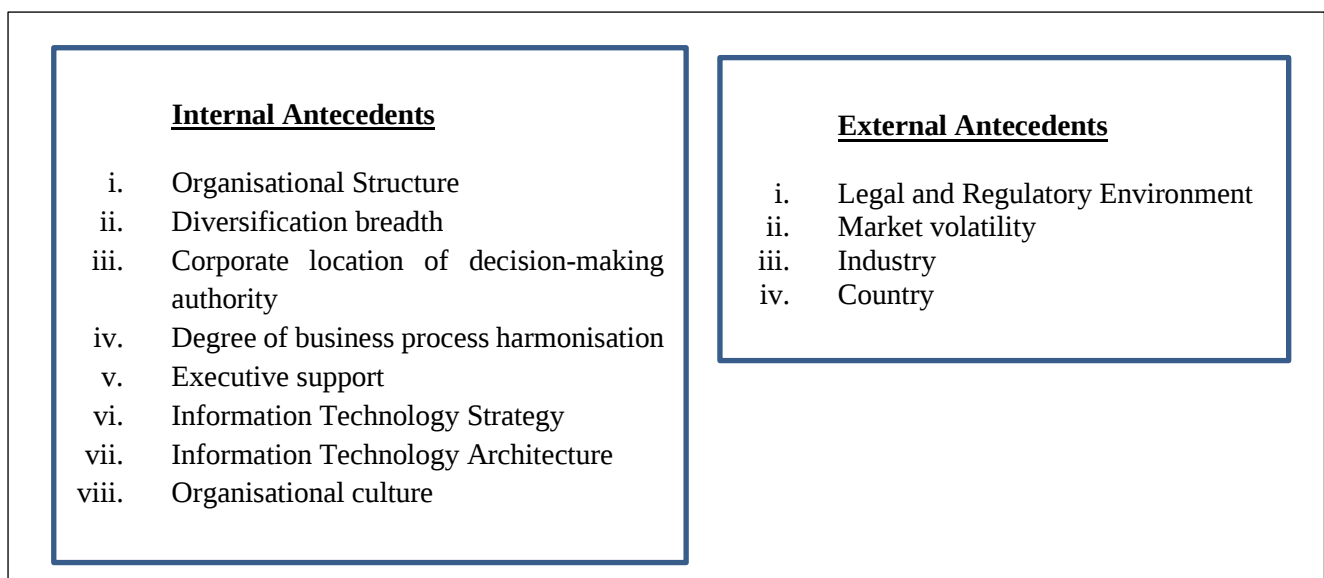
2.5.2 Data Governance Antecedents

Data governance antecedents refer to factors that influence the implementation and uptake of data governance (Lunardi, 2017). In particular, data governance antecedents are

contingency factors that exist within an organisation, determining the setup and implementation of a data governance program and influencing the adoption and implementation of the overall data governance initiative (Wende & Otto, 2007). Abraham et al. (2019) categorise data governance antecedents as internal and external factors, as presented in Figure 15.

Figure 15:

Categorisation of Antecedents for the Governance of Data



Source Abraham et al. (2019)

2.5.2.1 Data Governance Internal Antecedents

Internal antecedents are the conditions in an organisation that influence the configuration and implementation of a data governance program. Abraham et al. (2019) categorises internal antecedents as organisational, IT, and culture factors.

At the organisational level, the internal data governance antecedents include the nature of the organisational structure, the distribution of decision-making authority, executive support, and organisational diversity with respect to business functions or business processes, as well as other related attributes (Weber et al., 2009). For example, organisations with a highly hierarchical structure often have a corresponding highly hierarchical data governance structure (Weber et al., 2009).

In the case of internal antecedents for information technology that impact the development and implementation of a data governance initiative, examples include the IT governance strategy and the IT architecture (Al-Ruithe et al., 2018). Scholars such as Cheong and Chang (2007), Lunardi (2017), and Panian (2010) established that there is a positive correlation between good Information Technology governance and data governance. Additionally, increased use of Information Technology standards and systems integration promotes the practice of good data governance (Lunardi, 2017). Conversely, the use of legacy information systems, which typically operate in silos with limited integration, has adverse effects on data governance adoption (Benfeldt et al., 2020; Cheong & Chang, 2007). Furthermore, employees' lack of digital skills affects their capabilities to use data governance tools, ultimately affecting the design, implementation, and consequences of such an initiative (Ladley, 2019).

Cultural internal antecedents include the organisation's culture, top management support, and employee motivation for data governance (Berman, 2017; Muhumuza & Baguma, 2023; Randhawa, 2019). Furthermore, studies indicate that a positive employee attitude toward data governance is associated with the success of data governance programs (Berman, 2017;

Hagmann, 2013). Relatedly, a lack of ethics among employees or citizens leads to data abuse and misuse, which affects data governance initiatives (Bokori & Saturday, 2021; Eke & Stahl, 2024). The aspect of organisational culture is particularly important to this study since one of the study's objectives was to test the hypothesis that organisational culture significantly affects data governance.

As the practice of data governance evolves from traditional methods (overdependence on data custodians for ensuring data quality) to more modern methods (diversified data governance using sophisticated Information Technology tools), so do the factors that determine the success of data governance (Al-Badi et al., 2018; Fadler et al., 2021; Micheli et al., 2020). For example, Haryadi et al. (2017) identified antecedents for Big Data quality in financial institutions using a qualitative case study approach, focusing on the four Big Data V features. The four Big Data V features are i) *Volume*, which refers to the large volumes of data; ii) *Variety*, which refers to the diversity of the data formats; iii) *Velocity*, which refers to the speed of data generation and dispatch; and iv) *Veracity*, which refers to the data quality.

2.5.2.2 External Antecedents

External data governance antecedents cover all factors outside an organisation that influence the configuration and implementation of data governance. Abraham et al. (2019) identify legal and regulatory factors, market volatility, industry conditions, and country factors as external antecedents.

Existing international and sovereign data regulatory and legal frameworks, such as data protection laws, consumer rights laws, and national open data policies, heavily influence data

governance methods (Bokori & Saturday, 2021; PWC, 2019). Examples of such laws include the European Union's General Data Protection Regulation (GDPR), which requires organisations to protect data subjects' personal identification and rights (Cheong & Chang, 2007; PwC, 2019). These regulatory and legal provisions have a significant influence on data governance (Khatri & Brown, 2010).

Furthermore, many industry, regional, and country-specific considerations directly impact on the data governance methods (DAMA, 2009). For example, the financial services industry has stringent reporting requirements, such as the International Financial Reporting Standards, to increase transparency and risk management (PWC, 2019). Therefore, the requirements for data governance, including data governance principles, scope, mechanisms, and consequences, are to some extent influenced by the nature of the industry (Cheong & Chang, 2007).

Another external factor that influences data governance is society's trust in the intended purpose of data collection (Delacroix & Lawrence, 2018). Once the data subjects appreciate the beneficial use of their data, they will respond positively to data collection and provide timely and accurate data. Borikini and Saturday (2021) argue that the inclusive participation of citizens and communities builds their capacity and confidence to continue participating in data governance processes, which in turn leads to better design and implementation of data governance.

2.5.2.2 Relationship between the terms antecedents and critical success factors

Overall, it is essential to recognise the similarities between the concepts of “antecedents,” “critical success factors,” and “key success factors.” For example, Bullen and Rockart (1981) define critical success factors as core action areas whose implementation leads to the attainment of the desired objectives, while Lunardi (2017) defines data governance antecedents as factors that influence the implementation and uptake of data governance. An analysis of these two concepts reveals that to increase the implementation and adoption of data governance, it is necessary to focus on core or key action areas.

Few existing studies have investigated the critical success factors for data governance (Alhassan *et al.*, 2019; Mahanti, 2018). While these studies apply different methodologies, their findings are related. For example, Alhassan *et al.* (2019) identified seven critical success factors plus their root causes and proposed remedial actions to ensure success, as presented in Table 13, as arranged by priority.

Table 13:

Critical Factors for Successful Governance of Data

No.	Critical Success Factor	Resulting From	Proposed Intervention
i)	Human Resources for data governance	Lack of top management awareness and low employee competency levels for data governance.	Conduct capacity-building and training sessions for staff on data governance.
ii)	Transparent operations	Use of non-automated processes, e.g., data capture.	Establish relevant data processes and procedures embedded into the systems.
iii)	Flexible data tools and technologies	Data integration and the capacity to incorporate data policies, processes, and procedures.	Deploy necessary information and communications technology infrastructure and integrate the data.

No.	Critical Success Factor	Resulting From	Proposed Intervention
iv)	Standardized and simple-to-understand data policies	Existence of ambiguous data policies.	Develop systems that adhere to the established data policies.
v)	Institutionalised data functions and duties	Ambiguous leadership and functions.	Establish a data governance oversight group and assign responsibilities.
vi)	Precise and comprehensive data governance needs	Existence of inadequate data management procedures.	Validate requirements with the stakeholders before implementation.
vii)	Targeted and realistic data governance techniques.	Comprehending the significance of the data.	To regard data as an integral component and strengthen managerial support for this philosophy.

Source: Alhassan et al. (2019)

2.5.3 Data Governance Consequences

As data gains prominence as an enterprise asset, its abuse and misuse impact is also increasingly becoming a point of contention. This has led to increased discourse among scholars and the community of practitioners (Barker, 2016; DAMA, 2017; Rehman & Al-Raqom, 2020; Yebenes & Zorrilla, 2019) regarding more effective data governance approaches. The concept of consequences refers to the effects of data governance, which Abraham et al. (2019) categorize as short-term performance effects and risk management.

The short-term performance consequences may be positive or negative. These include the effect of data governance on organisational competitiveness, such as market capture or increased cost of doing business (Martijn & Jonker, 2015). Various scholars (Al-Ruithe, 2018; Panian, 2010; Otto, 2011b) agree that some of the strategic objectives of data governance are to increase profitability, reduce operational costs and increase revenue.

According to Abraham *et al.* (2019), another consequence of successful data governance is enhanced data risk management (Otto, 2011a). For example, adherence to data governance requirements helps mitigate risks associated with noncompliance with the legal data framework or management (Loshin, 2008).

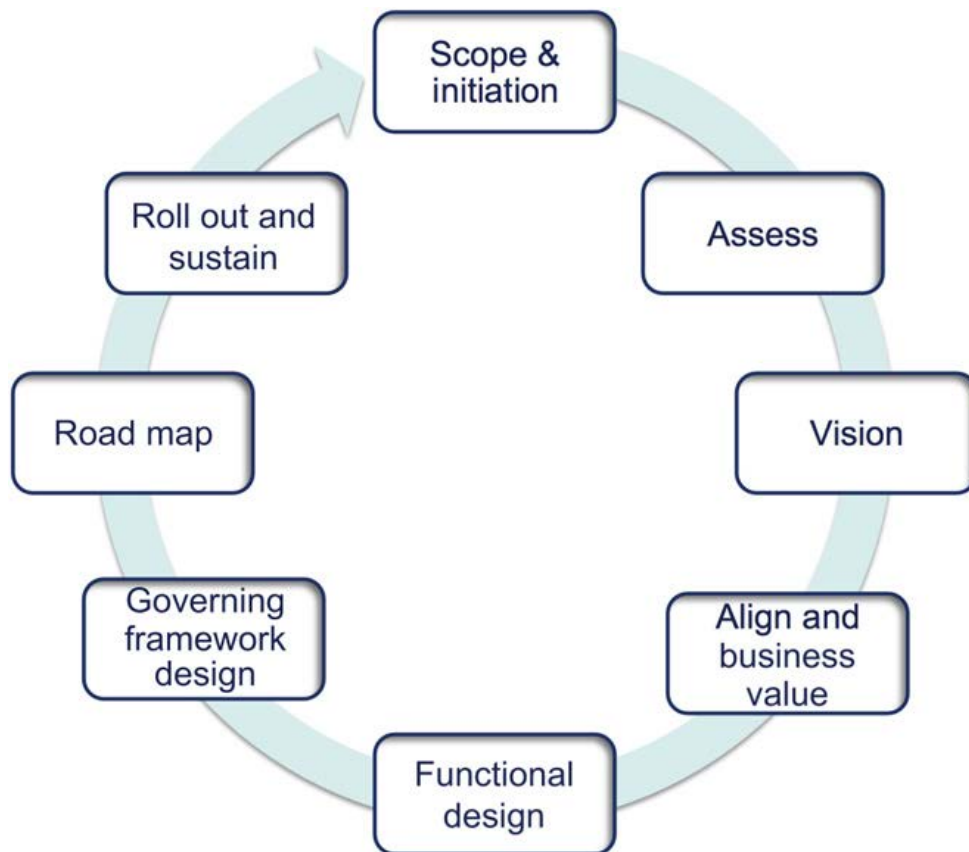
On the negative side, incidences of data governance failure have mainly been caused by implementing data governance as an Information Technology process without giving due consideration to other factors, such as organisational culture, which also contribute to the success of such initiatives (Al-Ruithe *et al.*, 2018; Cheong & Chang, 2007; Hagmann, 2013; Nguyen, 2016; Nielsen, 2017). Other causes of data governance failure cited by scholars (Al-Ruithe *et al.*, 2016; Daneshmandnia, 2019; Mullon & Ngoepe, 2019) include fragmented data management activities conducted on an individual system basis, which ignore the fact that data governance is a holistic enterprise endeavour.

2.5.4 Data Governance Operationalisation

There is a multiplicity of methods for conducting data governance activities, as evidenced by the several approaches proposed by industry and academia (Alhassan *et al.*, 2018; Cave, 2017; Hagmann, 2013; Mahanti, 2018; Randhawa, 2019). For example, Ladley (2019) proposes an iterative cyclic approach for deploying data governance, while Otto (2011b) identified two companies where one used a top-down approach and the other used a bottom-up approach. However, most scholars and practitioners concur on the features of a data governance initiative, such as the need to align the plan for the governance of data within the complete

scope of the entity's activities and business objectives (Begg & Caira, 2011; Ladley, 2019; Niemi, 2015; Yebenes & Zorrilla, 2019).

Furthermore, some scholars and practitioners (Ladley, 2019; OECD, 2019) posit that it is essential to conduct an assessment before operationalizing a data governance initiative, as indicated in Figure 16. The assessment helps to establish the current status, available capabilities, and scope of data governance activities (Ladley, 2019). This assessment may be conducted using a capability maturity assessment framework (Begg & Caira, 2011; Belghith et al., 2021; Steenbeek, 2019).

Figure 16:*Data Governance Operationalization*

Source: Ladley (2019)

The initial assessment findings inform the development of the data governance vision aligned with the business objectives (Begg & Caira, 2011; Ladley, 2019; Niemi, 2015). Consequently, the initial assessment and the alignment of the data governance strategy with the business objectives also inform the functional design of the actual data governance initiative. For example, depending on the organisation's needs, there may be a need to focus on organisational structure issues or prioritize technology requirements.

Once a data governance framework has been designed, an appropriate contextualized implementation plan or roadmap must be developed. However, most of the literature reviewed

(Khatri & Brown, 2010; Otto, 2011b; Weber et al., 2009) does not mention the need for an implementation plan.

The execution of data governance activities must be holistic, considering all the requisite dimensions. For example, Hagmann (2013) established that the success of data governance is highly dependent on creating a data governance culture, implementing change management activities, and improving communication.

2.6 PUBLIC SECTOR DATA GOVERNANCE OVERVIEW

Public sector governance of data encompasses both data management within public organisations and the regulation of data governance at the national level (OECD, 2019; Thompson et al., 2015). Increasingly, public organisations hold massive volumes of data that need to be managed appropriately because of their importance in organisational processes, such as supporting decision-making and policy formulation (Nielsen et al., 2018; Thompson et al., 2015). Additionally, the pervasive digitalization of services in both the private and public sectors' calls for Governments to create an enabling environment for data governance (Masilela & Nel, 2021). This section reviews the literature on public sector data governance along common thematic areas in the two types of public sector data governance (i.e., implementation of governance of data in public organisations and national data governance regulation).

2.6.1 Level for Public Sector Data Governance

A review of practitioner and scholarly literature on public sector data governance (Benfeldt et al., 2020; OECD, 2019; Thompson et al., 2015) indicates that implementation of public sector data governance mainly occurs at four levels, namely, international, national,

multi-organisational and individual organisational levels, as presented in Table 14. However, Van Ooijen et al. (2019) categorize data governance into two levels: i) the macro-level, which encompasses both international and national levels, and ii) the micro-level, which encompasses both multi-organisational and individual organisational levels of data governance.

Table 14:

Analysis of Levels of Data Governance

Wider Category	Detailed Category		Explanation
Macro-level	International level		Governance of data exchanges between sovereign states or Inter-Governmental Organisations such as the European Union (OECD, 2019; Van Ooijen et al., 2019)
	National level		Data Governance within a country such as local government (Benfeldt et al., 2020; Nielsen et al., 2018) or ministries (Herselman et al., 2019; Mullon & Ngoepe, 2019), the health sector (Dong, 2016; Were and Moturi, 2017) or the regulation of data governance (OECD, 2019)
Micro-level	Multi-organisational level		Management of data exchange and sharing across independent public organisations (Masilela & Nel, 2021; Rehman & Al-Raqom, 2020)
	Individual level	organisational	Management of data within a single organisation (Thompson et al., 2015)

In the last decade, data governance received a lot of attention from both scholars and practitioners due to its potential for digital-economic transformation at a macro-level (OECD, 2019; Van Ooijen et al., 2019) and organisational transformation at a micro-level (Khatri & Brown, 2010; Nielsen et al., 2018; Otto, 2011b). However, while public sector data governance has been studied at both the macro level (OECD, 2019; Van Ooijen et al., 2019) and micro

level, the majority of public sector data governance studies have been at the micro level (Masilela & Nel, 2021; Otto, 2011b; Rehman & Al-Raqom, 2020; Thompson et al., 2015).

Overall, studies on data governance in the public sector are still nascent, as exemplified by Nielsen's (2017) review of scholarly literature on data governance, where it was established that articles on public sector data governance constituted only 3% of the 62 articles reviewed. Furthermore, Nielsen et al. (2018) contend that there were no scholarly works on particular public sector divisions, such as data governance in local government administrations, prior to their study. Moreover, a literature scan on international data governance produced only the OECD (2019) publication, thus confirming that there are dismal studies in this macro-level area.

2.6.2 Data Governance Approach

Approaches to public sector data governance vary in prioritisation, institutional approach, and implementation, among other things. This subsection discusses the key approaches to public sector data governance.

2.6.2.1 Legal and Regulatory Approach

Evidence indicates that Governments have approached the initiative of creating an enabling environment for data governance at the international and national levels by enacting laws and related Policy instruments (Mahanti, 2018; OECD, 2019; Van Ooijen et al., 2019). Examples include the application of data privacy and protection laws, such as the South African Protection of Personal Information Act of 2013 (Herselman et al., 2019). At a macro-level,

most countries that lack institutionalised data governance structures have found respite in data protection laws or related policy instruments for various aspects of data governance (Herselman et al., 2019; Mullon & Ngoepe, 2019; OECD, 2019).

2.6.2.2 Inter-governmental Public Sector Data Governance Frameworks

An Intergovernmental organisation is “*an entity created by a treaty involving two or more nations to work in good faith on issues of common interest*” (Volgy et al., 2008, p. 40). Intergovernmental organisations include the African Union, the European Union, and the United Nations, as well as the International Telecommunication Union (ITU). Membership in intergovernmental organisations may be based on sovereign states, multinational organisations, technology companies, and academia.

Intergovernmental Data Governance refers to the management and use of data among an intergovernmental organisation's members. It encompasses macro-level governance, which involves national and international regulations, and micro-level governance, which focuses on data management within individual organisations. Following is a discussion of some Intergovernmental Data Governance Frameworks that include i) the African Union Data Policy Framework, ii) the European Union Data Governance Framework, and iii) the Organisation for Economic Cooperation and Development (OECD) Model Framework for governance of data.

2.6.2.2.1 African Union Data Policy Framework

The African Union (AU) Data Policy Framework, a unique and comprehensive policy instrument developed in 2022, is specifically designed to guide African Union member states' data governance (AUC, 2022; Nyirenda-Jere et al., 2022). It guides and empowers member

states, instilling in them the capability and responsibility to utilize proper data management as a critical resource required to catalyze socio-economic development, good governance, and regional cooperation.

The framework, with its standard approach to data governance, is essential in fostering regional integration. It establishes a standard data policy that facilitates cross-border sharing, use, and management of data, thereby aligning member states with the organisation's vision of a prosperous and integrated Africa.

The African Union Policy Framework is premised on three core principles, namely i) *Data Sovereignty and localization*, by advocating for data control within national borders and supporting data localization practices, such as ensuring critical data is stored and processed within African countries; ii) *Data Protection and Privacy*, where the framework aligns with global standards on data protection; It focuses attention on maintaining the privacy and ensuring responsible management of personally identifiable data in addition to encouraging the adoption of comprehensive data protection laws across member states (Yilma, 2022); and iii) *Inclusivity and Equity*, where cognizant of the digital divide, the framework highlights the significance of inclusive data practices and data-driven initiatives that are beneficial to all sections of the community, especially marginalized groups (AUC, 2022; UNECA, 2022).

The framework is a response to three core data governance challenges in Africa, namely i) *the fragmented nature of the African data ecosystem*, where it proposes a mechanism for harmonising data policies across the continent to facilitate data transfer across international borders and collaboration by addressing the varying levels of data governance maturity across

African countries, thus enabling the defragmentation of the African data ecosystem; ii) *Infrastructural challenges in Africa*, where it advocates for investment in data transmission, processing, storage and management infrastructure such as communication networks, Internet Exchange Points (IXPs), and datacentres, to support the growth of the African data ecosystem; iii) *Human Capacity Gaps*, such as the need to build data management and analytics capacities for public officials and citizens to equip them with relevant skills to harness value from data (Eke, 2022).

The framework has four main implementation strategies: i) *Establishment of Legal and Regulatory Frameworks*: which encourage member states to develop national data policies and establish regulatory bodies to oversee data governance and ensure adherence to data protection requirements that align with the African Union's principles; iii) *Promotion of Data Sharing Mechanisms*: through the establishment of standardized protocols and bilateral agreements between countries to promote secure and efficient cross-border data sharing; iv) *Encouraging Partnerships and Collaborations*: by promoting partnerships with key partners such as the private sector, academia, and international organisations to leverage expertise, technology, and resources to implement the framework effectively.

The benefits envisaged from implementing the AU Data Policy Framework include increased data treatment as an economic asset, which could significantly boost the continent's digital economy and support the growth of data-driven innovations in industries such as fintech, e-commerce, and artificial intelligence. Additionally, the framework's emphasis on data-driven decision-making can enhance governance across the continent. By improving the availability and quality of data, governments can identify evidence-based policy priority areas, resulting in

better outcomes in service delivery, productivity, and economic development. In the same regard, the focus on inclusive data practices could help bridge the digital divide, ensuring that underserved communities also benefit from digital transformation. This could lead to more equitable development outcomes.

While the AU Data Policy framework is comprehensive, implementation may be challenging, especially in countries with limited resources or weak data governance structures. Therefore, ensuring that all member states adopt and adhere to the framework's guidelines will be critical for the Policy Framework's success.

Additionally, the emphasis on data sovereignty could lead to overly restrictive data localisation policies that hinder innovation and cross-border data flows. Finding the right balance between protecting national interests and fostering an open international data environment will be crucial. Therefore, it is essential that member states establish mechanisms for balancing data sovereignty requirements with sufficient openness to facilitate the international flow of data.

The other challenge the AU Data Policy Framework faces is the difficulty of harmonisation (Eke, 2022; Yilma, 2022). Achieving harmonisation across diverse legal, cultural, and technological landscapes in Africa is a significant challenge. For example, some African Union Member States follow the British legal system, while others follow the French legal system (Kuper & Kuper, 2022). Additionally, countries at various stages of digital transformation may struggle to align with the framework's principles (UNECA, 2022).

In general, the African Union Data Policy Framework is a forward-thinking initiative that recognises the transformative power of data. The Framework provides a strategic approach to data governance, designed to unlock the potential of data for sustainable development in Africa. However, its success depends on African Union member states' commitment to implementing the framework effectively and addressing the challenges associated with harmonisation, capacity building, and infrastructure development.

2.6.2.2.2 *European Union Framework for Governance of Data*

The European Union (EU) Framework for Governance of Data offers a comprehensive approach strategically designed to foster a unified and transparent data economy in the European Union (EU, 2024). Comprising legislation, strategies, and guidelines, it serves as a beacon for innovation, data sovereignty, personal data protection, and data sharing and usage regulation across sectors (EU, 2024). The essential elements of the European Union Framework for Governance of Data are as follows:-

First is the Data Protection General Regulation (GDPR). This landmark regulation has redefined how European Union citizens' data is gathered, stored, and used within the European Union (EU, 2024). It applies to all organisations handling the personal data of EU citizens, regardless of geographic location. It has become the global data protection standard, influencing privacy laws worldwide. The European Union Data Governance Framework provides citizens with extensive rights over their information, such as access, rectification, erasure, and portability. In an increasing data-collection era, these rights give people more control over their personally identifiable information. As Kushner (2020) highlights, the GDPR has become a gold standard for other regions, with countries like Brazil and Japan enacting

similar data protection laws. Its extraterritorial scope ensures that non-EU entities processing EU citizens' data must comply, thus extending its reach well beyond Europe (EU, 2024). However, the GDPR's complexity and cost of compliance have been significant challenges, particularly for small and starting enterprises. According to Dreyer and Schulze (2020), Small and Medium Enterprises (SMEs) struggle with implementing GDPR's stringent requirements due to limited resources despite the regulation's laudable data protection and accountability goals.

Second is the European Union Data Governance Act (DGA). This European Union legislation, enacted in 2022, is a significant milestone in enhancing data sharing and regulating data reuse. This Act is crucial in nurturing the Common European Data Spaces, a framework that ensures the availability of open data for innovation and "Data as a public good" (De Streel & Husovec, 2021, p. 21). Additionally, the introduction of data intermediaries, as neutral entities facilitating data sharing, is a crucial feature of the Act. This aims to instill trust in the data-sharing process and guarantee adherence to the regulatory requirements of data protection. Moreover, the Act encourages voluntary data sharing for altruistic purposes, such as scientific research and public health, thereby enabling the collection and use of data for societal benefits. De Streel and Husovec (2021) highlight that the Data Governance Act is vital to addressing Europe's fragmented data economy by promoting cross-border data exchange. However, they also stress that achieving a fully integrated data space is contingent on the willingness of national governments to harmonise their data-sharing practices, underscoring the significance of this milestone.

Third, the European Union Digital Markets Act (DMA). The legislation addresses the role of large electronic platforms in the European Union economy and their impact on competition and data use (EU, 2024). It targets large technology companies, known as gatekeepers, by regulating how they handle user data and ensure fair competition (Geradin & Karanikioti, 2021). It includes data portability provisions, allowing users to move their data freely between services, promoting consumer choice, and reducing monopolistic practices.

Fourth is the Digital Services Act (DSA). The DSA focuses on transparency in algorithmic decision-making, requiring platforms to disclose how data is used to display content and adverts (EU, 2024; Geradin & Karanikioti, 2021). It also mandates platforms to provide access to data for public scrutiny and research, ensuring accountability in how they use and manage data. Geradin et al. (2021) argue that these acts represent significant progress in curbing the power of big tech companies, especially in terms of how they exploit user data to maintain market dominance. However, they also caution that enforcement will be problematic, as the success of the Digital Services and Digital Markets Acts depends on the capacity of EU authorities to monitor and penalize non-compliance effectively.

Fifth, the European Data Strategy. The Data Strategy for Europe (2020) seeks to establish a unified market for data and promote the growth of European data spaces in crucial industries such as healthcare, finance, energy, and public services. Some of the crucial principles of this strategy are i) *Data Sovereignty*, which ensures that data generated within the EU is stored and processed according to European legislations and values, notably GDPR; ii) *Common Data Spaces*, which promote sector-specific data sharing and collaboration, particularly in areas like AI, Healthcare, and Smart Cities (EU, 2024). As Larus et al. (2020)

note, the strategy is ambitious in its vision of positioning the EU as a leader in the global data economy. By fostering data-driven innovation and ensuring data privacy, the strategy balances creating new economic opportunities with protecting citizens' rights (Van Ooijen & Vrabec, 2019). However, achieving these goals will require substantial investment in digital infrastructure and cross-border cooperation (Larus et al., 2020).

Despite its strengths, the European Union Framework for the governance of data faces several challenges, and these include the following:

First, balancing innovation and regulation. A critical tension within the framework is balancing strict data protection laws (like GDPR) with promoting innovation and data sharing. While GDPR's stringent requirements protect individual privacy, they can stifle innovation, particularly for startups and SMEs struggling to meet compliance costs. Van Ooijen and Vrabec (2019) argue that although GDPR is critical for safeguarding privacy, its complexity can hinder the agility of companies that need to leverage data for innovation in fast-moving sectors such as AI and IoT.

Second, data exchange across international boundaries. It is still problematic to seamlessly exchange and share data across EU borders, partly because some member states interpret data governance legislation differently (EU, 2024). Data localization requirements in some countries also hinder the achievement of a genuinely unified data space (Van Ooijen & Vrabec, 2019). For example, according to Erdos (2020), the EU's desire for data sovereignty must be carefully balanced with the need for global data exchange, particularly in sectors like finance and healthcare, where international data flows are essential.

Third, enforcement and compliance. The EU's framework is only as robust as its enforcement mechanisms. The success of the GDPR, the Data Governance Act, and any other related legislation depends on the capacity of EU institutions and national regulators to monitor, investigate, and penalize violations. Gutwirth and De Hert (2020) emphasize the importance of strengthening Data Protection Authorities across the EU to ensure they have the resources and expertise to enforce the complex regulatory landscape effectively.

Above all, the EU Data Governance Framework is a globally significant model for balancing data protection, innovation, and competition in the digital age. The EU has implemented a comprehensive data governance policy via legislation, including the GDPR, the Data Governance Act, and the Digital Services Act, which fosters data sovereignty, trust, and openness. However, challenges remain, particularly balancing stringent regulatory requirements with the need for innovation and cross-border data flow. To fully realize its potential, the framework must adapt to requirements for emerging technologies and ensure consistent enforcement across member states.

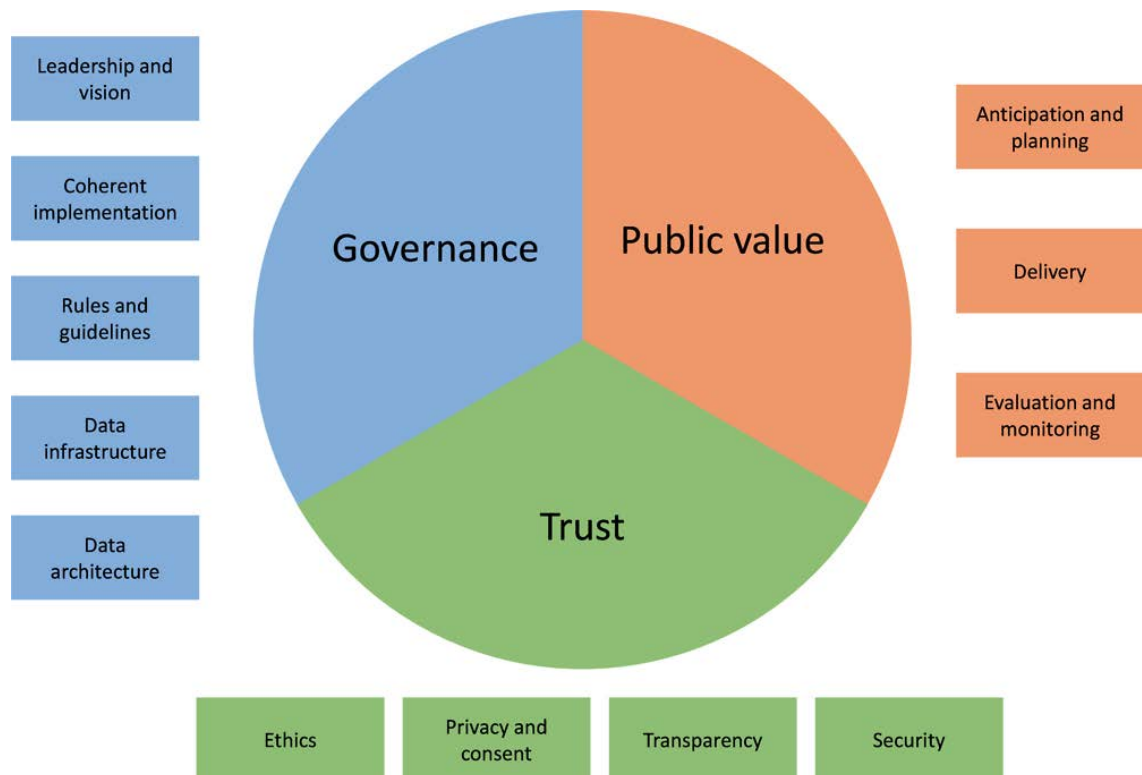
2.6.2.2.2 *OECD Model Framework*

In order to bridge the disparity in public sector data governance frameworks, the OECD model is a generic framework for countries or organisations to benchmark while planning for data governance (OECD, 2019). The OECD (2019) data governance model framework consists of three key focal areas, namely i) institutional governance structure, ii) conceptualization of data for public value, and iii) promoting public trust in data, which are augmented by twelve dimensions to deliver a holistic data governance framework as presented in Figure 17.

According to OECD (2019), some of the major obstacles to an international data governance framework implementation include i) *The complexity of jurisdiction*, which involves complying with several national and international laws, regulations, and standards. ii) *Data fragmentation*, which is concerned with combining information from many sources and formats across national boundaries; iii) *The linguistic and cultural barriers*, which refers to going beyond linguistic and cultural barriers to guarantee the efficient governance of data; and iv) *Data Protection and Security*, making sure that sensitive data is protected across borders and organisations.

Figure 17:

OECD Model Data Governance Framework

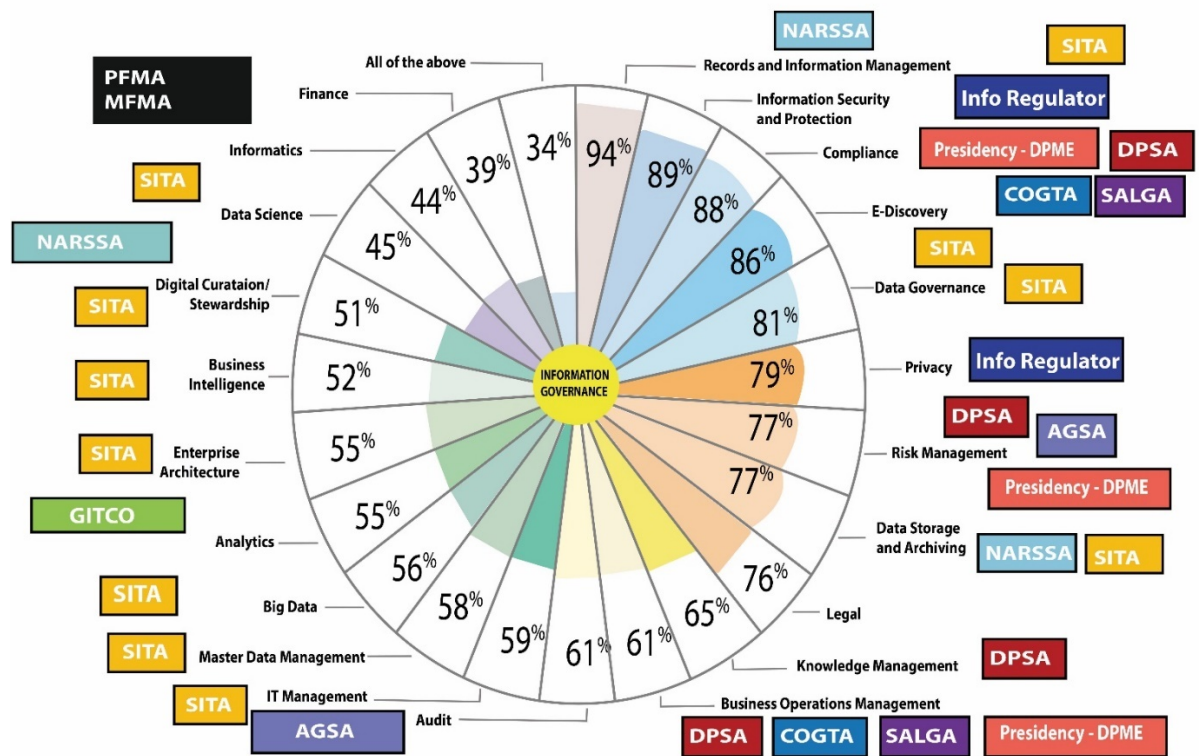


Source: OECD (2019)

Overall, the findings of this literature review indicate that different countries are at different levels of developing and implementing data governance frameworks (OECD, 2019). However, while most countries have in place data protection and information security laws or policies (Herselman et al., 2019; Mahanti, 2018; OECD, 2019; Van Ooijen et al., 2019), few countries (e.g., New Zealand, Estonia, and Norway) have attempted to develop standalone data governance frameworks (OECD, 2019). In addition, this literature review could not identify any comparative study that analyses the formulation, implementation, or maturity measurement of national data governance frameworks.

2.6.2.3 National Public Sector Data Governance Frameworks

Mullon and Ngoepe (2019) contend that there is no universal model for data governance at the national level, emphasizing the need to contextualize the model in relation to the prevailing local situation. For example, Mullon and Ngoepe (2019) conducted a study using the Information Governance Initiative's pinwheel facets as a theoretical framework to develop a country-level integrated Information Governance framework for South Africa. The pinwheel identifies key information governance domains and the responsible oversight mechanisms for implementation. Mullon and Ngoepe (2019) analyzed policy and legal documents concerning the information governance domains identified by the pinwheel to map actors to the pinwheel's data governance domains, as presented in Figure 18.

Figure 18:*Pinwheel Information Governance Model*

Source: Mullon and Ngoepe (2019)

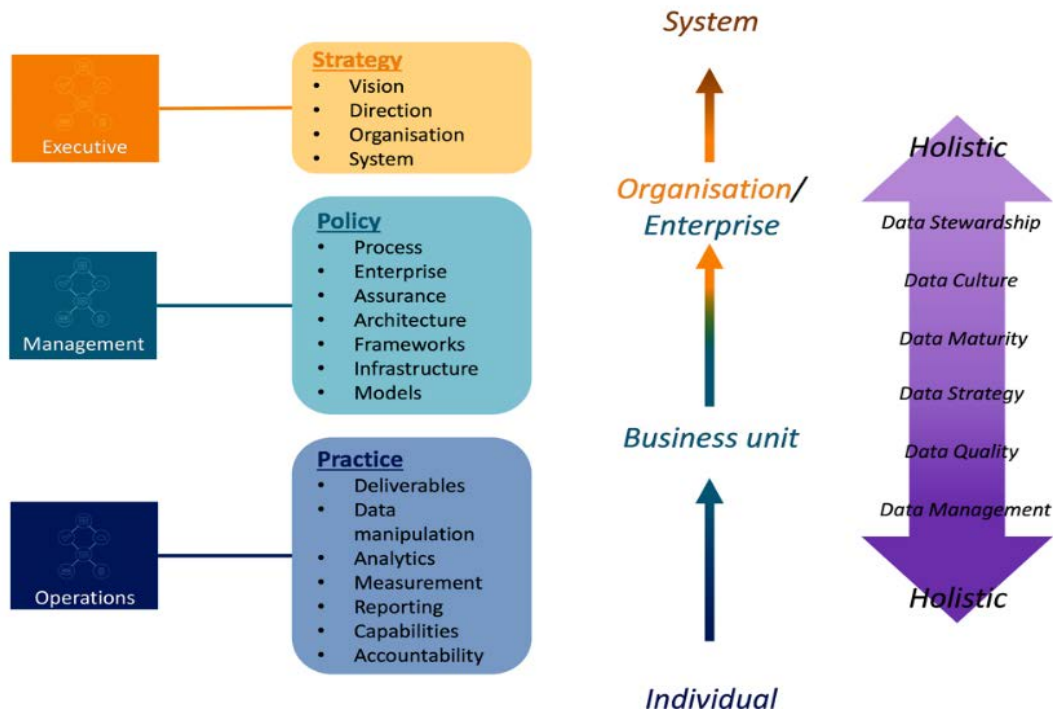
Their study established that there was no overarching framework for data governance in South Africa and that a few domains of Information Governance are legislated or driven by policy. Mullon and Ngoepe (2019) propose a framework comprised of key success factors, required policy and legislative instruments, principles, and action areas. However, the major limitation of their research is the overreliance on the existing policy and legal documents to

identify responsibility centres, which may exclude critical components not covered in the existing documentation.

Additionally, a study commissioned by the Organisation for Economic Co-operation and Development - OECD (2019) identified data governance frameworks in New Zealand as discussed in subsection 2.6.2.2.1, Norway as discussed in subsection 2.6.2.2.2, Estonia as discussed in subsection 2.6.2.2.3 and also proposed a generic framework for adoption by interested member states as discussed in subsection 2.6.2.2.4.

2.6.2.3.1 *New Zealand*

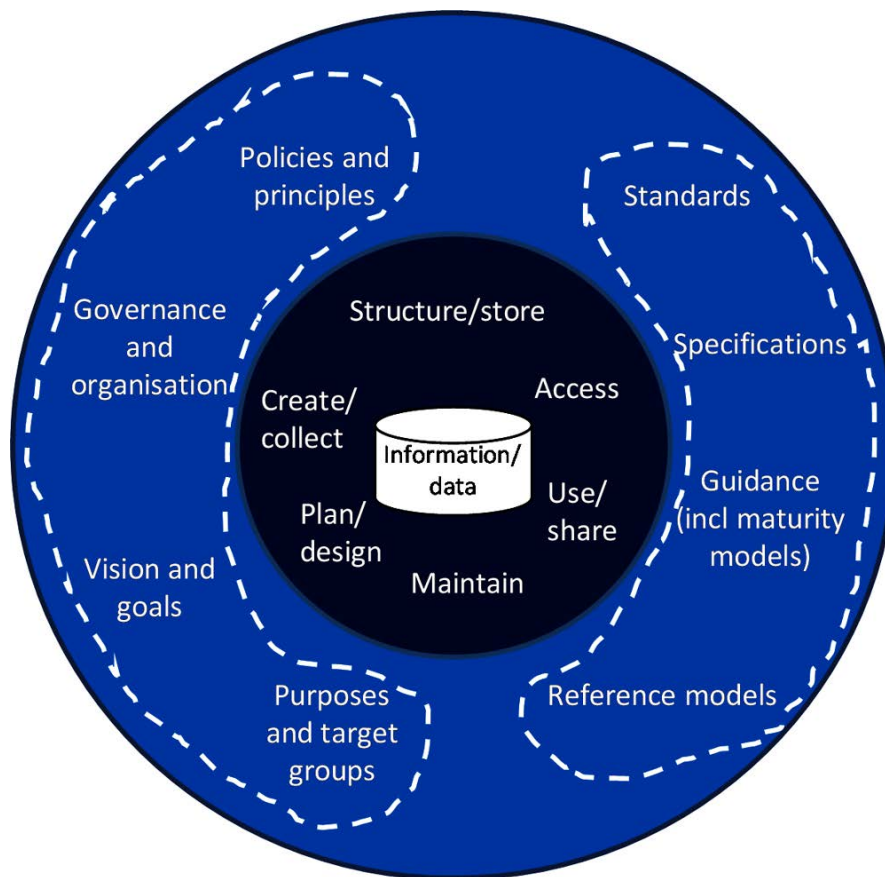
The New Zealand data governance framework aims to promote efficient public sector data management (OECD, 2019). The framework provides a hierarchical approach to data management throughout its entire life cycle, with executives responsible for setting strategy, management handling policy issues, and the operational level charged with the practical implementation of data governance activities. Figure 19 shows an illustration of the framework.

Figure 19:*New Zealand Data Governance Framework***Holistic data governance**

Source: OECD, 2019

2.6.2.3.2 Norway

The Norwegian data governance framework places a strong emphasis on the importance of public sector data governance in Norway's digital transformation efforts (OECD, 2019). On the one hand, the framework establishes the strategic direction for data governance through a clear vision, well-defined policies, established principles, and robust governance mechanisms. On the other hand, it establishes implementation plans, including standards, reference models, and guidelines for managing public sector data. The framework provides an overview of data governance throughout its lifecycle, as presented in Figure 20.

Figure 20:*The Norwegian Data Governance Framework*

Source: OECD, 2019

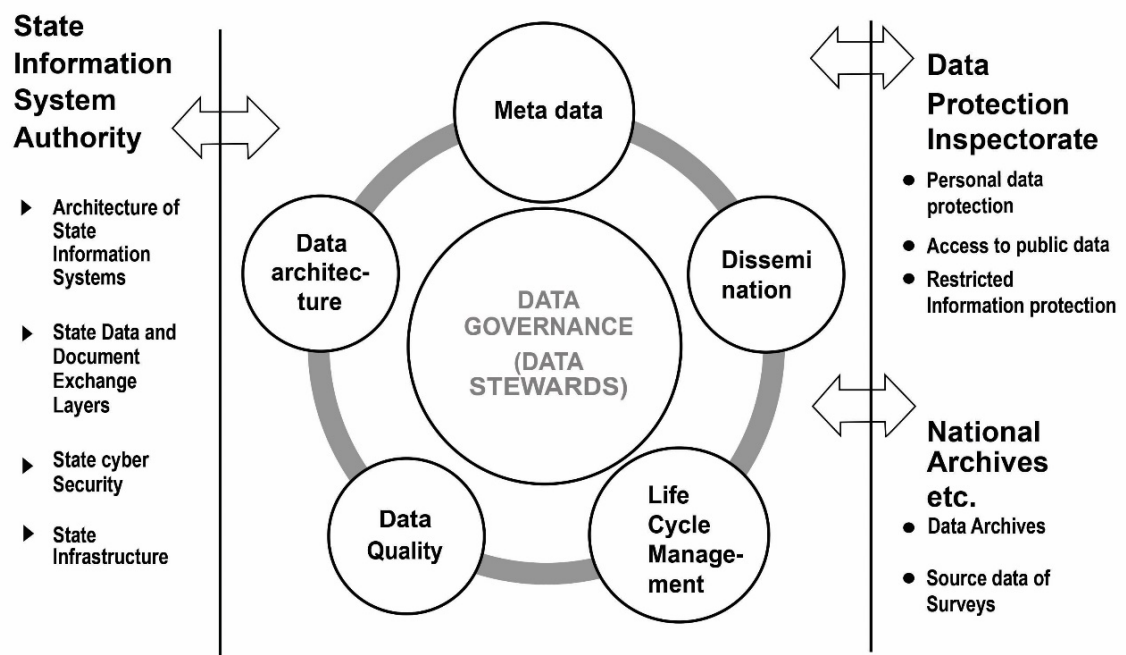
2.6.2.3.3 Estonia

The Estonian data governance framework is premised on three key elements, namely i) *data sources*, which is concerned with the identification and exchange of data from various sources; ii) *data processing and storage*, which is concerned with the business processes and archiving services, and iii) *data usage*, which refers to how the data is used, such as policy

formulation or decision making (OECD, 2019). The framework caters to data governance over the data's lifecycle, as presented in Figure 21.

Figure 21:

Estonia Data Governance Framework



Source: Estonia (2020)

One of the key lessons from the Estonia Data Governance Ecosystem is the use of data embassies, an innovative strategy for protecting sensitive government data from cyber threats, natural disasters, and various disruptions within a country by hosting it in a secure location outside the country. Estonia pioneered the data embassy initiative by hosting some of its national data in Luxembourg in 2015 (Estonia, 2024; Kotka & Liiv, 2015). Other countries have since adopted this concept, including Monaco (Estonia, 2024) and Ukraine (Stupp, 2022).

The main advantages of using data embassies include: i) *Jurisdictional Protection* - Data embassies are safeguarded by the International Convention for Diplomatic Relations, which offers immunity from search, seizure, attachment, or execution by the host nation. (Sierzputowski, 2019); ii) *Elevated Security Standards* - Data embassies are designed, built, and operated using top-of-the-range infrastructure and technologies (Ottis, 2018); iii) *International Digital Diplomacy* - Data embassies promote collaboration across nations, facilitating the exchange of best practices and knowledge in data management and security (Klymash et al., 2019; Rashica, 2024)

2.6.3 Governance of Data as a Public Good

According to Samuelson (1954), a public good is a product that is non-rivalrous (i.e., its consumption in one instance does not reduce its availability in others) and non-excludable (i.e., one's consumption does not prevent others from consuming the same product). Therefore, the concept of "Data as a Public Good" refers to the notion that certain types of data should be made freely available for the benefit of society.

Data is not always exclusively available as a public good; however, it can serve this role in certain contexts. Examples include public good, which encompasses data generated, collected, or funded by the public sector, such as administrative data, statistical data, and data from publicly funded research. Additionally, Open Government Data, which refers to machine-readable data that is freely accessible for reuse or redistribution, provided that attribution and share-alike requirements are met, is also a public good (Poikola et al., 2011).

It is crucial to note that even when data is consumed as a public good, it is still subject to data confidentiality needs, like the non-disclosure of personally identifiable information, emphasising the necessity for responsible data governance. Above all, it is crucial for Governments to invest in the collection of public data, as the private sector may not significantly participate in such an initiative if it does not contribute to profit (Poikola et al., 2011).

The benefits of data being a public good include i) *spurring innovation and economic growth* - for example, open data stimulates innovation by providing a foundation for new products, services, and business models; ii) *promoting transparency and accountability* - Making data publicly available enhances government transparency, enabling citizens to hold public officials accountable and promoting informed decision-making; and iii) *providing social and environmental benefits* - Publicly available data can be used to address social challenges, such as public health crises or environmental degradation, by informing policies and mobilizing resources (Concilio & Molinari, 2021; Poikola et al., 2011; Stüdlein, 2022; Williams, 2022).

Despite the benefits of data being a public good, it has challenges, which include i) *difficulties in implementing privacy and security requirements* - balancing data openness with the need to safeguard personal and private sensitive information is a significant obstacle that can be resolved by applying data anonymization techniques and robust data governance frameworks; ii) *ensuring equitable and inclusive access to data* - resolution of this challenge includes addressing the digital divide and promoting data literacy; iii) *meeting the costs for setup and operationalization* - the maintenance, curation, and updating of public data require resources require a long-term financial commitment to ensure sustainable of such initiatives;

iv) *maintaining data interoperability for it to be reused in different contexts and domains* - this challenge can be mitigated by standardizing the data, thus enabling seamless integration across systems.

Furthermore, to successfully implement the data as a public good initiative, the following should be in place: i) *establishment of an enabling environment* - there is a need for Governments to establish legal frameworks that mandate the sharing of certain types of data as public goods while protecting sensitive information; ii) *standardization of data and processes* – there is need for national and global collaboration, and harmonisation of standards of systems and data to ensure seamless sharing and exchange of data; and iii) *maintaining healthy stakeholder partnerships* – there is need for continuous collaborations between governments, private companies, and civil society that can help leverage resources and expertise to maximize the impact of data being a public good (Concilio et al., 2021).

Examples of data being a public good include the Government Open Data portal, which provides free access to various datasets, such as the Uganda National Statistical Office's open data portal at <https://nso-uganda.opendataforafrica.org>. Relatedly, there is a growing movement in the scientific community toward unrestricted access to research results, which can multiply the sharing of new knowledge and enhance innovation. For example, during the COVID-19 epidemic, sharing public health data was vital for developing public policy, coordinating international responses, and developing vaccines.

In summary, the notion of data as a public good holds the promise of substantial societal advantages; however, to actualise this potential, it is imperative to address the inherent challenges and establish comprehensive governance models carefully.

2.6.4 Public Sector Data Governance Challenges

Understanding the challenges that public sector organisations face in implementing data governance is essential for developing appropriate solutions. Globally, public sector organisations have placed much effort in collecting voluminous amounts of data as part of their regulatory function, but have not reciprocated by establishing data governance measures to ensure proper management of this data over its lifecycle (Benfeldt et al., 2020; Masilela & Nel, 2021; Thompson et al., 2015). For example, Thompson et al. (2015) conducted a study in Western Australia on the management of data from the Police Firearms Management System and the Department of Health Information System that revealed a lack of data protection, a lack of trust in data accuracy, and a lack of traceability of user actions. Their findings also revealed that the cause of these problems was not inadequacies in the business rules or the technology, but rather a lack of prioritising data governance as a critical activity in any digital transformation initiative. The authors recommend that mitigating these problems would require continuous monitoring of all data governance subcomponents, such as system development, system usage, and information security, and having professionals with a sound understanding of data management, which can provide reassurance and direction in addressing these challenges.

Furthermore, various scholars (Benfeldt et al., 2020; Thompson et al., 2015; Vilminko-Heikkinen et al., 2016; Were & Moturi, 2017) agree that the complex and diverse nature of

government processes compounds the challenges of public sector data governance. For example, Vilminko-Heikkinen et al. (2016) examined the process of establishing a central master data function in local government administration with the intention of creating a single source for critical data assets. Their findings indicated that instituting master data management across multiple local government administrations was characterised by tensions and conflicts among stakeholders due to ambiguities in data co-ownership, resulting from a tendency to focus on agency objectives rather than the entire local government administration. These findings indicate a need to consider the intricate complexities of government and plan mitigation measures for implementing a shared vision across public sector organisations to ensure effective collaboration among the stakeholders.

Relatedly, Benfeldt et al. (2020) studied the challenges of data governance in Danish Local Government Administrations and identified i) difficulty in comprehending the value of data, ii) lack of inter-organisational collaboration, iii) mismatched data governance capabilities, iv) differences in data sources, v) diversity of business processes and vi) political misunderstanding as critical public sector data governance challenges.

2.7 PUBLIC SECTOR DATA GOVERNANCE IN UGANDA

This subsection reviews the literature on data governance initiatives in Uganda. The content is arranged according to i) Data Governance Institutional Arrangements (Subsection 2.7.1), ii) Legal and Regulatory Environment (Subsection 2.7.2); iii) National Data Governance Technology and Infrastructure (Subsection 2.7.3), iv) e-Government Systems in Uganda (Subsection 2.7.4), v) Data Architecture (Subsection 2.7.5), vi) Cyber Security (Subsection 2.7.6) and vi) Consequences of lack of Data Governance in Uganda (Subsection 2.7.7).

2.7.1 Data Governance Institutional Arrangements

Currently, no single Ugandan Government Institution is responsible for the overall public sector data stewardship, which involves being solely accountable and responsible for the data management processes and their quality (DAMA, 2017). The following is a discussion of the key institutions with a core mandate in Uganda's data governance ecosystem.

2.7.1.1 *Ministry of Public Service*

The closest responsible institution with respect to overall data governance in the Public Sector is the Ministry of Public Service, which oversees the management of records, documents, and archives (MoPS, 2021). However, the Ministry of Public Service, established before Uganda's political independence from British Colonial rule in 1962, has primarily focused on managing paper-based records using manual techniques, despite the public service reforms in the sector and the increasing digitalisation of services (Olum, 2003). Furthermore, there is an ad hoc approach to public sector data management in Uganda, as the civil service structure lacks a dedicated position for data stewardship; instead, data management functions are assigned to Information Technology Officers (MoPS, 2021).

2.7.1.2 *Ministry of ICT and National Guidance*

The Ministry of ICT and National Guidance was established in June 2006 (MoICT, 2024) and is one of the youngest Ministries in the Government of Uganda. Its goal is to provide technical and strategic leadership, coordination, support, and advocacy for the ICT industry regarding laws, regulations, policies, and strategy issues (MoICT, 2024). In executing its

mandate, the Ministry has led the development and enactment of critical legislation that supports the governance of data, including the Data Protection Law (2019) and the Electronic Signatures Act (2011). The Ministry also oversees the planning and installation of ICT Infrastructure in the Country. Other roles of the Ministry include supervising the IT cadres in the Government and planning their job structures and roles. In this regard, the Ministry must ensure that data leadership, administration, and usage roles are adequately organised. However, as several scholars contend (Cheong & Chang, 2007; Hagmann, 2013; Nguyen, 2016; Weber et al., 2009), data governance is a holistic initiative that extends beyond Information Technology management.

2.7.1.3 The Uganda Bureau of Statistics (UBOS)

The Uganda Bureau of Statistics (UBOS), in its capacity as the National Statistical Office, is responsible for establishing a national statistical system to provide accurate statistics for policymaking and decision-making purposes (UBOS, 1998). Its critical roles include the enforcement of regulations for data collection and management, the conduct of quality control and assurance of statistical products, the provision of technical support for surveys and censuses, the coordination of stakeholders in the ecosystem of statistical data, and the guaranteeing of data dissemination and accessibility through initiatives such as open data are among its most important roles. In general, the Uganda Bureau of Statistics (UBOS) plays a fundamental role in maintaining reliable statistical governance, which supports sustainable development in Uganda.

2.7.1.4 *National Information Technology Authority - Uganda*

The National IT Agency (NITA) of Uganda was established under the Ministry of ICT to regulate and manage IT products, services and infrastructure (Uganda, 2009). The Agency's key functions include: i) Regulatory Function - Promotes IT laws and standards, ensuring compliance and certifying IT companies to protect consumers and enhance global competitiveness; ii) Software Licensing Service - Manages bulk software licenses for government entities, resulting in cost savings through economies of scale; iii) Technical Support and Guidance - Operates a National IT Service Desk for stakeholder support and aids in the development of IT products and services; iv) IT Research - Conducts ICT research to inform policy and infrastructure development. In relation to this study, NITA plays a crucial role in data governance in Uganda by enforcing compliance with national and international digital data regulations, providing communication infrastructure (National Backbone Infrastructure), and managing national data centres, among other responsibilities.

2.7.1.5 *Data Protection Office*

The Data Protection Office (DPO) in Uganda, established by the Data Protection and Privacy Act (2019), oversees the enforcement of data privacy laws. Its key functions include: i) *Regulation and Enforcement*: Ensures compliance with data privacy laws, guiding organizations on legal obligations; ii) *Legal and Regulatory Role*: Monitors data handling practices, ensuring lawful and transparent management of personal data, and imposing penalties for non-compliance; iii) *Handling Data Breach Incidents*: Receives and manages notifications of data breaches, assessing impact and determining remedial actions; iv) *Protection of Data Subject Rights*: Upholds data subjects' rights, allowing access, amendment, and complaint processes, and acting against violators; v) *Public Awareness and Education*:

Raises awareness about data rights and provides training for citizens and organizations on responsibilities; vi) *Issuance of Licenses and Certifications*: Licenses data controllers and processors, ensuring only qualified entities handle personal data; vii) *Policy Development and Advocacy Role*: Advises the government on policy and regulatory developments, aligning them with international standards; viii) *Collaboration and International Cooperation*: Collaborates with local and international bodies to promote data protection, sharing best practices and regulating cross-border data transfers. The DPO is crucial for establishing data management practices that strike a balance between privacy and lawful data usage in Uganda.

Above all, Uganda's data governance landscape is shaped by institutional arrangements, legal frameworks, and policies designed to manage and protect data. While implementation is challenging, ongoing efforts by key institutions, such as the National Data Protection Office, the Uganda Bureau of Statistics, and the National IT Agency, in collaboration with Ministries, provide a firm foundation for coordinating data governance. This needs to be further enhanced to ensure that data benefits Uganda's national development.

2.7.2 Legal and Regulatory Environment

The Ugandan government has strongly emphasised regulating the information technology industry. Several regulations, laws, and guidelines, some of which contain data governance requirements, are already in place. The following is a discussion of Ugandan laws, regulations, policies, and standards and their relationship with data governance.

2.7.2.1 Laws

The Government of Uganda has enacted several laws that have a significant effect on data governance, as highlighted in

Table 15.

Table 15

Compilation of Ugandan Laws Pertinent to Data Governance

Title of the Law	Short Description	Relevance to Data Governance
National Records and Archives Act (2001)	Provides for the management of public records and archives. Mandates the storage of valuable records with the National Archives and Records Centre (Uganda, 2001).	Responsible for the governance of records, a type of data used to keep evidence of particular actions (Luyombya, 2011).
Access to Information (2005)	This Act establishes the right to access information, classifies information as open or confidential, and establishes the process for obtaining access to that information.	It encourages the development of open data by providing unrestricted access to publicly available data controlled by government entities.
The National IT Authority Act (2009).	This Act establishes the Agency to regulate the information and communication technology (ICT) industry in Uganda (Uganda, 2009).	This legislation establishes the National IT Authority, which plays a crucial role in the data governance ecosystem.
Data Protection and Privacy Act (2019)	Regulates the collection, processing, and use of personal data (Uganda, 2019).	Promotes responsible management and use of personal data.
Computer Misuse Act (2011)	Regulates unlawful access, abuse, or misuse of information systems (Uganda, 2011b).	Promotes data quality by ensuring data integrity.
Electronic Transactions Act (2011)	Regulates electronic communications and online transactions (Uganda, 2011a).	Promotes the safety of data communications.
Electronic Signatures Act (2011)	Regulates digital signatures and establishes a Public Key Infrastructure to authenticate electronic documents (Uganda, 2011c).	Facilitates digital data authentication, such as signatures and documents, and enables full automation of digital services.

Title of the Law	Short Description	Relevance to Data Governance
National Regulations	Databank Regulates the creation and management of the National Databank (NDB, 2015).	Facilitates the central national data hosting.

2.7.2.2 Policies

Similarly, Table 16 presents a summary of the policies that have a significant effect on data governance in Uganda.

Table 16:

Compilation of Ugandan Policies Pertinent to Data Governance

Name of Policy	Short Description	Relevance to data governance
National Information and Communication Technology Policy	Intended to guide the development, implementation, and governance of ICTs (Uganda, 2014)	Complements all data governance initiatives
National Information Security Framework	Provides minimum information security standards that public sector organisations must comply with to minimize cyber risks and attacks (NISF, 2014).	It complements data governance aspects, such as data transmission security, user authentication, and data integrity (NITA, 2017).
Cloud Computing Policy	To guide the use of government cloud infrastructure and related services (NITA, 2018)	Promotes the use of shared ICTs and complements all data governance processes
e-Government Interoperability Policy	Guides the use of a common data vocabulary (metadata), linking of data sources, and exchange of data among e-government systems (e-GIF, 2021)	Facilities data governance processes

2.7.2.3 *Standards*

The Government of Uganda has adopted various international standards to support the development and use of information technology products and services (NITA, 2017). According to NITA (2017), the adopted standards include i) Information Security Management Standards (ISO IEC, 2015, pp. 1, 27001-27010), ii) Information Technology Service Management (ISO IEC 20000 series), iii) Telecommunications and Information Exchange (ISO IEC 9594-8: 2008) and iv) Data Management Standards (ISO IEC 9075-2:2011, 9075-11 and 9075-14). However, these standards are not comprehensive because they exclude other critical standards. For example, all three data management standards prescribe only database languages, excluding other standards, such as ISO/IEC 8000 for data quality (ISO, 2021; NITA, 2017).

Data governance elements manifest in various legal and regulatory instruments as components of the broader digital transformation initiative. However, the fragmentation of these components reduces their holistic impact on data governance. Moreover, this fragmentation complicates the monitoring and measurement of the impact of these policy instruments with respect to data governance. Additionally, some policy instruments, such as the National Records and Archives policy, require updating to encompass digital data management requirements, including digital information preservation (Luyombya, 2011).

2.7.3 **National Data Governance Technology and Infrastructure**

In a bid to establish Information Technology Infrastructure for running digitalized services, the Government of Uganda has inadvertently established some critical data

governance technology and infrastructure that include i) e-government Systems as discussed in subsection 2.6.4.3.1, ii) the National Data Centers as discussed in subsection 2.6.4.3.2, iii) Communication Infrastructure as discussed in subsection 2.6.4.3.3, iv) Primary Key Infrastructure as discussed in subsection 2.6.4.3.4 and v) Archive Centers as discussed in subsection 2.6.4.3.5.

2.7.3.1 Data Centre Services in Uganda

A data centre is a physical facility where enterprises store their digital assets, such as databases and Information Management Systems (Dodd et al., 2020). In Uganda, data centres can be classified into two primary categories, namely i) those that are publicly owned and ii) those that are privately owned. The following is a critical analysis of Uganda's data centre services industry, which examines various aspects of the industry, including infrastructure, market dynamics, regulatory environment, challenges, and opportunities.

2.7.3.1.1 Government Data Centres

The Ugandan Government invested in data centres to support e-government services, improve data security, and ensure the availability of critical infrastructure. There is one National Data Centre in Uganda, located at two sites: the primary site in Kampala City and the secondary site in Jinja City, with plans to establish additional sites. The National Data Centre is used for centralised hosting of e-government systems and public sector data at the primary site with replication capabilities at the secondary site for disaster recovery (NITA, 2024). The National Data Centre supports data governance processes by enabling easier centralised systems monitoring and database administration, ultimately leading to high data integrity. Additionally, different government entities operate various institutional data centres. The

National Data Centre provides a range of services, including data and application hosting, server management tools, shared services, and business continuity services (NITA, 2024). The clients hosted in the National Data Centre enjoy added-on services such as i) Integrated Security, ii) stabilised power with backup provisions and full-time air conditioning, and iii) managed services such as virtualised infrastructure monitoring of the platform that hosts the production environment for applications and databases.

2.7.3.1.2 *Private Sector Data Centres*

Several private sector operators in Uganda have established commercial data centres charging service fees (NITA, 2024; RENU, 2024; Sserwamukoko, 2024). These private data centres offer services similar to those of the National Data Centre. For example, Mobile Telecommunications Network (MTN), one of Uganda's leading Internet Service Providers, operates six commercial Data Centre Services located in the central, eastern, Western, and southern regions of the country, enabling organisations to outsource their hosting or disaster recovery requirements to them (MTN, 2024).

In addition to local private data centre service providers, Ugandan firms can access international cloud hosting services, such as Microsoft Azure cloud services and Content Distribution Networks, like Google Cloud (DTR, 2023; Sserwamukoko, 2024). However, hosting content on Ugandan citizens' Personally Identifiable Information requires clearance from the Data Protection Office (Uganda, 2019).

2.7.3.1.3 *Regulatory Environment*

The Ministry in charge of Communication and Information Technologies in Uganda oversees the ICT Sector. However, the direct supervision of ICT Infrastructure, including data centre services, is under the Communications Commission of Uganda (UCC), the Communications Sector Regulator (MOICT, 2024). This regulator ensures that data centre operators comply with all applicable regulations and laws on service quality, data confidentiality, security, and national information security preparedness (DP & PA, 2019; NISS, 2011).

2.7.3.1.4 *Opportunities for Data Centres*

The data centre industry in Uganda is experiencing significant growth opportunities driven by several key factors. Firstly, there is an increasing demand for data centre services due to rising digitalisation and e-commerce, prompting the government to foster partnerships with international cloud service providers, which have led to the establishment of modern data centres (Sserwamukoko, 2024). Secondly, both government and private sector initiatives are boosting the ICT sector by investing in data centres and necessary infrastructure, such as fibre optic networks (NITAb, 2022; RAXIO, 2024; RENU, 2024). Thirdly, the leading Tier III data centres in Uganda strike a balance between cost and reliability, although Tier IV options are not available (NITAb, 2022). Additionally, the popularity of cloud services across various sectors presents further growth potential for data centres (DTR, 2023). Furthermore, Uganda's strategic location enables it to serve neighbouring countries with less developed digital infrastructures, thereby enhancing its competitiveness (RAXIO, 2024; RENU, 2024). Lastly, the government's digital initiatives are expected to create more opportunities for public-private partnerships in data centre operations, driving demand for services (DTR, 2023).

2.7.3.1.5 *Datacentre Challenges in Uganda*

According to the literature reviewed, the data centre industry in Uganda faces challenges that include, i) lack of regulatory compliance, ii) intermittent electricity supply, iii) poor internet connectivity, iv) high device costs, v) data governance issues, vi) fragmented and disconnected datacentres, vii) lack of local talent to manage the centres' operations, viii) high operational costs, and ix) a lack of market for digital services offered by the datacentres, as detailed in Table 17.

Table 17:*Compilation of Ugandan Datacentre Challenges*

Challenge	Description	Recommendations
i. Regulatory Compliance and Enforcement	Regulations are sometimes not strictly enforced, and some datacentres are not compliant with data protection laws or industry standards, which exposes clients to potential risks (Uganda, 2019).	Datacentres must prioritise compliance with local regulations and international standards, particularly in data protection and cybersecurity, to build client trust and differentiate themselves in the market (Uganda, 2014).
ii. Electricity Supply	Uganda often experiences intermittent electricity supply, which negatively impacts datacentre uptime, increases costs, and pollutes the environment as operators use expensive alternative power sources, such as standby generators (Gillwald et al., 2019).	Datacentres should explore the use of solar energy and other renewable energy sources to reduce operating expenses and decrease their reliance on unpredictable grid electricity (DUV, 2020).
iii. Internet Connectivity	Maintaining efficient datacentre operations can sometimes be challenging due to limited and fragmented fibre-optic Internet infrastructure, especially for clients outside large urban centres (Sserwamukoko, 2024).	Collaboration between datacentre operators, telecom companies, and the government to improve fibre-optic infrastructure can enhance connectivity, particularly in underserved regions.
iv. Cost of Devices:	The high costs of devices, such as servers, network equipment, and storage devices, due to high taxation, hinder datacentre setup and expansion (DTR, 2023).	The Government should consider lowering the taxes levied on devices to promote uptake of ICTs (DTR, 2023; Gillwald et al., 2019).
v. Data Governance:	Mistrust, incomplete or incorrect data, a poor data culture, and inadequate data oversight policies can all adversely affect data administration services.	The Government should adopt a data governance framework and enforce its adherence.
vi. Fragmented and Disconnected datacentres	A synchronised datacentre system is essential for data governance (DTR, 2023; Sserwamukoko, 2024).	Regulators should encourage datacentre operators to integrate and share their infrastructure (MOICT, 2018).
vii. Lack of Local Talent	The establishment of datacentres is hindered by the scarcity of local	Addressing the skills gap through training, partnerships with equipment

Challenge	Description	Recommendations
	expertise in specialised fields, such as certified infrastructure engineers (Sserwamukoko, 2024).	manufacturers, and educational institutions is vital for improving the management of datacentres (DTR, 2023; Sserwamukoko, 2024).
viii. High Operational Costs:	Building and maintaining datacentres in Uganda is expensive, partly due to the importation of materials and the need for backup power, power reticulation, cooling systems, and security measures. These costs are often passed on to customers, making services expensive (Sserwamukoko, 2024).	The Government should consider lowering the taxes levied on materials used in the construction of datacentres and providing stable power to these facilities (Gillwald et al., 2019).
ix. Lack of market for digital services.	There is a low uptake of data centre services from the private sector (Sserwamukoko, 2024).	Datacentres should consider expanding their services to neighbouring countries in East Africa, leveraging Uganda's position as a regional hub for ICT services (Sserwamukoko, 2024).

Uganda's data centre market is expected to expand due to government initiatives aimed at automating services, rising cloud adoption rates, and growing consumer demand for digital services. Nevertheless, the industry faces numerous impediments to overcome, including poor connections, high operating expenses, and power supply issues. To fully realise the promise of data centre services in Uganda, strategic investments, regulatory compliance, and capacity building are necessary to address these obstacles. Data centres in Uganda can play a vital role in the region's digital transformation by emphasising innovation, sustainability, and regional expansion.

2.7.3.2 Communication Infrastructure in Uganda

Uganda's communication infrastructure has made significant strides in recent years, propelled by government initiatives and private-sector investments. This progress has greatly

improved connectivity and service delivery across the country, instilling optimism for the future. The availability of reliable communication is a fundamental prerequisite for the success of any data governance initiative. For example, Abraham et al. (2019) demonstrate that communication infrastructure is one of the critical domains through which data governance mechanisms, such as data quality management, are implemented.

2.7.3.2.1 *Overview of Communication Infrastructure*

The Ministry in charge of Communication and Information Technologies oversees the planning and deployment of Uganda's ICT infrastructure, which encompasses telecommunications, data communication, and radio and TV broadcasting infrastructure (MOICT, 2018). This infrastructure is categorised into tangible assets, such as Fibre optic cables and communication masts, or intangible assets, such as radio spectrum, telephony numbering, and domain name systems. The government's long-term goal is to harmonise the management of these resources to improve connectivity and service delivery throughout Uganda, providing reassurance about managing Uganda's ICT infrastructure (MOICT, 2018).

2.7.3.2.2 *Communication Infrastructure Stakeholders*

As discussed below, the stakeholders in the communication infrastructure ecosystem include regulators, infrastructure providers, and development partners.

First, Communication Infrastructure Regulators. The Uganda Communications Commission, operating under the overall guidance of the Ministry in charge of Information and Communications Technology, directly supervises the country's communications

infrastructure. The infrastructure is regulated through the provisions of the National Broadband Policy (MOICT, 2018) and the Uganda Communications Regulations (UCC, 2019).

Second, Public Infrastructure Operators. The National IT Authority – Uganda is responsible for installing the National Backbone Infrastructure (NBI), which aims to establish a high-speed fibre optic communications network to deliver e-government services (NITA, 2024). The infrastructure is being rolled out in phases, with the first phase connecting major urban centres and subsequent phases extending to border regions and providing last-mile connectivity to government facilities (NITA, 2024).

Third, Private Infrastructure Operators. Most of the country's communications infrastructure has been laid by private sector operators, such as mobile network operators and Internet service providers, who offer commercial connectivity services.

Fourth, Development Partners. This includes various players involved in providing various Internet Governance Services. Key among these is the Uganda Internet Exchange Point (UIXP), a non-profit organisation dedicated to enhancing Internet connectivity within Uganda and beyond by interconnecting local and international traffic within Uganda via high-capacity network switching infrastructure.

2.7.3.2.3 *Communication Infrastructure Challenges*

Challenges faced by communications infrastructure providers in Uganda include increased infrastructure vandalism, which raises concerns about safety and growth, necessitating collaboration among stakeholders such as the Communications Regulator and

local authorities (Muyobo, 2024). Additionally, as of March 2024, only 27% of the population, or 13.3 million people, were internet users (Mubiru, 2024), highlighting the need for initiatives to lower entry costs for new Internet Service Providers and expand the fibre optic network (DTR, 2023; Gillwald et al., 2019). Furthermore, high internet access costs hinder online service usage, indicating a need for revising the existing ICT tax policies.

Despite the developments in Uganda's infrastructure, its performance on global ICT indices is hampered by issues with low Internet penetration rates and high communication costs. The government recognises that reforms are necessary to enhance access to and utilisation of digital technologies by reducing the cost of ICT services, particularly in rural regions. Uganda's communication infrastructure is evolving, with significant investments and initiatives aimed at enhancing connectivity and improving service delivery. Continued efforts to address existing challenges will be essential for achieving universal access to ICT services and driving economic growth in the country.

2.7.3.3 Primary Key Infrastructure

Public Key Infrastructure (PKI) is a comprehensive system that uses cryptographic techniques to enable secure communication and data exchange over networks (Entrust, 2024; DigiCert, 2024). In particular, the Uganda Electronic Signatures Act (Uganda, 2011c) defines PKI as “*a framework for creating a secure method for exchanging information based on public key cryptography.*” It comprises technologies (i.e., hardware and software), policies, and procedures that manage the encryption and issuance of trusted digital certificates that confirm the digital signature (Adams & Lloyd, 2003).

2.7.3.3.1 Key Components of Primary Key Infrastructure

Table 18, shows the critical components of Primary Key Infrastructure.

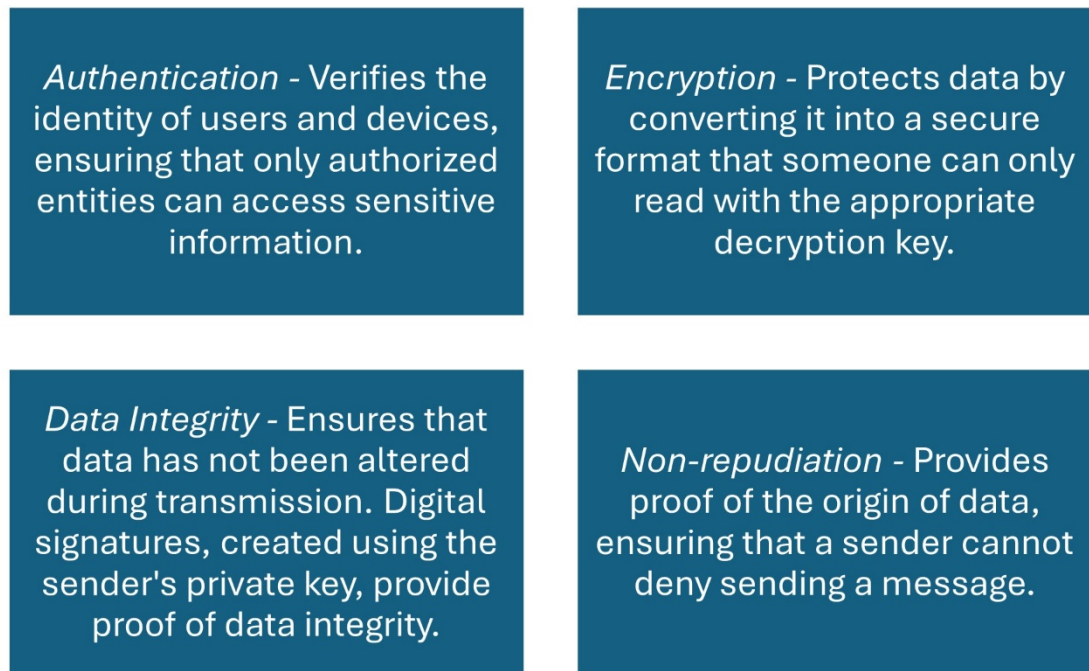
Table 18:

Critical Components of Primary Key Infrastructure

Component		Description
Certificate Authority (CA)		The CA is responsible for issuing, revoking, and managing digital certificates. It verifies the identity of entities requesting certificates and ensures the integrity of the certificate issuance process.
Digital Certificates		These are electronic credentials used to assert the identity of persons, equipment, or services issued by a trusted Certificate Authority (CA).
Registration Authority (RA)	Authority	This entity acts as a mediator between users and the CA, handling requests for digital certificates and verifying the user's identity before the CA issues a certificate.
Public and Private Keys		The PKI produces two keys (i.e., private and public keys) using asymmetric cryptography. The private one is kept confidential, but the public key is freely exchanged.
Key Management		This involves generating, distributing, storing, and revoking keys, ensuring they are securely managed throughout their lifecycle.

2.7.3.3.2 Functions of Primary Key Infrastructure

The functions of PKI are illustrated in Figure 22:

Figure 22:*Functions of Primary Key Infrastructure*

Source: Adams & Lloyd, 2003

2.7.3.3.3 Role of Primary Key Infrastructure in Data Governance

Public Key Infrastructure (PKI) is crucial for data governance, as it ensures secure communication, authentication, and integrity throughout the data lifecycle (Ascertia, 2024; DigiCert, 2024). Key aspects include: i) *Data Security*: PKI encrypts data transfers and verifies identities using asymmetric cryptography, protecting data integrity and privacy (Ascertia, 2024; DigiCert, 2024); ii) *Authentication and Identity Verification*: Digital certificates from Certificate Authorities authenticate users and systems, restricting access to sensitive information; iii) *Compliance*: PKI helps organizations meet regulatory data protection requirements, ensuring secure data management and avoiding legal penalties (EACO, 2017);

iv) *Non-repudiation*: Digital signatures verify sender identity and message integrity, crucial for legal and financial contexts; vi) *Lifecycle Management of Digital Certificates*: PKI manages the issuance, renewal, and revocation of certificates, maintaining reliability and preventing risks from expired certificates (Moulds, 2024; Topping, 2023).

2.7.3.3.4 Primary Key Infrastructure Implementation in Uganda

The Government of Uganda has initiated the implementation of the Public Key Infrastructure (PKI), which enables the authentication of digital signatures and encryption technologies for secure online data transmission (Albogami et al., 2021). The National IT Authority of Uganda (NITA-U) has issued Pos DigiCert, the first PKI provider license, to develop and implement a digital authentication and electronic signature solution called UGPASS (NITAA, 2022). UGPASS supports using advanced electronic signatures based on PKI, making them compliant with the Act and admissible in law courts (EACO, 2017; NITAA, 2022; Uganda, 2011c).

Using digital signatures to authenticate digital transactions and employing strong data encryption during storage and online transmission enhances the trust that data governance actors have in the data. Furthermore, since the Electronic Signatures Act (Uganda, 2011c) legally recognises signatures through the Primary Key Infrastructure, physical records will not be needed to provide evidence once all services are fully automated.

At the regional level, the East African Communications Organisation (EACO) initiated the development of PKI standard legislation for the East African Community member states in 2017 (EACO, 2017). The objective of this legislation was to i) maintain international

interoperability and ii) secure mutual operation for certificate issuance and certificate practices within the digital signature management system based on the Digital Signature Act (EACO, 2017). However, this law has yet to materialise to date. Furthermore, there is no evidence of any efforts intended to harmonise the implementation of PKI in the African Union member states.

In summary, Primary Key Infrastructure is a vital element of data governance because it provides the requisite tools and infrastructure to guarantee that data is safe, adheres to regulatory requirements, and stakeholders trust digital interactions more. Its authentication, encryption, and lifecycle management capabilities make it a foundational element in protecting sensitive information. Therefore, organisations may harness PKI to build trust, safeguard sensitive data, and control their data resources in an increasingly sophisticated and dispersed digital ecosystem.

2.7.4 Significance of Electronic Government Systems in Data Governance

Cognizant of the advantages of digital products and services in spurring national development, the Government of Uganda has placed significant emphasis on the digitalisation agenda. This strategic direction is evidenced by the multiplicity of ICT priorities in all high-level government policy documents, such as i) the Fourth National Development Plan (NDP IV, 2025), ii) the Digital Uganda Vision 2040 (DUV, 2020), iii) the National Resistance Movement Manifesto 2021-2026 (NRM, 2020), and iv) the Digital Transformation Roadmap 2023–2028 (DTR, 2023). Key among all these high-level policy instruments is the automation of public

services to ensure adequate availability of public services and goods to Ugandan citizens and other stakeholders.

2.7.4.1 Achievements in the Implementation of e-Government Systems in Uganda

Over the years, the Government of Uganda has invested heavily in developing Information Systems to deliver public services (Gillwald et al., 2019; Ngabirano et al., 2017). The United Nations e-Government Development Index (2020) shows an improvement in Uganda's electronic Government index from 56.94% in 2018 to 58.24% in 2020, which places the country in a high online service index echelon. The e-Government Development Index is an international comparative indicator for assessing the use of ICTs by United Nations member states in public service delivery. Uganda's success in utilising e-government systems is attributed to comprehensive digital government policies, strategies, and plans that are aligned with the National Development Plan (Gillwald et al., 2019; Index, 2020). Using e-government systems facilitates data management processes, including data entry, validation, processing, and storage (Osakwe & Adeniran, 2021).

2.7.4.2 Challenges Encountered in E-Government Implementation in Uganda

Despite the potential and existing benefits of using e-government systems in Uganda, several impediments still hinder the effective implementation of IT solutions in Uganda, as discussed below.

First, Inadequate Funding. The Ugandan public sector lacks significant financial resources for developing, maintaining, and operationalising IT solutions (DTR, 2023). Most

government entities operate with minimal ICT budgets, resulting in ad hoc investments that are not strategically aligned with national digital transformation aspirations. For example, in the Financial Year 2024/25, the Government of Uganda allocated United States Dollars 66 million to cover all aspects of ICT, such as Internet broadband connectivity and infrastructure rollout, e-services development and implementation, and cybersecurity, which is a tiny fraction of the overall budget (Parliament-Watch, 2024).

Second, Human Resource Constraints. Most ministries lack competent and experienced human resources to drive digitalisation initiatives (DTR, 2023). For example, many government ministries lack IT departments, and IT roles are often carried out by non-professional staff, such as Planners, Statisticians, or Information Scientists (MoPS, 2021).

Third, the Adoption of IT Systems. The uptake of electronic government services and other digital products by end users is notably insufficient in Uganda (Namatovu & Magumba, 2022; Omweri, 2024; Saleh et al., 2024). This challenge is attributable to many factors that include i) lack of sensitization on the existence of e-government systems, ii) low digital literacy, whereby a significant portion of the population lacks the necessary skills to operate IT systems and devices, iii) high cost of devices that hinder some of the citizens from purchasing the computing devices (Namatovu & Magumba, 2022; Omweri, 2024; Saleh et al., 2024).

Fourth is the Integration of e-government systems. The majority of e-government systems in Uganda operate in silos, with limited capability to exchange data or share processes (Gillwald et al., 2019; NITAb, 2022; Ngabirano et al., 2017). The lack of systems

interoperability and data integration severely impedes data governance (Al-badi et al., 2018; Al-Hassan et al., 2019; Nokkala, 2020; Otto, 2011).

Fifth, the Digital Divide. A disparity in Internet connectivity and access to digital services persists between rural and urban areas, limiting access to e-government systems (DTR, 2023; IT-Survey, 2022).

2.7.4.3 Future of e-Government Systems in Uganda

To address these challenges, the Ugandan government is carrying out the following:

First, Rollout of the Digital Transformation Roadmap. Uganda commenced the rollout of its digital transformation roadmap in 2023 with a focus on five pillars, namely i) Enhance ICT Infrastructure and Connectivity, ii) Empower Digital Skills and Literacy, iii) Enhance Digital Services, iv) Promote Cybersecurity, Data Protection and Privacy, and v) Foster Innovation and Entrepreneurship (DTR, 2023). In this regard, the government intends to prioritise the development of IT Solutions for priority sectors in both the Government and private domains, enhance standardisation, and promote the uptake of digital services (DTR, 2023). For example, the Government aspires to have 85% of the public services delivered online by 2030 (DTR, 2023).

Second, Strengthening Legal and Regulatory Frameworks: This will involve developing new and upgrading existing legal and regulatory instruments to meet the demands brought on board by technological volatility, international regulatory requirements, and emerging societal requirements.

Third, increasing funding for ICTs. The Government intends to utilise multiple channels for financing ICT initiatives, including loans, budget increases, and partnerships with development partners (DTR, 2023). Additionally, the Government intends to merge Agencies to cut expenses and use the savings for improved service delivery.

Fourth, increasing local content. The Government of Uganda has prioritised citizen development of local solutions to reduce dependence on foreign-based experts. This approach has the advantage of developing local capacity to produce critical skills, ensuring ongoing support, and ultimately leading to a reduced total cost of ownership (DTR, 2023; NISSP, 2018).

Uganda's e-government systems are poised to deliver significant improvements in citizen service. Therefore, resolving the existing challenges and seizing future opportunities will go a long way in enhancing the development and implementation of digital services in Uganda. However, implementing e-government systems requires e-governance (i.e., establishing roles, responsibilities, and processes for managing the systems themselves). Data governance is one of the essential e-governance processes (Nielsen, 2017); therefore, the success of e-government systems is contingent upon the efficacy of data governance in the Ugandan public sector (Bwalya, 2018; Masilela & Nel, 2021; Mullon & Ngoepe, 2019).

2.7.5 Architecture of Data

Data Architecture provides a framework for describing an institution's data resources, aligning their lifecycle with requisite activities, and offering guidelines on managing data

within an organisation in harmony with its business objectives (Bernad, 2012; Stedman, 2024; van Gils, 2023). It includes documentation of all the data models, definitions, data flows, guidelines, procedures, and standards that guarantee data is managed correctly and flows within the organisation (Bernad, 2012). This ensures it supports processes and, most importantly, plays a crucial role in meeting the business objectives (Knight, 2023; Stedman, 2024).

It is essential to recognise that Data Architecture represents a specific component within the broader context of Enterprise Architecture. This overarching framework is designed to harmonise an entity's data, technology, and processes with its business strategy to achieve its objectives (Bernard, 2012; Knight, 2023).

2.7.5.1 Key Components of Data Architecture

Data architectures are comprised of three components, namely i) Outcomes, ii) Activities, and iii) Behaviours as described in Figure 23.

Figure 23:*Key Components of Data Architecture*

Outcomes:	Activities:	Behaviours:
• These are artefacts e.g. data models, metadata, data flow diagrams and business strategy documents.	• Actions implemented to achieve the architecture's objectives e.g., data migration, outsourcing data hosting and security services, and system maintenance.	• Cooperative efforts, attitudes, culture, and abilities to influence corporate groups, e.g., Positive data quality mindset, metadata management skills, and Data Governance collaborations.

Source: Knight (2023)

2.7.5.2 Types of Data Architecture

Organisations may base their applications on two main types of data architectures: centralised and distributed (Knight, 2023). The centralised data architecture organises data in a single repository. A centralised data architecture can be exemplified by a data warehouse, a single repository for all information organised in a single schema for quick access. The distributed data architecture organises data in multiple repositories, such as a data mesh comprising multiple data warehouses (Knight, 2023). Understanding the various data architecture types is essential for designing effective data governance frameworks.

2.7.5.3 Significance of Data Architecture in Data Governance

Data architecture is a multidisciplinary profession that requires practitioners to have a mixture of business and technical skills, including translating business requirements into data collection and management policies. This confirms the notion that governance is a multidisciplinary field (Knight, 2023). The significance of data architecture in relation to data governance is multi-faceted: it aligns data management processes with strategic business goals, fostering integration between data operations and objectives (Knight, 2023). Additionally, it facilitates a common language within an enterprise, enabling effective communication about data assets among stakeholders (Stedman, 2024; van Gils, 2023). Data architecture also plays a crucial role in eliminating data silos by integrating sources across the organisation, ensuring data availability for all (Knight, 2023). Lastly, it establishes consistent metadata principles to minimise errors and inconsistencies in data handling (Knight, 2023; Stedman, 2024).

Overall, it is pertinent to note that the concept of data architecture is fundamental to data governance, and some scholars have used it to build data governance frameworks (Barker, 2016; Brous et al., 2020; Guetat & Dakhli, 2015; Ladley, 2019; Yebenes & Zorrilla, 2019). However, the shortcoming of this approach is that data architecture is a subset of enterprise architecture (Knight, 2023; Stedman, 2024; van Gils, 2023), and as such, basing a data governance framework on this concept may not conclusively cover all the parameters of data governance.

2.7.5.4 Status of Data Architecture in Uganda

In 2021, the Government of Uganda introduced an e-government Interoperability Framework reference architecture to guide the development and implementation of integrated

e-government systems (GIRA, 2021). The metadata-driven architecture enables Government entities to use standard data definitions, ultimately easing the data governance processes (GIRA, 2021). The Uganda Government Enterprise Architecture also adopts the Open Group Architecture Framework (TOGAF), which depends on a data architecture that describes the logical and physical data asset structures, including the associated data management resources (GIRA, 2021).

The National Information Technology Survey (IT-Survey, 2022) established that only 6% of Ministries, Departments, and Agencies (MDAs) had an institutional Enterprise Architecture, while only 5% had an institutional Information Technology Interoperability Framework. This highlights a pressing need for public sector organisations to establish frameworks that align their IT operations with business objectives. In particular, these frameworks should have specific interventions for data interoperability.

In summary, data architecture provides a critical framework that ensures data is properly managed and flows through the enterprise to support business needs and informed decision-making. It encompasses various components, activities, and behaviours, and its design and implementation require a deep understanding of business and technical requirements.

2.7.6 Cyber Security

As more people use internet services, they are more vulnerable to cyberattacks (Masilela & Nel, 2021). Developing and implementing cybersecurity plans is essential to counter the risks associated with increasing digitisation. Regarding this, the Ugandan

government is upgrading its national cybersecurity strategy (Uganda, 2022). The plan's primary goal is to enhance the nation's cybersecurity capabilities and readiness, ultimately achieving the highest level of security assurance. The significance of data security is underscored by the extensive body of scholarly work that identifies it as a vital area of decision-making (Barker, 2016; Masilela & Nel, 2021; Ramadhan et al., 2021; Randhawa, 2019; Rehman & Al-Raqom, 2020), highlighting its integral role in the governance of data.

In Uganda, the National Information Technology Agency has established relevant structures for information security governance. In particular, NITA-U developed the Uganda Information Security Policy, which provides the Government with the necessary policies, processes, standards, and guidelines for Information Assurance. Furthermore, working with various stakeholders, the National Information Security Advisory Group (NISAG) was established to provide advice on Information Security Governance, Risk Remediation Planning, and Response. This is supported by a national task team established to monitor and manage cybersecurity incidents and respond to cyber emergencies. While these structures have been established, there is a lack of an organisational structure for Government staff in information security management within Ministries and Local Government Administrations (MoPS, 2021).

2.7.7 Consequences of Lack of Data Governance in Uganda

Currently, data governance efforts in Uganda are fragmented and disjointed, lacking an overarching framework. This situation has led to several problems, including the following:

First, increased data security breaches. The lack of proper data management in the public sector in Uganda has led to increasing security breaches and cyber-related crimes such as unauthorised access, cyber fraud, and leakage of confidential information on social media (Ahimbisibwe & Nabende, 2023; Maluleke, 2023; Romaniuk & Omona, 2021).

Second, there is a lack of interoperable and integrated systems. Ngabirano et al. (2017) contend that the Ugandan government institutions build systems without adequate provisions for data sharing with other systems. This led to system duplication and multiple entries of the same data in different systems, resulting in challenges such as data integrity issues and high maintenance costs, among others (Tomusange et al., 2017). Additionally, there is a lack of uniform metadata definitions, business rules, standards, and data codes. For example, different systems use different codes and descriptions to identify the same objects. Implementing e-government systems without reaching a consensus on data semantics leads to data inconsistencies, which in turn contribute to a lack of data integrity and complicate data governance.

Third, there is a lack of data governance stewardship. The lack of centralised accountability and responsibility for public data governance in Uganda causes challenges in enforcing standards, especially for cross-cutting data (NITA, 2015).

Overall, the data governance ecosystem in Uganda is highly fragmented, with a silo-based approach, which complicates data management. However, the country has a broad range of policy and regulatory instruments that support data governance (NDB, 2015; Uganda, 2001, 2011a, 2011b, 2011c, 2019). Multiple government institutions collect data using disparate

systems that are not integrated (Ngabirano, 2017). The lack of systems interoperability and centralised public sector data governance stewardship impedes the country's data governance efforts.

2.8 SUMMARY

The objective of this chapter was to evaluate the existing data governance literature in comparison with the respective objectives of this study. In particular, this chapter aimed at i) examining the theoretical and conceptual requirements for effective data governance, ii) evaluating the existing data governance practices, iii) investigating the effect of employees' attitudes and behaviour towards data governance on data quality, and iv) analysing the existing data governance evaluation or measurement frameworks.

To meet the chapter's objectives, a systematic search was conducted across scholarly databases, including ProQuest, Google Scholar, and ScienceDirect. Additional academic sources were obtained from referenced papers, data governance practitioner repositories, and targeted searching for key resources from subject matter experts.

2.8.1 Theoretical and Conceptual Frameworks

This subsection summarises the theoretical and conceptual frameworks.

2.8.1.1 Theoretical Framework

The literature review commenced with the identification and analysis of the theoretical frameworks used in previous related research works, whose analysis revealed that various

scholars (Benfeldt et al., 2020; Berman, 2017; Cave, 2017; Ladley, 2019; Weber et al., 2009) had used different theoretical concepts with varying strengths and weaknesses in their study of the data governance concept. For example, Benfeldt et al. (2020) employed the Collective Action Theory; Berman (2017) employed the Theory of Planned Behaviour; Cave (2017) employed the Institutional Theory; Ladley (2019) employed the Zachman Architectural Framework, and Weber et al. (2009) employed the Contingency Theory as their theoretical basis for studying the data governance concept. The significant benefit of employing different theoretical frameworks to study data governance is that it offers a deeper understanding of the concept. However, it is evident that there is a need for conducting comparative studies in the future aimed at empirically investigating the merits and demerits of each theory with the view of proposing a unified theoretical approach.

Nonetheless, it is also important to note that some of the data governance studies reviewed employed the inductive approach, utilising case studies to develop theoretical frameworks (Alhassan et al., 2019; Cheong & Chang, 2007; Otto, 2011a). These scholars found it prudent to use the case study theory-building approach because the data governance domain has few previous research works (Bhattacharjee, 2012; Cresswell, 2014).

After a rigorous analysis of previous studies, the systems theory, which emphasizes the relationships and interdependence between system components (Lai & Huili, 2017; Mele et al., 2010; Montuori, 2011) was chosen as the conceptual framework for this study. The choice of systems theory as the theoretical foundation for this study was influenced by the fact that data governance is a holistic system of related and interdependent sub-systems, such as policies, people, processes, and technology that interact in an organisational environment for effective

results to be realised (Akoka & Comyn-Wattiau, 2019; Buff, 2016; Thomas, 2006). Furthermore, one of the core requirements of systems theory is that a system is incomplete without its subsystems and their interrelations (Montuori, 2011), which is similar to the concept of data governance. It is essential to note that some earlier attempts at data governance failed because they did not adopt a systems approach, instead focusing on individual components of data governance (Al-Ruithe, 2018). For example, some scholars and practitioners (Otto, 2011b; Weber et al., 2009; Wende & Otto, 2007) have primarily viewed data governance from the perspective of data quality management. Hence, the systems theory is appropriate as it emphasises a holistic approach to data governance. However, this study will consider that a major limitation of systems theory is the assumption that all variables have an equal effect on the overall system (Lai & Huili, 2017; Montuori, 2011). In practice, some variables are likely to have a greater or lesser effect than others, depending on the prevailing conditions. However, this study shall take cognisance of this shortfall and devise mitigation measures at the design stage.

2.8.1.2 Conceptual Framework

While following the systems theory approach, this study will extend the cross-functional data governance framework developed by Abraham et al. (2019) as a conceptual framework. The Abraham et al. (2019) cross-functional framework itself extends the Khatri and Brown (2010) data governance framework by adding the big data dimension and extending the scope to include data architecture, data storage, and infrastructure among the previous five decision domains of Khatri and Brown (2010), namely i) data principles; ii) data quality; iii) metadata; iv) data access; and v) data lifecycle. The Abraham et al. (2019) model is a relatively new framework that has not yet been widely applied as a conceptual framework to investigate

how data governance initiatives are developed or implemented. Therefore, this study will validate the Abraham et al. (2019) cross-functional data governance framework.

2.8.2 Data Governance Overview

This subsection presents key findings from the analysis of the literature regarding the constructs of the data governance concept, including: i) definition of data governance, ii) elements of data governance, iii) governance of data as a critical resource, iv) scope of data governance, v) motivations for implementing data governance, vi) obstacles to effective data governance, and vii) the influence of socio-elements on data governance.

2.8.2.1 Data Governance Definition

The concept of data governance lacks a widely accepted standard definition, as noted by Abraham et al. (2019), Panian (2010), and Weber et al. (2009). However, a critical analysis of the various definitions suggests that data governance is a multidisciplinary concept, with definitions influenced by the author's motivations, study discipline, and goals (Thomas, 2006). However, most definitions of data governance have some things in common, such as considering data as a critical enterprise asset (DAMA, 2017; MDM, 2015; Otto, 2011b; Weber et al., 2009); decision rights and accountabilities (Otto, 2011b; Thomas, 2006; Weber et al., 2019); regulation and leadership over data (Abraham et al., 2019). It is essential to remember that some academics and professionals use the terms data governance and information governance interchangeably (Abraham et al., 2019; Nguyen, 2016). While the two are conceptually different, uncertainties exist in identifying the point at which information is transformed from data, which is exacerbated by the emergence of increasingly complex data

types, such as big data. This research treats information governance and data governance as equivalent.

2.8.2.2 Elements of Governance of Data

The core elements of data governance are “data” and “governance.” This study’s discussion of data governance elements is intended to define these two elements and identify their scope and relationship, which is essential for obtaining a holistic view. The adopted definition of data in this study is that data are raw facts that can be represented in different formats, such as text, numbers, graphics, images, sound, or video, while information is defined as processed data (Abraham et al., 2019; Brous, 2020). As in some previous studies (Dahlberg & Nokkala, 2015; Niemi, 2015; Otto et al., 2007), this study does not distinguish between data and information, considering it does not delve deeply into data governance technologies.

2.8.2.3 Scope of Data Governance

According to the literature examination, most studies on data governance have been carried out in a single organisation (Berman, 2017; Cheong & Chang, 2007; Hagmann, 2013; Panian, 2010). The amount of research on inter-organisational data governance and data governance ecosystems is increasing (Gelhaar et al., 2021; Jagals & Karger, 2021; Lis & Otto, 2020; Nokkala, 2020). It was also identified that there is still insufficient research on data governance in public sector organisations from the viewpoint of emerging economies (Benfeldt et al., 2020; Masilela & Nel, 2021). Thus, this validates the need for this study, which was conducted in the emerging public sector data governance field in a developing country like Uganda.

2.8.2.4 Data Governance as an Asset

Historically, data was seen as a byproduct of Information Technology (IT) Systems (Alhassan et al., 2018; Otto, 2011b), but since the early 2000s, organisations have started to view data as an essential enterprise resource (Khatri & Brown, 2010; Ladley, 2019; Ramadhan et al., 2021; Sweden, 2008) instead of being a byproduct of IT Systems (Dahlberg & Nokkala, 2015; Panian, 2010; Khatri & Brown, 2010). In addition, after replacing many legacy systems in the early 2000s, organisations discovered that data outlasts IT Systems (Sweden, 2008), hence the need for proper data governance over its useful lifecycle. Data is regarded as one of the most valuable assets for contemporary organisations since it keeps them competitive, lowers expenses, and helps with regulatory compliance (Niemi, 2015; Panian, 2010; Ramadhan et al., 2021). Scholars generally agree that viewing data as a critical resource is a primary motivator for good governance of data (Alhassan et al., 2018; Ladley, 2019; Otto, 2011b). Thus, understanding the data's value proposition is crucial to any Data Governance initiative's success (Lardley, 2019; Olavsrud, 2021; Panian, 2010).

2.8.2.5 Motivations for Data Governance

Organisations prioritise data governance for various strategic, tactical, and operational compliance-related reasons, as shown in an analysis of the motivations for establishing a data governance initiative. In particular, entities are driven to implement data governance due to i) the need to comply with standards, regulatory and legal requirements; ii) improving operational efficiency through quality data utilisation; iii) strategic decision-making; iv) risk management; v) enhanced collaboration; and vi) enhanced competitive advantage. Recognising these

incentives helps clarify the reasons behind organisations' data governance investments and how success is influenced by them. Analysing the motivations for implementing data governance reveals various strategic, operational, and compliance-related reasons that drive organisations to prioritise this critical function. These motivations can be categorised into several key areas, namely i) Regulatory adherence to various laws, policies, and standards, ii) Integrity and quality of data - Institutions are motivated to implement data governance to improve data quality and integrity, iii) enhancing operational efficiency through leveraging data, iv) improving strategic decision making, v) risk management, vi) improved collaboration, vii) enhancing competitive advantage. Understanding these motivations aids in recognising the benefits of data governance, which ultimately helps organisations to design better data governance initiatives.

2.8.2.6 Barriers to Data Governance

Despite being essential for effective data management, data governance faces numerous obstacles that hinder its successful implementation. The most common barriers encountered in the literature were i) limitations in the development and implementation of legal and regulatory instruments, ii) inadequacies in the development of tools for governance of data, iii) financial resource constraints, iv) technological challenges, v) structural challenges, vi) lack of top executive sponsorship, and vii) human resource capacity challenges (Chalker, 2014; Hagmann, 2013; Sweden, 2008; Were & Moturi, 2017). Other barriers identified were i) overreliance on IT professionals at the expense of data owners (Weber et al., 2009), ii) the disconnect between an entity's organogram and the governance of data (Janssen et al., 2020), and iii) lack of communication (Hagmann, 2013).

2.8.2.7 Impact of Socio-ethical Elements on Data Governance

To use data responsibly and ethically, data governance and ethics are crucial. They complement efforts to maintain quality and accountability in data processes, safeguard the moral and legal rights of data subjects, and strike a balance between the advantages and risks of data governance (Andrew, 2023). Data governance challenges in socio-ethics are multidisciplinary and span several fields, including computer technology, law, and the social sciences. Therefore, developing universal ethical standards, balancing data security and privacy needs, and addressing the possibility of data misuse or exploitation are necessary to mitigate the adverse effects while promoting good socio-ethical data governance outcomes.

2.8.3 Data Governance Frameworks Overview

According to the literature reviewed for this study, data governance is a complex and interdisciplinary concept that has resulted in the design of many data governance frameworks, each with its unique approach, components, and goals (Kim & Cho, 2018; Niemi, 2015; Randhawa, 2019; Weber et al., 2009). However, these frameworks all share some common characteristics, such as the framework's scope or focus, guiding principles, roles and duties, regulations compliance requirements, and performance appraisal (Al-Ruithe et al., 2019; Ladley, 2019; Otto & Österle, 2015; Wende & Otto, 2007). This study also examines five practical data governance frameworks from the perspective of their approach, elements, advantages, and disadvantages. It also performs a comparative examination of the features, scope, design methodology, conceptual framework, strengths, and weaknesses of the academic data governance frameworks. This study also examines the methodological approach, elements, advantages, and disadvantages of industry data governance capability maturity

models. The review also identified several emerging trends shaping the landscape in data governance frameworks, such as i) Increased Adoption of fourth-industrial revolution technologies, ii) Data Privacy and Compliance, iii) Federated and Real-Time Data Governance.

2.8.4 Data Governance Implementation

This section summarises the discussions on design and implementation aspects of data governance initiatives, categorised into Data Governance Mechanisms, Antecedents, Operationalisation, and Consequences.

Data Governance Mechanisms. The Data Governance mechanisms refer to the overall data governance approach. Given the multidimensionality of the data governance concept, organisations employ various strategies to address data governance, influenced by prevailing business challenges, regulatory and legal provisions, or organisational quality assurance mechanisms (Mullon & Ngoepe, 2019). Abraham et al. (2019) decompose all these data governance activities into i) Structural (i.e., i) roles and duties for data governance and ii) the location of decision-making authority), ii) Procedural, which ensures effective data management via the right processes and procedures., and iii) Relational Data Governance Mechanisms, which is concerned with collaboration among the data governance stakeholders, namely capacity building, information dissemination, and decision-making coordination.

Data Governance Antecedents. Data governance antecedents refer to internal and external factors that influence the implementation and uptake of data governance (Lunardi, 2017). The study discusses internal antecedents, which are the conditions within an

organisation that influence the configuration and implementation of a data governance program. Abraham et al. (2019) aggregate internal antecedents into organisational, Information Technology, and organisational behaviour factors. On the other hand, external data governance antecedents cover all factors outside an organisation that influence the configuration and implementation of data governance. Abraham et al. (2019) identify legal and regulatory factors, market volatility, industry conditions, and country factors as external antecedents.

Data Governance Consequences. As data gains prominence as an enterprise asset, its abuse and misuse impact is also increasingly becoming a concern. This has led to increased discourse among scholars and practitioners (Barker, 2016; DAMA, 2017; Rehman & Al-Raqom, 2020; Yebenes & Zorrilla, 2019) on more effective data governance approaches. The concept of consequences refers to the effects of data governance, which Abraham et al. (2019) categorise as short-term performance effects, such as the adverse effect of poor governance of data on institutional competitiveness and risk management.

Data Governance Operationalisation. No universal data governance implementation solution exists, as evidenced by the numerous methodologies proposed by both practitioners and academics (Alhassan et al., 2018; Cave, 2017; Hagmann, 2013; Mahanti, 2018; Randhawa, 2019). Data governance approaches may include an iterative, cyclic approach (Ladley, 2019), a top-down approach, or a bottom-up approach (Begg & Caira, 2011; Ladley, 2019; Niemi, 2015; Yebenes & Zorrilla, 2019). The literature indicates that conducting a needs assessment helps identify the most suitable approach (Begg & Caira, 2011; Belghith et al., 2021; Ladley, 2019; OECD, 2019; Steenbeek, 2019), followed by developing an appropriate implementation roadmap contextualised to the needs.

2.8.5 Public Sector Data Governance Overview

This study reviews public sector data governance from four perspectives, namely i) at a public sector organisation level, ii) at a multi-institutional public level, iii) at the national level, and iv) at an international level.

National Level. Globally, most governments have attempted to implement data governance by enacting complementary laws and related policy instruments (Mahanti, 2018; OECD, 2019; Van Ooijen et al., 2019), such as data protection and privacy laws (Herselman et al., 2019). However, a few countries, such as New Zealand, Norway, and Estonia, have developed data governance frameworks (OECD, 2019). Overall, the findings of this literature review indicate that different countries are at different levels of developing and implementing data governance frameworks (OECD, 2019).

Intergovernmental. The literature discusses Intergovernmental Data Governance, which refers to the management and use of data among members of an intergovernmental organisation. It encompasses macro-level governance, which involves national and international regulations, and micro-level governance, which focuses on data management within individual organisations. The literature reviewed covered the i) African Union Data Policy Framework (AUC; 2022), ii) European Union Data Governance Policy, and iii) OECD Model Framework. The literature reviewed revealed that these intergovernmental data governance frameworks are very generic and restrict themselves to i) identifying principles, ii) establishing inter-regional legislations such as the EU GDPR, and iii) developing strategies and

guidelines. The guiding principles for the three reviewed frameworks shared standard views on i) establishing data sovereignty, ii) operationalising data sharing, iii) ensuring data protection and privacy, and iv) guaranteeing information security. Similarly, all three frameworks face challenges of i) harmonising sovereignty requirements with data sharing needs, ii) balancing the need for regulatory enforcement without stifling innovation, iii) integrating requirements for emerging technologies, iv) securing the data assets, and v) ensuring equitable and fair usage of data resources.

2.8.6 Public Sector Data Governance in Uganda

This literature review revealed a general lack of literature on data governance practices in Uganda, particularly an evident lack of institutionalised data governance (MoPS, 2021). While the Ministry of Public Service oversees the management of records, documents, and archives (MoPS, 2021), no single government institution was accountable for data governance across the public sector. Furthermore, it was noted that there is an ad hoc approach to public sector data management, with no organisational structure for data stewardship; instead, data management functions are conducted by Information Technology Officers rather than business process owners (MoPS, 2021). However, several scholars (Cheong & Chang, 2007; Hagmann, 2013; Nguyen, 2016; Weber et al., 2009) contend that data governance is a holistic initiative that extends beyond Information Technology management.

Regarding the legal and regulatory data governance approach, an analysis of official government documents revealed that the Government of Uganda has various laws, policies, and guidelines for managing and controlling information technology processes, which include

some inherent provisions for data governance. Examples of these include the Data Privacy and Protection Act (Uganda, 2019), the Computer Misuse Act (Uganda, 2011), the Electronic Signatures Act (Uganda, 2011), and the National Information Security Framework (NISF, 2014). Data governance elements manifest in various legal and regulatory instruments as components of the broader digital transformation initiative. However, fragmentation of these elements reduces their efficacy on data governance and complicates the monitoring and measurement of their impact. Additionally, in a bid to establish an Information Technology Infrastructure for running digitalised services, the Government of Uganda has inadvertently established some critical data governance infrastructure, including communication networks, Data Centres, and Primary Key Infrastructure. Furthermore, the Government of Uganda has developed an e-government Interoperability Framework reference architecture to guide the development and implementation of integrated e-government systems (GIRA, 2021). The metadata-driven architecture enables Government entities to use common data definitions that ultimately ease the data governance processes (GIRA, 2021). The Uganda Government Enterprise Architecture also adopts the Open Group Architecture Framework (TOGAF), which is highly dependent on a data architecture that describes the logical and physical data asset structures, including the associated data management resources (GIRA, 2021).

CHAPTER 3: RESEARCH METHODS AND DATA COLLECTION

3.1 INTRODUCTION

This chapter discusses the research design, methodologies, and techniques used in this study to investigate multi-institutional data governance practices in Uganda. The research design refers to the framework of the approaches and processes a researcher chooses to use when conducting a study. The chapter discusses the methods and techniques for the ethical collection and analysis of primary data to meet the research objectives. In essence, the contents of this chapter demonstrate that this research was executed following an appropriate research design.

3.1.1 Problem Statement

This study notes that, whereas governments have invested much in digitising services, data governance—a vital service—has gotten less attention (Ademuyiwa & Adeniran, 2020). Initial investigations revealed that a few public sector organisations in Uganda employ ad hoc data management strategies and guidelines, but lack overarching institutional data governance frameworks (NITA, 2015). For instance, a 2015 e-Government survey by the National IT Authority (NITA) found that only 25% of the 190 public sector organisations had data stewards in charge of monitoring and ensuring that high standards of data quality are maintained, while 68% of them lacked data governance policies. Despite these shortfalls, the Government of Uganda passed a data protection and privacy law in 2019, which mandates effective data administration (Daigle, 2021; Muhangi, 2019; Mukuki & Assenga, 2024). Additionally, the Ugandan Government is in the early stages of implementing an e-Government Interoperability

Framework to facilitate smooth data sharing among various Information Systems (e-GIF, 2021). Nonetheless, it is still important to investigate the country's data governance practices to find gaps and offer suggestions for remediation. Besides that, from the scholarship point of view, researchers have found that there are few empirical studies on multi-institutional data governance in developing countries (Abraham et al., 2019; Lis & Otto, 2020) and that this field of study is constantly changing due to dynamic technological advancements; thus, it requires continuous review (Alhassan et al., 2016; Gelhaar et al., 2021; Korhonen et al., 2013).

3.1.2 Purpose of the Study

This research aims to examine multi-institutional data governance practices from the perspective of a developing nation like Uganda, ultimately leading to the development of a robust, contextualised data governance framework.

3.1.4 Chapter Overview

The remainder of the chapter details why the study's methodology and research design were chosen. The research philosophy is discussed in Section 3.2, the research approach and design are discussed in Section 3.3, the research study's sample and population are discussed in Section 3.4, the research data collection tools are discussed in Section 3.5, the operational definitions of the variables are discussed in Section 3.6, the ethical considerations and controls are discussed in Section 3.7, and the data gathering techniques and instruments are presented in Section 3.8. A summary highlighting all the key issues discussed is provided at the end of this chapter.

3.2 RESEARCH PHILOSOPHY

Research philosophy is a researcher's viewpoint on a specific phenomenon that influences research design in areas such as data collection, analysis, and interpretation (Bhattacharjee, 2012; Saunders et al., 2009). Most scholars (Bhattacharjee, 2012; Johnson & Onwuegbuzie, 2004; Mugenda & Mugenda, 1999; Saunders et al., 2009) recognise four types of research philosophies, namely i) *Positivism*, which treats phenomena with objectivity and heavily relies on empirical measurement, analysis, and interpretation similar to how physical scientists handle natural phenomena; ii) *Interpretivism*, which employs a subjective interpretation of research phenomena in their natural settings, iii) *Realism Philosophy*, which is based on the notion that reality is independent of the mind and iv) *Pragmatism Philosophy*, which relies on the best method for finding the best solution to the phenomena being investigated.

This research is premised on the pragmatist research philosophy. The selection of this philosophy was informed by the fact that this study is primarily exploratory in nature, employs a mixed-methods approach, and investigates a nascent phenomenon that many scholars have not yet explored. Additionally, the pragmatist ideology permits the adoption of research designs that incorporate practical choices based on the most effective solution for answering the research question (Creswell & Clark, 2018; Saunders et al., 2009). The pragmatist philosophy enables researchers to conduct research in dynamic and innovative ways.

3.3 RESEARCH APPROACH AND DESIGN

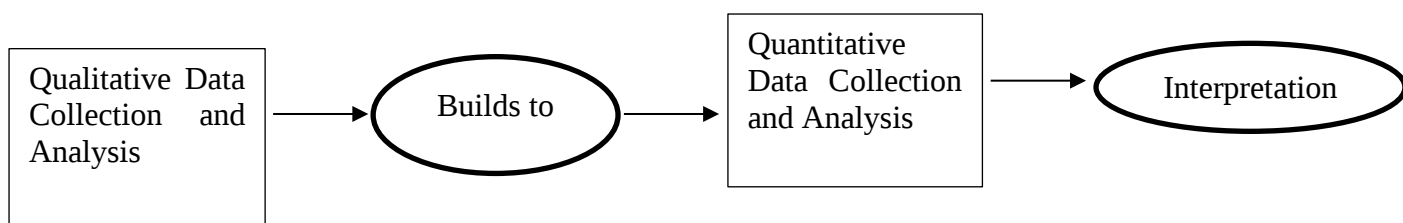
This study employed a mixed-methods research approach. In a mixed-methods research approach, a researcher employs both quantitative and qualitative techniques within a single research study to investigate an issue (Creswell & Clark, 2018; Johnston et al., 2007).

3.3.1 Research Design

Research designs encompass procedures for gathering, analysing, interpreting, and reporting results in research undertakings (Creswell & Clark, 2018; Osei, 2017). This study followed the exploratory sequential mixed methods research design, which begins with qualitative data collection and analysis, the findings of which are used in the subsequent quantitative data collection and analysis phase, as presented in Figure 24.

Figure 24:

Exploratory sequential mixed methods research design



Source: Cresswell (2014)

Overall, the exploratory sequential mixed methods research approach employed in this study consisted of four steps, as illustrated in Figure 25. The study commenced with the development of a qualitative data collection tool aligned with the research questions. The qualitative data were collected using a case study approach, which was chosen because of the

homogeneity of the Government Ministries in Uganda. Considering that the Ministries share many attributes, such as policies, organisational structures, infrastructure, and processes, selecting a few would yield representative results.

Permission was sought from the UNICAF University Research Ethics Committee to confirm that the study would not compromise the rights of the participants or harm them (**A copy of the UNICAF University Research Ethics Committee approval is attached as Appendix C**). Furthermore, clearance was sought from the Ministry in charge of Communication and Information Technologies, the technology leader of this study's domain (**A copy of the letter seeking MoICT & NG approval is attached as Appendix E**). These approvals helped to give credence to the study and were envisaged to enhance the participants' responsiveness during the data collection phases.

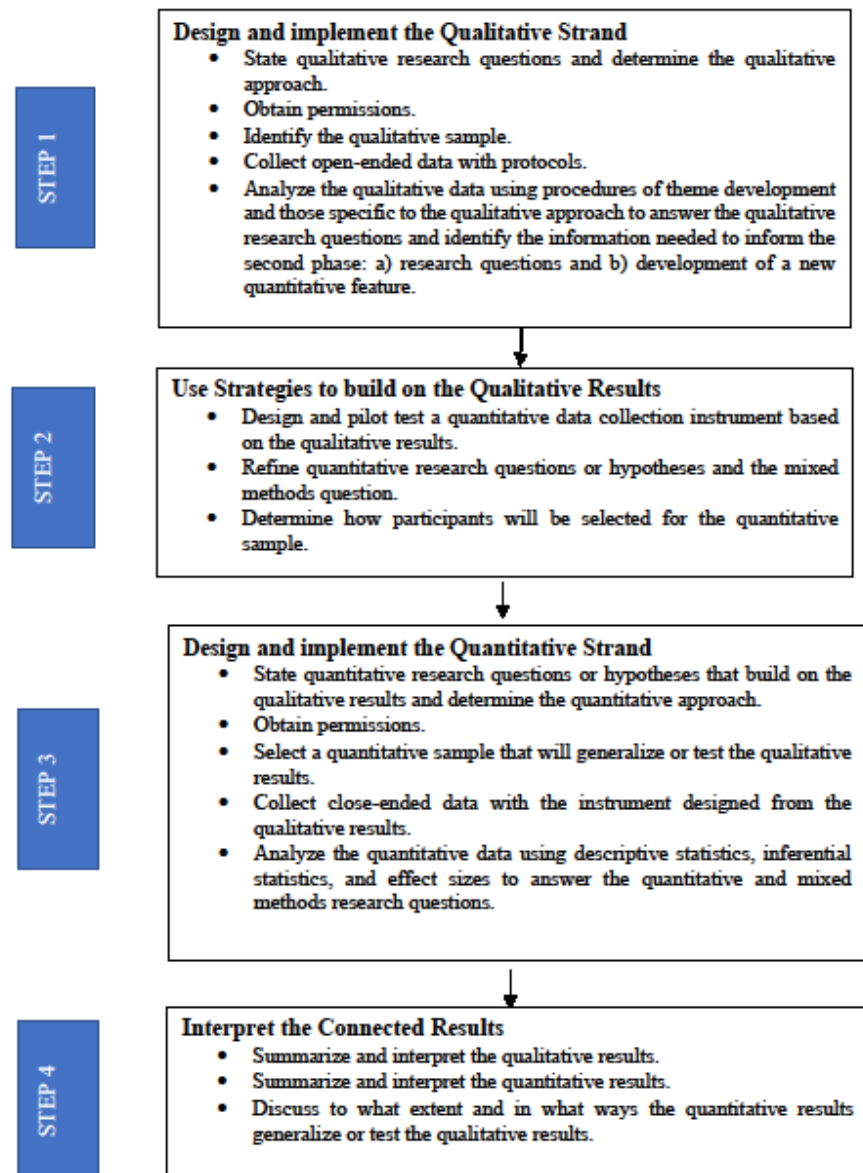
Purposeful sampling was used to select Ministries from whom qualitative data was collected using a semi-structured interview guide. The guide, with probing prompts, was deemed most appropriate for eliciting in-depth responses from the research participants.

The qualitative findings from the primary data collection were evaluated and contrasted with secondary data obtained from the literature and official document analysis. The findings from this first qualitative data analysis stage served as the foundation for creating a questionnaire used in the second stage for quantitative data collection. The questionnaire was pre-tested on a selected small sample before the quantitative data collection commenced. The pre-testing helped to refine the questionnaire following the participants' feedback. Once collected, the quantitative data were analysed using quantitative techniques that included the

computation of descriptive and inferential statistics, which were integrated and compared with the results from the qualitative phase.

This two-stage, exploratory sequential mixed methods study aimed to deeply examine respondents' perspectives using a qualitative approach (Berman, 2017; Cresswell, 2014; Olaitan et al., 2019). Subsequently, the quantitative data from the second phase were analysed to validate the adopted conceptual framework in comparison to the findings from the literature and the qualitative findings from the first phase (Berman, 2017; Creswell & Clark, 2018; Olaitan et al., 2019).

Figure 25:

Implementation Steps for the Exploratory Sequential Mixed Method

Adapted from: Creswell and Clark (2018)

3.3.2 Rationale for Research Method Selection

The mixed methods approach, which integrates qualitative and quantitative methodologies, was chosen because it offers opportunities for a deeper interrogation of the current study challenge than using either strategy alone (Cresswell, 2014). For example, using a mixed-methods approach enables the researcher to use the results from the in-depth qualitative phase to explain or explore in-depth constructs of the research phenomenon in the quantitative phase (Berman, 2017; Herselman et al., 2019; Osei, 2017). This strategy helps to develop data collection tools aligned with the research questions and relevant constructs based on the results of the qualitative phases. Additionally, considering that research on data governance is still in its infancy, applying a mixed methods approach that enabled in-depth exploration at the beginning was pragmatic for this study.

Generally, the choice of a mixed methods approach was justified because neither the quantitative nor the qualitative method could be utilised to obtain definitive answers independently. Instead, the two methods were combined for complementary reasons (Berman, 2017; Bhattacharjee, 2012; Creswell, 2014; Osei, 2017). The initial phase of gathering and analysing qualitative data served as a core foundation for thoroughly examining the needs for the data governance framework (Hesse-Biber & Leavy, 2010). Later, the second stage of gathering and analysing quantitative data aided in evaluating the authenticity and dependability of the initial findings and the adopted conceptual framework.

3.3.3 Alternative Mixed Methods Approaches

Other mixed methods research designs considered for this study included the convergent parallel and explanatory sequential mixed methods designs (Creswell & Clark, 2018; Tashakkori & Teddlie, 1998; Osei, 2017).

In the convergent parallel mixed methods design, both quantitative and qualitative data must be gathered and analysed simultaneously (Creswell & Clark, 2018). The reasons for rejecting this method were that i) this method gives equal priority to the quantitative and qualitative approaches, which is really difficult to achieve in practice given that the qualitative method needs a lot of time to obtain in-depth responses, unlike the quantitative approach that uses close-ended questions; ii) implementing the qualitative and quantitative phases at the same time requires a lot of responses that are not available in this case and iii) there are validity issues concerning the different sample size requirements where the smaller sample size of the qualitative side may not be representative as the larger quantitative size.

Conversely, the explanatory sequential approach is a mixed-methods design for two-phase research, involving the collection of quantitative data in the first phase, which is analysed, and the findings are used to inform the implementation of the second phase, which involves the collection of qualitative data (Creswell & Clark, 2018). The primary reason for rejecting this approach is that the research phenomenon being investigated in this study is still in its infancy stages and, as such, is more suited to exploratory approaches, yet the explanatory sequential approach commences with the quantitative phase, which does not provide in-depth data collection techniques as in the qualitative approach.

An exploratory sequential approach facilitates an in-depth examination of a phenomenon through initial qualitative data collection. This process enables researchers to gain a nuanced understanding and discover key themes before collecting quantitative data and hypothesis testing (Creswell & Clark, 2018; Tashakkori & Teddlie, 1998). In contrast, an explanatory approach that begins with quantitative data may overlook critical details. Ultimately, the exploratory sequential method allows for the flexibility to adapt research questions based on preliminary qualitative insights, resulting in a more thorough and contextually relevant investigation. Therefore, the exploratory sequential mixed methods approach was an exact fit for the pragmatist research philosophy on which this study was based.

3.3.4 Application of Mixed Methods Approach in Related Studies

The exploratory sequential mixed methods design has been previously employed by other researchers in their studies on the data governance domain. For example, Berman (2017) employed an exploratory sequential mixed methods research design to investigate research data management practices at the University of Vermont, with the aim of proposing an appropriate data management framework. The first phase of Berman's (2017) research involved collecting qualitative data from six staff members out of a population of thirty-five university staff. Based on the Data Lifecycle Model as the study's conceptual model, qualitative data were collected through interviews on i) data management planning, ii) data management activities (e.g., creation and use of metadata; storage of data, data preservation, and data sharing), and iii) problems encountered. The qualitative data were analysed, and the findings were used to develop a questionnaire, which was used in the second phase of quantitative data collection.

The second phase, which involved collecting quantitative data, was carried out through a survey that sampled a randomly stratified group of central government employees. The survey gathered information on five aspects of data management: i) data management activities, ii) data management plans, iii) data management challenges, iv) data management support, and v) attitudes and behaviours towards data management planning. The responses were analyzed using descriptive and inferential statistics, including frequencies, cross-tabulations, and chi-square tests of independence based on demographic variables such as gender, rank, college, and discipline. Additionally, the quantitative data were compared with the findings from the initial qualitative phase of the study and subjected to further analysis.

However, while Berman's (2017) study shares a similar design with this study, the two differ in that they employ different conceptual frameworks. Berman (2017) used the Data Lifecycle Model, while the theoretical model used in this research is the cross-functional data governance framework developed by Abraham et al. (2019) for managing data as a critical corporate resource. Presented in Table 19, are other related studies.

Table 19:

Summary of Related Studies

Author	Study Area	Approach
Herselman et al. (2019)	This study evaluated the maturity assessment approach for governmental data governance within the Eastern Cape region of South Africa.	The researchers used the design science approach to build a data governance framework. Data was gathered and analysed using a mixed-method, sequential exploratory technique when testing the generated model.

Author	Study Area	Approach
De Freitas et al. (2021)	The researchers conducted a mixed-methods investigation examining the utilisation and dissemination of research data related to rare diseases.	The study employed an explanatory sequential mixed-methods research design.
Luyombya (2010)	A study on information and communication technology (ICT) and digital records management in Uganda's public sector, employing a mixed-methods approach.	This study employed a hybrid explanatory mixed-methods approach. The first phase used a questionnaire with both closed- and open-ended questions, followed by a second phase of collecting qualitative data.

3.4 POPULATION AND SAMPLE OF THE RESEARCH STUDY

The Public Sector in Uganda is composed of three categories of institutions, namely i) Central Government Ministries, ii) Agencies, and iii) the Local Government District Administrations. The Central Government is responsible for the country's overall governance by setting national legal and regulatory instruments. In contrast, the local government is responsible for the governance of lower administrative units, namely Districts, Municipalities, and Town Councils.

Whilst the population of this research study included all Central Government Ministries in Uganda, the population was restricted to twenty-two, as presented in Table 20, excluding sensitive Ministries such as the i) Ministry of Security, ii) Ministry of Defence and Veteran Affairs, and iii) the President's Office. These Ministries were excluded from the sampling frame due to security and national defence considerations. All public sector organisations in Uganda are classified into fifteen distinct sectors, each representing a specific functional area

of government operations and service delivery. Table 20 lists the ministries covered in this study, along with the sectors to which they belong.

Table 20:

Central Government Ministries (Sampling Frame)

No.	Sector	Ministry
i.	Accountability and Financial Management	Ministry of Finance, Planning, and Economic Development
ii.	Agriculture	Ministry of Agriculture, Animal Industry, and Fisheries
iii.	Education	Ministry of Education and Sports
iv.	Health	Ministry of Health
v.	Lands, Housing and Urban Development	Ministry of Lands, Housing and Urban Development
vi.	Justice, Law, and Order	Ministry of Justice and Constitutional Affairs
vii.	Works and Transport	Ministry of Works and Transport
viii.	Public Administration	Ministry of Public Service, Office of the Prime Minister, Ministry of Internal Affairs, Ministry of Foreign Affairs, Ministry of East African Community Affairs
ix.	Water and Environment	Ministry of Water and Environment
x.	Social Development	Ministry of Gender, Labour, and Social Development, Ministry of Ethics and Integrity
xi.	Energy and Mineral Development	Ministry of Energy and Mineral Development
xii.	ICT and National Guidance	Ministry of ICT and National Guidance, Ministry of Science and Technology
xiii.	Local Government	Ministry of Local Government, Ministry of Kampala Capital City and Metropolitan Affairs
xiv.	Tourism	Ministry of Tourism, Wildlife and Antiquities
xv.	Trade, Cooperatives, Industry and Manufacturing	Ministry of Trade, Industry, and Cooperatives

Source: Ministries-List (2024)

3.4.1 Justification for Restricting the Study to the Central Government

The Public Sector in Uganda includes the following entities: i) the Central Government, ii) the Local Government or District Administrations, iii) Parastatals, and iv) Sectoral

Agencies, such as public health facilities and public educational institutions. Following the pragmatic philosophy, this study was restricted to the central government Ministries only. The rationale behind choosing central government Ministries as the target population was to keep costs low, have an impact on the research phenomenon, execute the assignment within the available timeframe, and accommodate convenience considerations for both the researcher and the respondents.

While the central government Ministries are headquartered in Kampala and Entebbe, the Local Government Administration units are scattered across 146 districts throughout the country. Consequently, the geographical dispersion necessitated considerable resources in terms of transportation costs and time, serving as a deterrent and thereby constraining the focus on central government ministries.

Furthermore, the central government leads the development and implementation of national policies, the delivery of government services, the installation of infrastructure, and the overall national governance framework. Relatedly, the local government administration units follow the strategic direction set by the central government. Moreover, the Central Government has better documentation and more accessible information than local governments, facilitating researchers' efforts to gather consistent and comprehensive data. Therefore, by focusing on the Central Government, the study was better positioned to deeply examine the policies, programs, and initiatives that influence public sector data governance in Uganda.

3.4.2 Research Participants

The anticipated age range for participants was set between 16 and 65 years. This range conforms to Uganda's Employment Act and the Public Service Standing Orders, which establish the minimum age for commercial employment as 16 years and the statutory retirement age as 60. However, the Act permits extensions in exceptional circumstances (MoPS, 2021; Uganda, 2006). Exemplary personnel or those possessing unusual and specialised abilities may be maintained on contract for a maximum of five extra years to promote knowledge transfer and mentorship within their organisations (MoPS, 2021). The participants in this study included both males and females.

Additionally, participants in this research were selected staff from officer level up to head of department drawn from the departments of Information Technology, Policy and Planning, Administration, and Finance in the selected Central Government Ministries. However, any participant who was unwilling or incapable of giving informed consent, such as those with cognitive impairments that prevent them from reasoning properly, would not be allowed to participate in the study.

Relatedly, non-officers such as secretaries and other clerical staff were excluded from this study. Participants with disabilities who were capable of giving informed consent for themselves were eligible to participate in the study. Where applicable, appropriate preparations were to be made to enable the full participation of disabled participants, such as providing screen readers or converting the questionnaire to Braille format for blind participants. However, this need did not arise since all participants were fully able-bodied. Additionally,

extra care was taken to avoid using derogatory or insensitive words that might hurt the feelings of the research participants or any other person.

3.4.3 Recruitment Process for Human Research Participants

A list of the twenty-five ministries of the Government of Uganda was obtained from the Research Department in the Office of the President (Ministries-List, 2024). However, three ministries were excluded from the target population due to security considerations. Human Resource Managers facilitated access to staff lists for the Departments of Information Technology, Finance, and Policy and Planning. From these lists, one respondent was selected per ministry based on availability, using a first-come, first-served approach. It is important to acknowledge that the number of eligible staff within the specified departments varied across institutions, reflecting differences in organisational structures and establishment.

For the qualitative phase of the study, which involved interviews with officials from six purposively selected ministries, the researcher collaborated with Human Resource Departments to identify potential participants from the Departments of i) Information Technology, ii) Policy and Planning, iii) Administration, and iv) Finance. Each identified official received an information pack and consent form prior to participation. Online interviews were scheduled with the first officials who provided informed consent and confirmed their availability. Throughout the process, the researcher maintained a professional and courteous approach to foster trust and encourage participation. As an additional incentive, participants who expressed interest were assured that a copy of the final dissertation report would be shared with them upon completion.

3.4.4 The first Phase of Data Collection

The initial stage of collecting qualitative data was conducted using purposeful sampling techniques. Purposive sampling is the deliberate selection of respondents based on factors that the researcher finds convenient, such as their interest in participating, accessibility, or knowledge of the study subject (Creswell & Clark, 2018). For this stage, the Ministries were purposefully sampled based on convenience to access them and the volumes of data processed by the entity. Qualitative data were collected from a sample of six Ministries out of a population of twenty-two Ministries, representing 27.3% of the study population. The target population of this study comprised twenty-two Ministries, identified after excluding those deemed sensitive. In particular, the Ministries of Security, Defence, and Veteran Affairs, as well as the Office of the President, were omitted due to national security concerns. This exclusion was methodologically necessary to mitigate potential risks associated with access to classified information, ensuring compliance with ethical research standards, and maintaining the feasibility of data collection within permissible institutional boundaries. One interview was held per institution, resulting in six participants at this stage. The selected entities for the qualitative data collection are presented in Table 21.

Table 21:

List of Purposively Selected Ministries for the Qualitative Phase

Ministry	Justification
i. Office of the Prime Minister	This Ministry is responsible for coordinating government business in the Legislature, monitoring and evaluating the implementation of national policies and programmes and

		overseeing the execution of government projects. (Constitution, 1995).
ii.	Ministry of Public Service	This Ministry oversees and coordinates the records management function in the public sector.
iii.	Ministry of Information, Communications Technology, and National Guidance	This Ministry is mandated to promote the usage/ availability of Information and Communication Technologies in Uganda.
iv.	Ministry of Education and Sport	This Ministry generates and manages large datasets of various categories of data on Uganda's Education and Sports sector.
v.	Ministry of Agriculture, Animal Industry and Fisheries	This Ministry generates and manages large datasets of various categories of data related to agriculture, Animal Industry, and Fisheries.
vi.	Ministry of Finance, Planning, and Economic Development	This Ministry generates and manages large datasets for financial, statistical, planning, and economic purposes.

Source: Primary Data

In qualitative studies, an optimal sample size is acceptable, considering that researchers emphasise the depth and richness of the responses rather than statistical generalisation (Creswell & Clark, 2018; Vasileiou et al., 2018). Still, with the sample of six Ministries, data was collected till the point of "data saturation", to a point where the participants could not significantly contribute any new insights, rendering the need for a larger sample size unnecessary. This was further accomplished through the meticulous selection of a purposive sample of six ministries that handle large datasets and were thus expected to have rich information pertinent to the study. Moreover, the selected six ministries from six sectors of the fifteen overall government sectors represented 40% of the Government. Considering the other factors, such as depth of inquiry and saturation of responses, this was a very good representation.

Additionally, in line with the pragmatism research philosophy that this study followed, the sample size for the qualitative phase was set at six ministries for pragmatic reasons (Vasileiou et al., 2018) that included i) *the availability of respondents* – these were mainly senior civil servants with busy schedules, so the number was established at the most optimal level to ensure minimum disruption and to increase participation, ii) *effect of COVID-19 Pandemic* - the interviews were conducted in a period where movements were restricted, official work was at a minimum, and morale was down due to the pandemic, iii) *budget constraints* – the financial resources available to the researcher were limited and thus the sample was kept at the most optimal minimum level to make it manageable, iv) *time constraints* – the sample size was kept at a manageable size considering the time required to manually transcribe the recorded audio on average one-hour interviews into text formats and analyze them, and v) *homogeneity of the government ministries* – there is a lot of similarities in aspects such as the vision, setup, governance, operations and infrastructure and hence it was deemed that selecting an optimal number would yield representative results.

3.4.5 The Second Phase of Data Collection

The second phase of data collection involved a stratified sampling approach. This probability sampling technique ensures that specific subgroups within a population are adequately represented in a sample (Berman, 2017; Creswell, 2014). Using this method, each of the twenty-two central government ministries that formed the study's population had the three divisions of i) ICT, ii) Policy and Planning, and iii) Finance/Accounting, forming strata. A sample of two respondents was then randomly selected from each stratum to form a total of

six respondents for each ministry. This approach aimed at collecting quantitative data from the entire population of twenty-two ministries, resulting in a total of 132 participants.

The advantage of stratified sampling is that it produces a large sample size and yields more precise findings that improve the generalizability of the results (Berman, 2017; Creswell, 2014). The basis for choosing participants from the departments of Information Technology (IT), Planning, Administration, and Finance is that they are responsible for processing/managing large volumes of data. In particular, the IT department is responsible for managing the technology used in data governance, while the departments of Planning, Administration, and Finance own and process large, critical data assets in the public sector. Thus, including respondents from these four departments was envisaged to increase comprehension of the problems with data governance while also improving the internal validity of the responses (Abraham et al., 2019; Creswell, 2014).

Although stratified sampling offers advantages, it has a significant limitation in requiring detailed prior knowledge of the population to accurately form strata. Furthermore, its implementation is complex and time-consuming (Creswell, 2014). Nevertheless, in this study, thorough due diligence and preparation were carried out to ensure the randomness of the sample selection and to minimise the turnaround time for selecting the sample, thereby improving the generalizability of the results.

3.5 MATERIALS/INSTRUMENTATION OF RESEARCH TOOLS

Two data collection tools were required for this two-stage mixed-methods research. The first stage involved gathering and analysing qualitative data using a semi-structured

interview guide, while the second phase involved collecting quantitative data using a questionnaire.

The interview guide and questionnaire used in this study were based on the cross-functional data governance model by Abraham et al. (2019), which served as the conceptual framework adopted by this study. While the research tools were based on an existing model, they had to be developed from scratch, as the literature review revealed no existing, validated instrument that was appropriate for the purpose.

3.5.1 Design of the Research Tools

In line with the attributes of the Abraham et al. (2019) cross-functional model, both the interview guide and the questionnaire had six main sections, namely i) Data Governance Antecedents, ii) Organisational Scope, iii) Data Scope, iv) Domain Scope, v) Governance Mechanisms, and vi) Consequences. However, an additional section was included to collect demographic data on the respondents and the organisation they represent. The demographic section was included to discern any patterns in the responses that could be attributed to the demographic characteristics of the respondents or the organisations they serve.

3.5.1.1 *Design of the Interview Guide*

The semi-structured interview guide was designed to collect qualitative data using open-ended questions (a ***copy of the interview guide is attached as Appendix A***). As Creswell and Creswell (2018) demonstrate, qualitative data may be collected using an unstructured or semi-structured interview guide. The decision to use a semi-structured interview guide was

premised on two facts, namely i) the phenomenon being investigated is complex and therefore required breaking down into easily understandable themes to ease the responses, and ii) the study was premised on the Abraham et al. (2019) cross-functional model as its conceptual framework, which already had pre-defined attributes. It is essential to note that the basis for adopting the Abraham et al. (2019) cross-functional model as the conceptual framework for this study was its alignment with the theoretical foundation of systems theory and its practical suitability for addressing the research objectives.

Care was taken to ease the response while determining the order of the sections and the subsequent questions. Due attention was given to the order of the questions to ensure a logical flow, which would help respondents feel more at ease as they provided their responses. For example, easier questions to answer, such as demographic information, were placed at the beginning of the interview guide, whereas more challenging questions, such as those regarding challenges encountered and future plans, were saved for the end. The flow of the questions was also partly influenced by the need to build the respondents' confidence and trust by letting them begin answering the easier questions at first, while the sensitive questions were saved for last.

Another design consideration was the language aspect. Care was taken to ensure that the language used in setting the questions was simple and easy to understand. This was done to ensure the questions were clear to the respondents, so that the responses provided would be the most accurate and appropriate.

3.5.1.2 *Design of the Questionnaire*

The design of the questionnaire was informed by insights obtained from the initial qualitative phase of the study (**a copy of the questionnaire is attached as Appendix B**). The first section, similar to the interview guide, asked demographic questions to gather more information about the participants and their organisations. These demographic variables provided critical context for interpreting the survey results, enhancing the descriptive and analytical efficacy of the study (Creswell & Creswell, 2018; Saunders et al., 2009).

In addition to demographics, the questionnaire had several thematic sections, namely: i) data governance antecedents, ii) data governance principles, iii) data governance mechanisms, iv) consequences of data governance failure, v) mitigation strategies, and vi) cultural influences on data governance. The items in each of these sections were derived directly from the qualitative analysis. Since the interview guide used in this study was based on the Abraham et al. (2019) cross-functional model, the questionnaire items were also aligned with the study's conceptual framework. This ensured consistency in data collection methods and enhanced the validity of the study's operationalisation of the conceptual dimensions.

The questionnaire required respondents to rate the commonness, strength, or weakness of the problems and solutions that arose during the interviews. Most of the questions were closed-ended, and many of them required a single choice from a list of options. To gauge attitudes and perceptions, participants were asked to express their degree of agreement with particular statements using a five-point Likert scale, ranging from "Strongly Disagree" to "Strongly Agree" (Saunders et al., 2009). Although these items may be susceptible to response

bias (Creswell, 2012), the chosen participants, due to their professional positions, were anticipated to respond diligently.

Google Forms was used to create and distribute the questionnaire. We chose this platform because it is inexpensive, easy to share, and can help ensure that respondents participate (Storozuk et al., 2020). The email invitation included a consent form and a letter from the gatekeeper (**copies of the Gatekeeper's Letter and the consent form are attached as Appendices F and G**). The decision to use an online tool was based on a number of factors: (i) all participants were comfortable with technology, (ii) they had and used official email accounts, (iii) they had reliable internet access, and (iv) the COVID-19 pandemic meant that there should be as little physical contact as possible to lower health risks. Additionally, online administration ensured consistency, safety, and efficiency by allowing respondents to enter data directly, thereby reducing errors that often occur when data is entered manually. Strong password protection, regular updates of passwords, and regular transfers of survey data from Google Drive to secure offline storage all helped keep data safe.

In designing the questionnaire, methodological rigour was guaranteed by ensuring the following: i) establishing a logical flow of sections and questions, ii) ensuring clarity and conciseness in wording, iii) avoiding leading questions, and iv) employing appropriate response formats, including Likert scales, checkboxes, and radio buttons. Together, these steps made the instrument more reliable and valid, while also helping to achieve the research goals.

3.5.2 Validation of the Research Tools

Both data collection instruments (i.e., the interview guide and the questionnaire) were pre-tested using a smaller sample representative of the population (Creswell & Creswell, 2018). The main objective of the pilot study was to minimise bias and to assess the validity of the research instruments. The researcher pre-tested the interview guide and questionnaire with five purposively selected individuals, who were chosen for their in-depth understanding of data governance.

The pilot assisted in refining the language and content of the questions for clarity and relevance. This helped make the questionnaire easier to complete. The pilot was also used to simplify the comprehension of the constructs in the questionnaire. As Saunders et al. (2009) recommend, a few additional questions were included in the data collection instruments during the pilot questionnaire to help in improving these tools. The sample questions included in the pilot were used to obtain responses on the following issues: i) duration of the interview; ii) clarity of the instructions; iii) identifying questions that were unclear or ambiguous; iv) identifying discomforting questions; v) assessing the layout of the tools; vi) asking these experts to provide any other comments. Responses to these questions helped refocus the questions so that respondents would provide valid and reliable answers.

Lastly, an online questionnaire provided real-time access to responses in a format that enabled easy analysis (Storozuk et al., 2020). This helped in quickly scanning the responses and running queries on the data to assess the quality of the responses.

3.6 OPERATIONAL DEFINITION OF VARIABLES

Considering the limited literature on data governance in the public sector in Uganda and the fact that this topic remains underexplored by researchers, this study adopted an exploratory approach. Therefore, it aimed to generate empirical data on the status of data governance in Ugandan public sector organisations. The variables used in this research were defined as discussed in subsections 3.6.1 to 3.6.6.

3.6.1 Descriptive Statistics

Both the qualitative and quantitative data were analysed to generate descriptive statistics. The descriptive statistics were derived from the demographic data collected on the research participants and the organisations that they serve, as defined in Table 22.

Table 22:

Definitions for the Descriptive Statistics Variables

Variable	Description
i. Response Rate	This ratio variable refers to the percentage of participants who responded to the research. It shall be calculated as the total number of participants who responded divided by the total sample size and the results multiplied by 100 (Saunders et al., 2007). This variable shall assess whether the response rate was good enough for the research results to generalize the population.
ii. Number of organisations per sector	This discrete numeric variable shall represent the number of organisations per sector.
iii. Number of employees per organisation	This is a discrete numeric variable representing the number of employees per organisation. It will be used to investigate the relationship between the number of employees in an organisation and the status of data governance.
iv. Highest level of education	This nominal variable will determine the frequency, mean, and percentage of academic qualifications among the research participants.

Variable	Description
v. Current job designation	This nominal variable will be used to classify the respondents' current job designations and will later be aggregated to determine the frequency, mean, and percentage of job titles.
vi. Number of years in current position	This continuous numeric variable will determine the frequency, mean, and percentage of the participants' length of stay in their current positions.
vii. Job hierarchy	This nominal variable will determine the frequency, mean, and percentage of participants in each category.
viii. Field of study	This nominal variable will determine the frequency, mean, and percentage of respondents' fields of study.
ix. Gender	This nominal variable indicates the number of participants by gender, i.e., the number of males, females, or those who preferred not to disclose their gender. This data will help determine the dominant gender in terms of research coverage, sector, and profession. The findings on this variable will also be used to establish relationships between various themes that have been identified relating to gender responses.
x. Age	This numeric continuous variable will be used to determine the frequency, mean, and percentage of the research participants' ages, as well as to identify the dominant age/age bracket. The findings on this variable will also be used to establish relationships between various themes identified in relation to the respondents' age.
xi. Employment duration	This is a numeric continuous variable used to determine the frequency, mean, and percentage of respondents' length of employment.
xii. Participant's data governance experience	This is a numeric continuous variable used to determine the frequency, mean, and percentage of respondents' length of experience in data governance.

Apart from the descriptive statistics derived from the research demographics section, the rest of the questionnaire was based on Likert scales. A five-point Likert scale was used to capture participants' opinions on a question or statement. To analyse the data, it was coded as follows: Strongly Disagree = 1, Disagree = 2, Neutral = 3, Agree = 4, Strongly Agree = 5. One must recall that Likert scales represent ordinal measurements, i.e., we can only say that one score is higher than another, not the distance between the points (Saunders et al., 2009).

3.6.2 Data Governance Antecedents

The variables in this category were intended to assess contingency factors that affect the uptake and execution of data governance. These variables were subdivided into external and internal antecedents.

3.6.2.1 External Antecedents

The external antecedent variables measure the effect of exogenous factors outside the study organisation on its data governance. In line with the Abraham et al. (2019) cross-functional data governance framework, these external antecedent variables included a) *Legal and Regulatory Provisions* - this variable was used in establishing the effect of the national legal and regulatory provisions on institutional data governance, b) *Service Demand Volatility* - this variable was used to store the participant's opinion on how surges in demand for services affects data governance, c) *Industry Data Compliance Requirements* - this variable was used in capturing the participants' opinion on the effect of given industry requirements for compliance to established standards on data governance, and d) *Political, and Socio-Cultural Conditions* - this variable was used in establishing the effect of the prevailing political and socio-cultural conditions on data governance.

3.6.2.2 Internal Antecedents

The internal antecedent variables were used to measure the effect of internal factors on an organisation's data governance. In line with the Abraham et al. (2019) framework, the internal antecedent variables are i) *Top Management Support* - this variable was used to assess the impact of top management support for data governance on the performance of data governance, ii) *Internal Policy Regime* - this variable was used to assess if there is a relationship

between the existence of internal data governance policies or strategies on the performance of data governance, iii) *IT Systems* - this variable was used to assess if there is a relationship between the use of IT Systems and the level of data governance in an organisation, iv) *Decision-Making Mechanisms* - this variable was used to assess if there is a correlation between decision-making and the level of data governance in an organisation, v) *Quality of Source Documents* - this variable was used to assess the quality of official documents in an organisation.

3.6.3 Data Governance Principles

This construct was intended to revalidate the data governance requirements from the qualitative data analysis, thus answering the first research question, “*RQ1: What are the requirements for effective data governance?*” Additionally, the Data Governance Principles construct was intended to be used in testing the hypothesis that “*Data Governance Antecedents have no significant effect on Data Governance Principles.*”

The variables under the Data Governance Principles construct included the following:

- i) *Inter-Departmental Data Governance Activities*: This variable was used to assess the inter-departmental data governance activities in the research participant’s organisation, e.g., at a departmental, project, or organisational level. The results of this variable test whether inter-departmental data governance activities significantly contribute to data governance performance;
- ii) *Intra-Organisation Data Governance Activities*: This is an ordinal variable that was used to assess the level of intra-organisational data governance activities in the research participant’s organisation, e.g., data governance activities with other Ministries or international organisations. The contents of this variable were used to determine if intra-

organisational data governance activities contribute to data governance performance; iii) *Level of Data Sharing and Reuse*: This variable's contents were used to ascertain whether the data sharing and reuse level affects data governance performance; iv) *Level of Evidence-Based Decisions*: This variable was used to determine whether evidence-based decision-making contributes to data governance performance; v) *Level of Data Quality Provisions*: This variable was used to assess if the research participant's organisation has adequate provisions for ensuring data quality with respect to parameters such as accuracy, timeliness, completeness, and integrity; vi) *Level of Data Criticality*: This variable was used to assess the extent to which the research participant's organisation treats data as a critical asset in data governance; vii) *Communication Impact*: This variable was used to establish the effect of the level of communication in the research participant's organisation on data governance performance; viii) *Legal and Regulatory Impact*: This variable was used to establish the impact of enforcing regulatory and legal provisions in the research participant's organisation on data governance performance; and ix) *Availability of Metadata*: This variable was used to assess the impact of metadata availability in the research participant's organisation on data governance performance.

3.6.4 Governance Mechanisms

The category of variables arranged under the governance mechanisms in the questionnaire was intended to be used in testing the hypotheses and answering the research questions. In accordance with the Abraham et al. (2019) cross-functional framework, the data governance mechanism construct variables are subdivided into three categories, namely, i) *Organisational Mechanisms*: – which cover policies, roles, and structures; ii) *Procedural*

Mechanisms – which cover processes and methods; and iii) *Relational Mechanisms*, which cover capacity building, coordination, and communication mechanisms.

3.6.4.1 *Organisational Mechanism Variables*

The constructs for organisational data governance mechanisms are: - a) *Roles and Duties* - This variable establishes whether data governance roles and duties contribute to data governance performance; b) *Decisions Domain Level* - This variable was used to establish if the level of attention given to the process of making data governance decisions improves data governance performance; c) *Policy Level*—This variable was used to establish the impact of the availability and application of internal data management policies, strategies, and standards on data governance.

3.6.4.2 *Procedural Mechanisms Variables*

The variables that measure procedural mechanism are: a) *Processes Level* - This is variable evaluates if the data governance processes and procedures adequately influence data governance; b) *Outsourcing Consideration* – The results of this variable were used to examine whether outsourcing data governance processes significantly influences data governance; c) *Performance Measures Level*—This variable was used to examine whether measuring of data governance performance help improve data governance; d) *Regulatory Compliance Monitoring* - This variable establishes whether monitoring organisations' compliance with data governance regulatory and legal provisions contributes to data governance performance; e) *Conflicts Resolution*—This variable is used to establish whether providing procedures for resolving data management conflicts contributes to data governance performance.

3.6.4.3 Relational Mechanism Variables

The variables for measuring relational data governance mechanisms are: a) *Communication Impact* – This variable establishes the effect of communication on data governance; b) *Training Impact* - This variable was used to establish the effect of staff training on data governance; c) *Access Control Level* - This variable was used to establish the level of data access control mechanisms; d) *Access Control Impact* - This variable was used to establish the effect of data access control on data governance; e) *Data Privacy Level* - This variable is used to examine the relation between data privacy and data governance; f) *Maintenance of Data Assets Inventory*—This variable examines the relationship between the maintenance of a data asset inventory and data governance; g) *Lifecycle Management*—This variable examines the relationship between data management over its lifecycle and data governance performance.

3.6.5 Consequences of Data Governance

This construct aimed to investigate the consequences of failing to govern data effectively. The findings in this category were expected to answer the research question on the challenges of data governance in Uganda. The expected challenges were identified from the results of the qualitative data analysis, and these are i) Lack of Financial Resources, ii) Lack of Communication of the Data Governance Benefits, iii) Lack of Data Governance Skills and Knowledge, iv) Lack of Dedicated Data Governance Staff, v) Lack of Stakeholders Training, vi) Incompatibility of Data governance with organisational culture and staff behaviour, vii) Lack of perceiving data being a critical asset, viii) Lack of Top Management Support, ix) Inadequate Data Governance infrastructure, and x) Perceiving Data Governance as a time-waster.

To affirm the solutions for overcoming the identified challenges, participants were also asked to assess the importance levels of the proposed solutions. The opposite of the variables used to store challenges were now used for the solutions, namely i) Increased availability of financial resources, ii) Increased communication of the Data Governance benefits, iii) iv) Increased Data Governance skills and knowledge transfer, v) Availability of dedicated Data Governance staff, vi) Increased stakeholders' training, vii) Increased alignment of Data Governance with Organisational Culture and Staff Behaviour, viii) Considering Data as a critical resource, ix) Increased Top Management Support, x) Availability of adequate Data Governance Infrastructure, xi) Data Governance as a pivotal contributor to organisational performance.

3.6.6 Effect of the Organisational Culture on Data Governance

This subsection sought to establish the effect of the respondents' attitudes, beliefs, and behaviour toward data management on data governance (activities and data quality). This construct aimed to answer the research question, "*What is the effect of the employees' attitude toward data management on data governance?*" Additionally, this category of variables was intended to be directly used to test the hypothesis that "*Organisational culture has a significant effect on data governance.*"

The variables under the effect of organisational culture on data governance construct included i) *Effect of Organisational Culture and Behavior of Staff* – this variable sought to establish the correlation between the organisational culture and behavior of staff towards data

governance practices and data governance; ii) *Staff attitude towards the value of data* - this variable sought to establish the correlation between staff's attitude towards the value of data and data governance; iii) *Leadership Style* - this variable sought to establish the correlation between leadership style and data governance; and iv) *Organisational Values* - this variable sought to establish the correlation between organisational values and data governance.

3.7 STUDY PROCEDURES AND ETHICAL ASSURANCES

This subsection discusses the ethical considerations undertaken during the execution of this study. These ethical considerations are arranged as i) Pre-data collection ethical considerations, ii) Data collection ethical considerations, and iii) Post-data collection ethical considerations.

3.7.1 Pre-Data Collection Ethical Considerations

Ethical considerations are paramount to any research undertaking (Davison et al., 2001). In this research, various measures were taken at multiple levels to ensure that the required ethical research standards were fully met. The ethical considerations of this research commenced with the approval of the Research Ethics Application by the UNICAF University's Research Ethics Committee (**Copy of the University's Research Ethics Committee Approval Letter attached as Appendix C**). To inform the Research Ethics Committee's decision, the researcher submitted a Research Ethics Application Form accompanied by i) *the data collection tools*, i.e., both the interview guide and the questionnaire, ii) *the gatekeeper letter*, which contained information for requesting clearance from the participating institutions, iii) *a sample of the informed consent form* which had information about the research for

debriefing participants and certificate of consent to confirm that the participant had given consent and iv) *a justification for no need of a guardian approval* - a note giving justification for no need of a guardian's informed consent considering that all the participants were above 18 and of sound mind (**Copy of the Research Ethics Application form are attached as Appendix H**).

The researcher also obtained institutional approval from the Ministry of ICT and National Guidance, a statutory body responsible for establishing an enabling environment that promotes the availability and use of ICTs. In addition, the Ministry supervises IT Officers across the Government (**A copy of the Ministry of ICT's Approval Letter is attached as Appendix D**). The letter seeking access to interview Government Officials explained the research goal, how the data would be collected, and the expected benefits from the research. The letter also expressed the researcher's willingness to share the research results with the organisation (a **copy of the letter seeking permission from the Ministry of ICT is attached as Appendix E**).

Furthermore, the researcher ensured that he obtained informed consent from the research participants. During data collection, all participants were informed about the purpose of the research and requested to participate in the survey voluntarily (Fischer, 2004; Resnik, 2011; Saunders et al., 2009). The participants were also informed that they were free to exit the interview at any moment if desired and to decline to answer any question(s) they felt were intrusive or disrespectful (Fischer, 2004). Additionally, the identities of the participants and their institutions were anonymised to protect their privacy, and they were informed accordingly before data was collected. For example, when evaluating the qualitative data and discussing

the findings in the dissertation or any other future publications, participants should be identified as Interview 1, Interview 2, etc., to avoid disclosing their identities.

To ensure that participants were adequately informed of the study's purpose, they were also sent an introductory letter containing information about the research and its ethical provisions. This letter also included the contact information of the supervisor and researcher, so that participants could reach out to them if they had any questions or concerns that the letter did not address.

3.7.2 Data Collection Ethical Considerations

The first phase of data collection, which involved collecting qualitative data, was based on the purposeful selection of one participant from each of the six Ministries, which were identified based on the volumes of data they processed. Depending on availability, appointments were arranged with heads of the IT, Policy and Planning, or Finance departments. In one instance, an earlier confirmed participant had a personal emergency, and the next available head of department was chosen. Therefore, the choice of participants for the qualitative data collection was made randomly, with the intention to minimise bias. Furthermore, during the qualitative data collection, permission was obtained from the participants to record their voices. All the participants agreed to be recorded, and efforts were made to ensure that no personal information was recorded. It should also be noted that due care was taken during data collection to ensure that personally identifiable information, such as the interviewee's name or employer, was not collected.

During the second phase of data collection, which involved collecting quantitative data from twenty-two Ministries, the researcher explained the purpose of the research to the Heads of the Human Resource Division and sought permission for staff to participate in the research. Once satisfied, the manager of Human Resources was asked for the emails of the required staff to participate as respondents during data collection, namely the Heads and staff of i) IT, ii) Statistics, iii) Finance, iv) Policy Analysis, and v) any officer that processes large volumes of data. To maintain confidentiality, care was taken not to ask for the names of these people. Additionally, the participating persons' emails were kept confidential by sending mass emails with blind copies and storing the list of emails in a password-protected Excel spreadsheet.

Furthermore, it is worth noting that the philosophical foundation of this study, pragmatism, necessitated the application of innovative methods to gain a deep understanding of the data governance phenomenon, drawing on the personal experiences, knowledge, and perspectives of public officers with responsibilities that encompassed aspects of data governance. Given this understanding, the researcher endeavoured to ensure that his personal experiences, knowledge, and thinking on data governance were divorced from the data collection processes. For example, the researcher ensured that his tone and interviewing style did not betray his personal feelings in a manner that would lead to biased responses from the research participants.

Notably, the researcher was an employee of the Ministry of ICT, and the research participants consisted of fellow senior and junior Government employees. Despite this, the researcher ensured that the study was carried out objectively by eliminating any factors that could potentially undermine its purpose. Most importantly, the researcher refrained from

exploiting his position as a Government employee to exert undue influence on participants, ensuring that they were neither coerced into participation nor biased in their responses.

3.7.3 Post-Data Collection Ethical Considerations

Even after ensuring the participants' privacy was catered for during data collection and analysis, the results of this research were securely stored and protected. In this regard, secure data storage techniques were deployed, which included local hosting and cloud-based storage.

The raw data files and the results files were stored on the Direct-Attached Storage (DAS) on the local hard disk drive of the researcher's laptop. Additionally, these files were backed up on removable external storage media and the Network-Attached Storage (NAS) of a file server at the researcher's workplace. Any changes made to the files on the researcher's laptop were immediately replicated across the three different types of storage media. To further enhance the security and safety of the findings and research results, the data files of this study were stored on a secure Cloud-Based Storage service, specifically Google Drive, which was chosen due to its cost-effectiveness. Access control and embedded security provisions further enhanced the local hosting and cloud-based storage services used in this study.

The data protection techniques applied in this study included a) Data Backup Strategies where full backups of all datasets was made whenever changes were made; b) Data Encryption where end-to-end encryption was applied to ensure data remains encrypted throughout transmission and storage; c) Access Control and Authentication where zero trust security was applied to ensure that no other user or system except the researcher is allowed access to the

datasets unless when explicitly specified. For example, the database containing the responses was i) password protected and the password was frequently changed to protect it from inappropriate access, ii) the responses databases was regularly backed up to an offline password-protected media to ensure the availability of copies of the data in case of any system malfunction; iii) access to the folder on which the database was stored was restricted only to the researcher (Paul & Aithal, 2019); and iv) the files were continuously monitored physically to ensure their integrity.

In Uganda, the Data Protection and Privacy Act (2019) and the National Archives Act (2001) do not specify a retention period for data. However, the Data Privacy and Protection Act (2019) specifies that personal data should be retained for a period long enough to serve the purpose for which it was collected. Therefore, considering this, the data collected in this research shall be kept for five years in secure off-site media. It is anticipated that this period will be sufficient for generating research products, such as practice and academic papers, to enhance the data governance ecosystem. Overall, this study presented minimal risk to the respondents, as all relevant ethical issues were addressed.

3.8 DATA COLLECTION AND ANALYSIS

In line with the attributes of the Abraham et al. (2019) cross-functional data governance model, which was adopted as this study's conceptual framework, both the interview guide and the questionnaire had six main sections, namely i) data governance antecedents, ii) organisational scope, iii) data scope, iv) domain scope, v) governance mechanisms, and vi) consequences. However, an additional section was included in both tools to collect demographic data on the participant and their employer. The demographic section was included

to discern any patterns in the responses that could be attributed to the demographic characteristics of the respondents or the organisations they serve.

3.8.1 Mapping of the Research Questions and Hypotheses

To achieve its purpose, this research aimed to answer four research questions on data governance, as presented in Table 23.

Table 23:

Mapping of the Research Questions to the Hypotheses

Research Question	Description	Constructs
i) What are the requirements for effective data governance?	This question sought to establish the scope and mechanisms of data governance.	Data Governance Scope; Data Governance Mechanisms
ii) What organisational provisions have been established to manage data assets?	This question aimed to understand the current data governance provisions in Uganda's public sector. This question will investigate the constructs of people, processes, technologies, structures, and policies that contribute to effective data management.	Data Governance Antecedents, Data Governance Principles
iii) What challenges do government employees face while managing data in Uganda?	This question aimed to identify the current public sector data management challenges facing one organisation or multiple organisations and propose an appropriate framework to help resolve them.	Data Governance Consequences
iv) What is the effect of organisational culture on data governance in the Ugandan Public Sector?	This question sought to establish the relationship between the respondents' attitudes, beliefs, and behaviours regarding data management activities and the quality of data.	Data Governance Antecedents, Organisational Culture

Additionally, this study was used to test three hypotheses based on data governance constructs based on the Abraham et al. (2019) cross-functional data governance framework,

namely i) data governance principles, ii) data governance antecedents, iii) data governance mechanisms, and iv) organisational culture (Alhassan et al., 2018; Were & Moturi, 2017). However, the research questions addressed during the qualitative phase are closely related to the hypotheses tested in the quantitative data analysis stage, as presented in

Table 24 below.

Table 24:

Relationship between Research Questions and Research Hypotheses

Code	Hypothesis	Constructs	Research question
H ₀₁ :	Data Governance Antecedents have no significant effect on Data Governance Principles.	Data Governance Antecedents	What are the requirements for effective data governance?
H ₀₂ :	Data Governance Antecedents have no significant effect on Data Governance Mechanisms.	Data Governance Mechanisms	What organisational provisions have been established to manage data assets?
H ₀₃ :	Organisational Culture has no significant effect on Data Governance.	Organisational Culture	What is organisational culture's effect on data governance in Uganda's public sector?

During data analysis, triangulation was made between the research question and the hypotheses, following the relationships identified in

Table 24 above.

3.8.2 Qualitative Data Collection

A semi-structured interview guide with open-ended questions was employed to obtain qualitative data from the five selected participants. The interviewer employed tact and ability to elicit responses from the participants, thereby collecting detailed information. (Alhassan et al., 2016; Olaitan et al., 2019; Otto, 2011).

The interviews were conducted in person by the researcher using the Zoom collaboration software. Before proceeding with the interview, permission was sought from the participants to record the interviews. Fortunately, all participants agreed to be recorded, and if any had declined, the researcher would have resorted to handwritten notes during the interview. Each interview lasted approximately one hour. The first interview was used as a pilot, which helped test the interview guide and gain a general understanding of the pertinent data governance issues related to the research.

3.8.3 Quantitative Data Collection

During the second data collection phase, a self-administered questionnaire with closed-ended questions was used to gather quantitative data. The survey tool requested responses on a binary or multiple-choice basis, as well as ratings using the Likert scale. The questionnaire was designed and administered using Google Forms software.

The Google form-based questionnaires were sent to the respondents' emails for filling out. While some respondents were quick to fill out and return the questionnaires, most required reminders via email and telephone calls to do so.

Generally, to increase responsiveness, respondents were encouraged to participate in the research by offering non-monetary incentives, such as assuring them that their identities/institutions would be anonymised and providing them with a copy of the dissertation report.

3.8.4 Proposed Data Analysis

As discussed below, a two-stage data analysis was conducted, beginning with qualitative analysis and followed by quantitative analysis.

3.8.4.1 Qualitative Data Analysis

The quantitative data analysis involved an iterative and interpretive process that entailed systematically transcribing the interview recordings, organising the files, and examining the textual data to identify recurring patterns, themes, and meanings (Cresswell & Clark, 2018), as discussed in subsections 3.8.4.1.1 to 3.8.4.1.5. The aim is to understand participants' perspectives, experiences, and the contextual factors influencing their responses.

3.8.4.1.1 Data Transcription

A combination of manual and computer-assisted methods was employed to analyse the qualitative data, ensuring both analytical rigour and interpretive depth. All voice recordings were transcribed verbatim to ensure the accuracy and completeness of the qualitative data. The interview recordings were transcribed manually to ensure accuracy and contextual integrity. Automated transcription software was deemed unsuitable because of its limitations in handling variations in pronunciation, accent, and technical terminology, which would compromise the accuracy of the transcribed data.

Each transcribed file was assigned a unique identification code (e.g., Transcript 01; Transcript 02), which corresponded to the names of the respective participating ministries (e.g., Ministry 01; Ministry 02). This coding system was utilised to protect the confidentiality of the participants and their associated institutions. Subsequently, the transcribed data were reviewed

for completeness and clarity before being imported into ATLAS.ti software for systematic management and analysis.

3.8.4.1.2 *Use of ATLAS.ti Software*

ATLAS.ti served as the primary tool for storing, organising, coding, and analysing the qualitative data. The software was selected for its user-friendly interface, analytical flexibility, and the availability of extensive training and support resources (Frieze, 2019). It facilitated a transparent and auditable process by allowing systematic retrieval, categorisation, and visualisation of coded data segments.

3.8.4.1.3 *Coding Process and Theme Development*

The coding and theme development process followed an abductive analytical approach. The coding process was conducted in three stages, namely i) *Open Coding*: The initial stage involved line-by-line examination of the transcripts to identify significant words, phrases, and ideas directly emerging from the participants' responses; ii) *Axial Coding*: Related codes were then grouped into broader categories to explore relationships among concepts and identify patterns within and across interviews; and iii) *Selective Coding*: The final stage involved synthesising these categories into overarching themes that represented the key findings of the study (Creswell, 2014; Hesse-Biber & Leavy, 2010). Throughout this process, the researcher iteratively compared codes and categories to refine and validate the emerging themes.

3.8.4.1.4 *Content Analysis and Data Visualisation*

To complement thematic coding, content analysis was employed to identify and group common response trends and determine the frequency of specific words or phrases. Analytical

tools within ATLAS.ti, such as word clouds, co-occurrence tables, code networks, and comparison diagrams, were utilised to visualise relationships among codes and highlight thematic linkages across participants. These visual representations facilitated a deeper understanding of the underlying structures and associations within the qualitative data.

3.8.4.1.5 *Integration with Quantitative Phase*

Given that this study employed an exploratory sequential mixed-methods design, the themes emerging from the qualitative phase directly informed the development of the questionnaire used in the subsequent quantitative phase. This ensured that the quantitative measures were grounded in participants' lived experiences and contextual realities, thereby enhancing the validity and comprehensiveness of the study's findings.

This approach is consistent with Creswell and Clark's (2018) framework for exploratory sequential mixed-methods research, which emphasises the use of qualitative results to inform the design of quantitative instruments. Although the two phases were conceptually sequential, the analysis of qualitative and quantitative data involved iterative cross-referencing to reinforce the credibility and depth of interpretation.

3.8.4.2 *Quantitative Data Analysis*

The questionnaire comprised closed questions with fixed multiple-choice options or Likert scales. Specifically, a five-point Likert scale was used to capture participants' opinions on a particular question or statement. Responses were assigned ordinal codes for data analysis as follows: Agree Strongly = 5, Agree = 4, Neutral = 3, Disagree = 1, and Disagree Strongly =

0. Since the measure of Likert scale items is ordinal, the mean response for each item was computed along with its standard deviation, and a cut-off point was established from which the trend of attitudes and behaviours was ascertained. The quantification of these items using the mean response also facilitated the conduct of correlation and regression analysis to test the study's hypotheses. The distribution of responses, such as percentages that agree or disagree, was also used to analyse and interpret the results.

Quantitative data analysis was performed using the Statistical Package for the Social Sciences (SPSS) to test the research hypotheses and validate the proposed framework. The analysis comprised three main stages:

First, Univariate Analysis: Descriptive statistics were generated to summarise respondents' demographic characteristics. Means and standard deviations of quantitative responses were compared with qualitative findings to enhance the validity of the framework. Frequencies and percentages were also presented to describe response distributions across items.

Second, Bivariate Analysis (Pearson Correlation): The Pearson Product-Moment Correlation Coefficient (r) was used to determine the strength and direction of relationships among quantitative variables. This test was applied after computing the mean scores for Likert-scale items, allowing for the assessment of linear associations between key constructs.

Third, Multivariate Analysis (Linear Regression): Linear regression analysis was employed as the principal statistical technique to test the study's hypotheses and examine the

predictive relationships between dependent and independent variables. This method was deemed appropriate due to the continuous nature of the data and the objective of estimating both individual and combined effects of predictors. The analysis utilised regression coefficients (β), the coefficient of determination (R^2), F-statistics, and corresponding p -values to interpret the direction, strength, and statistical significance of the relationships (Creswell, 2014; Bhattacharjee, 2013).

3.8.4.3 Triangulation of Results

The triangulation was conducted by examining the relationships between the research questions and hypotheses, as demonstrated in Table 24 and Table 23. Furthermore, findings from the literature review were used to support and enhance the triangulation of the results.

3.9 SUMMARY

This chapter outlines the research strategy employed in this study to investigate multi-institutional data governance practices in Uganda. The research strategy presented outlines the various stages through which the research was conducted, including problem identification, setting objectives, defining the underpinning research philosophy, research design, data collection, and analysis of findings (Creswell & Clark, 2018; Schoonenboom & Johnson, 2017).

The motivation for conducting this study stemmed from the inadequate attention to data governance amidst significant investments in digitalising services (Ademuyiwa & Adeniran, 2020). In particular, the literature review indicated that the public sector in Uganda lacked a standardised data governance framework (NITA, 2015). Thus, from a practitioner's viewpoint,

it was pertinent to investigate the country's data governance practices to identify gaps and make recommendations for improvement. This study was further necessitated by the limited scholarly research works on multi-institutional data governance in the public sector (Abraham et al., 2019; Lis & Otto, 2020). Furthermore, the technology volatility affects data governance (Alhassan et al., 2016; Gelhaar et al., 2021; Korhonen et al., 2013), thus the need for regular review. Therefore, given this background, this study aimed to contribute to a better understanding of the data governance phenomenon by examining data governance practices in the Ugandan Public Sector.

Due to its exploratory nature, this study was grounded in the pragmatist research philosophy, which emphasises the application of the most practical method for finding the best solution to the phenomenon under investigation (Bhattacharjee, 2012; Johnson & Onwuegbuzie, 2004; Saunders et al., 2009). The choice of this philosophy was influenced by the fact that this study is largely exploratory in nature, employing a mixed-methods approach and investigating a nascent problem that many scholars have not yet explored. The study employed a sequential exploratory mixed-methods approach, which began with qualitative data collection and analysis, followed by quantitative data collection (Creswell & Clark, 2018). The qualitative data were collected from a sample of six purposefully selected Ministries based on the volumes of data they processed, while the quantitative data were collected from a stratified sample that excluded only sensitive Ministries due to security concerns. All the data collection stages were preceded by ethical clearance from the University Research Ethics Committee, and further permissions were sought from relevant authorities in Uganda. Due attention was given to ethical considerations, including respecting the rights of participants, protecting their privacy, and ensuring the security of the collected data. The qualitative data collected were

later imported into Atlas Software for analysis, while the quantitative data were imported into SPSS for further processing and analysis.

CHAPTER 4: FINDINGS

This chapter commences with a section that highlights the trustworthiness, validity, and reliability of this study's results. Subsequently, the chapter presents the findings and their interpretation from the qualitative phase, arranged according to the four research questions (Subsection 1.4.1) on which this study is based. Later, the results of the quantitative phase and their analysis are presented in line with the research hypotheses. This is followed by the triangulation of the qualitative and quantitative findings to enhance the validity and credibility of the results from the two phases of this study. A proposed data governance framework based on the outcomes of this study is subsequently presented. The chapter concludes with a summary of the study's findings and their analysis.

This study employed a mixed-methods approach to explore data governance procedures in a multi-institutional environment from the perspective of Uganda, a developing country. The main aim of this study was to deepen the understanding of the data governance concept and provide practical insights for data governance practitioners and scholars. To meet this aim, the processes, findings, and outputs of this study needed to be trustworthy.

4.1 TRUSTWORTHINESS OF THE FINDINGS

Demonstration of the trustworthiness of research findings serves as proof of the research quality. This section gives credence to the trustworthiness of the data gathered in this study. Evidence of the trustworthiness of the findings is demonstrated using Guba's (1981) model of four parameters, namely i) credibility, ii) dependability, iii) confirmability, and iv) transferability, as discussed in subsection 4.1.1 up to subsection 4.1.4.

4.1.1 Credibility

Triangulation and member checking manifest the overall credibility of this study's qualitative data collection phase. The application of these two methods significantly contributed to the trustworthiness of the data.

Firstly, triangulation of the research findings was achieved through three techniques, namely i) *usage of semi-structured interview guides* - a standardized interview guide was used to collect the qualitative data, which ensured that all participants were asked the same questions; ii) *triangulation of primary data with secondary data* – this was achieved through comparative analysis of the findings from the primary data with secondary data obtained from official documents such as the National ICT Policy, the Digital Uganda Vision Strategy, Public Service Organisational Structure, National Records and Archives Policy Documents, and the National Databank Regulations; and iii) *checking consistency with previous studies* – this was achieved through comparison of the findings of this study with the results of previous studies on data governance.

Secondly, member checking, also commonly referred to as respondent or participant validation, was used to enhance the credibility of the findings of the qualitative data collection phase (Birt et al., 2016). The member checking technique involves presenting the research results to other participants to verify their accuracy and the degree of alignment with their experiences (Korstjens & Moser, 2018). In this study, member checking was conducted by sharing and discussing the research results with two data governance experts to evaluate the accuracy of the responses obtained from the sampled participants. The two experts confirmed

the accuracy of the findings. Therefore, the process of member checking further helped to ascertain the credibility of the research findings.

4.1.2 Dependability

Dependability of results refers to the consistency and reliability of qualitative research findings. The dependability of the research findings is enhanced when the research design and procedures are well-aligned with the research objectives (White et al., 2012). This attribute ensures that there is a rich description of the methodology used, which subsequently enhances the repeatability of the study.

The dependability of this study's findings was enhanced by using respondents drawn from several departments, including IT, Finance, Planning, and Statistics. Additionally, the respondents had diverse demographics and experiences, which provided a holistic representation of the public sector setting in Uganda, thereby increasing the likelihood of repeatability of the findings.

Another way to think about dependability is the degree to which an analysis and data collection technique produces the same result for several research participants (Franklin & Ballan, 2001). Therefore, the dependability of the qualitative data collected and the results was further strengthened by the fact that the respondents were interviewed online using a semi-structured interview guide (Kallio et al., 2016; Rashidi et al., 2014; Segal et al., 2006). A semi-structured interview guide consists of a standard set of questions and probe questions, enabling

the respondents to freely express their opinions on those questions without meandering and providing irrelevant responses (Kallio et al., 2016; Segal et al., 2006).

To mitigate the impact of the researcher's bias on the research process and outcomes, all procedures employed during the data collection and analysis were precisely defined and meticulously recorded. Through establishing a strong rapport, the respondents were able to give frank, impartial, and relevant in-depth responses.

4.1.3 Confirmability

Confirmability of qualitative research findings refers to the objectiveness of the research results (Korstjens & Moser, 2018). Confirmability is an indicator that demonstrates a qualitative study is impartial and unaffected by the investigators' presumptions or biases.

In this study, the confirmability of the data collected was ensured by continuously rechecking the data throughout the data collection and analysis phases to ensure that the results would be more likely to be repeatable in other related future studies. Further, an audit trail of the data collection and analysis processes was done by logging in a journal, detailing the activities conducted (Carcary, 2009). The intention of maintaining the audit trail was to provide a transparent mechanism for documenting the processes conducted. Finally, a data audit was conducted before the analysis was done (Carcary, 2009; Nowell et al., 2017; Creswell & Clark, 2018) to ensure that the transcribed information accurately reflects the information contained in the audio records to minimise errors that could have arisen due to low audibility or unclear pronunciations of words by the interviewees.

Overall, the confirmability of research findings should be used to establish the trustworthiness of qualitative research by producing results that objectively reflect the actual information collected from the research participants.

4.1.4 Transferability

The transferability of qualitative research results refers to the degree to which those results can be replicated in a related research study with different respondents (Korstjens & Moser, 2018).

The first strategy that was applied to increase the transferability of the results was the use of the stratified sampling technique. The goal of using the stratified sampling method was to increase the likelihood of transferability and generalizability of the findings to a bigger population while gaining a thorough understanding of the data governance experiences in the public sector.

The second strategy employed to enhance the transferability of this study's qualitative results was the use of thick descriptions (Ponterotto, 2006). This entailed encouraging the respondents to share their experiences and contextualise their responses with respect to their work settings. Additionally, an effort was made to provide detailed information on the data collection platform, respondents, and data collection methods.

Hence, the use of the stratified sampling technique and the thick descriptions helped to increase the transferability of this study's results.

4.2 RELIABILITY AND VALIDITY OF THE FINDINGS

This section discusses how the measurement instruments used in this study's quantitative research stage satisfied the criteria for reliability and validity. It is important to note that the aspects of reliability and validity for the qualitative research phase were presented in the preceding section (Section 4.1: Trustworthiness of the Data). In any case, as Creswell and Clark (2018) contend, reliability is often considered insignificant in qualitative research, as the researcher emphasises the importance of their subjective views.

4.2.1 Reliability

Reliability refers to the degree to which the methods for gathering data or conducting analyses will produce consistent results when repeated in other related studies (Saunders et al., 2009).

As Saunders et al. (2009) argue, the reliability of research results may be affected by four issues, namely i) *Respondent error*, which refers to the unintended provision of inaccurate responses by the interviewee; ii) *Respondent bias*, which refers to the intended provision of inaccurate responses by the interviewee, iii) *Interviewer error*, which refers to the unintended distortion of responses by the interviewer, and iv) *Interviewer bias*, which refers to the deliberate distortion of the responses by the interviewer.

Piloting of the data collection instruments was done to increase the reliability of the results in this study (Creswell & Creswell, 2018). The interview guide and questionnaire were piloted on a sample of the population. The main objective of piloting the data collection tools was to increase the reliability of these research instruments.

The pilot greatly helped identify shortfalls in the data collection tools, such as ambiguous sentences/words, grammatical errors, and wrong spellings. This subsequently helped to make the questions more readable and easier to comprehend (Saunders et al., 2009).

To help refine these instruments, a few more questions were added to the data collection instruments during the pilot, as suggested by Saunders et al. (2009). The additional questions were used to check the following issues: i) duration of the interview, ii) clarity of the instructions in the tool, iii) clarity and neutrality of the questions, and iv) layout of the tools. Responses to these questions helped improve the data collection tools. Thus, this further improvement of the data collection tools contributed to obtaining reliable findings from the respondents.

Additionally, the use of a self-administered web-based questionnaire facilitated access to responses in an analyzable format in real-time (Storozuk et al., 2020). Real-time access to the responses made it easier to quickly examine them in a digital format and query them to assess their quality.

4.2.2 Validity

A measure's validity is determined by how effectively it reflects the underlying idea it is designed to assess (Bhattacharjee, 2013; Saunders et al., 2009). In general terms, the validity of a research study may be categorised as internal validity and external validity (Roberts & Priest, 2006).

4.2.2.1 *Internal Validity of the Research Results*

Internal validity concerns the research design's effect on the appropriateness of the study's results (Saunders et al., 2009). During this study, efforts were undertaken to increase the internal validity of the results through the following methods: - i) triangulation of the research findings, ii) member checking with data governance experts, and iii) data saturation.

Firstly, the triangulation of the research findings, obtained from the qualitative and quantitative data collection phases, was based on the relationships identified in the research questions and hypotheses. Triangulating the quantitative and qualitative questions helped to enhance the validity of the findings from the two stages of this study.

Secondly, member checking was accomplished by presenting the quantitative research results to fifteen experts drawn from practitioners with data governance responsibilities and experience (Birt et al., 2016). These experts were shown the results to independently confirm their accuracy and degree of conformity with their experiences. All the experts agreed that the findings reflect the prevailing data governance situation in the Ugandan Public Sector. Thus, member checking helped confirm the validity of the results.

Lastly, as a strategy to increase the credibility of this study's findings, all respondents were interviewed until they could not provide any new information, thus ensuring data saturation.

4.2.2.2 External Validity of the Results

External validity is concerned with the generalizability of the research results. External validity is expected to document how well the data analysis and conclusion align with prior studies and research (Roberts & Priest, 2006).

In this study, both qualitative and quantitative findings were juxtaposed with prior research and existing literature to identify disparities, and matters that warrant further investigation are presented as recommendations for future studies, as outlined in Chapter 5.

4.3 RESULTS

This section presents the results in two subsections, namely subsection 4.3.1, which contains the qualitative phase results, and subsection 4.3.2, which contains the quantitative phase results. However, each of the subsections begins with the presentation of the demographic results. These are followed by the presentation of the results, arranged according to the research questions for the qualitative phase and the research hypotheses for the quantitative results subsection, respectively.

4.3.1 Qualitative Phase Results

The qualitative phase results are presented in two subsections. Subsection 4.3.1.1 presents the qualitative phase results on the characteristics of the respondents, and Subsection 4.3.1.2 presents the major qualitative phase results aligned with the research questions.

4.3.1.1 Qualitative Phase – Characteristics of Respondents

The first section of the semi-structured interview guide (Appendix I) contained quantitative questions on the demographic characteristics of the respondents and their organisations. The questions on the demographic characteristics of the organisation set out to establish i) the number of sectors from which the participating Ministries belonged and ii) the number of employees in the participating sectors per Ministry. Relatedly, the demographic questions on the respondents were intended to establish i) the highest level of education of the respondents, ii) the job categories of the respondents, iii) the job levels of the respondents, iv) the field of study of the respondents, v) the gender of the respondents, vi) the age of the respondents, and vii) the duration of the respondents in the current job position.

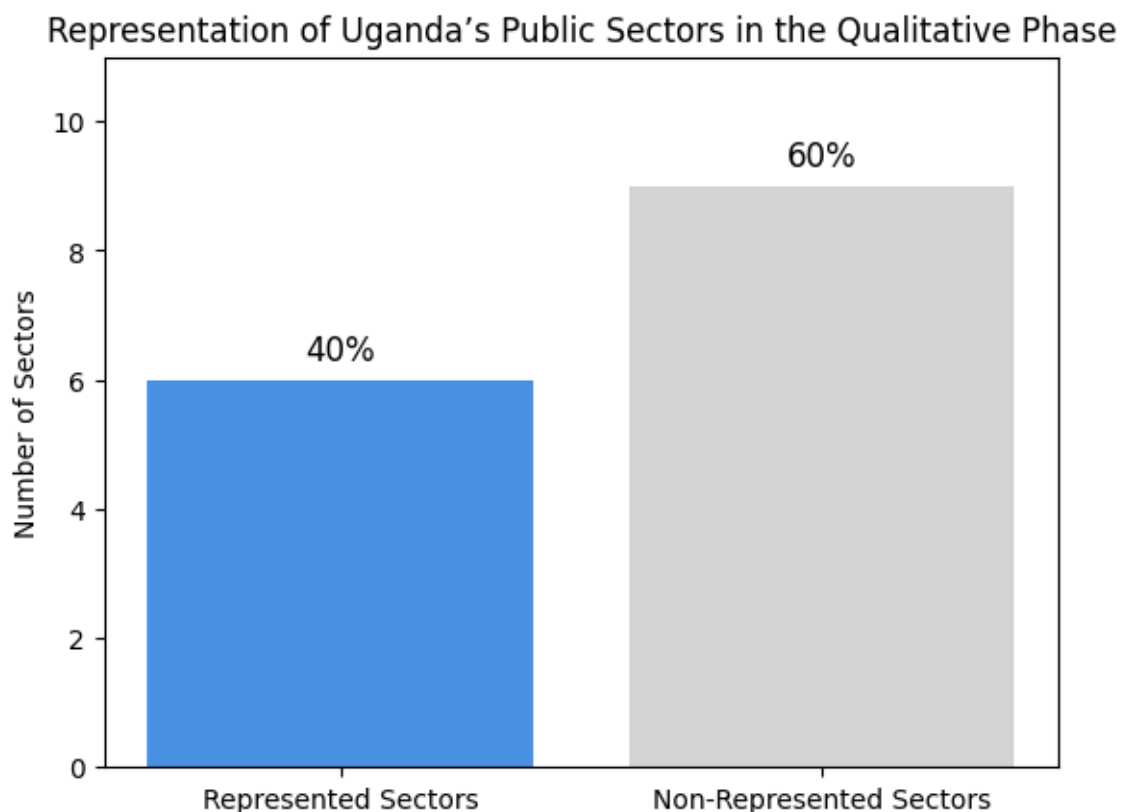
4.3.1.1.1 Participating Sectors

The Ugandan Public Organisations are categorised into 15 major sectors, namely i) Agriculture, Animal husbandry and Fisheries; ii) Education and Sports; iii) Energy and Mineral Development; iv) Financial and Accountability; v) Health; vi) Information and Communications Technology; vii) Justice, Law and Order; viii) Lands, Housing and Urban Development; ix) Public Sector Management; x) Science, Technology, and Innovation; xi) Tourism and Antiquities; xii) Gender, Labour and Social Development; xiii) Trade, Industry,

and Cooperatives; xiv) Water and Environment; xv) Works and Transport (MoPS, 2021). As presented in Figure 26. The six respondents in the qualitative phase were purposively selected from six of the 15 sectors, thereby representing 40% of Uganda's public sector.

Figure 26:

Sectors that Participated in the Qualitative Data Collection



Source: Primary data (2024)

4.3.1.1.2 *Number of Employees in the Participating Organisations*

The total number of employees for the Ministries that participated in the qualitative survey was 3,287. According to the Uganda Bureau of Statistics (UBOS, 2021), the National Labour Force Survey estimates that approximately 10 million persons were employed in Uganda, out of whom 14%, or 1,400,000, were employed by Government organisations.

Table 25:*Number of Employees in the Participating Organisations*

Sector	Employees	Percentage
Public Sector Management	274	8.34
Agriculture	1,400	42.59
Education	555	16.88
Public Service	327	9.95
Justice and Constitutional Affairs	469	14.27
ICT Services	262	7.97
Total	3,287	100.00

*Source: Primary data (2024)***4.3.1.1.3 Highest Level of Education of the Participants**

The results, as summarised in Table 26 indicated that all the respondents held postgraduate qualifications. This finding confirmed that these respondents were academically competent to respond to the interview questions and were aligned with the seniority of the jobs they held.

Table 26:*Highest Education Level of the Qualitative Phase Participants*

Education Level	Number	Percentage
PhD	1	16.67
Masters	5	83.33
Total	6	100

Source: Primary data (2024)

4.3.1.1.4 *Job Title*

This variable was used to capture the respondents' current job titles. The findings, as summarised in Table 27 indicated that all respondents held senior positions, as five of the six respondents were members of top management. Thus, the respondents were senior subject matter experts who were most suited to participate in the interviews.

Table 27:

Job Titles of the Qualitative Phase Respondents

Job Title	Frequency	Percentage
Director	1	16.67
Commissioner	1	16.67
Assistant Commissioner	3	50.00
Senior Statistician	1	16.67
Total	6	100.00

Source: Primary data (2024)

4.3.1.1.5 *Job Hierarchy*

This variable was used to establish the job hierarchy of the research participants. According to the Government of Uganda Public Service Standing Orders (MoPS, 2021), the job hierarchies are i) Top Level Management, ii) Senior Management, iii) Officer Level, and iv) Junior Level. The findings from this study, as summarised in Table 28 indicate that the respondents were drawn from the top and senior-level echelons of the hierarchy, thus affirming that they were the most appropriate persons to participate in the research.

Table 28:*Classification of Job Hierarchies of the Qualitative Phase Respondents*

Job Level	Number of Job Holders	Percentage
Senior Management	1	16.67
Top Management	5	83.33
Total	6	100

*Source: Primary data (2024)***4.3.1.1.6 Field of Study**

This variable was used to capture the respondent's area of specialisation by training. The findings, as summarised in Table 29, indicated that the majority of the respondents, i.e., three respondents representing 50%, had specialised in computer science, followed by two respondents representing 33.33% who specialised in Library and Information Science, while one respondent had specialised in Mechanical Engineering. Ultimately, this finding collaborates with the literature review finding that most data governance practitioners have an Information Technology background (Al-Ruithe et al., 2018; Mullon & Ngoepe, 2019; Panian, 2010).

Table 29:*Research Participants Field of Study*

Study Field	Frequency	Percentage
Mechanical Engineering	1	16.67
Computer Science	3	50.00
Library Information Science	2	33.33
Total	6	100.00

Source: Primary data (2024)

4.3.1.1.7 Gender

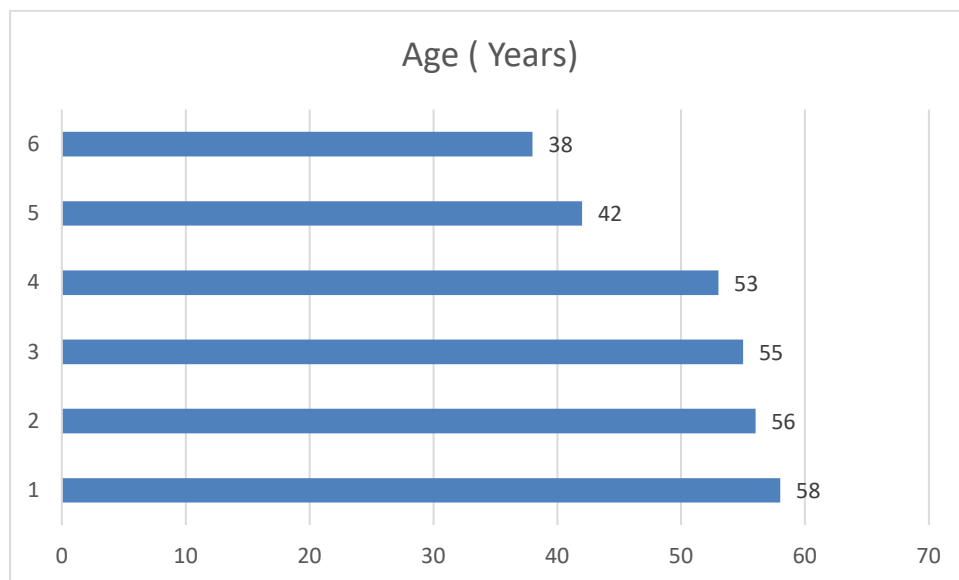
All six participants in the qualitative phase were male. This finding assumes that the most dominant gender in data governance is male.

4.3.1.1.8 Respondents Age

The results showed that the oldest respondent was 58 years old, while the youngest was 38 years old. This suggests that all respondents had adequate exposure and experience to participate in the study, given that Uganda's average age for starting a job is 24 years and the official retirement age is 60 years (MoPS, 2021).

Figure 27:

Age Categorisation of the Qualitative Phase Respondents



Source: Primary data (2024)

4.3.1.1.9 Number of Years in Current Job

This variable was used to establish the duration of service in the current job position for each qualitative research respondent. The findings, as summarised in Table 30 indicate that the least number of years spent on the current posting was two years, while the highest duration was eight years. This indicates that all the respondents were adequately experienced to respond, considering that two years of experience is sufficient for a qualified person to master data governance (Foote, 2023). Above all, 83.33% of the respondents had five or more years of experience cumulatively. Therefore, this further confirms that the responses provided were reliable and valid, considering the accumulated experience in the current position.

Table 30:

Duration of Respondents in their Current Job Positions

#	Years on the Job	Frequency	Percentage	Cumulative Percentage
1	8	1	16.67	16.67
2	7	2	33.33	50.00
3	6	1	16.67	66.67
4	5	1	16.67	83.33
5	2	1	16.67	100.00
Total	28	6	100	

Source: Primary data (2024)

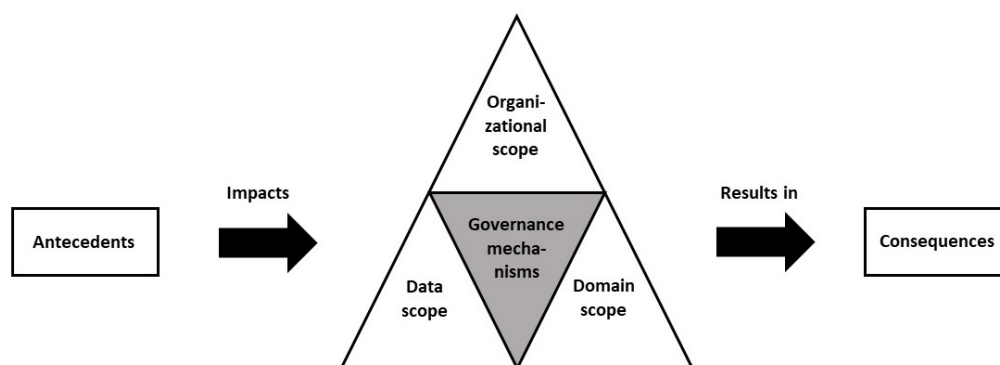
4.3.1.2 Qualitative Phase Major Findings

This study is based on the Abraham et al. (2019) cross-functional data governance model illustrated in Figure 28, which theorizes that data governance antecedents impact the scope of data (i.e., organisational scope, data scope, and domain scope), which in turn

influences the data governance mechanisms (i.e., organisational, procedural and relational mechanisms) and subsequently results in positive or negative consequences. This section, therefore, presents the results of the qualitative study arranged in four subsections on Data Governance, namely i) Antecedents, ii) Scope, iii) Mechanisms, and iv) Consequences.

Figure 28:

The Conceptual Framework



Source: Abraham et al. (2019)

4.3.1.2.1 Data Governance Antecedents

This study collected qualitative data on data governance antecedents, which were broken into two categories, namely, i) external and ii) internal antecedents. Following is a summary of the results from the interview questions on data governance antecedents.

i. External Antecedents

The external antecedents comprised four variables: a) National Legal and Regulatory Environment, b) Market Volatility, c) Industry effects or external factors, and d) National

political, social, and cultural environmental factors. An overview of the results for the external data governance antecedents is presented in Table 31.

Table 31:

Summary of the External Antecedent Results

Emerging theme	Summary of Findings
	Sub-theme/Description
i. Legal and Regulatory Requirements	<i>International Requirements:</i> Mentioned consideration for international Laws (e.g., GDPR), and Standards (e.g., ISO)
	<i>National Requirements:</i> National laws, regulations, strategies, policies, guidelines, and frameworks.
ii. Market Volatility	<i>Internal Clients:</i> Peak and off-peak continuous high demand for thematic data sets from within the organisations or other government organisations.
	<i>External Clients:</i> Identified as the general public and international stakeholders who seek various Government data services.
iii. Industry Effects	<i>Data reporting frameworks:</i> Various frameworks exist in their respective sectors, including national and international data reporting frameworks.
	<i>Data as a Public Utility:</i> Some industries treat data as a public good, standardise it, and open it up for private sector access.
	<i>Operational Requirements:</i> Systems integration, data exchange, and specific data governance compliance requirements.
	<i>Technological Factors:</i> The level of technology usage affects data access, use, and disposal.
iv. Country Effects	<i>Governance:</i> The country's political, social, and economic conditions impact data governance; for example, national elections lead to increased data demand.
	<i>Cultural effect:</i> Cultural beliefs, values, traditions, and historical events affect data quality.

Source: Primary data (2024)

Analysis of the Impact of the External Data Governance Antecedents

Legal and Regulatory Requirements - Organisations must comply with both domestic and international legal frameworks, which increases the complexity of data governance. Mentioning ISO standards indicates a rising emphasis on global interoperability.

Market Volatility - There is a need for scalable infrastructure (e.g., cloud solutions) to accommodate volatile demand, along with the importance of clear service-level agreements (SLAs) for internal and external clients. It also highlights the importance of data cataloguing and metadata standards in facilitating discovery and access.

Industry Effects - Organisations need interoperability strategies, open data policies, and cross-sector data standards. Entities must collaborate to upgrade and integrate legacy systems.

Country Effects - This highlights the need for context-aware data governance frameworks that consider cultural, political, and socio-economic factors. Data literacy training should be tailored to local contexts to respect cultural values and historical sensitivities. Establishing ethical frameworks for data collection and use is essential.

Overall, the findings highlight several antecedents of data governance, namely: regulatory compliance, technological readiness, interoperability across systems, organisational culture, context-awareness, and ethical accountability. These antecedents collectively form the foundation for robust, scalable, and internationally harmonised data governance frameworks.

ii) Internal Antecedents

The internal antecedents were comprised of five variables, namely a) Top Leadership Support; b) Internal Policies or Strategies; c) IT Systems Data Governance Strategies; d) Responsibility for making data governance decisions; and e) Effect of culture and staff

behaviour on data governance. An Overview of the results of the internal data governance antecedents is presented in Table 32.

Table 32:

Summary of the Internal Antecedent Results

Emerging theme	Summary of Findings
	Sub-theme/Description
i. <i>Organisational Strategy</i>	<i>Top leadership support</i> - To some extent, top leadership is aware of and supportive; however, more awareness is needed.
	<i>Corporate location of decision-making authority</i> - Data governance is a shared responsibility in Ministries, but top management is responsible for data governance decision-making.
	<i>Institutional regulatory framework</i> - They use the established national frameworks and industry best practices. However, they are at different stages of implementing or developing internal data governance regulatory instruments.
	<i>Allocation of the Mandate for Data Governance</i> - i) No single department or staff member has data governance roles and duties. ii) The IT or Statistics departments have officers who handle some data governance responsibilities.
ii. <i>Information Technology (IT) Systems</i>	<i>Internal IT Strategy</i> - Most were considering developing a data-sharing architectural framework, but some had already established information security strategies.
	<i>National ICT Policy</i> - All use the national ICT Policy, but some are in the process of developing internal ICT Policies.
	<i>Systems Integration</i> - Most systems are stand-alone with limited integration, but some have bilateral agreements for sharing or centralised data hosting.
iii. <i>Cultural Effect</i>	<i>Organisational Culture</i> - Organisational culture is vital for data security, protection, and sharing.
	<i>Data Management Culture</i> - The poor culture of managing data is improving, as evidenced by fewer incidences of data loss and inaccurate information.

Source: Primary data (2024)

Analysis of the Impact of the Internal Data Governance Antecedents

Organisational Strategy - Data governance may fail or suffer internal pushback without consistent leadership. Decision-making hierarchy, roles, and duties must be established. Lack

of customised internal policies promotes data breaches, legal concerns, and inefficiencies. Without a formal role or function, data governance tends to be reactive.

Information Technology (IT) Systems - Strong security without integration can hinder data flow and utility; a balance is needed. Internal ICT policies are essential for translating broad goals into concrete controls and practices. There's a need for a government-wide or sector-specific integration strategy — possibly with APIs, shared data platforms, or enterprise architecture principles.

Cultural Effect - Soft factors, such as values, motivation, and trust, are just as important as technical factors in enabling effective data governance. Cultural change should be formalised through performance metrics, training, and regular audits.

4.3.1.2.2 *Data Governance Scope*

The data governance scope is manifested in three constructs, namely i) Organisational Scope, ii) Data Scope, and iii) Domain Scope. The following section presents results from the data governance scope subsection.

i. *Organisational Scope*

The organisational scope construct comprises two variables, namely a) Intra-organisational and b) Inter-organisational scope. The findings for this variable and their analysis are presented in Table 33.

Table 33:*Summary of Organisational Scope Results*

Question	Summary of findings
	Emerging Theme/Description
i. <i>Inter-organisational Scope</i>	<i>Data Sharing</i> - There is an exchange of data and sharing of data management processes between entities.
	<i>Structures</i> - The majority have inter-ministerial multidisciplinary committees that oversee data management and other activities.
	<i>IT Infrastructure</i> - A centralized repository for data storage and archiving, as well as a data exchange platform.
ii. <i>Intra-organisational Scope</i>	<i>Data Ownership</i> - Data has no specific department as its custodian.
	<i>Data Sharing</i> - Data is shared across the organisation on demand by channelling requests through the Permanent Secretary.
	<i>Digital Data</i> - IT units are responsible for managing digital data.
	<i>Data Processes</i> - The IT staff conduct analytics and disseminates the data to other departments.

Source: Primary data (2024)

Analysis of the Impact of the Organisational Scope

Inter-organisational Scope - Interoperability and coordination are increasingly being emphasised as critical components of successful data governance. Data governance is being institutionalised at the highest level, promoting uniformity and accountability. Centralisation improves data integrity, IT operations, and unified access control. If not controlled properly, it can become a single point of failure.

Intra-organisational Scope - In the absence of sufficient data-sharing protocols, this may result in siloed operations. Robust control methods can mitigate misuse or data leakage;

however, centralised gatekeeping may hinder responsiveness, particularly in data-driven decision-making contexts. Defining clear boundaries of authority is essential for effective data governance; however, IT departments cannot independently derive value from data. This concept proposes a centralised analytics strategy that may be deficient in domain-specific insights. Departments receiving data may lack complete trust or understanding of the provided insights.

ii. Data Scope

This dimension refers to the types of data assets managed within an organisation, and it has only one variable: data type scope. The findings for this variable are presented in Table 34.

Table 34:

Summary of Data Scope Results

Summary of Findings	
Emerging Theme	Description
<i>Traditional</i>	They store physical and digital data, including administrative, statistical, and financial data.
<i>Big Data</i>	Several ministries manage new data formats, including machine-generated, biometric, streaming, and unstructured social media data.

Source: Primary data (2024)

Analysis of the Impact of the Data Scope

Traditional - The presence of physical and digital versions of the same data may lead to data duplication and inconsistency. Physical data can delay decision-making and increase the risk of data loss or deterioration. There is a pressing need to accelerate the digitisation of physical records, as this facilitates data governance.

Big Data – The findings suggest an incremental shift from traditional to modern data ecosystems. These formats require specialised tools and expertise; many ministries may lack data science competencies to manage them effectively. It is essential to integrate new data formats into policies, ensuring that storage and processing architectures are capable of supporting these emerging formats.

iii. Decisions Domain Scope

The decision domain scope encompasses decision areas relevant to data governance procedures. Its measurement variables include a) Data Quality, b) Data Security, c) Data Architecture, d) Data Lifecycle Scope, e) Metadata, and f) Data Storage and Infrastructure. The findings for this variable are presented in Table 35.

Table 35:

Summary of Decisions Domain Scope Results

Emerging Theme	Summary of Findings (Sub-theme/Description)
i.Data Quality Scope	<i>Information Systems:</i> They use an information system to manage data assets.
	<i>Coordination:</i> Coordination with the data team lead.
	<i>Training:</i> Continuous staff training in data management.

Emerging Theme	Summary of Findings (Sub-theme/Description)
<i>ii.Data Security</i>	<i>Information Security:</i> i) The organisations follow the National Information Security Policy and Regulatory Instruments, and ii) The IT department provides security services and conducts security awareness training. <i>Institutional Regulatory Framework:</i> i) Most are drafting institutional information security policies, and ii) The public service standing orders contain strategies to guide data protection and practical use. <i>Human Resources:</i> Some Ministries have specific internal IT Units that provide information security services.
<i>iii.Data Architecture</i>	<i>ICT Equipment:</i> Internal servers, information systems, and specialized ICT tools for collecting and reporting information. <i>Data Architecture:</i> The majority did not have a data assets architecture, and some were developing one. <i>Information Security:</i> Emphasis is placed on maintaining a well-controlled system with access and use restrictions on data.
<i>iv.Data Lifecycle Scope</i>	<i>Data Management Processes:</i> They conduct all aspects of data management throughout its lifecycle, including data collection, processing, storage, presentation, reporting, and archiving. <i>Coordination:</i> Have inter-organisational coordination committees and processes.
<i>v.Metadata Scope</i>	<i>Documentation:</i> Maintain documentation of metadata for their data resources, which defines and provides specifications for all datasets. <i>Data Catalogue:</i> However, the majority of the respondents indicated that they do not maintain proper data catalogues.
<i>vi.Data Storage and Infrastructure</i>	<i>Information Systems:</i> They have specialised information systems and off-the-shelf office management software. <i>ICT Resources and Infrastructure:</i> Most have servers, data centres, local area networks and Internet access infrastructure. <i>Information Security:</i> They have firewalls in place to protect both internal and external data. <i>Data Storage Location:</i> Utilise sectoral servers, the National Data Centre, local centralised servers, or standalone personal computers. <i>Disaster Recovery:</i> The National Data Centre and two disaster recovery sites host and backup resources.

Source: Primary data (2024)

Analysis of the Impact of the Decisions Domain Scope

Data Quality Scope - The findings highlight a commitment to data quality management through effective systems, governance, and capacity building, but there is no mention of standardised data quality metrics. The recommendation is to introduce a standardised Data Quality Framework, expand training to and implement quality assurance processes.

Data Security - The overreliance on national policies without institutional adaptation, reactive security management, and uneven human resource capacities impede effective data governance. The recommendation is to streamline internal security policies, standardise IT roles, and conduct regular vulnerability assessments and penetration tests to ensure effective data governance practices.

Data Architecture - Although tools and infrastructure exist, the data architecture remains underdeveloped, which limits integration, scalability, and interoperability. To support complex analytics and enterprise-wide governance, a national or institutional Data Architecture Blueprint and reference architecture (e.g., TOGAF, DAMA-DMBOK) are recommended.

Data Lifecycle Scope - The finding suggests a mature understanding of data management principles, considering lifecycle considerations for retention, disposal, and quality; however, it lacks automation tools, suggesting that manual processes may still dominate.

Metadata Scope - Institutions neglect metadata through structured data catalogues, limiting discoverability and reuse, and potentially affecting decision-making and analytics. Recommendation: define standards, deploy a central repository and Data Catalogue platform.

Data Storage and Infrastructure - This theme emphasises advanced hardware infrastructure and strong business continuity but points out that inconsistent storage practices could cause data fragmentation and vulnerabilities. It is recommended that data migration, development, and enforcement of storage policies, as well as the implementation of rigorous backup, be considered.

4.3.1.2.3 *Data Governance Mechanisms*

The data governance mechanisms were measured using three attributes, namely i) structural data governance mechanisms, ii) procedural data governance mechanisms, and iii) relational data governance mechanisms.

i. *Structural Data Governance Mechanisms*

This construct was measured using two variables, namely a) Roles and duties and b) Location of decision-making authority. The findings for this variable are presented in Table 36.

Table 36:*Summary of Structural Data Governance Mechanisms Results*

Emerging Theme	Summary of Findings (Sub-theme/Description)
i. <i>Roles and duties</i>	Top leadership support: Top management, led by the Permanent Secretaries, provides high-level support for data governance. Structure: i) Inter-ministry committees coordinate data exchange activities between various stakeholders; ii) No specific department is responsible for data governance.
ii. <i>Location of decision-making authority</i>	Roles and duties: Data governance is a shared responsibility under the overall responsibility of the Permanent Secretary.

Source: Primary data (2024)

Analysis of Structural Data Governance Mechanisms

Roles and duties – The strong leadership by the Permanent Secretaries signals strong political/administrative will, which is a critical success factor in embedding governance practices. However, the risk is that leadership support appears to be concentrated at the very top. If operational ownership is weak, implementation may stall despite strategic backing due to a leadership-implementation gap.

Location of decision-making authority - Centralising authority in the Permanent Secretary maintains accountability and signals the seriousness of governance. However, this risks over-centralisation, where operational teams may defer decisions upward instead of exercising delegated authority. However, shared responsibility without clarity on who is responsible for what can lead to the “*everybody’s job is nobody’s job*” syndrome.

ii. Procedural Data Governance Mechanisms

This construct was evaluated using six variables, namely a) Data Strategy, b) Processes and procedures, c) Data management contractual agreements, d) Data management performance measures, e) Compliance monitoring activities, and f) Issues resolution. The findings for this variable are presented in Table 37.

Table 37:

Summary of Procedural Data Governance Mechanisms Results

Emerging theme	Sub-theme/Finding
i. <i>Institutional Data Strategy</i>	Institutional Regulatory Framework: i) Inadequate internal data governance policies, strategies, guidelines, and standards, but some are being developed; ii) ineffectively implemented data management guidelines. Data Standards/Data Structures/Data Management Processes: They have standardised data structures and defined data management workflows for standard processes, such as finance, planning, and human resources functions.
ii. <i>Data management processes</i>	Information Management Systems: i) Both manual and digital tools are used in data management; ii) A few internally custom-tailored information systems.
iii. <i>Data management contractual agreements</i>	External Outsourcing: Outsourcing data collection or specialised services, such as data analytics, due to a lack of internal capacity in terms of numbers and skills. Internal Outsourcing: Internal outsourcing of non-sensitive processes to other government agencies and the conducting of delegated functions.
iv. <i>Data management performance measures</i>	Performance Metrics: The performance of external service providers is measured through standard public performance planning, performance appraisal, and the client charter, while the performance is measured through contract management processes.
v. <i>Compliance monitoring activities</i>	Data Governance Complementary Services: i) Monitor and evaluate data and processes to ensure regulatory and legal compliance; ii) Execute periodic security and compliance audits on information. Monitoring and Evaluation Tools: There is currently no specific framework for monitoring compliance with regulatory and legal provisions; however, they are working with the Data Protection Office to establish mechanisms to meet this requirement.

Emerging theme	Sub-theme/Finding
vi. <i>Issue resolution</i>	Institutional Regulatory Framework: They did not have any specific internal procedures for resolving data management issues; however, ad-hoc resolution processes were employed. Self-regulation: They apply the avoidance approach to data management issues or conflicts by conducting processes in a manner that minimises errors. Agreements: They sign agreements with other entities to ensure harmonious data management processes.

Analysis of Procedural Data Governance Mechanisms

Institutional Data Strategy – The lack of comprehensive institutional data policies has led to fragmented practices, duplication, errors, and inadequate compliance with established standards. This situation calls for finalising and adopting draft policies, establishing data governance committees, and aligning data governance with recognised international standards.

Data Management Contractual Agreements - Outsourcing and internal outsourcing can bridge capacity gaps, but over-reliance on external providers risks data security, sustainability, and accountability. Organisations should build internal capacity through training, recruitment, and build data accountability mechanisms.

Data Management Performance Measures - Organisations should develop KPIs for internal data management, introduce reporting dashboards, and integrate metrics into strategic plans to improve oversight and measurement of data governance activities.

Compliance Monitoring Activities - Regular audits with the Data Protection Office demonstrate compliance awareness; however, the lack of a framework limits the effectiveness

of enforcement. Establishing a compliance monitoring framework, a data governance focal point, and fostering stronger collaboration with data regulators is necessary.

Issue Resolution - Ad-hoc processes slow issue handling, mitigation of conflicts, and affect accountability. Organisations should develop formal resolution procedures, establish a Data Governance Helpdesk, and establish SLAs for improving issue resolutions.

iii. Relational Data Governance Mechanisms

This construct was measured through the following variables a) Communication, b) Training, and c) Coordination of decision making. The findings for this variable are presented in Table 38.

Table 38:

Summary of Relational Data Governance Mechanisms Results

Emerging theme	Sub-theme/Finding
i. Communication	Effect of Communication – The findings revealed that i) Communication has helped departments own their data and improve data governance in the organisations. ii) Communication has contributed to consensus-building and better data governance.
	Communication Strategy - Advocacy programs are used to convince top management of the effectiveness of data management.
	Communication Channels - Communication channels encompass both electronic and physical platforms, where staff are educated on data governance, information system usage, and process modifications.
ii. Training	Effect of Training - Training has had a positive impact on data governance performance, enabling staff to manage data more effectively.

Emerging theme	Sub-theme/Finding
	Training Scope - i) They have received basic training on tools and data management operations on the Government data integration platform (ug-Hub) but lack deep technical training in data governance. ii) Few indicated that they conducted training for internal and external staff, especially statisticians. iii) Training is conducted mainly through the IT department.
iii. <i>Coordination of decision making</i>	Structure - Decision-making processes follow the public service structure. Location of decision-making - i) Coordination of data governance decision-making is decentralised, and departments manage their data. ii) Few expressed a need for centralised decision-making.

Source: Primary data (2024)

Analysis of Relational Data Governance Mechanisms

Communication – The findings reveal that effective communication has strengthened departmental data ownership, accountability, and consensus-building, though uneven uptake risks fragmentation. Advocacy programs targeting top management have enhanced leadership commitment, but without formalisation, resource prioritisation may weaken. The use of both electronic and physical communication channels has increased staff awareness of governance practices, yet reliance on ad hoc platforms creates inconsistencies. To mitigate these risks, institutions should establish cross-departmental forums, formalise advocacy strategies within governance policies, and develop standardised communication frameworks supported by digital platforms.

Training – The findings indicated that training has enhanced staff capacity to manage data, strengthening foundational skills, compliance, and data handling quality. However, the limited scope of technical and advanced training—primarily IT-led—constrains governance

maturity and creates over-reliance on IT units, potentially leading to poor data quality and limited analytics capacity. To address these gaps, institutions should institutionalise continuous professional development, expand training beyond IT, introduce specialised modules in data governance and analytics, and collaborate with academic or training institutions.

Coordination of Decision-Making - Decision-making in data governance follows the public service structure, ensuring formal accountability and compliance, while decentralisation allows departments to manage their own data, promoting ownership and context-specific decisions. However, rigid structures and decentralised management risk delays, fragmentation, duplication, and poor interoperability. To mitigate these risks, institutions should introduce flexible decision-making mechanisms, streamline approval processes, and adopt a hybrid model that balances departmental ownership with a central coordinating authority to enforce standards.

Overall, Communication and training are strengthening ownership, awareness, and basic capacity for data governance. However, inconsistent communication channels, limited training depth, and decentralised decision-making pose risks of fragmentation, duplication, and uneven implementation. To address this, the public sector organisations should formalise communication strategies, broaden the scope of training, and adopt a hybrid governance model that balances departmental ownership with central oversight.

4.3.1.2.4 *Consequences*

This dimension was used to measure the following: i) the Short-term/Intermediate Performance Effects and ii) the Long-term risk management constructs.

i. Short-term/Intermediate Performance Effects

The Short-term or Intermediate Performance Effects construct was measured using two variables, namely a) challenges encountered and b) proposed solutions to mitigate the identified challenges. The findings on the challenges encountered and the solutions used are presented in Table 39 and Table 40, respectively.

Table 39:

Summary of Results on Key Challenges Encountered

Challenge Area/Key Issues	Analysis of impact
i) <i>Lack of National Regulatory Instruments</i> - Incomplete/inadequate policies; low awareness and compliance; over-reliance on digital tools and self-regulation; inadequate monitoring frameworks; irregular data quality assurance audits	Inconsistent enforcement of regulatory instruments leads to fragmented practices across institutions. Low compliance erodes accountability and trust in government data. Over-reliance on self-regulation leaves gaps in oversight, making systems vulnerable to abuse. The absence of monitoring frameworks increases the risks of corruption, data misuse, and poor data quality.
ii) <i>Absence of Institutional Regulatory Instruments</i> - Lack of Institutional ICT policies; absence of internal data governance strategies and frameworks	Without internal ICT and governance policies, institutions lack guidance on data handling. Results in siloed practices, duplication of effort, and weak coordination. Increases risk of non-compliance with broader national or international regulations.
iii) <i>Technological Challenges</i> - High upgrade costs; limited systems integration; weak, hack-prone systems; password fatigue	Costly system upgrades strain budgets, delaying modernisation. Limited integration restricts data sharing across ministries, resulting in inefficiencies and policy gaps. Weak systems are vulnerable to cyberattacks, which can slow down processes and expose sensitive data. User fatigue from multiple logins can lead to lower productivity and increased human error.
iv) <i>ICT Infrastructure & Equipment</i> - Poor internet, data on stand-alone computers, weak	Poor internet connectivity undermines real-time decision-making and e-government

Challenge Area/Key Issues	Analysis of impact
server infrastructure, obsolete equipment, and reliance on personal devices	adoption. The use of personal PCs and devices increases the risks of data loss, leakage, and insecure storage. Frequent downtime disrupts public services, lowering citizen trust. Obsolete equipment reduces efficiency, forcing staff to use workarounds that compromise data integrity.
v) <i>Data Capability Shortfalls</i> - No standardisation; data in silos/physical formats; no governance performance measures	Lack of standardisation complicates data comparison, slowing analysis and reporting. Physical/siloed data limits evidence-based policy and cross-institutional collaboration. Absence of performance measures makes it impossible to assess governance progress or justify funding.
vi) <i>Data Sovereignty Issues</i> - Due to automation limitations and incompatibilities, some organisations' data is inadequate, costly, and undistributable.	Data stored in incompatible systems becomes costly to share, limiting inter-agency coordination. Restricts national ownership of strategic data, sometimes creating dependency on foreign systems or vendors. Hampers innovation, as inaccessible data cannot be repurposed for new services.
vii) <i>Cultural Effects</i> - Negative cultural beliefs; poor staff attitudes; resistance to e-government; perception of extra workload; poor data management culture; data abuse	Cultural taboos (e.g., reluctance to count children or livestock) lead to incomplete datasets and distorted statistics. Negative staff attitudes and resistance slow ICT adoption and reform. A poor data culture undermines data quality, fostering distrust in official records. Misuse of data (intentional or accidental) damages public confidence and may lead to legal disputes.
viii) <i>Human Resource Challenges</i> - Lack of skilled staff; weak ICT competencies; no governance roles in structures; insufficient staff; no committees; inadequate training; low awareness	Lack of skilled professionals creates bottlenecks in data management. Weak ICT literacy among staff and clients reduces system uptake. Undefined governance roles weaken accountability and coordination. Few committees and limited training opportunities mean governance efforts are unsustainable. Low awareness of governance benefits reduces motivation for compliance.
ix) <i>Lack of Sponsorship</i> - Insufficient funding; weak leadership support; limited complementary services (audits, security, assurance)	Insufficient funding stalls implementation of data governance frameworks. A lack of leadership support hinders institutional buy-in, rendering initiatives short-lived. The absence of audits and quality assurance services

Challenge Area/Key Issues	Analysis of impact
	increases the risks of fraud, inefficiency, and poor decision-making.

Collectively, these challenges substantially compromise data quality, security, interoperability, and citizens' confidence in public sector data, all of which are essential components for evidence-based policymaking, effective e-government, and efficient service delivery. Additionally, they also hinder Uganda's aspirations to comply with international standards and best practices in data governance and digital transformation.

Table 40:*Summary of Results of the Proposed Solutions*

Challenge/Solution(s)	Analysis of Findings
i. <i>Lack of National Policy and Regulatory Instruments</i> - Conduct a regulatory impact assessment to identify policy and regulatory inadequacies.	Weakens national coordination, standards, and compliance in data governance. Risks if unaddressed include data fragmentation, poor accountability, regulatory gaps, and inconsistent practices.
ii. <i>Lack of Institutional Policy and Regulatory Instruments</i> - Develop sectoral frameworks that guide data governance; Develop complementary regulatory instruments; Develop internal data governance policies, strategies, and frameworks.	Limits institutional alignment and ability to enforce governance frameworks. Risks include Fragmented practices, duplication, low compliance, and reduced efficiency.
iii. <i>Technological Challenges</i> - i) Increased digitisation of processes. ii) Embed tighter controls in the systems to counter cyber-attacks and related misuse of systems.	Slows digital transformation affects data security and integrity. Risks if Unaddressed - Cybersecurity breaches, system misuse, and operational inefficiency.
iv. <i>Inadequate ICT Infrastructure</i> - Provide adequate infrastructure, such as server storage, to promote data storage on less volatile media	Limits the storage, accessibility, and reliability of data systems. Risks if Unaddressed: Data loss, inefficient operations, and slow response times.
v. <i>Data Capability/Requirements Shortfalls</i> - Develop data standards, metadata, and e-Government Interoperability Frameworks to promote data sharing; and digitise the physical records held in public sector organisations.	Hinders interoperability, data quality, and standardisation. Risks if Unaddressed: Poor data sharing, inconsistent metadata, slow service delivery, and incomplete digitisation.
vi. <i>Data Sovereignty Issues</i> - Conduct process re-engineering to ensure the collection of complete data; Rationalize data processing to reduce costs and minimize access fees payable by data consumers; Increase automation of processes across Ministries.	Affects ownership, control, and accessibility of national data. Risks if Unaddressed: High processing costs, incomplete data collection, dependence on external providers, and compliance risks.
vii. <i>Cultural Effects</i> - Mindset change and national guidance should be conducted among the citizens to eliminate backward cultural beliefs that affect the availability and accuracy of data; Train staff in the use of IT tools to eliminate technology phobia and change their attitude to data management.	Influences data availability, accuracy, and adoption of technology. Risks if Unaddressed: Resistance to data collection, errors, and underutilization of IT systems.
viii. <i>Human Resources</i> - Define specific roles and duties for effective data governance; Reengineer government processes to become compatible with data governance; Establish	Weakens institutional capacity to manage, analyse, and govern data. Risks if Unaddressed - Over-reliance on a few skilled personnel, gaps in

Challenge/Solution(s)	Analysis of Findings
structures and mechanisms for data governance collaboration with all stakeholders; Train government officials and the external users of systems.	accountability, and low adoption of governance practices.
ix. <i>Lack of Sponsorship</i> - Advocate for increased data governance funding; Create partnerships with development partners; Develop innovative ways of generating revenue.	Limits funding, strategic prioritisation, and sustainability of data governance initiatives. Risks if Unaddressed - Insufficient resources, stalled projects, dependency on ad hoc funding, and lack of innovation.

Source: Primary data (2024)

ii. Long-term Risk Management

The Long-term Risk management construct was measured using two variables, namely a) the anticipated risks and b) the proposed risk mitigation measures as presented in Table 41 and Table 42, respectively.

Table 41:

Summary of Results for Anticipated Risks

Risk Type	Description	Analysis of the Findings
i. Legal and regulatory policy instruments	i) Many policies are in draft form pending the requisite verification and approvals. ii) There is a lack of adequately documented strategies and regulations at the national level to guide data governance.	Draft policies and a lack of national strategies weaken alignment and compliance, introducing risks of data fragmentation, duplication, and non-compliance with international standards.
ii. Data Governance Structures	i) The lack of a job structure for data governance specialists in the Government causes a general risk. ii) The lack of other critical complementary roles, such as cybersecurity specialists, poses a risk.	The lack of dedicated roles in data governance, reliance on general staff, and vulnerability to cyber threats pose significant risks to data, necessitating the creation of specialised roles and their integration into Human Resources structures.

Risk Type	Description	Analysis of the Findings
iii. Coordination Risks	There is a risk of data silos, which affects the ability to use the systems effectively; thus, a significant amount of quality information is not utilised due to a lack of data sharing.	Implement a central governance authority, enforce data-sharing protocols, and adopt interoperability frameworks to address data silos, reduce duplication, inefficiencies, and underutilization of information.
iv. Storage Systems Vulnerabilities	Some e-government systems may not be adequately protected physically and logically, making them vulnerable to data breach risks, including unauthorised access, cyber fraud, and computer misuse.	Weak protection can lead to unauthorised access, fraud, reputational damage, and financial loss. Strengthening security controls, conducting regular audits, investing in secure infrastructure, and robust backups are recommended.
v. Data handling and transmission risks	There is a lack of exposure to best practices for data governance. Simple mistakes can cause grave consequences.	The lack of best practices increases error rates, data loss, corruption, breaches, and compliance risks. To mitigate these, continuous training, adoption of standard operating procedures, and use of secure protocols are recommended.

Source: Primary data (2024)

Above all, the assessment of data governance within government institutions reveals critical risks in policy frameworks, institutional structures, coordination, system security, and staff capacity. Many policies remain in draft form, key professional roles are missing, and data silos persist, limiting the value of collected information. Additionally, storage systems are vulnerable to breaches, and limited staff exposure to best practices heightens the risks associated with handling and transmitting data. To strengthen national data governance, there is an urgent need for regulatory reform, institutional capacity-building, secure technological investments, and systematic training programs.

Table 42:*Summary of Results for Risk Mitigation Measures*

Risk	Mitigation Measures	Analysis of the Findings
<i>i. Legal and Regulatory Risk</i>	i) Develop a national data governance risk and compliance framework that can help to identify/foresee risks; ii) Define risk mitigation actions; iii) Develop national data management and security standards that specify minimum expected behaviour from government institutions; iv) Empower the National Data Protection Office in capacity building and creating awareness on data protection and privacy; v) Regularly monitor data governance activities in the institutions.	The findings indicated that organisations prioritise compliance, accountability, and data governance, but face risks like fragmented compliance, weak enforcement, litigation, reputational damage, and citizen mistrust. Recommendation: finalise the national risk framework, establish minimum standards, and empower the Data Protection Office.
<i>ii. Storage Risk</i>	Provide for secure and resilient data storage, such as multiple disaster recovery sites, using less destructible media, and storing key data on non-erasable media.	To maintain data integrity and service continuity, entities should establish redundant disaster recovery sites, use tamper-proof media for backups, and consistently test their resilience and recovery capabilities.
<i>iii. Information Security</i>	i) Institute tighter cyber security controls, such as system access controls, physical security, and infrastructure security, to guard against hackers; ii) Continuously conduct security awareness campaigns; iii) Establish minimum standards for systems interoperability; iv) Develop and implement standard operating procedures to guard against data breaches.	To protect sensitive data from unauthorised access and misuse, it is crucial to strengthen technical and physical safeguards, implement awareness initiatives, establish clear security standards, and enforce breach-response procedures.
<i>iv. Human Resources</i>	i) Conduct a comprehensive human resources needs assessment to identify data governance gaps and ensure recruitment of the required staff; ii) Train staff and external system users on best practices; iii) Automate processes to minimize human interaction in data management, thus reducing human error incidences.	Skilled staff operationalise policies and safeguard systems, but skills gaps persist, resulting in errors and ineffective policy enforcement. HR needs assessment, recruitment, training, and automation.

Risk	Mitigation Measures	Analysis of the Findings
v. <i>Data Management</i>	i) Prioritise data management by providing adequate resources; establish a structured way of managing data. ii) Establish classifications for data and the requisite access control levels.	Improves data quality, consistency, and interoperability. Duplication, poor decisions, inconsistent access, and operational inefficiencies. It is recommended to institutionalise structured data management frameworks, enforce classification/access controls, and secure adequate resources.
vi. <i>Sponsorship</i>	i) Provide more awareness to top management and political leadership on the professionalisation of data governance. ii) Solicit increased financial support for the data governance function.	Secures the political and financial sustainability of governance reforms. Inadequate funding, stalled reforms, weak leadership buy-in, and failure to institutionalise practices. Advocacy to leadership; mobilise domestic and donor funding; position data governance as a strategic enabler

Source: Primary data (2024)

Above all, the assessment of data governance within government institutions reveals critical risks in policy frameworks, institutional structures, coordination, system security, and staff capacity. Many policies remain in draft form, key professional roles are missing, and data silos persist, limiting the value of collected information. Additionally, storage systems are vulnerable to breaches, and limited staff exposure to best practices heightens the risks associated with handling and transmitting data. To strengthen national data governance, there is an urgent need for regulatory reform, institutional capacity-building, secure technological investments, and systematic training programs.

4.3.1.3 Summary of Qualitative Phase Major Findings

This subsection presents a summarised analysis of the overall qualitative phase findings. Figure 29 illustrates the relationship between the research objectives and the findings, while Figure 30 shows the alignment of the summarised research findings with the research questions and specific research objectives.

Figure 29:

Relation between the Research Objectives and the Qualitative Findings

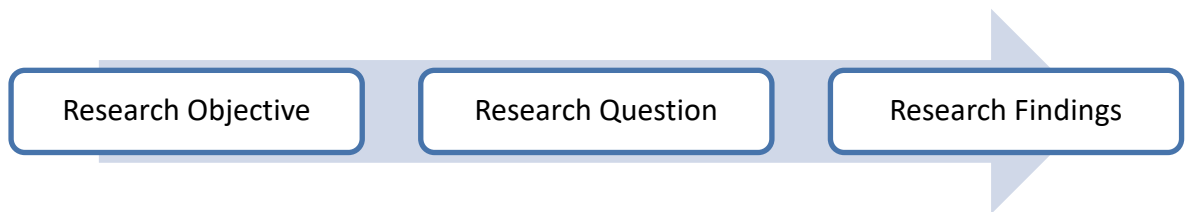
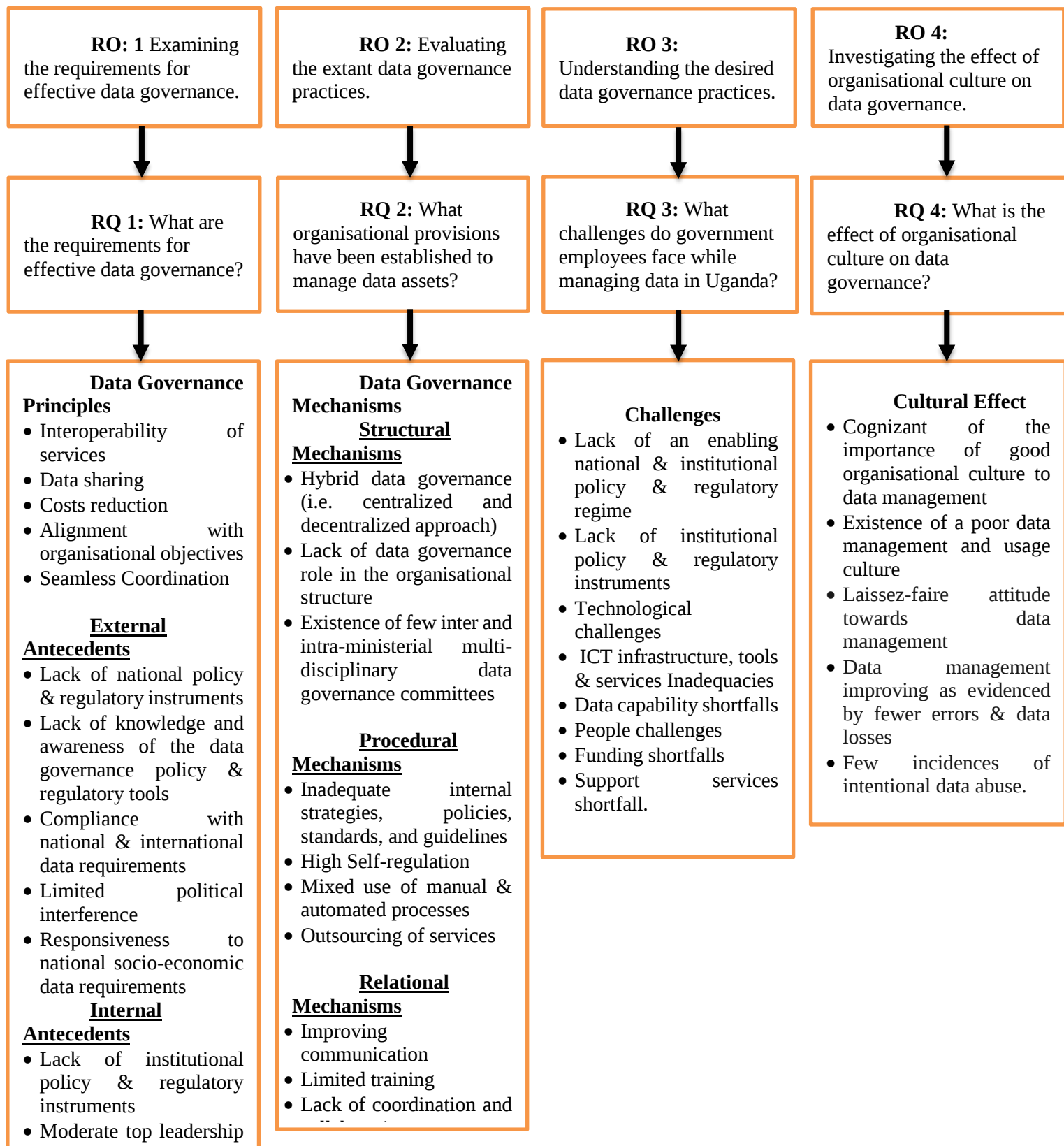


Figure 30:*Summarised Qualitative Phase Results Analysis*

4.3.2 Quantitative Phase Results

The quantitative phase results are presented in two subsections: Section 4.3.2.1 presents the quantitative phase results on the demographic characteristics of the respondents, and Section 4.3.2.2 presents the quantitative phase major results aligned with the research hypotheses.

4.3.2.1 *Quantitative Phase Results on the Respondents' Demographics*

The quantitative phase demographics results present descriptive statistics derived from the demographic data collected during the second phase of this study. These cover i) descriptive statistics on the respondents' demographics as presented in subsection 4.3.2.1.1, and ii) descriptive statistics on the characteristics of the organisations to which the respondents belong as presented in subsection 4.3.2.1.2.

4.3.2.1.1 *Descriptive Statistics on the Respondents' Demographics*

This subsection presents the findings from the demographic characteristics of the individual participants in the quantitative phase, as summarised in Appendix H and as discussed below: -

- i) *Response Rate*: The study achieved a response rate of 77.27%, with 102 out of 132 questionnaires distributed duly filled and returned, while 30 participants did not respond. This high response rate enhances the representativeness of the sample, thereby strengthening the generalizability of the findings to the wider population (Saunders, 2009). Moreover, it contributes to the robustness and credibility of the study's conclusions in relation to its stated objectives (Story, 2019; Daikeler et al., 2020; Wu et al., 2022).

- ii) *Respondents by Sector*: The survey included all sectors, with two respondents unsure of their sector affiliation, indicating that the sampled respondents were representative of the population.
- iii) *Number of Employees per Organisation*: The study found that 75% of respondents, 77 out of 102, were from organisations with 101-1,000 employees, with 92% from organisations with 101-5,000 employees. Only 4% had either more than 5,000 or fewer than 100 employees. This indicates that the respondents were mainly from large Ugandan Ministries, likely involved in data governance activities.
- iv) *Highest Level of Education*: The study found that 67% of respondents had postgraduate qualifications, while 33% had graduate qualifications. This indicates that the respondents were academically well-grounded, as they were graduates and held postgraduate qualifications, which is crucial for the Ugandan public service, which typically employs graduates for officer-level jobs (MoPS, 2021).
- v) *Current Job Title*: The study found that the most common job title in Uganda is Head of Information Technology (27%), followed by ICT Officer (24%). Additionally, 9% and 1% of respondents were Systems Administrators and Principal ICT Officers, respectively, indicating that IT roles accounted for 10% of respondents, which suggests a strong IT presence in Uganda.
- vi) *Employment Duration*: The study found that the majority of respondents, 98 of whom answered, had a current employment duration of 16 years, indicating their experience and suitability for the research.
- vii) *Seniority of the Respondents*: The majority of respondents (44%), primarily at the officer level, were at senior and top management levels, with 54% at senior and top management levels, and no respondents indicated Assistant Officer Level, indicating a higher level of seniority.
- viii) *Area of Study*: The majority of respondents (66%), 67 out of 102, studied in a computing field, followed by 12% in economics. This aligns with literature indicating data governance is a multidisciplinary venture, with origins in computer science.
- ix) *Respondents' Gender*: The study found that out of 102 respondents, 65.7% were male, and 34.3% were female, indicating that males are the more dominant gender in Uganda's governance domain.
- x) *Respondents' Age*: The study found that the respondents' minimum and maximum ages were 26 and 56 years, respectively, indicating validity. The highest age bracket was 30-34 years, with 22 respondents, or 21.6%, falling within this range. The other age brackets were within the same range.

- xi) *Data Governance Experience*: The study found that respondents with the highest data governance experience were 28 years old, consistent with other quantitative data governance findings.
- xii) *Main Function of the Respondent's Department*: The study found that 74% of respondents were from Information Technology departments, followed by Policy and Planning, Finance and Administration, and Statistics, with 66% studying computing.

4.3.2.1.2 *Descriptive Statistics on the Participating Organisations*

This subsection outlines the demographic characteristics of the Organisations to which the respondents for the quantitative phase of this study belonged, as summarised in Appendix I and discussed below.

- i. *Nature of IT Tools Used*: The study found that 61.8% of organisations use both traditional IT and cloud-based computing technologies, while 34.3% use only traditional tools. This suggests future research should focus on big data governance in response to this trend.
- ii. *Importance of implementing a Data Governance Programme*: The majority of respondents (81.4%) rated data governance as very important, 16.7% as crucial, and only 2% as unsure, indicating its importance as an essential organisational activity, indicating its worth for further investigation.
- iii. *The Existence of the Information Security Officer*: The study found that 39.2% of organisations have an Information Security Officer, 5.9% are recruiting, and 34.3% did not have nor were they planning to recruit. Half understand the importance of information security in data governance, while the other half lacks understanding.
- iv. *The Existence of the Data Governance Committee*: The findings indicated that the majority of the organisations (66.7%) lack data governance oversight committees, with only 33.3% having Inter-Ministerial Committees in place.
- v. *Data Quality Responsibility*: It was established that 43.1% of organisations have a designated data custodian or officer responsible for monitoring data quality, while 32.4% reported having no such personnel. This aligns with qualitative findings indicating that many organisations lack dedicated data governance officers.
- vi. *The Existence of a Data Governance Policy/Strategy*: The results indicated that only 6.9% of the organisations had a data governance policy/strategy, 28.4% were in the process of developing one, while the majority (36.3%). This finding

shall later be considered in Chapter 5 when proposing recommendations for application.

- vii. *The Existence of a Data Dictionary:* The results indicated that only 32.4% of the organisations had a data dictionary, 5.9% were in the process of developing one, 34.7% were still considering developing one, while 26.7% of the respondents did not have a plan to create one. This finding indicates the need for sensitisation on the importance of a data dictionary.

Overall, the key demographic and structural characteristics of the sample closely resemble those of the target population, as indicated by descriptive statistics of individual respondents and participating organisations. The study's external validity is strengthened by this representativeness, which ensures that the results can be consistently extrapolated outside of the sample. The overall validity and impact of the research are thereby enhanced, and the conclusions reached are more solid, reliable, and consistent with the study's objective.

4.3.2.2 *Quantitative Phase Major Findings*

The questionnaire used in this study had six sections, namely i) Demographic Information, ii) Data Governance Antecedents, iii) Data Governance Principles, iv) Data Governance Mechanisms, v) Consequences of Data Governance Failure, and vi) Cultural Effect. The summary of results from section one (i.e., demographic information) was presented in subsections 4.3.2.1.1 (Descriptive Statistics on the Respondents) and 4.3.2.1.2 (Descriptive Statistics on the Organisation). The findings from the other questionnaire sections are presented in subsections 4.3.2.2.1 to 4.3.2.2.6.

The responses to questions in sections two through six were based on a Likert Scale, with “Strongly Disagree” assigned a value of 5, “Disagree” = 4, “Neutral/Not Sure” = 3, “Agree” = 2, and “Strongly Agree” = 1. For each of the questionnaires, the findings were

analyzed using SPSS, from which the mean (M) and standard deviation (SD) were derived and categorised accordingly for easy interpretation, as presented in Table 43.

The standard deviation measures the degree of dispersion of the data in relation to the mean (Bhattacharjee, 2012). Data with a small standard deviation are closely grouped around the mean, whereas data with a large standard deviation are widely dispersed.

Table 43:

Interpretation of Mean (M) and Standard Deviation (SD) Values

Range of the Mean	Interpretation	Range of SD	Interpretation
1.0 – 1.7	Strongly Disagree	0 – 0.9	Small
1.8 – 2.5	Disagree		
2.6 – 3.3	Neutral/Not Sure		
3.4 – 4.1	Agree	1 and above-	Large
4.2 – 5.0	Strongly Agree		

Source: Primary data (2024)

4.3.2.2.1 Data Governance Antecedents

Data Governance Antecedents is the independent variable of this study. Based on the Abraham et al. (2019) cross-functional data governance model, data governance antecedents were measured under nine dimensions, as presented in Table 44. The overall findings for this variable indicate that, on average, all the respondents agreed (M = 3.78, SD = .361) that data governance antecedents are important inputs for implementing data governance activities.

Table 44:

Summary of Data Governance Antecedents Findings

Item	Mean	Interpretation	SD
i.Do you think we have adequate national legal and regulatory provisions for data governance in Uganda?	3.05	Neutral/Not Sure	.872
ii.Do you think that sudden changes in the demand for services by citizens affect how data is governed in your organisation?	3.8	Agree	.975
iii.Do you agree that industry effects in your sector affect data governance in your organisation?	3.94	Agree	.842
iv.Do you agree that prevailing political and socio-cultural conditions in the country have an impact on data governance?	4.48	Strongly Agree	.686
v.Do you agree that the lack of your organisation's top management support towards data governance affects data quality in your organisation?	4.16	Strongly Agree	1.115
vi.Do you agree that your organisation's lack of internal policies or strategies for data governance affects data quality?	4.35	Strongly Agree	.828
vii.Do you agree that Information Technology (IT) Systems in your organisation have adequate provisions for data governance?	2.95	Neutral/Not Sure	.969
viii.Do you think you have adequate mechanisms for making decisions about data governance in your organisation?	3.10	Neutral/Not Sure	1.165
ix.Do you agree that the quality of the source documents affects data governance performance?	4.27	Strongly Agree	.832
Mean Response on Data Governance Antecedents	3.78	Agree	.361

Source: Primary data (2024)

4.3.2.2.2 Data Governance Principles

Data Governance Principles are one of the two dependent variables of this study. Based on the Abraham et al. (2019) cross-functional data governance model, Data Governance Principles were measured under nine dimensions as presented in Table 45. The overall findings for this variable indicate that, on average, all the respondents agreed ($M = 3.66$, $SD = .541$) that data governance principles are an important input for the successful implementation of data governance activities.

Table 45:*Summary of Findings on Data Governance Principles*

Item	Mean	Interpretation	SD
i.Do you have inter-departmental data governance activities in your organisation, e.g., at a departmental, project, or organisational level?	3.33	Agree	1.163
ii.Do you share data governance activities with other Ministries or international bodies?	3.66	Agree	1.121
iii.Do you think your organisation has fully identified opportunities for sharing and reusing data?	2.83	Neutral/Not Sure	1.126
iv.Do you think data is adequately used to make policy decisions?	3.03	Neutral/Not Sure	1.267
v.Do you think you have adequate provisions for ensuring data quality for parameters such as accuracy, timeliness, completeness, and integrity in your organisation?	2.72	Neutral/Not Sure	1.075
vi.Do you think treating data as a critical asset improves data governance?	4.55	Strongly Agree	.539
vii.Do you agree that communicating business uses of data on an ongoing basis contributes to improving data governance?	4.34	Strongly Agree	.652
viii.Do you think enforcing regulatory and legal provisions helps improve data governance?	4.40	Strongly Agree	.693
ix.Do you think metadata availability improves the data governance function?	4.22	Strongly Agree	.607
Mean Response to Data Governance Principles	3.66	Agree	.541

Source: Primary data (2024)

4.3.2.2.3 Data Governance Mechanisms

The Data Governance Mechanism is a dependent variable of this study. Based on the Abraham et al. (2019) cross-functional data governance model, Data Governance Mechanisms were measured under fifteen dimensions as presented in Table 46. The overall findings for this variable indicate that, on average, all responses were neutral or unsure ($M = 3.16$, $SD = 0.630$) regarding whether the data governance mechanisms used in the public sector in Uganda adequately contributed to the successful implementation of data governance activities.

Table 46:*Summary of Findings on Data Governance Mechanisms*

Item	Mean	Interpretation	SD
i.Does your organisation have adequate data governance roles and duties?	2.76	Neutral/Not Sure	1.101
ii.Has the process of making data governance decisions been given enough attention in your organisation?	2.80	Neutral/Not Sure	1.152
iii.Do you think your organisation has adequate data management policies, strategies, and standards?	2.62	Neutral/Not Sure	1.161
iv.Do you think your organisation has well-defined and robust data governance processes and procedures?	2.47	Neutral/Not Sure	1.096
v.Do you think that your organisation should outsource some data management activities in your organisation?	2.73	Neutral/Not Sure	1.179
vi.Do you think your organisation has adequate data governance measures?	2.45	Disagree	.991
vii.Do you regularly conduct activities to monitor your organisation's compliance with data governance regulatory and legal provisions?	2.35	Disagree	1.058
viii.Do you think that you have adequate procedures for resolving data management issues?	2.24	Disagree	.946
ix.Do you think communication has aided your organisation's data governance?	3.12	Neutral/Not Sure	1.018
x.Do you think that the training of staff involved in data governance in your organisation has positively influenced their performance?	3.48	Agree	1.114
xi.Do you have adequate data access control mechanisms in your organisation?	3.15	Neutral/Not Sure	1.230
xii.Do you agree that data access control is a strong requirement for proper data governance?	4.31	Strongly Agree	.901
xiii.Do you process all data requests in a manner that protects the privacy of the data subjects?	3.37	Agree	1.121
xiv.Do you think it is important to maintain an inventory of the data assets?	4.49	Strongly Agree	.613
xv.Do you think that proper management of data over its lifecycle has a significant effect on overall data governance?	4.46	Strongly Agree	.557
Mean Response to Data Governance Mechanisms	3.16	Neutral/Not Sure	.630

Source: Primary data (2024)

4.3.2.2.4 Consequences of Data Governance Failure

Earlier, several challenges hindering the successful implementation of data governance were identified based on the results of the qualitative phase. The respondents were then asked to confirm if they were encountering similar challenges in their organisations during the quantitative phase. As presented in Table 47, the overall findings indicate that all respondents agreed ($M = 3.93$, $SD = .560$) that they were facing challenges similar to those identified earlier in the qualitative stage.

Table 47:

Summary of Findings on Data Governance Challenges

Item	Mean	Interpretation	SD
i.Lack of adequate financial resources	4.48	Strongly Agree	.780
ii.Lack of communication of the data governance benefits	4.19	Strongly Agree	.609
iii.Lack of data governance skills and knowledge	4.25	Strongly Agree	.826
iv.Lack of dedicated data governance staff	4.28	Strongly Agree	.776
v.Lack of training for the data governance stakeholders	4.20	Strongly Agree	.771
vi.Lack of a data governance culture	3.41	Agree	1.330
vii.Data is not perceived as a critical asset	3.63	Agree	1.342
viii.Lack of top management support	3.79	Agree	1.360
ix.Lack of adequate data governance infrastructure	4.06	Agree	.877
x.Data governance is perceived as a time waster	3.16	Neutral/Not Sure	1.307
The mean response to data governance challenges	3.93	Agree	.560

Source: Primary data (2024)

4.3.2.2.5 *Solutions for Data Governance Failure*

Based on the results from the qualitative phase, the respondents proposed several solutions to challenges that were hindering the successful implementation of data governance. These potential solutions were then presented to the respondents in the quantitative stage for confirmation. The overall findings indicate that all respondents strongly agreed ($M = 4.46$, $SD = .442$) that the proposed solutions were suitable for resolving the data governance challenges in public sector organisations in Uganda, as summarised in Table 48.

Table 48:

Summary of Solutions for Resolving Data Governance Challenges

Item	Mean	Interpretation	SD
i.Availability of increased financial resources	4.62	Strongly Agree	.718
ii.Improved communication of the data governance benefits	4.51	Strongly Agree	.576
iii.Increased training and capacity building in data	4.51	Strongly Agree	.576
iv.Recruitment of dedicated data governance staff	4.42	Strongly Agree	.710
v.Increased awareness and training of stakeholders	4.48	Strongly Agree	.576
vi.Data governance and organisational culture alignment	4.37	Strongly Agree	.659
vii.Considering data as a critical asset	4.50	Strongly Agree	.609
viii.Strong top management support for data governance	4.51	Strongly Agree	.576
ix.Improved data governance infrastructure	4.50	Strongly Agree	.579
x.Consideration of data governance as a key contributor to overall organisational performance	4.38	Strongly Agree	.546
Mean response on data governance solutions	4.46	Strongly Agree	.442

Source: Primary data (2024)

4.3.2.2.6 *Cultural Effect*

Based on the results from the qualitative phase, the respondents proposed several employee cultural and behavioural issues that impede the successful implementation of data governance. These issues were then presented to the respondents in the quantitative stage for their confirmation. As presented in Table 49, the overall findings indicate that all respondents strongly agreed ($M = 3.94$, $SD = .666$) that employee cultural and behavioural issues affect the successful implementation of data governance in Public Sector Organisations in Uganda.

Table 49:

Summary of findings on the effect of culture on Data Governance

Item	Mean	Interpretation	SD
i.Organisational culture and behaviour of staff towards data governance practices have a positive effect on data quality	4.33	Strongly Agree	1.028
ii.Staff exhibit a positive attitude towards the value of data	3.52	Strongly Agree	.941
iii.The leadership style in my organisation promotes data governance	3.59	Strongly Agree	1.028
iv.Organisational values such as honesty, teamwork, innovation, etc., play an important role in the results of data governance	4.33	Strongly Agree	.916
Mean response on the effect of the employees' attitude towards data management on the quality of data	3.94	Strongly Agree	.666

Source: Primary data (2024)

4.3.2.3 *Hypotheses Testing Results*

This subsection presents the results of the regression analyses that were performed to test the proposed hypotheses, along with a detailed interpretation of the findings.

4.3.2.3.1 *Hypothesis H01: Data Governance Antecedents have no significant effect on Data Governance Principles*

The results of the regression analysis for the first hypothesis, that Data Governance Antecedents have no significant effect on Data Governance Principles, are presented in Table 50.

Table 50:*Model Summary for Antecedents versus Principles*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	F Statistic	Sig. value	
1	.390 ^a	.152	.144	.50080	17.967	0.000 ^b	
a. Dependent Variable: Data Governance Principles b. Predictors: (Constant) Data Governance Antecedents							
Model			Unstandardized Coefficients		Standardized Coefficients	t	Sig.
			B	Std. Error	Beta		
(Constant)			1.449	.524		2.766	.007
Data Governance Antecedents			.585	.138	.390	4.239	.000
Dependent Variable: Data Governance Principles							

Source: Primary data (2024)

The regression model was statistically significant ($R^2 = 0.152$, $F(1,100) = 17.97$, $p < 0.01$), indicating that Data Governance Antecedents explain 15.2% of the variance in Data Governance Principles. Although the R^2 value is relatively low, this is a common finding in human studies, particularly within the public sector.

The regression coefficient ($\beta = 0.39$) is significant ($t = 4.24$, $p < 0.01$), suggesting that a 1-unit improvement in Data Governance Antecedents is associated with a 39% improvement in Data Governance Principles.

Since the p-value is less than 0.05, we reject the null hypothesis H01 and conclude that Data Governance Antecedents significantly affect Data Governance Principles.

4.3.2.3.2 Hypothesis H02: Data Governance Antecedents have no significant effect on Data Governance Mechanisms

The results of the regression analysis for the second hypothesis, that Data Governance Antecedents have no significant effect on Data Governance Mechanisms, are presented in Table 51.

Table 51:

Model Summary for Antecedents versus Mechanisms

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	F Statistic	Sig. value	
1	.376 ^a	.142	.133	.59577	16.485	0.000 ^b	
a. Dependent Variable Data Governance Mechanisms b. Predictors: (Constant), Data Governance Antecedents							
Model			Unstandardized Coefficients		Standardized Coefficients	t	Sig.
			B	Std. Error	Beta		
(Constant)			.600	.623		.964	.338
Data Governance Antecedents			.666	.164	.376	4.060	.000
Dependent Variable: Data Governance Mechanisms							

Source: Primary data (2024)

The model was statistically significant ($R^2 = 0.142$, $F(1,100) = 16.49$, $p < 0.01$), indicating that Data Governance Antecedents explain 14.2% of the variation in Data Governance Mechanisms. The standardized beta coefficient ($\beta = 0.376$) is significant, indicating that a 1-unit increase in Data Governance Antecedents is associated with a 38% improvement in Data Governance Mechanisms.

Since the p-value is less than 0.05, we reject the null hypothesis H02 and conclude that Data Governance Antecedents significantly affect Data Governance Mechanisms.

4.3.2.3.3 *Hypothesis H03: Organisational Culture has no significant effect on Data Quality*

The results of the regression analysis for the third hypothesis, that Organisational Culture has no significant effect on Data Quality, are presented in Table 52.

Table 52:

Model Summary of Organisational Culture versus Data Quality

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	F Statistic	Sig. value	
1	.177 ^a	.031	.020	1.09604	2.740	0.102 ^b	
a. Dependent Variable: Data Quality b. Predictors: (Constant), Organisational Culture							
Model			Unstandardized Coefficients		Standardized Coefficients	t	Sig.
			B	Std. Error	Beta		
(Constant)			1.523	.763		1.996	.049
Organisational Culture			.321	.194	.177	1.655	.102
Dependent Variable: Data Quality							

Source: Primary data (2024)

The regression model was not statistically significant ($R^2 = 0.031$, $F(1,85) = 2.74$, $p = 0.102$), indicating that Organisational Culture explains only 3.1% of the variance in Data Quality. The beta coefficient ($\beta = 0.177$) is not statistically significant ($p > 0.05$), indicating that there is no strong evidence to support a meaningful relationship between the variables.

However, caution must be exercised in interpreting this result. Respondents appeared non-committal when assessing data quality (Mean = 2.72, SD = 1.08), and there is limited evidence of structured data quality initiatives in many of the public sector institutions surveyed. Therefore, the insignificant result may reflect response bias or systemic data governance issues rather than a true absence of effect.

Since the p-value is greater than 0.05, we fail to reject the null hypothesis H03. This study did not find sufficient evidence to support the claim that Organisational Culture significantly affects Data Quality.

4.4 EVALUATION OF FINDINGS

This mixed-methods study employed qualitative data analysis to provide in-depth insights into the research questions, while quantitative data analysis was used to statistically evaluate and test the proposed hypotheses. Subsection 4.4.1 presents and assesses the qualitative findings in relation to the guiding research questions. Relatedly, subsection 4.4.2 discusses the quantitative results in light of the stated hypotheses. In both subsections, the results are interpreted in the context of the reviewed literature and further examined in relation to pertinent contextual factors that could explain the observed similarities or differences.

4.4.1 Evaluation of Findings per Research Question

This study employed qualitative data analysis to explore and analyse the four research issues under examination in order to attain its research objectives. An evaluation of the qualitative findings for the four research questions is presented below, incorporating insights

from the existing literature and the situational analysis of data governance in Uganda, as elaborated in Subsections 4.4.1.1 to 4.4.1.4.

4.4.1.1 RQ1: What are the Requirements for Effective Data Governance?

This research question sought to identify the contextual and generic core elements that Ugandan public organisations must establish to develop, implement, and maintain effective data governance initiatives. The results show that good data governance depends on two interdependent dimensions, namely i) *data governance antecedents*, which refer to organisational and environmental factors, such as policy frameworks, institutional structures, technological capabilities, resource availability, and cultural adaptability, that enable data governance mechanisms to be established and succeed; and ii) *data governance principles*, which refers to the rules and guidelines that govern the ethical, procedural, and strategic aspects of data management. Principles such as accountability, accessibility, inclusiveness, data quality, and global alignment go beyond structural issues to create a consistent value system that supports reliable, long-lasting data practices.

The findings revealed that principles are not secondary guidelines but fundamental governance prerequisites that establish the legitimacy, reliability, and enduring efficacy of data governance systems. They put governance into practice by integrating ethical reasoning, professional standards, and openness into how institutions operate. One respondent said, "*In our organisation, data governance is based on the principle of professionalism, which requires following internationally accepted laws, ethical standards, conventions, and norms of the statistical profession to make sure that high-quality data is produced.*" This statement demonstrates that data governance principles function as an overarching framework that

influences organisational behaviour, procedural activities, and strategic decision-making, thereby facilitating the institutionalisation of effective and sustainable data governance within the public sector. Figure 31 summarises the analysis of the findings for the requirements for effective data governance.

Figure 31:

Summary of Requirements for Effective Data Governance

DATA GOVERNANCE PRINCIPLES • Data Globalisation • Whole-of-Government Approach • Customer Centricity • Accountability • Data Accessibility • Data Quality	DATA GOVERNANCE ANTECEDENTS <u>External Antecedents</u> • National policy & regulatory instruments • National & international data requirements • Conducive political and socio-economic environment <u>Internal Antecedents</u> • Institutional policy & regulatory instruments • Top leadership support • IT Systems Governance Strategies
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These findings are consistent with the work of Abraham et al. (2019), who assert that the essential components of effective data governance are categorised into two groups, namely i) external requirements arising from outside the organisation and ii) internal requirements functioning within the organisation. Khatri and Brown (2010) emphasise the importance of organisational structures and external regulatory frameworks in developing effective data governance. DAMA International (2017) emphasises that effective data governance relies on a balance between internal provisions, such as policies, stewardship, and infrastructure, and external drivers, including regulatory compliance requirements and adherence to industry best practices and international standards.

Similarly, in Uganda's context, local factors such as the legal and regulatory environment—including the enactment and implementation of the Data Protection and Privacy Act, the digital transformation agenda, and the development of supporting infrastructure (e.g., data centres and National Backbone Infrastructure communication networks)—strengthen data governance initiatives. However, efforts in data governance are also constrained by financial resource shortages, system fragmentation, and inadequate human resource capacity.

Table 53:

Summary of Analysis of the Data Governance Principles

Principle	Description	Contextual Relevance for Uganda	Collaborative Literature
Data Globalisation	Adherence to internationally recognised standards while preserving national sovereignty supports interoperability and equitable data use.	Critical for reporting to regional (East African Community) and international stakeholders; enables access to development funding.	The respondents highlighted the high demand for data in global reporting; the literature warns that external priorities can override local needs (OECD, 2021; Kitchin, 2021; Coche et al., 2024).
Whole-of-Government Approach	Coordination of data governance across all ministries and agencies to reduce silos and fragmentation.	Addresses siloed data governance challenges in Uganda, promoting inclusiveness and equity in data management.	There is evidence of lost benefits due to data fragmentation and a lack of coordination mechanisms (Al-Ruithe et al., 2019; Mullon & Ngoepe, 2019).
Customer-Centricity	Emphasises high-quality, user-generated data and its effective utilisation by stakeholders; includes accessibility and feedback mechanisms.	Strengthens stakeholders' capacity to produce and utilise accurate data, thereby enhancing usability and informed decision-making.	The literature affirms that data originates from users and that data governance initiatives should prioritise the needs of both data generators and consumers (Martijn & Jonker, 2015; Were & Moturi, 2017).
Accountability	Ensures clear ownership of data assets, collective responsibility, regulatory compliance, and performance evaluation.	Provides structure for multiple producers and sources, enhancing transparency in governance within Uganda's public sector.	Supports decision-making and policy compliance; aligns with Khatri & Brown (2010) on data ownership and accountability.

Principle	Description	Contextual Relevance for Uganda	Collaborative Literature
Data Accessibility	Ease of discovering, acquiring, understanding, and using data across stakeholders promotes openness and data sharing.	Essential to break silos, integrate databases, and support organisational objectives; accommodates varying technological literacy levels.	Various scholars have identified the operational efficiency and strategic planning associated with open data and data sharing (Muhumuza & Baguma, 2023; Omweri, 2024; van Ooijen <i>et al.</i> , 2019).
Data Quality	Ensures integrity, accuracy, and reliability throughout the data lifecycle, which is foundational to all other principles.	Crucial for Uganda's public sector to realise other principles (globalisation, accountability, accessibility); addresses challenges of inattentive data ownership.	Recurrent principle in literature (Abraham <i>et al.</i> , 2019; Brous <i>et al.</i> , 2016; Khatri & Brown, 2010).

On the part of the data governance antecedents, the thematic analysis of the external findings is summarised in Figure 32, and the internal antecedents in Figure 33.

Figure 32:

Analysis of the Findings on External Antecedents

National Legal and Regulatory – there was a consensus this is crucial for efficient data governance. Identified the lack of sufficient legal and regulatory instruments, the existence of many draft instruments in draft form, and the lack of awareness as key barriers.

Market Volatility - findings indicated that changes in the demand for services from clients such as internal organisation clients, the General Public, other Government bodies, and international organisations affect data governance in their organisations.

National & International Data Requirements/Industry Effects - The findings indicated that there are specific national, regional, and international data reporting requirements that Ministries must comply with, which affect data governance processes.

Country Effect – the findings indicated that the prevailing political, social, and cultural conditions in the country such as national elections, cultural festivities, or natural disasters have an impact on data governance requirements.

Overall, the results of the external requirements are in line with the existing scholarly works where *the lack of an enabling policy and regulatory environment*, such as dependence on generic policies and fragmented policies (Mullon & Ngoepe, 2019; Were & Moturi, 2017) are identified as barriers of data governance; degree of market regulation volatility (Otto, 2011); industry effects such as national and international data reporting requirements (Herselman et al., 2019; Otto, 2011); and the country-context (Mullon & Ngoepe, 2019; Nguyen, 2016; OECD, 2019) have been identified as critical requirements for effective data governance.

Figure 33:

Analysis of the Findings on Internal Antecedents

Top Leadership Support - the findings indicated that top leadership support is a key requirement for data governance. Noted that the leadership appreciates the role of maintaining accurate data and supports the function of data governance in their institutions.

IT Systems Governance Strategies – Identified the need for having IT Systems Data Governance Strategies in place as a requirement for effective data governance. Specific strategies mentioned were institutional data-sharing architectural framework, ICT Policy & Information Security Strategies.

Internal Policies or Strategies - Confirmed that the lack of adequate internal data governance policies and strategies impedes their work.

The analysis of the internal antecedents is in line with the existing scholarly works where i) top leadership support (Abraham et al., 2019), ii) institutional data governance policy and regulatory provisions, and iii) availability of complementary policies and strategies, such as the IT Systems Governance strategies, have been identified as critical requirements for effective data governance.

4.4.1.2 RQ2: What organisational provisions have been established to manage data assets?

The objective of this research question was to evaluate the degree of institutionalisation of data governance within Ugandan public sector organisations and their compliance with theoretical frameworks and best practices in data management. The findings indicated that the primary organizational provisions for managing data assets consist of two dimensions: i) data scoping, which entails delineating data types, boundaries, and content; and ii) data governance mechanisms, which include structural mechanisms (e.g., roles, decision-making bodies, and compliance frameworks), procedural mechanisms (e.g., processes and workflows), and relational mechanisms (e.g., communication, capacity building, and training). These findings

are consistent with the systematic review by Abraham et al. (2019), which underscores the interdependence of structural, procedural, and relational mechanisms in the integration of sustainable data governance practices.

One respondent who answered this question emphasised this integration, stating, "*Our organisation has set up a data management committee that is in charge of setting data standards, reviewing data-sharing protocols, and coordinating training for departmental focal persons.*" These arrangements ensure that decisions about data go beyond technical tasks performed separately; they are part of our overall management processes. This observation highlights that systematically aligned organisational provisions promote structural accountability and behavioural commitment, thereby enhancing the institutionalisation of data governance within the public sector. Table 54 presents an analysis of the organisational provisions mapped to their corresponding theoretical dimensions, along with the observed strengths and gaps/challenges, and supporting literature in the Ugandan context.

Table 54:

Summary of Analysis of the Data Governance Principles

Organisational Provision	Theoretical Dimension	Observed Strengths	Gaps/Challenges	Supporting Literature
Data Governance Committees/Designated Data Stewards	Structural	Establish accountability and oversight roles; several ministries have formal committees and focal points.	Limited authority and inconsistent enforcement across agencies; committees often lack resources and decision-making power.	Abraham et al. (2019), Mutebi, Namatovu, & Namaganda (2023)
Policies & Standards on Data Quality,	Structural/Procedural	Anchored by the <i>Data Protection and Privacy Act</i> (2019)	Enforcement is weak; compliance varies across	Abraham et al. (2019); Uganda (2019, 2021)

Organisational Provision	Theoretical Dimension	Observed Strengths	Gaps/Challenges	Supporting Literature
Security, Privacy, Interoperability		and Regulations (2021), it provides a strong normative baseline.	institutions; many policies are aspirational rather than applied.	
Data Collection, Storage, Validation, Integration, Access, Disposal Workflows	Procedural	Formal workflows are in place in agencies managing high-value datasets; some ministries demonstrate strong lifecycle management practices.	Fragmented systems, a lack of standardised metadata, and a lack of integration across agencies; duplication persists.	Abraham et al. (2019); Mutebi et al. (2023); Open Data Institute (2024)
Platforms, Tools, and Infrastructure Supporting Data Management	Technological	Significant investment in digitisation; examples include interoperable pilots in fiscal management and e-government platforms.	Legacy systems, interoperability barriers, and resource gaps prevent system-wide integration.	Abraham et al. (2019); Open Data Institute (2024)
Training Programs, Awareness Campaigns	Relational People	/ Growing recognition of the need for capacity building has led to several agencies providing training and awareness activities.	Initiatives are ad-hoc, underfunded, and not institutionalised; low overall data literacy hampers governance.	Abraham et al. (2019); Mutebi et al. (2023)
Organisational Culture: Treating Data as a Strategic Asset	Cultural Relational	/ Nascent recognition that data is a strategic resource; some agencies promote data-driven decision-making.	Data is still treated as secondary to administrative compliance; lack of incentives and leadership commitment slows cultural embedding.	Abraham et al. (2019); Mutebi et al. (2023)

Ugandan public sector organisations have laid the groundwork for data governance through laws and policies, but these need to be better implemented in practice. The focus should be on strengthening enforcement mechanisms and developing its capacity to address skills shortages, thereby enhancing governance maturity. While encouraging a data-driven culture

necessitates leadership commitment and reward systems for data stewardship, investing in interoperable infrastructure is essential to reducing fragmentation. By addressing these strategic concerns, Uganda will be able to establish sustainable, effective data governance aligned with international best practices.

4.4.1.3 RQ3: What challenges do government employees face while managing data in Uganda?

This question was designed to explore the challenges Ugandan government employees face in managing data, focusing on their firsthand experiences to uncover the operational realities underlying institutional arrangements. The findings reveal a range of persistent obstacles, including limited technical expertise, inadequate ICT infrastructure, weak organisational cultures around data stewardship, and difficulties in implementing existing policies and standards. These constraints illustrate the gap between formal organisational provisions for data governance and their practical execution, thereby exposing the institutional fragmentation that undermines coherent data management across government entities. One respondent summarised these challenges as:

“I would start from the strategic level as I said we don’t have a data governing framework, a documented data governing framework in place. The board or the committee that is supposed to spearhead data governance is not yet in place we only have a staff committee that is the one doing that work. We have functional data across government with each institution managing it their own. This has led to the extent there are challenges of sharing that data between government institutions. Undefined roles and responsibilities; Then when I come down to roles and responsibilities who is a data owner, who is a data steward all these are not clearly defined. Coming down to the infrastructure that supports data governance, as I said in some areas we don’t have Internet connectivity, in some places they have inadequate equipment like computers. We don’t have adequate staff which would have helped us in scrutinizing and ensuring data quality so data quality aspect. We don’t have proper governance or proper structures for ensuring data quality. For example, the person who is supposed to go to court and do prosecution of cases is the one expected to come and do data assurance and in most cases the person is busy working so it affects the data quality due to lack

of specialized structure for managing data. There is need for management to address issues like resistance to change, where some people consider data collection and processing as an extra work being done. We also have challenges with the tools required for the collection, analysis, processing, and storage of data”.

This statement encapsulates the multifaceted nature of data governance challenges, spanning structural, technical, and human resource dimensions. The respondent’s experience reinforces the study’s broader finding that fragmentation and ambiguity, in both roles and infrastructure, limit the operationalisation of data governance principles such as accountability, accessibility, and data quality. The absence of well-defined stewardship roles and coordinated data-sharing frameworks reflects a disconnect between policy intent and implementation capacity. These observations align with Abraham et al. (2019), who emphasise that effective data governance requires not only formal mechanisms but also enabling conditions, such as institutional clarity, adequate resourcing, and a data-driven culture.

Consequently, the findings highlight the need for a comprehensive and context-sensitive data governance framework that addresses both organisational and infrastructural deficits. Strengthening institutional coordination, building human capacity, and investing in digital infrastructure are therefore critical to bridging the gap between policy design and practical data management. A detailed synthesis of these findings that includes the identified challenges, existing organisational provisions, observed strengths and weaknesses, relevant supporting literature, and actionable recommendations is presented in Table 55.

Table 55:

Summary of Analysis of the Data Governance Challenges

Challenge	Organisational Provision	Strengths	Gaps	Supporting Literature	Recommendations
Lack of enabling policy & regulatory environment	Policy provisions (Abraham et al., 2019)	Existence of the Data Protection and Privacy Act (2019)	Weak enforcement, poor coordination, and limited institutional capacity	Carroll et al. (2019); Van Ooijen et al. (2019)	Strengthen policy alignment through a whole-of-government approach, establish enforcement mechanisms, and institutionalise national data strategies.
Technological challenges	Technology provisions	Some sector-specific systems (e.g., e-passport, National ID System)	Fragmented legacy systems, low cybersecurity maturity	Benfeldt et al. (2020)	Introduce standardised technology platforms, enhance cybersecurity protocols, and encourage shared infrastructure solutions.
Inadequate ICT infrastructure	Technology provisions	Broadband expansion initiatives are underway	Low penetration, unreliable infrastructure, and lack of datacentres	Van Ooijen et al. (2019)	Invest in digital public infrastructure (cloud, broadband, data centres) supported by PPPs and donor engagement.
Data requirements (standardisation, interoperability, accessibility)	Process provisions	Sectoral databases exist (tax, health, ID)	Fragmented silos, no national standards, duplication	Carroll et al. (2019); Were & Moturi (2017)	Develop national data standards & interoperability frameworks; adopt APIs and data registries for integration.
Data sovereignty (ownership & control)	Structural policy & provisions	National digital ID & e-passport enhance ownership	Cloud reliance, unclear ownership of shared data	Mullon & Ngoepe (2019)	Establish clear data ownership guidelines, promote local hosting solutions, and negotiate terms of sovereignty in cloud contracts.
Cultural effects (organisational & behavioural)	Cultural provisions	Growing awareness of data as a	Resistance to sharing, compliance-	Mullon & Ngoepe (2019)	Promote a data-driven culture through leadership

Challenge	Organisational Provision	Strengths	Gaps	Supporting Literature	Recommendations
		strategic asset	driven mindset		commitment, effective change management, targeted incentives, and awareness campaigns.
Funding shortfalls	Resource support provisions	Donor support for some initiatives (World Bank, UNDP)	Chronic underfunding of ICT budgets	Were & Moturi (2017)	Create a sustainable funding model for data governance (national ICT Fund, PPPs, earmarked budget lines).
Human resource challenges (skills, roles, structure)	People provisions	Some training programs exist	Shortage of skilled staff, unclear roles, and leadership gaps	Were & Moturi (2017); Benfeldt et al. (2020)	Institutionalise capacity-building programs, define clear data governance roles, and establish career pathways for data professionals.

All the identified challenges align with the findings of the literature review, where various scholars (Caroll et al., 2019; Benfeldt et al., 2020; Mullon & Ngoepe, 2019; van Ooijen et al., 2019; Were & Moturi, 2017) have identified similar barriers to data governance initiatives. For example, Were and Moturi (2017), who conducted an inquiry into the data governance challenges in Kenyan health regulatory bodies, established that the obstacles to be overcome include a lack of knowledge about the data governance concept, a lack of ownership and support from top leadership, and a shortage of resources and finances to implement data governance activities.

4.4.1.4 RQ4: *What is the effect of organisational culture on data governance?*

This question sought to establish the relationships among respondents' attitudes, beliefs, and behaviour regarding data management activities and data quality. All the respondents agreed that organisational culture is critical regarding data security, protection, and sharing. One respondent emphasised that *"There is a poor culture of managing data in the government"*. One of the respondents asserted that *"the culture has improved, evidenced by fewer incidences of data loss and inaccurate information, such as ghost employees and pension miscalculations"*. To a lesser extent, it was also noted that a few public employees have a laissez-faire attitude towards data management. For example, one respondent mentioned that *"some employees carelessly copy confidential data from the system onto portable media to carry home and seem not to understand the implications if it falls into the wrong hands."* Although there were a few documented cases of deliberate data abuse, there was not enough background information to determine the underlying causes, whether they were institutional, personal, or cultural.

The literature indicates that organisational culture has a significant impact on information and data governance outcomes. Studies show that culture affects employees' adherence to data handling protocols, prioritisation of data quality, and stewardship practices (Lillie & Eybers, 2019; Pansara, 2023). For example, Daneshmandnia's (2019) research reveals correlations between cultural dimensions and the effectiveness of governance in public institutions. Similarly, Hagmann (2013) emphasises that a supportive governance culture is essential, as mere policy instruments and technical controls may not yield sustainable improvements.

Above all, the effect of employees' attitudes towards data management on the quality of data held in the public sector in Uganda could not be sufficiently determined from the findings, as there were limited responses to this construct. Nonetheless, the findings suggest that culture, to some extent, influences data governance. The fact that there was no overwhelming evidence from the responses could be attributed to respondent bias, where respondents may have been hesitant to share negative views on how bad organisational culture is impeding data governance in the Ugandan public sector.

The findings on the effect of organisational culture on data quality have implications for data governance practice and future research. On the part of practice, improvements will require i) strengthening culture through communication, incentives, and training; ii) clarifying roles and accountabilities; and iii) closing technical and process shortfalls. Comparative studies show that culture change is most effective when reinforced by role clarity and technical controls (Daneshmandnia, 2019; Alhassan, 2016). On the research side, there is a need to determine the effect of employee attitudes on data quality more conclusively. Future studies should further explore the effect of additional cultural dimensions on data quality. For example, experimental or longitudinal designs would help separate the effects of culture from those of capability and incentive.

Overall, the findings on the effect of organisational culture on data quality align with international evidence that organisational culture is a critical enabler (or barrier) to sound data management and data quality (Daneshmandnia, 2019; Hagmann, 2013; Wang et al., 2023). However, the current qualitative data do not provide sufficient granularity to quantify the effect of attitudes and behaviours on data quality in Uganda's public sector. Therefore, this study recommends future investigations on the cultural effect on data governance in Uganda.

4.4.2 Evaluation of Findings by Research Hypotheses

This research is based on Abraham et al.'s (2019) cross-functional data governance model, which serves as the conceptual framework for the study. The model posits that data governance antecedents influence the data scope (i.e., data type, organisational, and domain) and mechanisms (i.e., structural, procedural, and relational) of governance, which in turn impact governance outcomes. Based on this theoretical framework, the study examines three hypotheses regarding data governance. The empirical analysis is substantiated by comprehensive data and evidence, ensuring a reliable foundation for interpreting the results. In this research, data governance antecedents are utilised as the independent variable, whereas data principles and governance mechanisms serve as the dependent variables. Subsections 4.4.2.1 to 4.4.2.3 show the results of the quantitative analysis that tested these hypotheses.

4.4.2.1 H01: Data Governance Antecedents have no significant effect on Data Governance Principles

The regression model was statistically significant ($R^2 = 0.152$, $F(1, 100) = 17.97$, $p < 0.01$). The regression model summary results in Table 56 show that Data Governance Antecedents explained a significant proportion (15.2%) of the variations in Data Governance Principles. This finding is crucial, as it demonstrates that considerable variability is inherently unexplained, a common characteristic in human and public sector governance studies. For example, according to Frost (2024), human perceptions are difficult to predict, and any study that attempts to predict human behaviour will tend to have R-squared values of less than 50%, compared to studies in physical processes that tend to have very high R-squared values of well

over 90%. Several scholars (Chicco et al., 2021; Frost, 2024; Gupta et al., 2024; Ozili, 2023) agree that there is no one-size-fits-all best answer for how high or low R-squared should be. Ozili (2023) asserts that in the domain of social sciences and governance studies, R-squared values ranging from 0.10 to 0.30 are deemed acceptable. Therefore, the 15.2% R-squared value has significant meaning for those seeking to enhance data governance principles by utilising data governance antecedents. It was found that Data Governance Antecedents significantly predicted Data Governance Principles with a 95% confidence interval ($\beta = .39$, $t(100) = 4.24$, $p < .001$). Table 56 shows that 1% improvement in Data Governance Antecedents results in a 39% improvement in Data Governance Principles. This significant finding led to the rejection of the null hypothesis at a 5% significance level.

Table 56:

Summary of Quantitative Findings for the First Hypothesis (H01)

Statistical Result	Theoretical Interpretation	Contextual Relevance (Uganda/Africa)	Supporting Scholarly Evidence (APA 7)
$R^2 = 0.152$ (15.2% of variance explained)	Results indicate that data governance antecedents moderately predict the variance in governance principles. Reflects complex socio-organisational influences where multiple factors interact.	Consistent with the nature of Uganda's public institutions, diverse institutional, legal, and leadership factors shape data practices. Demonstrates that antecedents contribute meaningfully to the development of governance principles, despite contextual constraints.	Frost (2024) notes that R^2 values below 50% are typical in human and governance studies; Ozili (2023) argues that R^2 values of 10–30% are acceptable in the social sciences.
$F(1,100) = 17.97$, $p < .01$	The model is statistically significant, confirming that antecedents collectively explain meaningful variation in data governance principles.	Indicates that organisational readiness and antecedent strength (e.g., policy coherence, leadership commitment) are vital for Uganda's digital transformation agenda.	Chicco et al. (2021) emphasise that statistical significance in behavioural data indicates practical interpretive relevance despite moderate model fit.

$\beta = 0.39$, $t(100) = 4.24$, $p < .001$	A one-unit improvement in antecedents leads to a 0.39 increase in governance principles. Reflects a moderate-to-strong positive relationship, validating Abraham et al.'s (2019) cross-functional model.	Suggests that enhancing antecedent conditions (leadership, policy clarity, data culture) could substantially strengthen Uganda's adherence to AU-aligned data governance principles.	Abraham et al. (2019) conceptualised antecedents as enablers shaping governance scope and principles; Gupta et al. (2024) empirically confirm this in public sector settings.
H ₀ Rejected	Empirical evidence confirms that antecedents have a significant influence on principles, supporting the validity of the theoretical framework.	Highlights that improving institutional antecedents (capacity, leadership, and culture) is critical for Uganda and other countries with similar characteristics.	Okello and Musoke (2022) African Union (2022), and Were & Moturi (2017) emphasise antecedents as foundational enablers of data governance in Africa.

Source: Primary data (2024)

The statistical evidence ($R^2 = 0.152$, $\beta = 0.39$, $p < .001$) supports the theoretical proposition that data governance antecedents significantly influence data governance principles, providing empirical validation of Abraham et al.'s (2019) model. Despite the modest R^2 , this relationship holds substantial *practical and policy relevance* in Uganda's public sector, where strengthening antecedent factors can accelerate the institutionalisation of data governance principles in alignment with African Union policy aspirations.

Overall, the results from hypotheses H₀₁ and H₀₂ collectively reinforce the theoretical assertion of Abraham et al. (2019) that data governance antecedents form the foundational layer upon which both governance principles and mechanisms are built. In H₀₁, antecedents accounted for 15.2% of the variance in data governance principles ($\beta = .39$, $p < .001$), while in H₀₂, they explained 14.2% of the variance in data governance mechanisms ($\beta = .38$, $p < .01$). These findings, though moderate in explanatory power, are significant within the behavioural and institutional contexts typical of governance studies (Frost, 2024; Ozili, 2023). The results

collectively suggest that enhancing antecedent factors such as leadership commitment, organisational culture, policy coherence, and resource alignment substantially improves both the normative (principles) and operational (mechanisms) dimensions of data governance.

4.4.2.2 H02: Data Governance Antecedents have no significant effect on Data Governance Mechanisms

The regression model was statistically significant ($R^2 = 0.142$, $F(1, 100) = 16.49$, $p < 0.01$). The regression model summary results in Table 57 show that Data Governance Antecedents alone account for 14.2% of the variability in Data Governance Mechanisms. Similarly, in this case, considerable variability remains unexplained. However, being a human study and the sector (public), as already alluded to in the case of hypothesis H_{01} above, the 14.2% R-square remains relevant to those aiming at improving Data Governance Mechanisms based on Data Governance Antecedents. It was found that Data Governance Antecedents significantly predicted Data Governance Mechanisms with a 95% confidence interval ($\beta = .38$, $t(100) = 4.06$, $p < 0.01$). Table 57 shows that a one percentage improvement in Data Governance Antecedents results in a 38% improvement in Data Governance Mechanisms. Overall, this led to the acceptance of the null hypothesis at a 5% significance level.

Table 57:

Summary of Quantitative Findings for the Second Hypothesis H_{02}

Statistical Result	Theoretical Interpretation	Contextual (Uganda/Africa)	Relevance	Supporting Scholarly Evidence (APA 7)
$R^2 = 0.142$ (14.2 % of variance explained)	Indicates that Data Governance Antecedents moderately explain the variation in Data Governance Mechanisms, consistent with behavioural and institutional models that involve multiple interacting influences.	Reflects the reality of Uganda's public institutions, where leadership, organisational culture, and regulatory coherence only partly determine the functioning of data mechanisms, leaving room for socio-political and infrastructural factors.		Frost (2024) notes that R^2 values between 0.10 and 0.30 are acceptable in social science research; Ozili (2023) concurs that such magnitudes are meaningful for governance and human studies.
$F(1, 100) = 16.49, p < .01$	The regression model is statistically significant, confirming that antecedents as a group have a measurable effect on mechanisms.	Demonstrates that strengthening enabling conditions—leadership commitment, data policy frameworks, and organisational alignment—can tangibly improve operational governance mechanisms such as stewardship, data-sharing protocols, and compliance processes.		Chicco, Warrens, & Jurman (2021) emphasise that statistical significance, even with modest R^2 , signals practical relevance in governance research.
$\beta = 0.38, t(100) = 4.06, p < .01$	A one-unit improvement in antecedents yields a 0.38 increase in mechanisms, supporting Abraham et al.'s (2019) proposition that antecedents directly shape governance processes and operational mechanisms.	Suggests that a 38 % improvement in governance mechanisms can be achieved by enhancing antecedent factors—critical for Uganda's drive toward institutional data maturity and regional compliance with AU Data Policy Framework standards.		Abraham, Schneider, & vom Brocke (2019) empirically link antecedents with mechanisms; Gupta, Sharda, & Grewal (2024) find similar predictive patterns in public-sector data governance.
H_0 Rejected ($p < .05$)	Confirms a significant positive relationship between antecedents and mechanisms, thereby reinforcing the theoretical structure of the cross-functional data governance model.	Highlights that public organisations in Uganda and across Africa must prioritise foundational antecedents—leadership, culture, and policy coherence—to institutionalise effective data governance mechanisms.		The African Union (2022), NITA-U (2023), and Okello & Musoke (2022) identify antecedent factors as essential enablers of data governance mechanism development.

The regression model ($R^2 = 0.142, \beta = 0.38, p < .01$) demonstrates that *Data*

Governance Antecedents significantly influence Data Governance Mechanisms, explaining

14.2 % of their variability. Although moderate, this relationship is meaningful within governance and social science research, confirming that antecedent conditions are pivotal levers for enhancing data governance practices in Uganda's public sector. The result empirically validates Abraham et al.'s (2019) cross-functional data governance framework and underscores that sustained improvements in leadership, institutional policy, and organisational culture are critical to strengthening operational data governance mechanisms in line with the African Union's (2022) data policy priorities.

4.4.2.3 H03: Organisational Culture has no significant effect on Data Quality

The regression model for this hypothesis was statistically insignificant ($R^2 = 0.031$, $F(1, 85) = 2.74$, $p = 0.102$). The regression model summary results in Table 58 show that Organisational Culture accounts for only a 3.1% proportion of the variability in Data Quality. This, though insignificant in explaining variance in Data Quality, might not be a true reflection of the actual picture on the ground. Firstly, admitting that there are no data quality arrangements among public servants would become an indictment of the quality of their data governance and an admission of failure on their part. Even in responding to the question of rating data quality levels, the majority were undecided and non-committal regarding the prevailing Data quality standards in the public service ($M = 2.72$, $SD = 1.08$). Indeed, in many government ministries studied, there have been no deliberate attempts yet to guarantee data quality. Therefore, there is a need to be very cautious in the attempt to dismiss organisational culture as not being an important variable that influences Data quality. Therefore, this study found that Organisational Culture did not significantly affect Data Quality at a 95% confidence interval ($\beta = .177$, $t(85) = 1.66$, $p = .102$). Overall, this led to the rejection of the null hypothesis at a 5% percent level of significance.

Table 58:

Model Summary of Quantitative Results for the Third Hypothesis (H_{03})

Hypothesis		H ₀₃ : Organisational Culture has no significant effect on Data Quality.
Statistical Results		$R^2 = 0.031$, $F(1, 85) = 2.74$, $p = 0.102$, $\beta = .177$, $t(85) = 1.66$, $p = 0.102$. The model was statistically insignificant, indicating that organisational culture explained only 3.1% of the variance in data quality.
Interpretation of Results		The results suggest that organisational culture, while conceptually important, did not statistically predict data quality in this study. However, the low R^2 value may not accurately reflect the practical significance of organisational culture due to potential response bias and limited institutional awareness of data quality practices. The lack of significance could also indicate that the relationship between culture and data quality is mediated by other organisational factors such as leadership support, data governance mechanisms, and employee capability (Abraham et al., 2019; Gupta et al., 2024).
Theoretical Implications		Although the statistical results are insignificant, the findings are theoretically consistent with the literature that conceptualises organisational culture as an indirect but essential antecedent of data quality (Panian, 2021; Tallon et al., 2019). In weakly institutionalised settings, culture may shape behaviours and norms that influence how data is valued and managed, but may not immediately translate into measurable improvements in data quality (Khatri & Brown, 2010).
Contextual Implications (Uganda/Africa)		Within Uganda's public sector, the weak and inconsistent data management culture observed aligns with broader African challenges, including fragmented accountability structures and limited incentives for data stewardship (African Union, 2022; MOICT, 2023). The non-significant results may reflect cultural inertia and limited organisational learning around data quality rather than a genuine lack of influence. Strengthening value-driven organisational culture remains essential for improving data reliability and integrity in government systems.
Supporting Evidence	Scholarly	Abraham, Schneider, & vom Brocke (2019) posit that cultural factors influence data governance maturity through shared values and leadership engagement. Similarly, Panian (2021) and Gupta et al. (2024) highlight that data quality improvements are contingent upon sustained cultural change and top management support. African studies (Okello & Musoke, 2022; MOICT, 2023) affirm that cultural barriers—such as bureaucratic resistance and lack of ownership—undermine data quality assurance efforts across public institutions.

While the statistical model does not confirm a significant relationship, the theoretical and contextual evidence underscores the latent but critical role of organisational culture in shaping long-term data quality outcomes. The rejection of the null hypothesis at the 5% significance level is therefore supported on both theoretical and contextual grounds, rather than solely on statistical significance.

4.4.3 Integrative Evaluation of all the Research Hypotheses

The outcomes of hypotheses H_{01} , H_{02} , and H_{03} collectively provide a comprehensive insight into the structural and behavioural aspects of data governance within Uganda's public sector. The significant outcomes of H_{01} and H_{02} validated that data governance antecedents have a quantifiable impact on both data governance principles ($R^2 = 0.152$; $\beta = .39$; $p < .001$) and data governance mechanisms ($R^2 = 0.142$; $\beta = .38$; $p < .01$). These results confirm the cross-functional model proposed by Abraham et al. (2019), which identifies antecedents—such as leadership commitment, regulatory support, and organizational structures—as essential enablers that influence both the normative (principles) and operational (mechanisms) dimensions of governance.

Conversely, H_{03} , which examined the impact of organisational culture on data quality, produced statistically insignificant outcomes ($R^2 = 0.031$; $\beta = .177$; $p = 0.102$). Nonetheless, the theoretical and contextual analysis indicates that this lack of significance does not undermine the practical relevance of organisational culture. Instead, it emphasises the latent and indirect influence of culture as a mediating or moderating factor that determines how antecedents are assimilated into organisational routines and manifested in the quality of data

outputs (Panian, 2021; Khatri & Brown, 2010; Gupta et al., 2024). The perceived disparity between culture and quantifiable data quality in Uganda's public sector may arise from inadequate institutional integration of governance standards, insufficient data literacy, and minimal accountability incentives—circumstances that are similarly reflected in various African governance frameworks (African Union, 2022; Okello & Musoke, 2022; MOICT, 2023).

These findings indicate that structural antecedents (such as leadership and policy frameworks) have a significant impact on governance principles and mechanisms, whereas cultural antecedents influence the eventual realisation of data quality in a more gradual and systemic manner. This supports the idea that to achieve good data governance in developing countries, a holistic systems approach is necessary that not only builds formal governance structures but also fosters a culture of stewardship, trust, and accountability centred on data (Abraham et al., 2019; Tallon et al., 2019). In Uganda and comparable African settings, this cultural transformation constitutes the essential missing link between governance design and the actual quality of data outcomes.

4.5 PROPOSED DATA GOVERNANCE FRAMEWORK

Following the definition of a data governance framework (Subsection 2.4.1), a data governance framework serves as a blueprint for organising how data is managed and utilised within an organisation (Ladley, 2019; Lefebvre & Legner, 2024). As Weber et al. (2009) contend, there is no one-size-fits-all data governance framework; therefore, the framework developed in this study is contextualized for data governance in the Ugandan public sector.

4.5.1 Purpose of the Framework

The primary objective of this proposed framework is to establish a structure that facilitates the management, protection, and utilisation of public sector data resources. Ultimately, this is intended to enhance public service delivery, improve organisational performance, and comply with regulatory requirements, while also addressing data governance challenges and alleviating associated risks.

4.5.2 Framework Development Approach

The proposed framework was developed through an abductive reasoning approach, whereby empirical insights derived from primary data analysis were integrated with evidence from the literature review.

During the qualitative data collection, respondents provided in-depth responses regarding the existing data governance situation in Ugandan public sector organisations, the challenges and risks encountered, and proposed mitigation measures, which were subsequently validated in the quantitative phase.

The qualitative phase generated rich accounts from respondents regarding the prevailing data governance practices within Ugandan public sector organisations, the associated challenges and risks, and potential mitigation strategies. These emergent themes were subsequently validated during the quantitative phase, thereby enhancing the analytical rigour and reinforcing the validity of the framework. Figure 34 illustrates the process followed in developing the proposed framework.

Figure 34:*Framework Development Processes*

4.5.3 Principles of the Proposed Data Governance Framework

The overall design of the framework is premised on six principles that evolved from the analysis of the primary data collected in this study and the literature reviewed, namely i) Data Globalisation, ii) Whole-of-Government Approach, iii) Customer Centricity, iv) Accountability, v) Data Accessibility, and vi) Data Quality. The following is a detailed discussion of each of these principles.

First, Data Globalisation: Data internationalisation is a crucial prerequisite for efficient data governance, as evidenced by the examination of primary data and the existing body of literature. This was highlighted by one respondent, who stated that *"you also have the highest data demand at the end of the financial year because you are not only reporting on government frameworks but also on regional and international frameworks"*. This emphasises how data generated locally in Uganda must adhere to international standards in order for stakeholders worldwide to utilise it effectively. Therefore, the data globalisation principle mandates that governance systems and activities adhere to international norms, like those advocated by the

World Bank and the African Union, while also preserving national sovereignty (OECD, 2021; Kitchin, 2021). This is especially important in the Ugandan context because government ministries and agencies usually depend on globally comparable data in order to participate in regional integration initiatives (e.g., the East African Community) and to secure international development funding (Government of Uganda, 2020). Scholars warn, however, that globalisation of data should not lead to the imposition of external priorities at the expense of local needs; rather, a balanced approach is necessary to ensure interoperability, trust, and equitable use of data resources (Coche et al., 2024; Delacroix & Lawrence, 2018; Pansara, 2023).

Second, the whole-of-Government approach: The results of this study overwhelmingly indicated that data governance activities in the Ugandan public sector occur in silos with little collaboration among Ministries. As one respondent stated, “*We hold a lot of quality information, but because of silos, we are not able to share it, and the benefits are lost.*” Therefore, to alleviate the challenge of data governance fragmentation, the proposed framework must adopt a whole-of-government approach, designed with modalities for coordinating data governance activities across all Government Ministries, staff, processes, and data assets. The whole-of-government approach ensures inclusiveness and equity in the participation of all government stakeholders in data governance activities.

Third, Customer-centricity: This principle emphasises the importance of high-quality user-generated data and its effective utilisation by stakeholders. Findings from this study indicate that the majority of data within the public sector is either entered into the systems or generated directly by users. Consequently, the proposed framework must incorporate

provisions for strengthening stakeholders' capacity to produce accurate data, enhance their ability to use it effectively, promote data accessibility, and establish feedback mechanisms to continuously improve data quality.

Fourth, Accountability: As highlighted by Khatri and Brown (2010), data governance structures must be designed to ensure accountability of data across organisational contexts. In this regard, the accountability principle ensures clear ownership of the data assets. Considering the multiplicity of data producers/sources, domains, and stakeholders, the framework must provide a structure that supports data ownership, enables collective responsibility, enhances decision-making, and facilitates performance appraisal. This principle also ensures compliance with relevant regulations and policies, such as privacy and data protection legislation.

Fifth, Data Accessibility. Data accessibility refers to the ease with which stakeholders can discover, acquire, understand, and utilise data within an organisation. In the contemporary digital environment, where information is essential for operational efficiency, strategic planning, and policy development, data accessibility is crucial. Creating an environment where data is both accessible and usable by clients with varying levels of technological expertise is essential to ensuring data accessibility. This strategy is closely related to data sharing, which aims to break organisational silos by ensuring that data is integrated and accessible, rather than concealed in separate databases, thereby aiding in achieving organisational business objectives. Therefore, this principle ensures the openness and accessibility of data and its management processes, whether the data is a public good or a public utility.

Sixth, Data Quality: Data quality, as a principle of data governance, ensures data integrity, accuracy, and dependability at every stage of its lifespan, from its initial creation and collection to storage, usage and disposal. Data quality is one of the most recurring data governance principles in the existing literature (Abraham et al., 2019; Brous et al., 2016; Khatri & Brown, 2010). As one respondent stated, “*some of the officers who are supposed to be data owners don’t put sufficient time to ensure data quality*” thus, it is important to ensure data quality. Moreover, the realisation of all the other governance principles, including data globalisation, a whole-of-government approach, accountability, and data accessibility, is contingent upon the presence of quality.

4.5.4 Components of the Framework

As the literature analysis revealed, data governance occurs at both the macro level, which encompasses the international or national levels (OECD, 2019; Van Ooijen et al., 2019), and the micro level, which covers multi-organisations or individual organisations (Masilela & Nel, 2021; Rehman & Al-Raqom, 2020). It is in this regard that the proposed data governance framework has three core levels, namely i) the national and international level/environment, ii) the organisation level, and iii) the client level in order to enhance data governance at the respective levels. The following is a detailed discussion of the framework's components as illustrated in Figure 35.

4.5.4.1 *The National and International Environment*

The proposed framework has three core components at the national and international levels, namely: i) Legal and regulatory provisions, ii) Infrastructure, and iii) Country-specific effects. The following is a description of each of these components.

First, the National and International legal and regulatory provisions: The Uganda public sector data governance framework must be designed with capabilities to satisfy i) national and international legislations like the National Data Protection and Privacy Act (2019) or the General Data Protection Regulations - GDPR (Delacroix & Lawrence, 2018); ii) international standards like ISO 8000 standard for Data Quality and Enterprise Master Data Management (Al-Badi et al., 2018).

Second, National and International Infrastructure: The data governance initiatives in the Ugandan public sector will benefit from shared international infrastructure, such as communication infrastructure (e.g., undersea Internet cables, Internet Exchange Points (IXPs)), storage infrastructure (e.g., data centres), and High-Performance Computing (HPC) facilities.

Third, Country-Specific Effects: Data governance must be sensitive to the country's prevailing political, social, and economic conditions and priorities. Its activities and programs must be aligned with national priorities to obtain top leadership support and sponsorship.

4.5.4.2 *The Organisation Level*

At the organisational level, the data governance framework shall provide strategic and tactical data management. The strategic data management provisions include i) the

development and implementation of institutional data management policy and regulatory instruments such as data management strategies, standards, and guidelines, ii) data governance principles, iii) roles and duties, and iv) structure.

4.5.4.3 The Client Level

At the client level, the data governance framework shall provide for i) stakeholder management, which encompasses user control; ii) data accessibility, which ensures that users can access and use the data; and iii) user data capabilities, which covers capacity building and training of the users.

4.5.4.4 The Operational Level

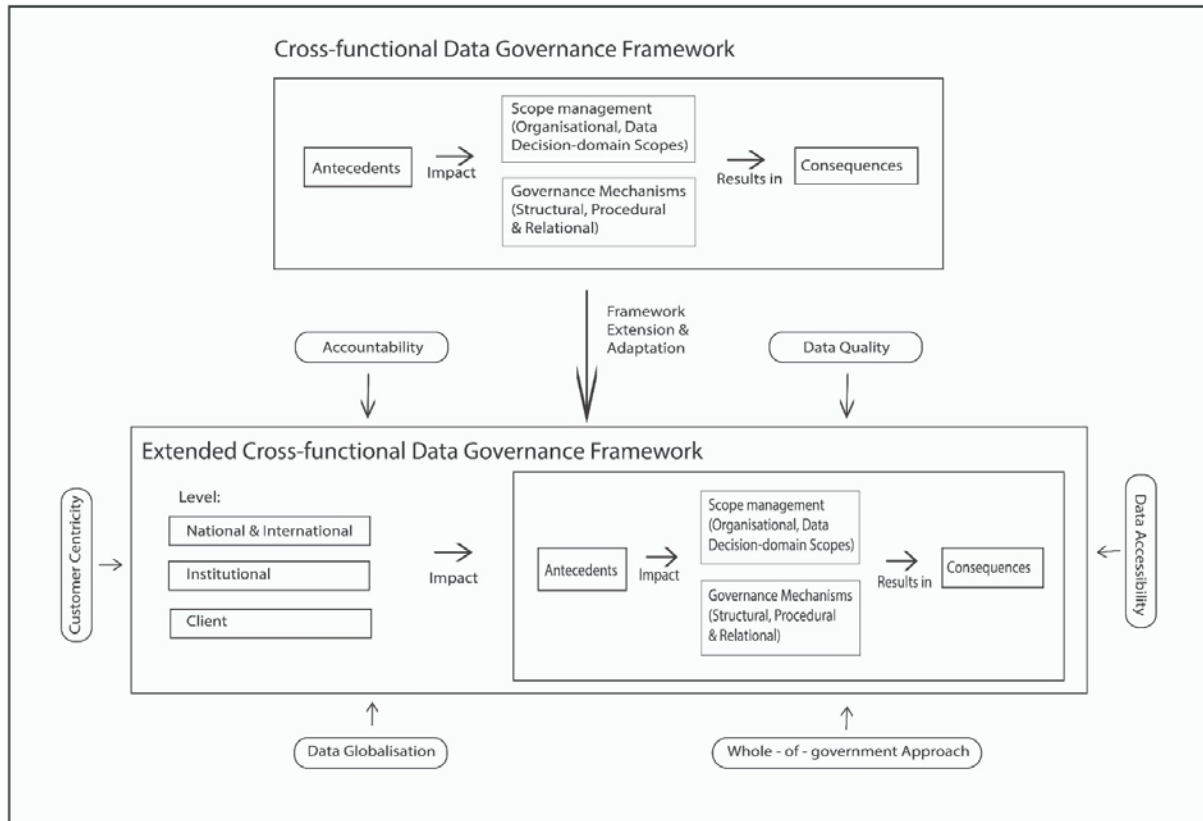
At the operational level, the framework, which extends the Abraham et al. (2019) cross-functional data governance framework, shall provide for the establishment of the required antecedents that, in turn, will impact the scope management and implementation of data governance mechanisms, resulting in either positive or negative data consequences.

4.5.4.5 Implementation Guidelines

The proposed framework is accompanied by a structured set of implementation guidelines, articulated through a pragmatic, phased checklist. The activities contained in the guidelines are specifically designed to facilitate the methodical implementation and execution of the proposed data governance framework. These guidelines are attached as Appendix J.

Figure 35:

The Proposed Public Sector Data Governance Framework for Uganda



4.5.5 Uniqueness of the Proposed Framework

The uniqueness of the proposed framework is manifested in four aspects, namely i) Data Internationalization, ii) Data for Public Utility, iii) Multistakeholderism Approach, iv) Risk Identification and Mitigation, v) Implementation guidelines, each of which is elaborated upon in the subsequent discussion.

First, consideration for data internationalisation. The literature reviewed (Al-Salim et al., 2022; Coche & Ocelík, 2024; Mugellini et al., 2021), along with the analysis of primary data from this study, indicates that Data Governance initiatives are implemented at the Institutional, Multi-Institutional, National, and International levels. Nonetheless, the requirements for data internationalisation must be addressed at these various stages. Therefore, the proposed framework provides for regulatory and legal provisions (such as bilateral and multilateral data sharing agreements and harmonisation of international and sovereign data regulatory frameworks), as well as the setup and operationalisation of international and national infrastructure, and the implementation of country-specific requirements.

Second, data as a public utility. The proposed framework recognises the evolving consideration of data as a public good by proposing to reduce data access fees and operational costs, and increase efficiency through coordinated efforts and shared infrastructure, data, and processes. This consideration will greatly enhance the availability and usability of data.

Third, the multistakeholderism approach. The framework emphasises the importance of balancing and satisfying the often divergent requirements of multiple data governance stakeholders, including data subjects, regulators, service providers, producers, collectors, generators, and consumers. In particular, extensive multistakeholder engagement in the formulation of data governance policies is essential for fostering legitimacy, building consensus, and securing broad-based support. Such engagement not only enhances the credibility of data governance initiatives but also increases their likelihood of effective implementation and sustainability.

Fourth, risk identification and mitigation. The literature reviewed indicated that failure to identify and mitigate risks is a critical shortcoming of most data governance frameworks (Al-Ruithe & Benkhelifa, 2017; Hanson et al., 2020; Ndulu et al., 2023). This research further investigated risks and potential mitigation measures in the governance of public sector data in Uganda (Subsection 4.3.1.2.4). Against this background, this framework prioritises developing a risk identification and mitigation strategy as a core instrument for effective governance of data. It offers a structured method for managing risks while guaranteeing adherence to regulatory requirements and harmonising data governance objectives with the entity's business objectives.

Fifth, provision for implementation guidelines. The review of existing literature conducted in this study revealed the absence of detailed implementation guidelines in most of the existing data governance frameworks. To address this gap, the present research proposes a set of comprehensive, actionable directives designed to facilitate the effective implementation of the developed framework, which are attached as Appendix J.

4.5.6 Relationship between the Proposed Framework and the Conceptual Model

The proposed framework extends the cross-functional data governance framework developed by Abraham et al. (2019), which serves as the conceptual model for this study. While the original model offers a structured foundation, it does not explicitly articulate the principles of data governance. The proposed framework addresses this limitation by embedding six guiding principles, namely i) Data Globalisation, ii) Whole-of-Government Approach, iii)

Customer Centricity, iv) Accountability, v) Data Accessibility, and vi) Data Quality. These principles collectively encapsulate the provisions of the framework and provide normative direction for governance practice.

In addition, the proposed framework introduces a three-tiered structure comprised of i) national and international, ii) institutional, and iii) client levels, which contrasts with the more general orientation of the Abraham et al. (2019) cross-functional data governance framework. This stratification reflects the layered nature of data governance in practice, thereby enhancing the framework's applicability to real-world contexts.

Nonetheless, at each tier, the framework incorporates the core dimensions of the original conceptual model: (i) antecedents, (ii) mechanisms, and (iii) consequences/outcomes. In this way, it preserves theoretical continuity with Abraham et al.'s (2019) framework while advancing a more comprehensive, principle-driven, and context-sensitive approach to data governance.

4.6 CHAPTER SUMMARY

This chapter begins with a discussion that demonstrates the trustworthiness, validity, and reliability of the research findings. The trustworthiness of the research findings was illustrated using Guba's (1981) model of four parameters (i.e., credibility, reliability, confirmability, and transferability). For the reliability of the findings, the researcher piloted the data collection instruments (Creswell & Creswell, 2018), which were subsequently refined to ensure the collection of reliable data.

Furthermore, the validity of the results was enhanced by ensuring that the questions in the data collection instruments were well-aligned with the research objectives (Bhattacharjee, 2012; Saunders et al., 2009). This was achieved by i) member checking, where selected experts reviewed the instruments and proposed improvements, ii) interviewing respondents until the saturation point was reached, where no new ideas could be generated, and iii) triangulating the results from the qualitative phase with those from the quantitative phase.

Using a mixed-methods approach, this study investigated data governance practices in a multi-institutional setting from the viewpoint of Uganda, a developing nation. By answering four research questions and testing four hypotheses, the study achieves its goal of improving understanding of the data governance concept and offering practical knowledge to data governance practitioners. During the interpretation and analysis of the findings from this study, both the qualitative and quantitative findings are triangulated to enhance the validity and credibility of the results from this mixed-methods study.

Both the qualitative and quantitative data collected contained demographic data on the respondents and the organisations they worked for. The descriptive statistics generated from the demographic variables of both the respondents and the organisations were then used to augment the major findings. For example, it was established that all respondents in the qualitative phase held a postgraduate qualification, with all of them possessing a master's degree and one holding a Doctor of Philosophy degree. This finding was used to confirm that these respondents had advanced knowledge that empowered them to understand matters of data governance in their organisations.

This study was based on the Abraham et al. (2019) cross-functional data governance model, which theorises that data governance antecedents impact the scope of data (i.e. organisational scope, data scope, and domain scope), which in turn influences the data governance mechanisms and subsequently results in positive or negative consequences.

The results of the qualitative study were used to answer four research questions. The first research question, “*RQ1: What are the requirements for effective data governance?*” This research question aimed to identify the essential components of a data governance system that are necessary for data governance initiatives to be successful. The findings indicated that the components that should be in place are in two categories, i) internal components within the organisation which include top leadership support, internal policies and strategies, IT Systems, and data governance decision centres; and ii) the external components that exist outside the organisation which include the national legal and regulatory provisions, data demands, and industry compliance needs. This finding was aligned with the Abraham et al. (2019) cross-functional data governance model, which posits that the main requirements for effective data governance are the antecedents.

The second research question was “*RQ2: What organisational provisions have been established to manage data assets?*” The purpose of this question was to understand Uganda's current public sector data governance provisions. The findings indicated that the current public sector data governance provisions in Uganda encompass the management of various data types, data governance principles, structures, roles, and duties, as well as coordination, IT infrastructure (e.g., data centres and networks), and Information Systems. Subsequently, it was

confirmed that these current provisions are in line with the Abraham et al. (2019) cross-functional data governance model constructs, namely scope and data governance mechanisms.

The third research question, “*RQ3: What challenges do government employees face while managing data in Uganda?*” aimed to identify the current challenges that public sector organisations encounter when managing data in Uganda. The responses to this were summarised as i) lack of an enabling policy and regulatory environment, ii) technological challenges, iii) inadequate ICT infrastructure, iv) data requirements challenges, v) data sovereignty issues, vi) cultural effects, and vii) lack of funding.

Lastly, the fourth question, “*RQ4: What is the effect of the employees’ attitude towards data management on the quality of data held in that Ministry?*” sought to ascertain how the respondents' attitudes, convictions, and actions toward data management responsibilities related to the quality of the data held in the public sector organisations in Uganda. Every respondent expressed agreement that the organisation's culture influences data management activities such as data protection, sharing, and security. However, in the prevailing situation, one respondent emphasised that there is a poor culture of managing data, while another asserted that the culture has improved, as evidenced by fewer incidences of data losses and inaccurate information. At this stage, the overall impact of employees' attitudes towards data management on the quality of data held in public sector organisations in Uganda could not be sufficiently determined using the qualitative findings alone. It was anticipated that the findings from the quantitative findings (discussed in Subsection 4.4.2.3) would provide more insights into this parameter.

During the second phase of this study, the quantitative data findings were presented and subsequently interpreted in line with the research hypotheses. This study tested three hypotheses. The first null hypothesis, “*H01: Data Governance Antecedents have no significant effect on Data Governance Principles.*” The results from the test of this hypothesis indicated that the regression model was statistically significant ($R^2 = 0.152$, $F(1, 100) = 17.97$, $p < 0.01$). These results demonstrated that Data Governance Antecedents explained a significant proportion (15.2%) of the variation in Data Governance Principles. Thus, this led to the rejection of the null hypothesis at a 5% significance level.

The second hypothesis (H02) posited that “*Data Governance Antecedents have no significant effect on Data Governance Mechanisms.*” The test results of the regression model for this hypothesis indicated that it was statistically significant ($R^2 = 0.142$, $F(1, 100) = 16.49$, $p < 0.01$). The regression model results indicated that Data Governance Antecedents account for 14.2% of the variability in Data Governance Mechanisms. It was also established that Data Governance Antecedents significantly predicted Data Governance Mechanisms, with a 95% confidence interval ($\beta = 0.38$, $t(100) = 4.06$, $p < 0.01$). Overall, the null hypothesis was rejected at a 5% significance level.

The third hypothesis posited that “*Organisational Culture has no significant effect on Data Quality.*” The regression model for this hypothesis was found to be statistically insignificant ($R^2 = .177$, $F(1, 85) = 2.74$, $p = .102$). The regression model results indicated that Organisational Culture accounts for only a 3.1% proportion of the variability in Data Quality. This, although insignificant in explaining variance in Data Quality, might not be a true reflection of the actual picture on the ground. Confirmation of the lack of data quality

management controls by the public servants would become an indictment on the quality of their data governance and an admission of failure on their part. Even when responding to the question of rating data quality levels, the majority were undecided and non-committal regarding the prevailing data quality standards in the public service ($M = 2.72$, $SD = 1.08$). Indeed, the qualitative findings also confirmed the lack of data quality controls. However, it is recommended that further inquiries be conducted in the future on the influence of organisational culture on data quality. Overall, this study established that Organisational Culture did not significantly affect Data Quality at a 95% percent confidence interval ($\beta = .177$, $t(85) = 1.66$, $p = .102$).

In general, the findings of this study indicated that all four research questions were addressed, and the three hypotheses were satisfactorily tested, meeting the objective of this mixed-methods study by enhancing the understanding of the data governance concept and providing practical solutions to data governance practitioners.

CHAPTER 5: IMPLICATIONS, RECOMMENDATIONS, AND CONCLUSIONS

This Chapter discusses the implications, recommendations, and conclusions from this study based on evidence from the analysis of findings and the reviewed literature. This chapter commences with an introduction that relates the research results to the research aim, questions, and hypotheses. The next section examines the operational implications obtained from the study's findings. The subsequent section presents a discussion of proposals that diverse stakeholders may consider adopting in light of the research findings. The chapter subsequently outlines proposals for future research that other scholars may undertake.

5.1 INTRODUCTION

This study acknowledges the increased uptake of digital services, leading to exponential growth in the volume of data by Government Ministries in the Ugandan public sector. Data constitutes a critical enterprise asset that is essential to informed decision-making, policy development, and productivity enhancement. The study is premised on the idea that, in Uganda, the public sector has made significant expenditures in automating services but has not treated data as a vital resource with the importance it deserves.

Moreover, the literature assessment carried out for this study demonstrated that data governance is not just a phenomenon that has received little research (Lis & Otto, 2020; Abraham et al., 2019), but its practice is still nascent and is continuously evolving due to its dependency on Information Technology (Alhassan et al., 2019; Gelhaar et al., 2021; Korhonen et al., 2013). Additionally, the majority of previous scholarly works (Berman, 2017; Cheong

& Chang, 2007; Hagmann, 2013; Panian, 2010) focused on investigating data governance from the perspective of a single organisation. Consequently, this study explores data governance practices in a multi-institutional setting in Uganda's public sector.

Overall, this research aimed to provide valuable insights into data governance practices and advance the understanding of the data governance phenomenon. In particular, this research sought to investigate data governance processes in a multi-institutional environment from the viewpoint of a developing country like Uganda. The ultimate output of this research is a contextualised data governance framework appropriate for developing countries.

The study employed a sequential exploratory mixed-methods approach. Initially, qualitative data on the current and ideal data governance requirements of public sector organisations were collected from a sample of five representatives drawn from five ministries of the Government of Uganda. Later, quantitative data were collected from twenty-two Ministries and analysed using SPSS Software. One of this study's shortcomings is that it focused on the Central Government by sampling respondents from Ministries while ignoring the Local Government Administrations and Parastatals. It is also important to note that ethical considerations intended to minimise bias, protect the respondent's identity, and secure the integrity of the data were prioritised during this study.

The qualitative data collected were used to answer four research questions, namely: i) RQ1: What are the requirements for effective data governance? ii) RQ2: What organisational provisions have been established to manage data assets? iii) RQ3: What challenges do government employees face while managing data in Uganda? and iv) RQ4: How does the

employees' attitude towards data governance affect the data quality held in public sector organisations?

Conversely, the quantitative data collected were used to test four hypotheses derived from the research questions and the Abraham et al. (2019) cross-functional data governance model on which this study is based. These hypotheses, namely i) H_{O1} : Data Governance Antecedents have a significant effect on Data Governance Principles, ii) H_{O2} : Data Governance Antecedents have a significant effect on Data Governance Mechanisms and iii) H_{O3} : Organisational Culture has a significant effect on Data Governance.

The research questions and hypotheses aimed to evaluate the requirements for effective data governance, the current provisions that public sector organisations have in place for data governance, the challenges faced while managing data and their proposed mitigations, and to investigate whether organisational culture has a significant impact on data quality. Against this background, the primary purpose of this study was to enhance the comprehension of the data governance phenomena and offer practical advice for those who implement data governance

The next sections of this chapter discuss the study's implications (Section 5.1), recommendations for application (Section 5.2), future research considerations (Section 5.3), and conclusions (Section 5.4).

5.2 IMPLICATIONS

This section presents the anticipated implications of the study. It discusses how some identified limitations have affected the interpretation of the results. It also explains how the

results are significant, meet the study's objectives, and align with the conceptual framework. Additionally, the section examines whether the results align with the existing literature and provides plausible explanations for unexpected or contradictory outcomes. The section concludes by analysing the study's academic and applied contributions to the data governance domain.

5.2.1. Understanding of Data Governance

The results of this study will expand our theoretical and practical knowledge of data governance implementation in the civil service of developing countries. An overview of the scholarly works on data governance through literature review reveals a dearth of studies that specifically examine data governance in a multi-institutional context from the standpoint of a developing nation (Abraham et al., 2019; Al-Ruithe et al., 2019; Al-Ruithe et al., 2018; Brous et al., 2016; Lillie & Eybers, 2019; Niemi, 2015; Ramadhan et al., 2021).

A quick scan of the literature revealed a few studies that have been done in African countries in the Data Governance domain, as analysed in Table 59.

Table 59:

A Scan of Studies on Data Governance in Africa

Author(s)	Aim	Scope	Methodology	Key Findings
i.Masilela and Nel, 2021	This study aimed to determine whether integrating cybersecurity and data governance techniques may enhance	Three South African government ministries participated in the study.	This inquiry employed a qualitative methodology with a series of case study designs. A	This study established the insufficiency of national systems, management processes,

Author(s)	Aim	Scope	Methodology	Key Findings
	data governance in public sector organisations.		content analysis was used to examine the collected raw qualitative data.	governance regulations, and information security governance practices.
ii.Herselman et al., 2019	This study aimed to build a framework for assessing the level of data governance maturity for South African Government Departments in the Eastern Cape.	The study was conducted in four Government Ministries in the Eastern Cape Province of South Africa.	Applied the design science methodology to construct a data governance framework.	Proposed a structure for assessing the level of data governance maturity across government agencies in the Eastern Cape province of South Africa.
iii.Mullon and Ngoepe, 2019	The study aimed to develop a national integrated information governance framework for South Africa.	The study utilised secondary data on information governance in South Africa, sourced from official government documents and a literature review.	Used content analysis of policy documents, legislative frameworks, and literature review.	Established lack of national data governance, and that only a few elements of Information Governance are governed by laws or policies. The study proposes a framework for contextual data governance.
iv.Were and Moturi, 2017	The study aimed to determine the current status, motivations, and challenges of data governance in Kenya's health regulatory agencies.	Qualitative and quantitative data were gathered from employees of eight health professional regulatory agencies in Kenya.	The conceptual framework for the inquiry was based on the data governance constructs presented by Khatri and Brown (2010).	Highlighted that data governance drivers are quality, customer satisfaction, security, and efficiency. The challenges were a lack of awareness and management sponsorship.

The results of this quick literature scan, as summarised in Table 59, reveal i) unequal distribution of the countries where the studies were done (three of the six studies were done in South Africa), ii) a multiplicity of disciplines (e.g., only two of the six studies are in the realm of information systems, i.e., Masilela and Nel (2021), and Benfeldt et al. (2020)), and iii) most of these research were carried out in a public sector environment (four of the six studies were conducted in public sector organisations, i.e., Masilela & Nel, 2021; Herselman et al., 2019; Mullon & Ngoepe, 2019; Were & Moturi, 2017). It is worth noting that none of these peer-reviewed research studies were conducted in Uganda. The evidence available to the researcher suggests that this could be a pioneering study from the perspective of Uganda. Therefore, this study's outputs are envisaged to enhance the knowledge reservoir on data governance in the Government sector of a developing country.

5.2.2. Awareness Creation

Analysis of the quantitative findings revealed that, in general, all the respondents indicated they were unsure if communication had helped improve data governance in their organisations. However, the qualitative findings indicated that all the respondents agreed that Communication helped to improve data governance in their organisations. It was mentioned that, before introducing various data management activities, facilitating communication between departments and other public entities helped build consensus, leading to improved data governance. Furthermore, the results revealed that advocacy programs were used to convince top management of the benefits of digitisation and proper data management. The respondents also indicated that internal communication helped the departments own the submitted data, thus improving quality. Other forms of communication mentioned by the

respondents included electronic platforms where staff are constantly guided on how to use the information systems, informed of procedure changes, and trained on data governance.

Furthermore, all the respondents unanimously agreed that the lack of adequate communication of the benefits poses a significant obstacle to implementing data governance. This finding was further reinforced by the quantitative finding, which demonstrated that all the respondents strongly agreed that the absence of communication significantly hampers the successful implementation of data governance activities.

The results of this investigation are consistent with the body of current scholarship, where numerous scholars (Cave, 2017; Hagmann, 2013; Herselman et al., 2019) have advocated for effective and strategic communication as a crucial success factor in data governance. This alignment with established research positions this study's findings as valuable input for raising awareness among government agencies and the global community of data governance practitioners, both in Uganda and beyond.

5.2.3. Contribution to Data Governance Practice in Uganda

In the current data-driven landscape, organisations are grappling with ever-increasing data volumes. Government entities' large volumes of data necessitate the adoption of appropriate data governance strategies and techniques for effectiveness. This study adds significant value to the field of data governance, providing the practitioner community with insightful information. It delves into practical data governance implementation techniques in the Ugandan public sector, aiming to equip data governance practitioners with a comprehensive

understanding of the practice, its challenges, and the regulations governing data governance. Thus, this research significantly contributes to the data governance knowledge reservoir by enhancing comprehension of the phenomena and disseminating additional information on implementing effective data governance initiatives.

5.2.4. Contribution to International Data Governance Practice

The results of this study on data governance in the public sector in Uganda will have significant impacts on other countries, offering valuable benchmarks, highlighting potential obstacles, and influencing the design of their own contextualised data governance frameworks.

Firstly, it contributes to the formulation of data regulatory governance instruments. Insights from this study can help other countries to benchmark and learn from the practical recommendations. This study examines the legal and regulatory provisions governing local, regional, and international data governance. The findings from these reviews can be adapted for implementation in other jurisdictions by customising them to suit their specific needs and regulatory environments.

Second, the adoption of the developed data governance framework. Other countries can further study the data governance framework for application in their own settings. Particularly, countries with similar technological, economic, political, and social settings can easily adopt the framework developed in this study.

Third, promoting international collaboration: This study provides practical insights for effective international cooperation that include i) systems and data interoperability, ii) data governance infrastructure sharing, iii) cross-border data-sharing, iv) data internationalisation by developing common standards and adopting best practices, and v) promoting international regulatory compliance. This further enhances the aspirations of regional data governance frameworks, such as those of the EU and the African Union (AUC, 2022), which are analysed in this study.

Fourth, learning from the data governance shortcomings highlighted in this study. This study identifies risks and challenges, including inadequacies in data governance skills, funding, and technology, and proposes potential solutions. Hence, other countries can benchmark on the findings of this study to resolve and avoid pitfalls that have already been identified.

Above all, the results from this study on governance of data in the Ugandan public sector, which undertakes an extensive inquiry into the data governance requirements, existing practices and the challenges along with their potential solutions, offer valuable insights for enhancing data governance in other nations, especially developing countries.

5.3 RESEARCH ASSUMPTIONS, LIMITATIONS AND DELIMITATIONS

This subsection discusses the research assumptions made at the study's commencement, the limitations or challenges encountered during its conduct, and the delimitations intentionally developed to make the study manageable.

5.3.1 Assumptions made in this Study

This study considered certain assumptions that were expected to remain valid throughout its duration.

First, ethical assumptions. It was assumed that the respondents would not have any issues providing their informed consent. However, during the study, the researcher had to go to great lengths to convince the respondents to fill out the consent form, sign it, and return it. This was compounded by the fact that the interviews were conducted solely online. On the other hand, respondents who may have had reservations about participating in this study were reassured that their personal identification data and responses would be kept confidential, with the researcher making every effort to ensure this confidentiality. The participants were further assured that, in instances where their names or those of their parent institutions were to be mentioned, these names would be kept generic or pseudonymized. Additionally, the respondents were given assurance that their responses would be used for academic purposes.

Second, the validity of responses. The respondents were expected to voluntarily provide accurate information and facts in response to the questions asked. Additionally, it was presumed that the respondents would give complete responses to all the questions using the data collection tools. The respondents' responses were accurate, as the primary data results align with the literature reviewed, as evidenced by the outputs of this research.

Third, participant availability. The selected sample was presumed to be accessible and amenable to research participation. Additionally, considering the critical significance of a study on governance of data within the public sector, it was presumed that the respondents, predominantly senior government officials, would be highly motivated to participate in the

research. The results and the researcher's personal experience suggest that the research participants were eager to receive the study's findings and recommendations, which would help advance data governance practices.

Fourth, availability of resources. It was assumed that the research could be conducted within the time set by the UNICAF University for each stage. Additionally, the researcher assumed he would have enough financial resources to conduct the study.

Fifth, researcher bias. The researcher was expected to control his emotions, subjectivity, and prejudices to avoid affecting the study. Through capacity building, the researcher developed professional interviewing mechanisms that helped to prevent the introduction of researcher bias in this study. If any personal bias had slipped into the study, it was unintentional and highly regretted.

Overall, these assumptions were considered when designing and implementing the study to ensure their impact on the veracity and accuracy of the research findings was reduced to acceptable levels.

5.3.2 Research Limitations

The limitations encountered in this study emerged as weaknesses or constraints that could potentially affect the dependability, validity, or generalizability of the results.

First, research design. This monolithic case study focused on data governance in central government ministries, which could complicate generalising the findings to other government institutions that are not part of the central government ministries, such as local government administrations and Parastatals. However, there is limited variability in the structure, operations, funding, and governance of public institutions in Uganda; hence, the findings of this research can still be utilised to generalise the situation in the public sector as a whole.

Second, the impact of the COVID-19 epidemic. This research was conducted during a period when the global community was experiencing the consequences of the COVID-19 pandemic, resulting in a nearly two-year lockdown that restricted people's movement and limited the spread of infections through human-to-human contact. This situation impeded the collection of data. There were limited physical interactions, and some respondents were not in the best of moods at the time. However, the researcher used innovative tactics to convince the respondents to take time off and participate in the study.

Third, time constraints. The researcher had to conduct this study while continuing to work full-time. This resulted in shortfalls in the time available to complete the research due to a demanding work schedule at the workplace. However, the researcher could frequently take leave and extensively use nights, weekends, and public holidays to do most of the work whenever possible.

Fourth, sample size and selection. In the first part of this mixed-methods research, which was qualitative in nature, convenience sampling was used to produce a non-random

sample of six ministries. Nonetheless, this technique could potentially introduce bias, as a sample selected in this manner may not accurately represent the population. However, the likelihood of this bias occurring was significantly reduced because central government ministries are homogenous in most characteristics, such as organisational structure, resources, equipment, and location. Additionally, a small sample size of six ministries may raise concerns about the generalizability of the findings. However, this was mitigated by ensuring data was collected up to the saturation point during qualitative interviews.

Fifth, methodological constraints in the interviewing techniques. During the qualitative data gathering, respondents were asked a variety of questions, and their responses were based on their ability to recall events that had transpired or that they intended to undertake at their institutions. While the respondents were not restricted from consulting other colleagues or referring to official documents, they all preferred to give responses off the cuff as the interview progressed. This approach could have introduced some respondent bias due to memory recall failure or the desire to present themselves or their institutions in a favourable light.

5.3.3 Research Delimitations

Study delimitations refer to the deliberate decisions made by a researcher to define the parameters and boundaries of the research. The delimitations outlined here describe the particular features that constrain the study. Two major delimitations were encountered in this research.

First, the conceptual framework. This study was based on the Abraham et al. (2019) cross-functional data governance framework, which comprises four constructs, namely i) Data

Governance Antecedents, ii) Data Scope, iii) Data Governance Mechanisms, and iv) Data Governance Consequences. While the qualitative phase covered the whole framework, the quantitative part did not cover the data scope construct but instead introduced the data principles and organisational culture constructs. This study aimed to assess the impact of these two constructs on data governance. After that, if the results return positive, the researcher would consider extending the cross-functional data governance framework developed by Abraham et al. (2019) to include these constructs. Therefore, while the model applied in this study had fewer variables than the original Abraham et al. (2019) cross-functional data governance framework for the quantitative phase of this mixed-methods study, this was done intentionally to facilitate proposing an extension of this framework.

Second, the study population. This study aimed to investigate data governance in government entities in Uganda. The research population was restricted to the central government ministries, mainly with headquarters in the cities of Kampala and Entebbe. This population scope limitation was intentional in helping make the study manageable, considering the financial and time constraints that the researcher faced.

Third, the implementation requirements for the proposed framework. Resources are needed to successfully set up and operationalise the proposed data governance framework. However, due to financial and time constraints, this study did not investigate the requirements for operationalising the framework developed in this study with respect to inputs such as the implementation roadmap and financial budget. This shortfall is proposed as a potential area for future investigation. Nonetheless, this study provides implementation guides, which are attached in Appendix J.

Overall, the research assumptions, limitations, and delimitations that were established or encountered in this study were extensively examined, and remedies were developed to either benefit from their positive impacts or minimise their negative consequences. By clearly articulating a study's delimitations, researchers can ensure a well-defined and manageable investigation, ultimately contributing to more reliable and meaningful research findings.

5.4 RECOMMENDATIONS FOR APPLICATION

This section presents the recommendations for implementation, which are premised on the studied literature and research findings.

5.4.1. Policy Formulation

The recommendations from the research findings will be used as input for policy formulation and regulation of data governance in the Ugandan Public Sector.

Based on the analysis of findings from the research question “*What challenges do government employees face while managing data in Uganda?*” which sought to establish the current public sector data management challenges in Uganda, the most recurring response indicated a lack of an enabling policy and regulatory environment for data governance. Hence, based on the responses regarding external data governance antecedents, the respondents confirmed that no national public sector data governance framework, either in terms of policy or strategy, exists. However, many scholars have established that data governance policies are critical success factors for data governance (Al-Hassan et al., 2019; Al-Ruithe et al., 2017;

Mahanti, 2018). Therefore, the government must consider developing an overarching national data governance policy.

Furthermore, from the analysis of the internal data governance antecedents, it became apparent that most respondents did not have institutional data governance policies in their organisations. Relatedly, the descriptive statistics from the quantitative data analysis indicated that only 6.9% of the organisations had a data governance policy/strategy in place. Therefore, as a policy recommendation, there is a need for individual public sector organisations to develop institutional data governance protocols, guidelines, and policies that should be harmonised with the overarching national data governance policy. According to Gartner (2024), 80% of firms' data governance initiatives will fail due to a lack of strategy that aligns with company objectives.

Above all, since the development of national public policies and the general provision of public services in a nation depend on reliable data, public sector data governance is essential to effective government planning.

5.4.2. Data Governance Funding

The results of this study indicate inadequate funding for data governance activities in public sector organisations in Uganda. Whereas there is a clear interest in having effective data governance, as exemplified by the enactment of national legislation and investment in ICT infrastructure/systems, the results indicated a lack of commensurate investment in funding data governance activities. This finding aligns with the existing literature, highlighting that

sponsorship for data governance activities is vital for effective data governance (Garip & Ateş, 2023).

Relatedly, while this study's findings indicated that top leadership support for data governance is generally present, top leadership support and collaboration are still needed to prioritise data governance. Additionally, organisational data governance needs must continue to be articulated and communicated.

Above all, there is a dire need in Uganda, as well as in any other country with similar economic conditions, to advocate for sufficient funding to meet the demands necessary for executing data governance initiatives amidst numerous competing priorities. Securing funding for data governance initiatives is crucial, as these efforts require resources to implement and maintain effective data management frameworks. Funding can be obtained from various sources, depending on the entity's size, sector, and strategic priorities. The following is an overview of potential funding avenues and strategies for obtaining funding for data governance initiatives.

First, the Government of Uganda's budget allocation. The most reliable funding source is internal budget allocation, where the ministry designates a portion of its operating budget to data governance. However, a compelling business case that outlines the value of data governance, including cost savings from improved efficiency, risk reduction from enhanced data security, and increased revenue opportunities from better data utilisation, is needed. Such a business case shall help to secure executive sponsorship by aligning data governance goals with strategic business objectives, such as digital transformation, regulatory compliance, and

customer trust. Additionally, a cost-benefit analysis may be necessary to quantify the investment gains from data governance initiatives, including both short-term and long-term benefits, such as reduced cybersecurity incidents and improved decision-making.

Second, project-based funding. Data governance can be integrated into specific projects, such as digital transformation, data integration, or compliance initiatives, where it becomes part of the project's overall budget. To realise this objective, it is vital to position governance of data as an essential component of all business initiatives.

Third, grants funding. Governments and development partners such as intergovernmental organisations and civil society organisations often provide grants and other related funding opportunities for data-related initiatives, especially those focused on innovation, public safety, or compliance with regulations. It is recommended that applications for grants focusing on digital innovation, data science, and cybersecurity be submitted to relevant authorities to obtain additional funding. Notably, joint applications for funding or collaborative projects can increase the chances of securing grants.

Fourth, public partnerships. It is proposed that collaboration be sought with other Ministries, Departments, and Agencies that may benefit from improved data governance to share the costs and resources. Additionally, partnerships may be sought from public sector organisations with mandates for data governance and security, who may have budget provisions for supporting implementing agencies. Efforts should also be made to seek Regulatory Compliance Funding. For example, compliance with data protection regulations or

health safety standards may provide opportunities to apply for grants aimed at improving data governance.

Fifth, private-public partnerships. Public Sector organisations can seek funding from private sector companies, such as those in the technology, finance, and consulting sectors, with a vested interest in robust data governance. Engagements may be made with technology vendors who may co-fund data governance initiatives as part of broader technology implementation projects, particularly when adopting their data management or security solutions. Partnerships may also be sought with consulting firms that specialise in data governance. These firms may offer co-funding arrangements, especially if the project can serve as a showcase or case study. Relatedly, support may be sought from Corporate Social Responsibility (CSR) programs of large corporations that fund projects with a social impact, such as data governance initiatives aimed at improving transparency, privacy, or public health data management.

Sixth, cost-saving opportunities. Sometimes, organisations fund activities through cost-saving programs that arise from improved efficiency and process optimisation. Therefore, it is necessary to demonstrate how effective data governance can lead to cost reductions in data storage, data retrieval, and regulatory compliance. Then, we propose reinvesting savings into data governance initiatives, thus creating a virtuous improvement cycle.

Funding data governance initiatives requires a multifaceted approach that combines internal advocacy, strategic partnerships, and exploring external funding opportunities. By demonstrating the strategic significance of data leadership and administration, aligning with

business objectives, and effectively communicating the potential Return on Investment, organisations can secure the necessary funding to build robust and effective data governance frameworks.

5.4.3. Information Technology

Information Technology plays a vital role in the execution of data management activities. As established in this study, data lifecycle management activities, such as data gathering, system entry, validation, analysis, storage, and presentation, among others, heavily rely on Information Technology. Therefore, it is essential to propose information technology recommendations for application in the Uganda Public Sector Data Governance, which include the following.

First, modernise the ICT systems and equipment. This study's findings revealed that some public sector organisations still use outdated technologies that do not meet current data governance requirements. For example, one of the challenges identified was that some legacy desktop applications are still in use. Systems such as the National Identity Card System and the National Voters Registration System have limitations, including the absence of i) a mobile phone application interface, ii) QR (Quick Response) code functionality, and iii) iris or face biometrics capabilities because their codebases were built using outdated technologies (Ayang, 2022). Therefore, this study recommends an urgent need for continuous investment in suitable technologies to address the increasing data governance technological requirements.

Second, data governance platforms: The literature examined in this study affirmed the significance of utilising comprehensive platforms that amalgamate diverse facets of governance of data, including metadata control, data quality assurance, and regulatory adherence auditing, through the deployment of digital tools such as automated data dictionaries (Berman, 2017; Brahmantara et al., 2021; Nokkala, 2020). However, the quantitative results analysis indicated a lack of digital tools to support data governance. For example, only 32.4% of the organisations had a data dictionary and could not automate their metadata management. Relatedly, there is a need to implement specialised tools and frameworks to govern large-scale data environments, such as data lakes and big data platforms, ensuring that governance practices scale with the volume and complexity of the data. Hence, this study recommends the acquisition of data management platforms to automate the data governance processes.

Third, data architecture. The findings indicated that the data architecture of the information systems implemented in public sector organisations needs to be improved to enhance data exchange and sharing of processes. For example, all the respondents in the qualitative survey indicated that they did not have a definite data assets architecture attuned to sharing data with other government institutions. One respondent mentioned that “*emphasis is put on having a well-controlled system with easy access and use of data restrictions.*” The scholarly works reviewed in this study revealed that Data architecture, which can be described as an enterprise-wide framework that aligns the business strategic data requirements with the design approaches and data models, is an essential parameter for successfully executing a data governance initiative (Ladley, 2019).

5.4.4. Continuous Data Governance Operations Improvement

The primary data analysis results from this study (subsection 4.4.4.1.4) indicated the existence of a laissez-faire attitude toward data governance among government employees. Therefore, a continuous approach to data governance improvements is recommended. The specific proposed actions include the following.

First, training and capacity building. Government employees require continuous training and capacity building to deliver effective data management services. Therefore, continuous training must be the norm, and reference materials must be developed to educate civil servants about data governance regulations and policies, assigned governance functions, and best practices for data management.

Second, awareness creation. Public-sector organisations should run awareness campaigns to foster a culture of data stewardship and ensure staff comprehend its significance and their responsibilities. Awareness is essential to instilling a shared vision among the players involved in data governance (DAMA, 2017; Lardley, 2019).

Third, performance monitoring and continuous improvement. One key attribute of effective Data Governance is the availability of performance monitoring and evaluation mechanisms. Establishing feedback mechanisms to communicate challenges and mitigation measures can enhance the continuous improvement of data governance. Similarly, developing and implementing Key Performance Indicators (KPIs) can help evaluate the effectiveness of data governance activities, including conformity rates, data quality metrics, and incident response times.

Enhancing employee performance through training, capacity building, and awareness creation on the importance of data governance, coupled with performance monitoring, will lead to sustained data governance performance.

5.4.5. Data Governance Infrastructure

Data governance infrastructure refers to the resources and tools organisations use to oversee their data resources efficiently. An effective data governance structure is crucial for maximising the significance of an organisation's information and reducing the risks associated with data governance. A practical framework for governing data ensures data accessibility, integrity, safety, and adherence to legal obligations. The following considerations are presented for establishing and maintaining an efficient data governance infrastructure within the Ugandan public sector, based on a literature review and analysis of the findings from this research.

First, the availability of data management tools. The findings from this study indicate that most ministries use information management systems to manage data throughout their lifecycle. Similarly, the literature reviewed confirmed the prevalence of information management systems in data collection, processing, and dissemination (Gillwald et al., 2019; Ngabirano et al., 2017). Beyond electronic government systems, there is a necessity for data governance tools that assist government organisations in discovering, understanding, and effectively managing their data assets. The recommended action areas in this regard include:-

- i) Using tools to manage master data, thus ensuring consistency and accuracy of critical business data across various systems and processes, ii) putting in place tools that offer a

centralized inventory and management of data resources (e.g., metadata, data lineage, and data classification), iii) implementing tools that automatically evaluate and enhance data quality by detecting errors, inconsistencies, and duplicates. Data quality control tools are vital for maintaining accurate and trustworthy data. Examples of such tools include i) data mining systems that help organisations identify and solve complex business problems by analyzing data from large datasets to reveal subtle patterns and relationships and ii) data warehousing/business intelligence tools, which are back-end platforms that help organisations to collect, process and maintain large quantities of disparate data obtained from multiple sources for later use with inbuilt business intelligence capabilities that may be tailored to the entities's needs.

Second, data integration and interoperability. The literature reviewed in this research revealed that data integration and interoperability are key motivators (Al-badi et al., 2018; Otto, 2011) and critical success factors in data governance (Al-Hassan et al., 2019). The findings from this study confirmed that, although the respondents acknowledged the importance of data integration and interoperability, there was a lack of uniform standards and data integration platforms, as well as technological incompatibilities. Therefore, the following recommendations are made to promote data integration and interoperability: i) There is a need to enhance the existing system/data integration platforms, such as the UGHub (e-GIF, 2021), and develop and use more integration platforms, thus enabling seamless data exchange between different systems, ensuring that data flows smoothly across the Ugandan Public Sector Systems; ii) Develop APIs and data services that provide standardized access to data, enabling interoperability between various applications and systems; and iii) Ensure hardware

interoperability by ascertaining that the various digital equipment used in public sector organisations can connect and seamlessly exchange data with each other, without restriction.

Third, the availability of complementary infrastructure. For effective data governance, there is a need for complementary infrastructure that supports specific processes at various stages of the data governance lifecycle. The recommended complementary infrastructure includes i) There is a need for High Power Computing Facilities that will enable faster processing of data, thus freeing up servers for usage by other services; ii) The availability of local Internet Exchange Points, which will increase the Internet latency, boost data flow speeds by keeping local traffic local, and reduce the costs of Internet services; iii) Availability of third-party Data Centres which will enable the public sector organisations to outsource some of their non-core services from these providers; iv) Co-location services, where the government organisations may rent space such as rack cabinets or floor space, to house their servers, or networking equipment enabling cost savings since there will be no need for setting up data centres and procuring equipment.

A comprehensive data governance infrastructure is essential for institutions to manage their data resources efficiently, ensuring that the data is of high quality and meets regulatory requirements. Organisations may enhance the significance of their data while reducing risks and preserving stakeholder confidence by investing in the appropriate data management technologies, procedures, and governance frameworks.

5.4.6. Disaster Recovery and Business Continuity

In the context of an entity's efforts to govern data, planning for recovery from catastrophes and continued business execution are critical components. They aim to ensure that essential business functions can continue or quickly be restored following a disruption. Disaster Recovery and Business Continuity Plans often focus on restoring IT systems and data after a disruption (Wallace & Webber, 2017). They include policies, processes, and procedures for recovering from hardware failures, cyberattacks, natural disasters, or other incidents that affect the IT infrastructure. The recommended actions for Disaster Recovery and Business Continuity provisions include the following:

First, developing disaster recovery and business continuity plans. This shall involve developing a formal document that outlines the procedures for responding to various types of disasters, including roles and duties, communication plans, and step-by-step recovery processes. The plan should include regular testing and conducting recovery drills to ensure the backups work as intended. The plan should also designate primary and secondary disaster recovery sites. While Disaster Recovery focuses on the technical aspects of recovery, Business Continuity covers the broader organisational response. An effective Business Continuity plan integrates Disaster Recovery strategies to guarantee that IT systems are restored in a manner that complements overall business continuity.

Second, scheduling data backups. Regularly scheduling and conducting backups of critical data is crucial to ensure that information can be restored in the event of a disaster. This includes on-site and off-site backups, cloud backups, and ensuring data redundancy.

Third, establishing and monitoring performance metrics. Mechanical backups alone are insufficient; key performance indicators like mean time to recover (MTTR), which specifies the maximum amount of time systems can be offline before affecting critical business functions, and recovery point objective (RPO), which specifies the maximum acceptable amount of data loss measured in time (e.g., an RPO of 4 hours means that up to 4 hours of data can be lost), should be established and monitored.

Fourth, benchmarking with established standards. Benchmarking a disaster recovery and business continuity plan against established international standards and frameworks is desirable. Examples of such standards include ISO 22301, which provides a structure for implementing and controlling effective business continuity plans, and ITIL (the IT Infrastructure Library), which offers guidelines for managing IT services, including business continuity and disaster recovery.

Fifth, managing challenges. The challenges for implementing Disaster Recovery and Business Continuity Planning include i) Cost implications - Implementing robust DR and BC plans can be expensive, requiring investment in technology, resources, and training; ii) Complexity – coordinating DR and BC efforts across multiple Ministries in many locations may pose operational challenges; iii) Compliance - Entities must guarantee that their Disaster Recovery and Business Continuity plans comply with relevant regulations and standards.

Sixth, implement centralised data hosting services. The findings indicated that various Ministries operate independent Data Centres and Disaster Recovery Services. As revealed by the respondents and the literature reviewed, operating independent data centres and disaster

recovery services causes several technical and operational challenges. These challenges include

- i) High Operational Costs for infrastructure setup, utilities (e.g., electricity and air conditioning), maintenance and human resource costs, and technical difficulties such as Synchronous real-time data replication between the primary data centre and the disaster recovery site being complex and resource-intensive. Therefore, it is recommended that the Government of Uganda consider developing a strategy for re-purposing the existing independent data centre and recovery sites into a centralised national data hosting network that is centrally managed to benefit from large-scale hosting services such as scalability, better-managed security, and reduced total ownership costs.

Disaster Recovery and Business Continuity planning guarantee that organisations can withstand and recover from disruptions. A comprehensive approach that integrates Disaster Recovery and Business Continuity, harmonised with the entity's risk management strategy, will help safeguard critical operations, protect assets, and maintain stakeholder trust. Regular testing, continuous improvement, and adherence to industry standards are critical to the success of these plans.

5.4.7. Integration of Data Governance with Emerging Technologies

Considering the benefits of adopting new technologies, there is a need to introduce Fourth-Industrial Revolution (4IR) Technologies into public sector data governance in Uganda (Fadler et al., 2021; Micheli et al., 2020; Rehman & Al-Raqom, 2020; Yebenes & Zorrilla, 2019). The following areas could benefit from the application of emerging technologies.

First, capacity building and training. The results from this research revealed the prevalence of insufficient digital capacity among Government employees. Hence, there is a need for conducting capacity building and training for government employees in Artificial Intelligence technologies ranging from basic Artificial Intelligence (e.g., introduction to basic Artificial Intelligence concepts and principles, machine learning/deep learning fundamentals, and Artificial Intelligence applications), Intermediate (e.g., Data analytics and modelling), and Advanced (e.g., Artificial Intelligence products development).

Second, implementing artificial intelligence (AI) enabled data governance. Investigating and developing AI solutions that can significantly enhance data governance processes, such as policy enforcement, data quality management, and risk assessment, is important.

Third, the Implementation of cloud computing. This research revealed that many ministries have their own file servers in addition to the national data centre. To further benefit from the advantages of cloud computing, the isolated file servers need to be consolidated into data centres. For example, such a move will introduce cost efficiencies by eliminating the need for individual ministries to acquire expensive on-premises hardware and reducing maintenance costs for such equipment.

Fourth, harnessing Internet of Things (IoT) technologies. This study suggests that a progressive framework for data governance must be capable of managing vast amounts of information generated by new technologies.

The design of frameworks for data governance that can handle new technologies is essential because they play a critical role in augmenting activities such as real-time data traffic monitoring, innovative error reporting, breach detection, and self-correction capabilities.

5.4.8. Data Governance Structures

A data governance structure is a crucial component of the data governance construct. Considering that data is a crucial enterprise asset (Al-Hassan et al., 2019; Lis & Otto, 2020; Ramadhan et al., 2021) that affects organisational performance (Martijn & Jonker, 2015; Weber et al., 2009), it is imperative to define data governance structures and assign clear roles/responsibilities to data governance stakeholders to ensure effective data governance. However, this study established that there is no provision for data governance in the organisational structure of the Ministries in Uganda. Hence, this study recommends that a position or roles and duties for overseeing data governance be assigned to specific officers. Otherwise, without intentionally assigning data governance roles/responsibilities to specific officers, there will be no accountability for data governance functions, which may jeopardise the quality of data maintained by public sector organisations.

Additionally, the study's qualitative and quantitative results demonstrated that most public sector organisations in Uganda (i.e., 63% and 66.7%) lacked data governance councils, boards, or committees. However, the respondents in the qualitative research indicated that having Inter-Ministerial Committees and Internal Committees that oversee the data management processes in their organisations is essential for effective data governance. The qualitative findings also indicated a general risk caused by the lack of job structure for data

governance specialists and other critical complementary roles, such as cybersecurity specialists in ministries (Subsection 4.3.1.2.4). Furthermore, the literature reviewed confirmed that Data Governance Committees are a crucial ingredient for the success of data governance programmes (Alhassan, 2016; Cave, 2017; Korhonen et al., 2014; Weber et al., 2009). Hence, it is recommended that Data Governance Committees and Technical Working Groups be established to set strategic direction and oversee the technical implementation of data governance initiatives

5.5 RECOMMENDATIONS FOR FUTURE RESEARCH

The study generated suggestions for further inquiry that are expected to complement this research's objectives.

5.5.1. Scope of the Study

The scope of a research project defines the boundaries and parameters of the study, defining what is included or excluded. The scope was influenced by time constraints, which limited the researcher's timeline for completing the study, as well as limited funding, given that this was a self-sponsored undertaking. Additionally, there were restrictions on the use of human resources, requiring the work to be conducted by the researcher. However, assuming that financial, time, and human resource constraints were not present, the following recommendations would significantly improve the results of this study.

First, coverage of various types of public sector organisations. The coverage of this research was restricted to twenty-two government ministries. However, the public sector in

Uganda comprises various institutions in addition to Ministries, including Government Agencies and Local Government Administrations. Therefore, it is recommended that future research on public sector data governance in Uganda be increased to include other categories of Government institutions, such as Parastatals, Local Government administrations, and Commissions. Expanding the scope would facilitate a deeper comprehension of how data governance is being implemented across many organisations in various functional sectors and geographical regions.

Second, increased stakeholder engagement: The respondents in this study were limited to government employees. However, the document analysis and this research's results revealed that the stakeholders in a data governance initiative include i) management staff, ii) processors, and iii) end users. For the specific case of public sector data governance, stakeholders include i) government employees, ii) citizens, and iii) third-party service providers. Therefore, it is recommended that future studies solicit responses from various stakeholders in data governance to gain a deeper understanding of diverse perspectives and enhance collaborative governance strategies.

Third, the implementation of longitudinal studies. The literature analysis conducted in this research indicated that most data governance studies are cross-sectional (Alhassan et al., 2019; Cheong & Chang, 2007; Otto, 2011a). Hence, it is recommended that future researchers undertake longitudinal studies to evaluate the efficacy of established data governance frameworks over extended periods. Such studies would help discern the long-term performance of data governance initiatives, which would aid in understanding the effects of experience and related factors on the effectiveness of data governance.

5.5.2. Application of the Conceptual Model

This study was based on Abraham et al.'s (2019) cross-functional data governance model, which posits that data governance antecedents influence the scope and mechanisms of data governance, ultimately leading to data governance consequences. Future research must include data governance scope as a dependent variable, considering this study only employed data governance antecedents as an independent variable and data principles and data governance methods as the dependent variables.

5.5.3. Development of a Public Sector Data Governance Framework

To develop and validate a contextualised data governance framework best suited to Uganda's public sector. While this study attempts to validate and extend an existing data governance model, it is recommended that future studies consider developing a data governance artefact using iterative methodological information systems techniques. For example, the literature reviewed indicated that some data governance frameworks had been developed using design science (Fadler & Legner, 2021; Janssen et al., 2020; Niemi, 2015) and the Enterprise Architecture Approach (Ladley, 2019). However, these studies were conducted in jurisdictions that lacked similarities in aspects such as technology, economic conditions, and infrastructure. Additionally, the researcher proposes that future studies consider examining the feasibility and requirements for operationalising the framework proposed in this research regarding inputs such as the implementation roadmap and financial budget. Therefore, it would be beneficial to scholars and the data governance practitioners' community if future studies developed comprehensive contextual frameworks.

5.5.4. Big Data Governance

This research indicated that most public sector organisations (61.8%) in Uganda use Traditional IT and Cloud-based Computing Technologies. The literature review also disclosed a few investigations on big data governance in a developing country like Uganda. Limited research on big data governance has been conducted in low-developed countries such as Uganda (Whittard et al., 2022). As more organisations adopt emerging technologies, more studies should be conducted to investigate the readiness or implementation of big data governance in Uganda's public sector. Relatedly, research that focuses on secure techniques for analysing large datasets while upholding data governance and security standards is needed.

Overall, future research in big data will be driven by the need to manage, process, and derive value from increasingly large and complex datasets while ensuring privacy, security, and ethical use. As big data continues to permeate all aspects of society, interdisciplinary research, innovation in AI and analytics, and the development of scalable and efficient systems will be critical to unlocking its full potential.

5.5.5. Information Security for Data Governance

The quantitative findings from this study indicated that nearly an equal number of organisations understand (39.2%) and do not understand (34.3%) the importance of information security in relation to data governance. These responses are below 50%, indicating the further need to explore the relationship between Information Security and Data Governance. Conversely, research in Information Security for data governance is rapidly

evolving due to the increasing consideration of data as a critical asset. Future research trends should focus on the following areas:

First, privacy requirements in Data Governance. Preserving privacy is very crucial for data governance. Future research in this area could aim to i) develop enhanced methods to anonymise data while retaining its utility for analysis and easing the data governance processes, and ii) develop robust differential privacy techniques to secure data in shared or publicly available datasets.

Second, data governance compliance and regulatory adherence requirements. This study's findings revealed complexities in stakeholders' compliance with regulatory requirements. Future research in this area could explore using AI to automate the monitoring and enforcement of policies for data governance, ensuring adherence to policy instruments such as the Data Privacy and Protection Act.

Third, investigating the human factor contribution to secure data governance. Human involvement provides one of the weakest links in securing information assets (Colwill, 2009). Research in this area should aim to i) develop programs and tools to educate users on the value of data governance and their obligations in maintaining security, and ii) explore strategies to mitigate risks posed by insiders, who often have authorised access to sensitive data.

Fourth, investigating the impact of cybersecurity on Data Governance. Research in this area could i) explore how to integrate Zero Trust principles into data governance frameworks to enhance security, ii) investigate how to enhance threat detection mechanisms designed

explicitly for data governance, including anomaly detection and response strategies for data breaches, iii) investigate the implications of emerging technologies on data security and governance, especially in aspects like encryption of data, data processing, quantum computing, and iv) investigate how to build cyber resilience and tolerance into data governance strategies to withstand and recover from cyberattacks.

These areas represent the future direction of research in information security for data governance, aiming to address the growing complexity and importance of managing data securely and effectively in a digital world.

5.5.6. Cultural Effect on Data Governance Practice

One of the research questions in this study aimed to determine the impact of employees' attitudes toward data management on data quality. This question aimed to ascertain the respondents' beliefs, attitudes, and behaviours regarding data management obligations related to the quality of data maintained by Ugandan public sector enterprises. While the qualitative findings indicated that all the respondents agreed that the organisation's culture influences data management activities, analysis of the quantitative results indicated that Organisational Culture has no significant effect on Data Quality.

Regarding the current state of affairs, however, one respondent highlighted that there is a weak data management culture, while another claimed that the culture has improved, as seen by a decrease in data loss and false information. The conflicting findings from the qualitative and quantitative data analysis rendered it very difficult to determine the actual effect

of culture on data governance. These conflicting results may be attributed to response bias, where respondents may not have provided honest answers, considering the sensitivity of the question.

It is essential to note that some existing academic literature suggests that a good organisational culture has a positive impact on the effectiveness of data governance (Burton, 2021; Daneshmandnia, 2019). In addition to the effect of culture on data quality, it has been established that public sector organisations lack a culture of data usage (Burton, 2021).

Therefore, the above findings confirm that further exploration is needed to determine the influence of cultural effects such as organisational culture, staff perceptions of data quality, and staff behaviour on parameters such as data governance and usage.

5.5.7. Impact of Social and Ethical Issues on Data Governance

The reviewed literature in this research demonstrated that social and ethical matters substantially affect data governance. For example, it indicated that social and ethical issues, such as human biases in data generation, inaccurate data annotation, or poor-quality data, may lead to incorrect outputs, which have consequences for the overall data governance processes. This study's findings also revealed the existence of poor data management and a culture of data misuse, which severely affects data governance.

Future research could help us better understand the impact of data ethics by answering questions such as, "Who owns the data?" or "How does data sovereignty affect data

governance?" How should we seek data subjects' consent? How do we mitigate the harms of data utilisation? How can we ensure that activities related to data governance are inclusive and equitable? How can we ensure efficient data governance while balancing the interests of conflicting stakeholders? Extensive studies on the ethical consequences of data use should be conducted, particularly on governance structures and their potential to safeguard vulnerable groups and reduce the likelihood of data exploitation.

Therefore, considering the examination of the current literature and the outcomes of the primary data analysis conducted in this study, it is recommended that future studies investigate how ethical and social issues affect data governance.

5.5.8. Data Governance Capability Maturity Models

The literature analysed in this study indicated that few academic studies have been conducted on data governance capability maturity models (Belghith et al., 2021; Steenbeek, 2019). This research theoretically evaluated three data governance capability maturity models based on the literature review (Subsection 2.4.4). The maturity models evaluated in this study are i) MIKE2.0 - Method for an Integrated Knowledge Environment (McClowry, 2010), ii) DAMA-DMBOK Data Management Association Body of Knowledge (DAMA, 2017), and iii) DCAM - Data Management Capability Assessment Model (Steenbeek, 2019). However, many data governance capability maturity assessment frameworks developed by the data governance practitioner community still require scientific evaluation (Al-Ruithe, 2018; Herselman et al., 2019). Therefore, this study recommends that future scholarly works conduct comprehensive theoretical and empirical reviews of data governance capability maturity models. For example, other models to be investigated further include the following: i) IBM Data Governance Council

Maturity Model (Ballard et al., 2014), ii) The Open Group Architecture Framework Maturity Model (Yebeles & Zorrilla, 2019), and iii) Gartner Data Governance Maturity Model (Jimenez & Duarte, 2019), among other things. Future works could investigate the efficacy of the key parameters of these models, such as i) the evaluation criteria, ii) the defined maturity levels/stages, iii) proposed improvements, and iv) recommendations for contextualization of the models.

Furthermore, future research on Data Governance Capability Maturity Frameworks could focus on several areas to advance the understanding and implementation of these frameworks in various industries. Here are some potential areas for future research:

Integration of Fourth Industrial Technologies in Data Governance. It is essential to investigate how new technologies can be incorporated into Data Governance Capability Maturity Frameworks to automate decision-making processes and improve efficiency. Additionally, future research should investigate how the frameworks can be adapted to the real-time nature of information in modern entities, particularly given the increasing adoption of new technologies in business processes. Potential research questions may include i) How can Artificial Intelligence (AI) models enhance the predictive capabilities of maturity frameworks, ii) What are the risks and governance issues associated with using Artificial Intelligence in data governance, iii) How can Data Governance Capability Maturity Frameworks be made more dynamic and real-time, iv) What are the policy instruments and technologies that facilitate real-time data governance? v) Can blockchain improve openness and accountability in the governance of data? and vi) What are the maturity considerations for organisations adopting distributed governance models?

Industry-Specific Frameworks. Develop maturity models tailored to specific industries or sectors, such as the public sector. Research questions may include: i) How do data governance requirements differ across industries? ii) Can existing Data Governance Capability Maturity Frameworks be modified to address sector-specific challenges, such as regulatory compliance in healthcare or finance?

Quantitative Metrics for Maturity Levels. Create more quantitative metrics for evaluating the data governance maturity in entities. Potential research questions in this regard include: i) What are the most reliable indicators of data governance maturity? ii) How can organisations implement metrics that objectively assess progress and gaps in governance?

Cultural and Organisational Change in Data Governance. Investigate how organisational culture and change management strategies impact the effectiveness of Data Governance Capability Maturity Frameworks. Research Questions may include: What are the cultural barriers to improving data governance maturity? How can change management strategies be integrated into maturity frameworks to facilitate smoother transitions?

Global Compliance and Data Privacy. To investigate how global compliance frameworks, such as GDPR, affect the development and implementation of Data Governance Capability Maturity Frameworks. Research Questions may include: How can Data Governance Capability Maturity Frameworks integrate compliance requirements across multiple jurisdictions? What governance structures are most effective in ensuring compliance with international data laws?

Cross-Organisation Data Governance Collaboration. Study collaborative data governance models where multiple organisations share data governance responsibilities, especially in ecosystems such as supply chains. Research Questions may include: How can multiple organisations collaborate effectively under a unified Data Governance Capability Maturity Framework? What governance and maturity frameworks can be adapted for collaborative ecosystems?

Benchmarking and Best Practices. Identify best practices and develop benchmarking tools that enable organisations to compare their data governance maturity with that of their peers. Research Questions may include: What are the key factors contributing to best practices in data governance maturity? How can organisations benchmark their data governance practices using standardised models?

5.5.9. Prospective Studies on Intergovernmental Data Governance

The literature reviewed in this research indicates that most data governance research works have investigated this phenomenon at organisational/multi-organisational levels, as well as country levels. Additionally, the literature examination findings and the results of the primary data analysis revealed that some various international standards and frameworks had been adopted or developed by multinational organisations (e.g., Microsoft), African Regional Economic Communities (e.g., East African Community), and Intergovernmental Organisations (e.g., the African Union Commission – AU Data Policy Framework, United Nations (UN) Data

Governance Framework and International Telecommunications Union Data Governance Framework), among others.

Therefore, considering that some Intergovernmental Organisations are implementing data governance frameworks, scholars need to conduct empirical studies in this emerging area, given its increasing importance in public policy, administration, and international relations. Future research on intergovernmental data governance can focus on several critical areas, as presented in Table 60.

Table 60:

Potential Research Areas in Intergovernmental Data Governance

Research area	Research Focus	Challenges
Interoperability and Standards	Examine how different governments can develop and adopt common data standards, protocols, and frameworks to enable seamless data sharing and interoperability.	Diverse legal frameworks, technological infrastructures, and political considerations.
Data Sovereignty and Jurisdiction	Investigate the impact of data sovereignty on intergovernmental data governance, particularly in areas such as cross-border data flows, privacy regulations, and jurisdictional disputes.	Balancing national interests with global cooperation, addressing conflicts in data laws, and harmonising regulations.
Trust and Data Security	Investigate the effect of trust on intergovernmental data exchange, emphasising human factors, trust-building mechanisms, encryption standards, and information security measures.	Ensuring data security across various governance models, mitigating the risks of data breaches, and establishing transparent processes for data handling.
Governance Models and Best Practices	Analyse existing governance models and frameworks for intergovernmental data sharing, identifying best practices and lessons learned from successful initiatives.	Adapting governance models to different political and cultural contexts, ensuring inclusive participation, and promoting transparency.

Research area	Research Focus	Challenges
Technological Advancements and Data Innovation	Investigate the potential and use cases of how new technologies can facilitate intergovernmental data governance.	Resolving the digital divide, guaranteeing equitable technology usage, and managing the ethical implications of advanced technologies.
Impact of Geopolitical Tensions	Examine how geopolitical tensions and international conflicts impact intergovernmental data governance, particularly in areas such as cybersecurity, trade, and diplomacy.	Managing conflicts of interest, maintaining cooperation amid tensions, and safeguarding critical data infrastructure.
Public Participation and Transparency	Assess the role of public participation in intergovernmental data governance, with a focus on transparency, accountability, and citizen engagement.	Ensuring meaningful participation, striking a balance between transparency and security, and addressing disparities in access to information.
Impact on Sustainable Development Goals (SDGs)	Analyse how intergovernmental data governance can support the achievement of the SDGs, particularly in areas like health, education, and environmental sustainability.	Coordinating global efforts, aligning data governance with SDG targets, and addressing data availability and quality disparities.
Case Studies and Comparative Analyses	Conduct case studies and comparative analyses of different countries or regions to understand how various approaches to data governance impact intergovernmental cooperation and outcomes.	Selecting relevant cases, ensuring comparability, and generalising findings.

These research areas can help address the complex challenges of intergovernmental data governance and contribute to the development of more effective, ethical, and inclusive frameworks.

5.5.10. Future Research on Data as a Public Good

The literature reviewed in this study has revealed that data, being a public good, is gaining more traction as it becomes increasingly integral to all aspects of society (Concilio et al., 2021; Poikola et al., 2011). Our findings also indicate that recognising data as a public

utility is an emerging external factor that is increasingly influencing the governance of data in the Ugandan public sector (Subsection 4.3.1.2.1). Given the scope of the content, time constraints, and financial limitations, our study was unable to thoroughly explore the impact and governance of data as a public good. Despite the extensive research on public goods, there is a strong justification for further investigation into data governance as a public good, given its emerging significance in the contemporary world. Future research should concentrate on the following aspects to rectify a notable deficiency in existing knowledge.

First, standardising the definition of data as a public good. The research gap in this regard is that data, being a public good, is still evolving, with diverse definitions and interpretations (Ostrom, 2010). There is a need to refine and standardise data definition as a public good. Future studies could focus on establishing a comprehensive framework that defines the boundaries of data being a public good, considering the different contexts in which data is generated and used. This includes examining the function of government data and its ramifications for private sector data.

Second, ensure an equitable and inclusive data ecosystem. Another crucial aspect of future research is the development of equitable and inclusive data ecosystems. Creating systems that ensure all citizens and communities have access to and can benefit from public data is essential for fair and effective data governance. Data governance must address ethical concerns, particularly regarding who benefits from data and who can be harmed (Floridi, 2013). The equitable distribution of data-driven benefits is critical, especially in vulnerable communities. In this regard, future research should focus on developing ethical guidelines and governance structures that ensure the benefits of data are equitably distributed. This includes

exploring models of participatory data governance, where communities have a say in how their data is used, as well as the development of ethical AI systems.

Third, harmonisation of legal and policy frameworks. Current legal frameworks often need to keep pace with the dynamic evolution of data management technologies. There is a pressing need to develop adaptive regulatory mechanisms that can effectively govern data as a public good (Zuboff, 2019). Suggests possible solutions, including governance and management, legal and policy frameworks, and international standards, to establish global norms and standards for data sharing, particularly for data of global significance, such as climate data. The technical standards for open data. Additionally, future research could help investigate the development of legal frameworks that balance the need for innovation with the protection of individual rights and public interest, which is crucial. Comparative studies across jurisdictions, particularly between different approaches to data governance (e.g., the EU's GDPR vs. the African Union's Data Policy Framework approach), could provide valuable insights.

Fourth, data governance and public trust. Public trust in data governance is crucial for the successful implementation of policies that treat data as a public good (Fukuyama, 1995). However, trust is fragile and can be easily undermined by data breaches or misuse. Future research should focus on understanding the factors that build or erode public trust in data governance. This includes exploring the role of transparency, accountability mechanisms, and public engagement in governance processes.

Fifth, impact assessment studies on Data being a Public Good. While data, being a public good, can drive innovation, much remains to be learned about how this process works in different sectors. Understanding the relationship between open data, innovation, and economic growth is essential (Mazzucato, 2018). Future studies could focus on how data, as a public good, fosters innovation, particularly in critical sectors such as agriculture, education, healthcare, and financial planning. This includes examining the function of data ecosystems, public-private partnerships, and the effect of open data regulatory instruments. Furthermore, exploring open data and government activities could help assess the benefits and constraints of open data in a knowledge-based economy, the limitations of private sector data, and emergent issues with open government data. Evaluating the social, economic, and environmental impacts of treating data being a public good is crucial to informing future policies and practices.

Sixth, technological innovations and governance models for data as a public good. As technology evolves, so must the governance models that oversee the use of data. Emerging technologies, such as blockchain, decentralised data platforms, and privacy-enhancing technologies (PETs), including end-to-end encryption, offer new ways to govern data; however, their implications are not yet fully understood (Pentland, 2014; Nguyen et al., 2021; Shen & Pearson, 2011). One key challenge concerning public data sharing is the requirement for enhanced privacy safeguards. Developing new technologies and legal frameworks to ensure that public data can be shared without compromising individual privacy is crucial for future research and innovation. Therefore, to enhance accountability, transparency, and user control, further research is needed to investigate how these technologies can be effectively integrated into frameworks for data governance. Case studies of successful implementations of these technologies could provide practical insights.

Seventh, private sector participation in producing data as a public good. There is a need to examine strategies for incentivising the private sector so that they can contribute to frameworks for the governance of public data. Public-private partnerships, tax breaks, or mandates to exchange non-sensitive data for the benefit of society could all fall under this category. Research questions may include: i) What incentives may be utilised to encourage the private sector to share data for public purposes? ii) How may public-private partnerships be established to mutually benefit both parties equally?

Overall, data governance as a public good is a rapidly evolving field that intersects with legal, ethical, technological, and socio-economic issues. As data becomes increasingly central to global economies and societies, research in this area must address the complexities of balancing innovation with public interest, privacy, and equity. By focusing on these emerging challenges, future research can help build resilient and adaptive frameworks for data governance that maximise the benefits for all stakeholders.

5.5.11. Data Sovereignty versus Data Governance

The emergence of fourth industrial technologies has led to the globalisation of data flows, the ubiquity of the Internet, and the increasing adoption of new technologies, which have significantly elevated the significance of data sovereignty and international governance (Hummel et al., 2021). As data traverses international boundaries, the issue of data sovereignty becomes increasingly critical, with governments, organisations, and individuals grappling with data control and ownership (Cohen, 2019). In light of this, future research on data sovereignty

governance should explore key areas that require further study, assess existing gaps, and anticipate the potential impacts of emerging trends. The following paragraphs will delve into the research gaps related to data sovereignty.

First, legal and regulatory frameworks. According to the literature reviewed in this study, aligning national data legal and regulatory frameworks across different jurisdictions is a growing challenge (Cohen, 2019; Hummel et al., 2021). Whereas international data traffic is essential for online digital transactions, it sometimes generates conflicts in data ownership/control, data localisation, data standards, and data protection/privacy requirements (Kuner, 2015). Therefore, future research should investigate requirements and develop harmonised legal and regulatory frameworks that respect national sovereignty while facilitating cross-border data exchange. Some of the research objectives for future research may include: i) clarifying and developing a standard definition of the data sovereignty concept, ii) understanding how data sovereignty requirements affect data governance, iii) examining the impact, benefits, and efficacy of data localization requirements imposed by sovereign states to keep data within their borders, and iv) developing Regional Data Governance Frameworks that accommodate diverse regulatory environments, ensuring cross-border data protection.

Second, technological solutions. Technological advancements, such as Privacy-Enhancing Technologies (PETs) and blockchain, offer potential solutions for maintaining data sovereignty without compromising data utility (Ajala et al., 2024). Future studies should investigate how these technologies may be onboarded into governance frameworks to strengthen data protection while ensuring adherence to sovereignty requirements. Some specific areas that are good candidates for research include: i) developing data governance

frameworks customized to use blockchain technologies for decentralized data management, ii) investigating cryptographic techniques that balance data governance and data sovereignty requirements, iii) examining how blockchain's decentralized technologies can ensure data sovereignty by providing immutable records and distributed control, iv) exploring data governance models in which stakeholders own and control data collectively while maintaining data sovereignty (i.e., Data Trusts and Cooperative Models) and v) examining the sovereignty requirements in parameters such as digital sovereignty, cybersecurity sovereignty versus data sovereignty.

Third, ethical and social implications. The ethical dimensions of data sovereignty are crucial, particularly in relation to privacy, human rights, and the protection of vulnerable populations. Research is needed to help understand how data sovereignty requirements impact human rights (Taylor et al., 2017) and explore frameworks that balance sovereignty requirements with human rights. Another aspect is investigating how data sovereignty can be ensured for marginalised communities, preventing digital colonisation by more powerful nations or corporations (Rainie et al., 2019). Additionally, examining how communities can maintain control over their cultural data and indigenous knowledge by preventing exploitation or misuse.

Fourth, economic impact. Data sovereignty requirements have a significant impact on governments and the business community in terms of innovation, operations, and business costs (Cohen, 2019; Hummel et al., 2021). Therefore, there is a need to understand how strict data sovereignty laws impact data-dependent innovation in domains such as AI, IoT, and big data analytics. Other research areas include investigating the cost and operational implications

of compliance with data sovereignty requirements across jurisdictions for multinational companies and Small and Medium Enterprises (SMEs).

Five, geopolitical considerations. Another area that requires further research is addressing the legal and ethical issues surrounding data sovereignty, particularly in the context of global data transfers and cloud storage solutions. Data sovereignty is becoming an increasingly significant geopolitical issue, with nations asserting control over data as a matter of national security (Wu, 2021). Research in this area should examine the role of data sovereignty in national security strategies, including the protection of critical infrastructure. The other research areas include Internet Governance, for example, examining the balance between state control over the Internet within their borders and the global nature of the Internet, and Data Diplomacy, such as understanding how sovereign states can engage in diplomacy to resolve conflicts arising from data sovereignty issues.

Sixth, Case Studies and Comparative Analysis. Comparative studies on how different countries approach data sovereignty can provide insights into the effectiveness of various data governance models. Future research should involve detailed case studies that compare the legal regimes of different regions, such as the IT Laws, National Data Governance Frameworks, and Intergovernmental Data Governance Frameworks. These comparisons can help identify challenges and best practices and propose harmonised solutions to common challenges.

The long-term prospects of data sovereignty governance are complex and multifaceted, necessitating interdisciplinary research that spans multiple fields, including law, technology,

economics, and ethics. By addressing these areas, researchers can help shape policies that protect national interests while enabling global collaboration and innovation.

Ultimately, the results of these proposed studies would significantly expand the body of knowledge on data governance, thereby advancing the field of data governance.

5.6 CONCLUSIONS

This section presents the concluding remarks for the entire study. It provides a background to the study by reminding readers of the research purpose (Subsection 5.4.1), the research objectives (Subsection 5.4.2), and an analysis of how these objectives were achieved (Subsection 5.4.3). Subsequently, a discussion on the significance of the results of this study in comparison to previous scholarly works and data governance practices is presented (Subsection 5.4.4). This is followed by a discussion of recommendations for implementation (Subsection 5.4.5). This section ends with a discussion on recommended future research work (Subsection 5.4.6).

5.6.1. Research Purpose

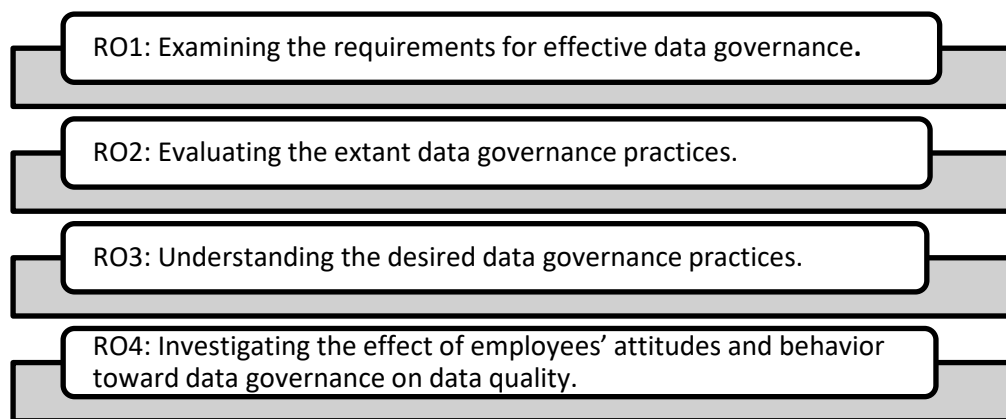
As presented in Chapter One, this mixed-methods study aimed to investigate the concept of data governance in a multi-institutional setting from the perspective of Uganda, a developing nation (Subsection 1.2.1).

5.6.2. Research Objectives

This study had four specific objectives derived from the main objective of achieving its intended purpose. Figure 36, shows a list of the four research objectives of this study.

Figure 36:

The Research Objectives



5.6.3 Evaluation of the Research Objectives

The four research objectives of this study were achieved through i) qualitative data collection and analysis, ii) quantitative data collection and analysis, iii) analysis of existing academic literature, and iv) review of practice documents. Subsections 5.6.3.1 through 5.6.3.4 provide an overview of the methods employed to achieve each of the four research objectives of this study.

5.6.3.1 RO1: Examining the requirements for effective data governance.

The first research objective of this study was to examine the prerequisites for efficient data governance in Ugandan public sector organisations, as detailed in Subsection 1.2.3 and summarised in Figure 31. Research Question 1 (RQ1) was the first to address this goal: *What conditions must be met for data governance to be effective?* Figure 31 illustrates the two main categories of requirements that emerged from the thematic analysis of the qualitative findings: data governance antecedents and data governance principles.

These results align with previous research. For instance, Were and Moturi (2017) list information security as one of the antecedents and operational efficiency and customer satisfaction as drivers of data governance success. Similar to this, Benfeldt et al. (2020) contend that both structural factors (e.g., policies, roles, and responsibilities) and cultural factors (e.g., accountability and awareness) contribute to effective data governance, while Brous et al. (2016) highlight organisational alignment, compliance, and the development of a shared understanding as key data governance drivers. These viewpoints support the study's finding that, taken together, governance antecedents and principles serve as mutually reinforcing prerequisites for efficient data governance.

The first hypothesis, *H01: Data Governance Antecedents have no significant effect on Data Governance Principles*, was also used to further evaluate the first research objective. The results of the quantitative analysis indicated that Data Governance Antecedents significantly predicted Data Governance Principles at a 95% confidence interval ($\beta = 0.39$, $t(100) = 4.24$, $p < .001$). Through methodological triangulation, this statistical evidence supports the study's conclusions and validates the qualitative insights (Creswell & Plano Clark, 2018).

Theoretically, these findings are also consistent with systems theory, which views organisations as systems made up of interacting and interdependent subsystems (von Bertalanffy, 1968; Checkland, 1999). According to this framework, governance antecedents and principles can be viewed as subsystems that interact to maintain the overall data governance system's coherence, functionality, and adaptability. The results thus support the explanatory capacity of systems theory in capturing the dynamic interplay between antecedents and principles, while also providing empirical insight into governance requirements in Ugandan public sector organisations.

5.6.3.2 *RO2: Evaluating the extant Data Governance Practices*

This study's second research objective was to evaluate the current requirements for effective data governance in Ugandan Public Sector Organisations, as presented in Subsection 1.2.3 and also summarised in Figure 30. This objective was aligned with the second research question, “*RQ2: What organisational provisions have been established to manage data assets?*”

Thematic analysis of the qualitative results revealed that the majority of Uganda's current data governance provisions align with the definition of data governance mechanisms outlined in Abraham et al.'s (2019) cross-functional data governance framework. These mechanisms, which can be divided into relational, procedural, and structural components, offered a helpful analytical framework for evaluating the empirical data.

The study's findings regarding structural mechanisms indicate that senior leadership in public sector organisations clearly supports data governance at a high level. This finding aligns with previous research that emphasises leadership commitment as a crucial prerequisite for governance maturity (Fadler & Legner, 2021; Khatri & Brown, 2010). An institutionalisation of governance structures is also demonstrated by the creation of inter- and intra-ministerial data governance committees, which is consistent with findings from international studies that emphasise the function of multi-stakeholder committees in coordinating cross-organisational data practices (Otto, 2011).

In terms of procedural mechanisms, the findings showed that organisations have implemented conflict-resolution procedures, adopted lifecycle-based data management practices, created institutional policies and strategies, and outsourced specific services. These results are consistent with those of Nafi'ah (2021), who demonstrated that the foundation of operationalising governance principles in developing-country contexts comprises procedural mechanisms, such as policies, standards, and workflows. They also align with research conducted in the public and private sectors that emphasises the need for formalised processes to guarantee compliance and accountability (Fadler & Legner, 2021).

The significance of relational mechanisms, such as coordination efforts, training-based capacity building, and stakeholder communication, was also emphasised by the analysis. These results support the claim that cultural congruence, interpersonal trust, and ongoing stakeholder engagement are essential for effective data governance, which cannot be maintained solely through structures and policies (Weber et al., 2009; Abraham et al., 2019). According to earlier studies, relational mechanisms are particularly important in settings with a variety of actors

and limited technical capability, such as those found in many low- and middle-income nations (Addo-Tenkorang & Helo, 2016).

The second hypothesis (*H02: Data Governance Antecedents have no significant effect on Data Governance Mechanisms*) was tested in order to quantitatively address the second research objective. With a 95% confidence interval ($\beta = 0.38$, $t(100) = 4.06$, $p < 0.01$), the findings showed a significant predictive relationship between antecedents and mechanisms. This confirms previous empirical findings that organisational antecedents, including policy frameworks, leadership commitment, and resource availability, are important factors influencing the effectiveness of governance mechanisms (Fadler & Legner, 2021; Tallon et al., 2013).

Although mainly grouped around mechanisms rather than principles, these findings generally imply that Uganda's public sector organisations have established the fundamentals of data governance. This result is generally in line with the larger corpus of literature (Abraham et al., 2019; Nafi'ah, 2021; Fadler & Legner, 2021), which emphasises the importance of mechanisms while cautioning that, in order to ensure sustainability, relational and cultural aspects must be added to structural and procedural arrangements.

5.6.3.3 *RO3: Understanding the desired data governance practices.*

The third objective of this study was to examine the desired data governance practices in Ugandan public sector organisations, as presented in Subsection 1.2.3 and summarised in Figure 30. This objective was partly addressed through Research Question 3 (RQ3): *What challenges do government employees face while managing data in Uganda?* Both qualitative

and quantitative methods were employed to identify the prevailing challenges and to derive the desired data governance practices.

The qualitative results identified a number of persistent issues with data governance in public sector organisations, including: i) insufficient regulatory and policy tools; ii) technological difficulties; iii) a lack of ICT infrastructure; iv) difficulties with data requirements; v) concerns about data sovereignty; vi) cultural barriers; vii) financial deficiencies; and viii) a lack of human resources. Participants' responses included the following: i) more funding; ii) improved communication; iii) training and capacity-building; iv) hiring specialised data governance personnel; v) reorienting organisational culture; vi) strong top management support; and vii) infrastructure development.

A mean score of 4.46 (on a 5-point scale) and a standard deviation of 0.442 were obtained from the quantitative validation of these solutions (see subsection 4.3.2.2.5), indicating that respondents strongly agreed that the suggested solutions were appropriate.

According to systems theory, the identified problems can be viewed as subsystems whose dysfunctions collectively limit the efficacy of the larger data governance system. Inadequate ICT infrastructure (technological subsystem), funding constraints (resource subsystem), and weak policy and regulatory tools (structural subsystem) combine to form systemic bottlenecks that hinder consistent governance practices. Similar to this, even in cases where technical solutions are available, the adoption of governance frameworks is hampered by cultural barriers and a lack of human resource capacity (social and human subsystems). Von Bertalanffy's general systems theory (1968) posits that flaws in one subsystem can impact the

system as a whole, thereby decreasing its overall functionality. The suggested remedies, on the other hand, like increased communication, better infrastructure, and capacity-building, are reinforcing mechanisms that can improve system resilience and adaptability by strengthening inter-subsystem linkages (Skyttner, 2005).

These results align with previous research. While Benfeldt et al. (2020) demonstrate how cultural resistance can lead to coordination issues at the system level, Carroll et al. (2019) emphasise that fragmented policy instruments weaken the structural subsystem of governance. According to van Ooijen et al. (2019), sovereignty and interoperability problems are emergent characteristics of poorly aligned governance subsystems. Mullon and Ngoepe (2019) emphasise that insufficient ICT infrastructure, combined with funding shortages, produces compounded system weaknesses. In a similar vein, Were and Moturi (2017) argue that to achieve systemic stability and strengthen weak subsystems, managerial support and capacity-building are essential interventions.

Therefore, this study demonstrates that Uganda's data governance issues are systemic interdependencies necessitating integrated interventions rather than discrete technical or organisational issues. The results indicate that the emergence of sustainable governance practices is contingent upon the holistic alignment of structural, technological, social, and cultural subsystems within the larger governance ecosystem.

5.6.3.4 *RO4: Investigating the effect of Organisational Culture on Data Governance*

The fourth objective of this study was to “*investigate the effect of employees’ attitudes and behaviour toward data governance on data quality,*” as presented in Subsection 1.2.3 and

also summarised in Figure 36. Qualitative and quantitative techniques were applied to examine how employee attitudes and behaviour towards data governance affect data quality.

The qualitative part partly achieved this objective by answering the fourth research question, “*RQ4: What is the effect of organisational culture on data governance?*” In addition, the third hypothesis, “*H₀₃: Organisational Culture has no significant effect on Data Quality,*” was used to evaluate the quantitative results.

The qualitative results indicated that organisational culture is important in implementing data management activities such as data security, protection, and sharing. However, the respondents could not categorically confirm that a bad organisational culture in the Uganda public sector affects data quality. This finding may be attributed to respondent bias resulting from a fear of retribution. Relatedly, the quantitative findings supported this result, as the regression model for this hypothesis was statistically insignificant ($R^2 = 0.031$, $F(1, 85) = 2.74$, $p = .102$).

In this study, the effect of organisational culture on data governance was measured using four variables, namely i) behaviour of staff, ii) attitude, iii) leadership style, and iv) integrity. However, organisational culture is a complex concept with many attributes, including norms, principles, beliefs, practices, and environmental factors (Sargiotis, 2024). Therefore, it is possible that the choice of attributes used in this study may not have sufficiently measured the concept of organisational culture. Nonetheless, there is evidence in the literature reviewed that good organisational behaviour has a positive effect on data (Daneshmandnia, 2019; Hagmann, 2013).

5.6.4 Summary of the Research Significance

The significant contribution of this study is in the following areas: i) aiding the understanding of the data governance concept, ii) creating awareness, and iii) enhancing the data governance practice.

Firstly, this study contributes to a better understanding of the data governance concept by investigating this phenomenon from the perspective of i) the public sector view, ii) a multi-institutional setting, and iii) a developing country like Uganda. This is useful, considering that the literature review conducted in this study revealed a scarcity of data governance academic research content arising from a public sector, multi-institutional and developing country perspective (Abraham et al., 2019; Alhassan et al., 2018; Al-Ruithe et al., 2019; Al-Ruithe et al., 2018; Brous et al., 2016; Lillie & Eybers, 2019; Niemi, 2015; Ramadhan et al., 2021). The available evidence suggests that this could be a pioneering study that extensively investigates data governance from the perspective of the Public Sector in Uganda.

Secondly, the results of this study indicate a need for awareness creation, which can also serve the same purpose. The qualitative findings indicated that a lack of awareness of data governance's legal and regulatory instruments is one of the key challenges (Subsection 4.3.1.2.4) faced when implementing data governance in the Ugandan Public Sector. Additionally, the quantitative findings (Subsection 4.4.1.3) indicated that all respondents were generally neutral or unsure whether communication had helped improve data governance in their organisations. Overall, this study highlights the need for communication to increase

awareness of data governance aspects, which can also be used as a tool while conducting the awareness.

Thirdly, this study shall contribute to the practice of data governance by proposing policy recommendations for effective data governance based on the research findings. Additionally, the results from this study shall be used to develop a contextualised data governance framework for the public sector in Uganda. The data governance framework proposed in this study is designed to be agile, supporting the development of integrated data-driven services, business process reengineering, and effective coordination among stakeholders.

5.6.5 Summary of Recommendations for Application

This study makes recommendations for application (Section 5.2) based on the research findings and the literature reviewed. The recommendations fall in the following areas: i) Policy formulation, ii) call for increased funding, iii) application of Information Technologies, and iv) implementation of data governance structures.

Firstly, the study identified inadequacies in the national and institutional data governance legal and regulatory environment. In particular, the findings on the external data governance antecedents indicated the absence of a national public sector data governance framework in terms of policy or strategy. Additionally, the findings of this study may be reused as input for evidence-based policy development. Furthermore, analysis of the internal data governance antecedents indicated a lack of institutional data governance policies/strategies.

Therefore, as a policy recommendation, there is a need to develop both national and institutional public sector data governance legal and regulatory instruments.

Secondly, the results of this study indicate a need for additional funding for data governance activities in the Ugandan public sector. Although it was noted that there is interest in effective data governance, as exemplified by legislation such as the Data and Privacy Act (2019), a lack of commensurate funding for data governance activities remains. This finding aligns with the existing literature, which emphasises the significance of sponsorship for effective data governance (Garip & Ateş, 2023). Therefore, this study recommends increased funding for data governance and related activities.

Thirdly, Information Technology plays a critical role in data governance. Data management activities are heavily reliant on IT. However, the findings indicated that some public sector organisations still use obsolete technologies that are not aligned with meeting data governance requirements. Hence, this study recommends an urgent need for continuous investment in appropriate IT tools and services to meet the ever-increasing technological requirements for data governance.

Fourth, Organisational Structure. The data governance literature indicates that people-centric inputs, such as organisational structures, roles, and responsibilities, are key components of the data governance construct (Al-Hassan et al., 2019; Lis & Otto, 2020; Ramadhan et al., 2021). However, this study established that there is no provision for data governance in the public service organisational structure of Uganda. Hence, this study recommends that a position or roles and duties for overseeing data governance be assigned to specific officers.

Otherwise, without the intentional assignment of data governance functions to specific officers, there will be no accountability for these functions, which may jeopardise the quality of data maintained by public sector organisations.

Continuous Data Governance Operations Improvement. The literature review indicated that the existing industry data governance frameworks are complex and require steep learning. Additionally, the primary data analysis results indicated a shortage of prerequisite skills and knowledge among government employees for data governance. Against this background, this study proposes enhancing employee knowledge and skills through training, capacity building, and awareness creation on the importance of data governance, coupled with performance monitoring, which will lead to continuous improvement in data governance performance.

Data Governance Infrastructure. A dynamic infrastructure is required to maximise an entity's data value and reduce data management risks. A fit-for-purpose data governance infrastructure guarantees data security, integrity, accessibility, and compliance with legal obligations. Organisations can leverage their data effectively using appropriate technologies, processes, and governance structures, while minimising risks and upholding stakeholder confidence.

Disaster Recovery and Business Continuity. Planning for disaster recovery and business continuity ensures companies recover from shocks with minimal delays and disruptions. A thorough strategy that combines interventions for maintaining operations and recovering from unforeseen events, aligning with the organisation's overall risk management plan, will help preserve data, protect vital operations, and uphold stakeholder trust. Regular testing, ongoing

enhancements, and adherence to industry standards are essential for the success of these plans. Planning for maintaining operations and recovery from unforeseen events is vital in strengthening data governance. Integrating plans for upholding operations and recovery from disasters with data governance will enhance data availability, integrity, and protection in the event of unforeseen disruptions. By combining these areas, organisations may maintain robust data governance procedures, reduce risks, and guarantee regulatory compliance during and after crises.

Integration of Data Governance with the Fourth Industry Revolution Technologies.

Integrating Data Governance with Fourth Industrial Revolution technologies requires applying a dynamic approach that can harness the benefits while minimising the challenges of such an undertaking. Such a strategy would combine a mix of robust processes for real-time management of various types of information, including machine-generated and unstructured data from 4IR applications, as well as ethical usage, robust security, and cross-border compliance. By implementing these recommendations, organisations can effectively govern the complex and vast data environments created by the Fourth Industrial Revolution, ensuring transparency, trust, and responsible data use.

5.6.6 Summary of Recommended Future Research Works

The study generated recommendations for further inquiry that are anticipated to bolster the goals of this research. These recommendations are based on the researcher's experience gained during this research, the research's limitations, and the study's findings. Following is a summary of the specific recommendations for future research: -

First, the scope of the sampling frame should be increased. The scope of this study was limited to Ministries; however, the public sector in Uganda comprises other institutions, such as Parastatals, Agencies, Commissions, Academia, and Local Government Administrations, among others. Therefore, it is recommended that the scope of future research on data governance in the public sector in Uganda be increased to cover other sectors/arms of government beyond ministries. An increase in scope would help further understand the implementation of data governance in more organisations within different functional sectors and geographical locations.

Second, it is essential that future studies consider applying the complete conceptual model. This study was built upon the Abraham et al. (2019) cross-functional data governance model, which suggests that data governance antecedents impact the scope and mechanisms of data governance, leading to its consequences. While this study used data governance antecedents as an independent variable and both data principles and governance mechanisms as dependent variables, future studies should include data governance scope as a dependent variable. Including all the variables from Abraham et al. (2019) 's cross-functional data governance model will ensure the complete validation of the model's effectiveness, which is paramount to data governance research.

Third, iterative development of a Public Sector Data Governance Framework. To develop and validate a contextualised data governance framework best suited to Uganda's public sector. While this study attempts to validate and extend an existing data governance model, it is recommended that future studies consider developing a data governance artefact

using iterative methodological information systems techniques. For example, the literature reviewed indicated that some data governance frameworks had been developed using design science (Fadler & Legner, 2021; Janssen et al., 2020; Niemi, 2015) and the Enterprise Architecture Approach (Ladley, 2019). However, these studies were conducted in jurisdictions that lacked similarities in technology, economic conditions, and infrastructure. Therefore, it would benefit scholars and the data governance practitioners' community if future studies developed contextual frameworks.

Fourth, explore the dimension of big data governance. This study's findings indicated that most public sector organisations (61.8%) in Uganda use Traditional IT and Cloud-based Computing Technologies. Therefore, future studies should consider investigating the readiness or implementation of big data governance in the public sector in Uganda, as even more organisations adopt emerging technologies. Additionally, the literature review indicated that very few studies have been conducted on big data governance for a developing country like Uganda. A few studies on big data governance have been conducted in low-developed countries such as Uganda (Whittard et al., 2022).

Fifth, exploring the relationship between information security and data governance. The quantitative findings from this study indicated that nearly an equal number of organisations understand (39.2%) and do not understand (34.3%) the importance of information security in relation to data governance. These responses are below 50%, indicating the further need to explore the relationship between Information Security and data governance. Therefore, future studies must investigate the relationship between Information Security and Data Governance.

Sixth, exploring further the cultural effect on data governance practice. One of the research questions in this study aimed to determine the impact of employees' attitudes toward data management on data quality. This question aimed to ascertain the respondents' beliefs, attitudes, and behaviours regarding data management obligations related to the quality of data maintained by Ugandan public sector enterprises. While the qualitative findings indicated that all the respondents agreed that the organisation's culture influences data management activities, analysis of the quantitative results indicated that Organisational Culture has no significant effect on Data Quality. However, one respondent highlighted a weak data management culture in relation to the current state of affairs. At the same time, another claimed that the culture has improved, as evidenced by a decrease in data loss and the dissemination of false information. The conflicting findings from the qualitative and quantitative data analysis rendered it very difficult to determine the actual effect of culture on data governance. These conflicting results may be attributed to response bias, where respondents may not have provided honest answers, considering the sensitivity of the question. It is essential to note that some academic research suggests that organisational culture has a positive impact on the efficacy of data governance (Burton, 2021; Daneshmandnia, 2019). Similarly, research has shown that public sector organisations lack a positive culture of data usage (Burton, 2021). Consequently, the results above attest to the necessity for additional research into the impact of cultural factors, such as organisational culture, staff perceptions of data quality, and staff behaviour, on data governance.

Seventh, investigating the impact of socio-ethics on data governance. The reviewed literature in this research demonstrated that social and ethical matters substantially affect data governance. Relatedly, the study's qualitative findings also revealed the existence of a poor

data management and usage culture, which severely affects data governance. However, the quantitative findings showed that the effect of organisational culture is not very significant. Therefore, considering the conflict in the literature reviewed and the results of this study, it is recommended that future studies investigate how ethical and social issues impact data governance.

Eighth, Data Governance Capability Maturity Frameworks. Future research on Data Governance Capability Maturity Frameworks should aim to develop more adaptable, industry-specific, and technologically enhanced frameworks that consider the rapidly changing data landscape resulting from emerging technologies. Incorporating ethical issues, international compliance, and real-time data governance requirements will be essential.

Nine, Intergovernmental Data Governance. Future studies on intergovernmental data governance should concentrate on establishing secure infrastructures for international data sharing, harmonising legal frameworks, and upholding moral values. Cybersecurity, crisis response protocols, and international cooperation are crucial topics that need more research. The primary objective is to establish structures that foster cooperation while upholding individual rights and national interests.

Ten, future research on the Governance of Data as a Public Good. Future studies should concentrate on developing scalable, ethically acceptable, and inclusive governance models that view data being a public asset. This entails investigating novel frameworks for data sharing, guaranteeing fair access, and creating moral and legal guidelines that uphold people's rights while optimising society's good.

Eleven, issues of sovereignty in data governance. The intricate relationship between data governance and data sovereignty requirements presents a strong justification for future studies. Future researchers can provide critical insights into how these concepts will shape data governance in the global digital economy by exploring topics such as balancing sovereignty and innovation, the impact of emerging technologies, and the role of multinational organisations. Furthermore, as data drives technological innovation, understanding and harmonising these frameworks will foster a more equitable and efficient global data ecosystem.

In conclusion, this research's main outputs are i) a contextualised public sector data governance framework and ii) practical insights intended to assist in designing and successfully implementing data governance initiatives in public sector organisations in developing countries.

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APPENDIX

Appendix A - The Interview Guide



DATA COLLECTION TOOLS

TITLE OF RESEARCH

A Data Governance Framework for the Public Sector in Uganda

in partial fulfillment of the
requirements for the award of the Degree of
DOCTOR OF PHILOSOPHY

STUDENT

Silas Ngabirano

SUPERVISOR

Dr. Maria Emmanouilidou

Appendix B - The Questionnaire

A Data Governance Framework for the Public Sector in Uganda

The main purpose of this research is to investigate the data governance practices in a multi-institutional setting in the perspective of a developing country like Uganda with the objective of proposing a rigorous contextualized data governance framework.

It is envisaged that the findings from this study shall help scholars to further understand the data governance concept and also aid in improving data governance practice by proposing evidence based policy recommendations.

Participants for this study have been randomly selected from heads/senior staff of departments that heavily use data in the Government of Uganda.

** Indicates required question.*

1. Email *

2. What is your gender?

Mark only one oval.

☐ Female

☐ Male

☐ Prefer not to say

3. What is your age? Please type your age.

Appendix C – Copy of The University Research Ethics Committee Approval



**Unicaf University Research Ethics Committee
Decision**

Student's Name:

Student's ID #:

Supervisor's Name:

Program of Study:

Offer ID /Group ID:

Dissertation Stage:

Research Project Title:

Comments:

Decision*:

Date:

*Provisional approval provided at the Dissertation Stage 1, whereas the final approval is provided at the Dissertation stage 3. The student is allowed to proceed to data collection following the final approval.

Appendix D - Copy of the Ministry of ICT and National Guidance Approval Letter

Telephone: +256-414-236262
Fax: +256-414-231507
Website: www.ict.go.ug
In any correspondence on this
subject please quote
Ref: **ADM/70/188/02**



THE REPUBLIC OF UGANDA

Ministry of ICT & National
Guidance
P O Box 7817
KAMPALA
UGANDA.

29 September 2022

Mr. Silas Ngabirano
Ph.D. Student
UNICAF University
ZAMBIA

REQUEST FOR CLEARANCE TO COLLECT DATA

Reference is made to your letter dated 26 September 2022 in which you request clearance to collect data.

I am pleased to inform you that your request for permission to conduct research amongst the Information and Communication Technology (ICT) staff in the Government of Uganda on a topic titled "Digital Data Governance in the Public Sector in Uganda" has been approved on condition that the collected data

- i) shall be solely used for academic purposes only
- ii) shall not be used to identify individuals' personal data, and
- iii) shall not be used for disclosing confidential Government data/processes.

We hope that the research findings will benefit the Government and the ICT Industry at large in providing evidence for improving the data governance practice.

We wish you all the best in your research undertaking.

Geoffrey Agoi (Eng.)
Ag. PERMANENT SECRETARY

Appendix E - Copy of the Data Collection Clearance Application



26 September 2022

The Permanent Secretary,
Ministry of Information and Communication Technology and National Guidance
KAMPALA, UGANDA

REQUEST FOR CLEARANCE TO COLLECT DATA

I am a doctoral student at UNICAF University Zambia. As part of my degree, I am carrying out a study titled "Digital Data Governance in the Public Sector in Uganda". I am writing to request permission to conduct research amongst the Information and Communication Technology (ICT) staff in the Government of Uganda.

The main purpose of this research is to investigate the data governance practices in a multi-institutional setting from the perspective of a developing country like Uganda with the objective of proposing a rigorous contextualized data governance framework.

This study has been approved by the UNICAF University Research Ethics Committee (Copy of the UNICAF University Research Ethics Committee approval letter attached as appendix A). The study will be using a sequential mixed methods approach to collect data about data governance in the public sector in Uganda commencing with qualitative data collection and ending with quantitative data collection (Copy of the data collection tools attached as Appendix B).

Appendix F - Copy of the Gatekeeper Letter

General Lines : +256 414 250 534/5
 : +256 414 250 557/8
 Minister : +256 414 251003
 Minister of State : +256 414 251004
 Permanent Secretary : +256 414 251002
 Toll Free : 0800 100 2004201/202
 Email : ps@publicservice.go.ug
 Website : www.publicservice.go.ug



MINISTRY OF PUBLIC SERVICE
 PLOT 12 NAKASERO HILL ROAD
 P.O. BOX 7003
 KAMPALA
 UGANDA

In any correspondence on
 this subject please quote no. **ADM 24/109/01**

27th September 2022

Mr. Silas Ngabirano
 PHD Student
 UNICAF University
 Lusaka
ZAMBIA

CLEARANCE TO CONDUCT RESEARCH ON DATA GOVERNANCE IN THE PUBLIC SERVICE

Reference is made to your letter dated 26th September 2022, in which you request clearance to conduct research on Data Governance in the Ugandan Public Service.

The Ministry of Public Service is mandated to develop, manage, and administer human resource policies, management systems, procedures, and structures for the Ugandan Public Service. In particular, the Department for Records and Information Management is responsible for setting policies and procedures for proper records and information management in the Uganda Public Service.

We appreciate that this study's findings and recommendations will aid the Government of Uganda in developing policies, strategies, technologies, and institutional frameworks on data governance implementation. We expect this study to be conducted with strict confidentiality and privacy considerations.

Therefore, the purpose of this letter is to give you no objection to conducting this research study in Ministries. Please provide a copy of your final dissertation report to the Ministry of Public Service upon successful completion of your research.

Lillian R. Ariso
For: PERMANENT SECRETARY

Mission: To provide human resource policies, management systems and structures that facilitate efficient and effective public service performance for national development and improved quality of life in Uganda

Appendix G - Copy of the Consent Form



UU_IC – Version 2.1

Informed Consent Form

Part 2: Certificate of Consent

This section is mandatory and should be signed by the participant(s)

Student's Name: SILAS NGABIRANO

Student's E-mail Address: Ngabirano.silas@gmail.com

Student ID: A1901D7460343

Supervisor's Name: Dr. Maria Emmanouilidou

University Campus: UNICAF University Zambia (UUZ)

Program of Study: Doctorate of Philosophy

Research Project Title: A Data Governance Framework for the Public Sector in Uganda

I have read the foregoing information about this study, or it has been read to me. I have had the opportunity to ask questions and discuss about it. I have received satisfactory answers to all my questions and I have received enough information about this study. I understand that I am free to withdraw from this study at any time without giving a reason for withdrawing and without negative consequences. I consent to the use of multimedia (e.g. audio recordings, video recordings) for the purposes of my participation to this study. I understand that my data will remain anonymous and confidential, unless stated otherwise. I consent voluntarily to be a participant in this study.

Participant's Print name:

JIMMY AMATRE

Participant's Signature:

[Handwritten Signature]

Date:

06/06/2024

If the Participant is illiterate:

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had an opportunity to ask questions. I confirm that the aforementioned individual has given consent freely.

Witness's Print name:

Witness's Signature:

Date:

Appendix H - Demographic Characteristics of Individual Respondents

i) Quantitative Survey Response Rate					
Category		Frequency	Percent	Valid Percent	Cumulative Percent
Number of Questionnaires returned		102	77.27	77.27	
Number of Questionnaires not returned		30	22.73	22.73	
Total Questionnaires issued		132	100		
ii) Number of Respondents Per Sectors					
Sector		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agriculture	7	6.9	7.0	7.0
	Education	7	6.9	7.0	14.0
	Energy and Mineral Development	2	2.0	2.0	16.0
	Financial and Accountability	6	5.9	6.0	22.0
	Health	5	4.9	5.0	27.0
	ICT and National Guidance	13	12.7	13.0	40.0
	Justice, Law, and Order Sector	2	2.0	2.0	42.0
	Land and Housing	2	2.0	2.0	44.0
	Local Government	6	5.9	6.0	50.0
	Public Sector Management	10	9.8	10.0	60.0
	Science, Technology, and Innovation	4	3.9	4.0	64.0
	Security	4	3.9	4.0	68.0
	Social Development	12	11.8	12.0	80.0
	Tourism	2	2.0	2.0	82.0
	Trade and Industry	6	5.9	6.0	88.0
	Water and Environment	6	5.9	6.0	94.0
	Works and Transport	4	3.9	4.0	98.0
	Others	2	2.0	2.0	100.0
	Total	100	98.0	100.0	
Missing	System	2	2.0		
Total		102	100.0		
iii) Number of Employees per Organisation					
Category		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	More than 5,000 employees	4	3.9	4.0	4.0
	1,001 – 5,000 employees	15	14.7	15.0	19.0

Invalid Total	101 – 1,000 employees	77	75.5	77.0	96.0
	Less than 100 employees	4	3.9	4.0	100.0
	Missing responses	2	2.0		
	Total	102	100.0		
iv) Analysis of the Respondents' Highest Level of Education					
Category		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Post-Graduate	68	66.7	67	66
	Graduate	34	33.3	33	100
	Total	102	100.0	100.0	
v) Analysis of the Respondents' Highest Level of Education					
Category		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Post-Graduate	68	66.7	67	66
	Graduate	34	33.3	33	100
	Total	102	100.0	100.0	
vi) Analysis of the Roles of the Respondents					
Role in the Organisation		Frequency	Percent	Valid Percent	Cumulative Percentage
Accountant		2	1.96	2	2
Accounts Officer		2	1.96	2	4
Data Governance Manager		2	1.96	2	6
Data Governance Officer		1	0.98	1	7
Digital Health Advisor		1	0.98	1	8
Economist		5	4.90	5	13
Head Communications		2	1.96	2	15
Head of IT		28	27.45	27	42
Head of Policy and Planning		6	5.88	6	48
ICT Officer		24	23.53	24	72
Information Scientist		4	3.92	4	75
Lecturer Research		1	0.98	1	76
Principal Engineer		1	0.98	1	77
Principal ICT Officer		1	0.98	1	78
Statistician		10	9.80	10	88
Systems Administrator		9	8.82	9	97
Technical Advisor		1	0.98	1	98
Others		1	0.98	1	99
Missing		1	0.98	1	100
Total		102	100	100	

Employment Duration Findings							
Item		N	Range	Minimum	Maximum	Mean	SD
Duration in current position (in Years)?		98	15.83	.17	16.00	5.8104	3.95087
Valid N (listwise)		98					
Gender Orientation of the Respondents							
Item		Frequency	Percent	Valid Percent		Cumulative Percent	
Male		67	65.7	65.7		65.7	
Female		35	34.3	34.3		100.0	
Total		102	100.0	100.0			
Age of Respondents							
Item		N	Range	Minimum	Maximum	Mean	SD
Age		102	30.00	26.00	56.00	40.5882	8.77593
Valid N (listwise)		102					
Data Governance Experience Findings							
Item		N	Range	Minimum	Maximum	Mean	SD
Data governance experience? (In years)		101	27	1	28	8.80	6.600
Valid N (listwise)		101					
Seniority Levels of the Respondents							
Item		Frequency	Percent	Valid Percent		Cumulative Percent	
Valid	Top Level Management	17	16.7	17.0		17.0	
	Senior Management	38	37.2	37.0		54.0	
	Officer Level	45	44.1	44.0		98.0	
Missing	System	2	2.0	2.0		100.0	
Total		102	100.0				
Respondents' Area of Study Findings							
Item		Frequency		Percent	Valid Percent	Cumulative Percent	
Valid	Communications	2		2.0	2	2	
	Computing	67		65.7	66	68	
	Accounting and Finance	6		5.9	6	74	
	Statistics	10		9.8	10	83	
	Economics	12		11.8	12	95	
	Engineering	3		2.9	3	98	
	Information Systems	1		1.0	1	99	

Prefer not to Say		1	1.0	1	100
Total		102	100.0	100.0	
Analysis of the Age Brackets of the Respondents					
Age		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	25-29	13	12.7	12.7	12.7
	30-34	22	21.6	21.6	34.3
	35-39	13	12.7	12.7	47.1
	40-44	17	16.7	16.7	63.7
	45-49	16	15.7	15.7	79.4
	50-54	13	12.7	12.7	92.2
	55-59	8	7.8	7.8	100.0
	Total	102	100.0	100.0	
Findings of the Primary Function of the Participating Departments					
Item		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Information Technology	75	73.5	74	74
	Finance and Administration	6	5.9	6	79
	Policy and Planning	16	15.7	16	95
	Statistics	5	4.9	5	100
	Total	102	100.0	100.0	

Source: Primary data (2024)

Appendix I: Demographic Characteristics of Participating Organisations

i) Results on the Nature of the IT Tools Used					
Category		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Traditional IT	35	34.3	35.0	35.0
	Cloud Computing	2	2.0	2.0	37.0
	Both Traditional and Cloud Computing	63	61.8	63.0	100.0
	Total	100	98.0	100.0	
Missing	System	2	2.0		
Total		102	100.0		
ii) Results on the Importance of Data Governance					
Category		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I don't know	2	2.0	2.0	2.0
	Important	17	16.7	16.7	18.6
	Very Important	83	81.4	81.4	100.0
	Total	102	100.0	100.0	
iii) Overview of the Results on the Existence of the Information Security Officer					
Category		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	40	39.2	39.2	39.2
	No, but we are in the process of selecting or recruiting one	6	5.9	5.9	45.1
	No, but we are considering selecting or recruiting one	21	20.6	20.6	65.7
	No, nor do we have a plan to select or recruit one	35	34.3	34.3	100.0
	Total	102	100.0	100.0	
iv) Results on the Existence of the Data Governance Committee					
Category		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	3	2.9	3.0	3.0
	No, but we are in the process of selecting or forming one	10	9.8	10.0	13.0

Missing Total	No, but we are considering selecting or forming one	24	23.5	24.0	37.0
	No, nor do we have a plan to select or form one	63	61.8	63.0	100.0
	Total	100	98.0	100.0	
	System	2	2.0		
v) Results on the Data Custodian or Data Quality Management Officer					
Category		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	44	43.1	43.1	43.1
	No, but we are in the process of selecting or recruiting one	4	3.9	3.9	47.1
	No, but we are considering selecting or recruiting one	21	20.6	20.6	67.6
	No, nor do we have a plan to select or recruit one	33	32.4	32.4	100.0
Total		102	100.0	100.0	
vi) Results on the Existence of the Data Governance Policy/Strategy					
Category		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	7	6.9	7.0	7.0
	No, but we are in the process of developing it	29	28.4	29.0	36.0
	No, but we are considering developing it	37	36.3	37.0	73.0
	No, nor do we have a plan to develop one	27	26.5	27.0	100.0
Missing Total	Total	100	98.0	100.0	
	System	2	2.0		
vii) Overview of the Results on the Existence of a Data Dictionary					
Category		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	33	32.4	32.7	32.7

	No, but we are in the process of developing it	6	5.9	5.9	38.6
	No, but we are considering developing it	35	34.3	34.7	73.3
	No, nor do we have a plan to develop one	27	26.5	26.7	100.0
	Total	101	99.0	100.0	
Missing	System	1	1.0		
Total		102	100.0		

Source: Primary data (2024)

Appendix J: Implementation Guidelines for the Proposed Data Governance Framework

DATA GOVERNANCE FRAMEWORK IMPLEMENTATION GUIDELINES

This document presents a pragmatic, phased checklist designed to support the implementation of a comprehensive data governance framework.

Phase	Preparation and Planning
Purpose	To understand the organization's current state and strategic goals.
Key Activities:	• Define Objectives: Align data governance goals with business priorities such as compliance, risk mitigation, and analytics. • Secure Executive Sponsorship: Obtain top leadership buy-in to ensure long-term support and resource availability. • Identify Internal Stakeholders: Identify Stakeholders across internal departments. • Identify External Stakeholders: Other organizations, development partners, regulators, etc. • Assess Current State: Conduct a data governance maturity assessment to identify gaps. • Define Scope: Decide whether the program will be enterprise-wide or domain-specific. • Review Tools & Technologies: Audit existing platforms and identify needs for new tools.

Phase	Establish a Governance Structure
Purpose	Creating a formal structure and assigning clear responsibilities is crucial for decision-making and accountability.
Key Activities:	• Define Vision and Principles: Establish a clear mission statement and governance philosophy. • Form Governance Bodies: Set up Councils, working groups, and committees. • Assign Roles and Responsibilities: Identify Data Owners, Stewards, Custodians. • Develop Policies: Start drafting foundational governance policies and charters.

Phase	Metadata and Data Management
Purpose	To enable data understanding and traceability
Key Activities:	• Data Cataloging: Implement or enhance a searchable data catalog. • Metadata Management: Standardize business and technical metadata definitions. • Identify Core Data Assets: Focus governance efforts on high-impact data. • Master and Reference Data: Define authoritative sources and synchronization processes and standards/Identify critical data elements and define rules for them. • Data Lineage: Map how data flows and transforms across systems.

Phase	Implementation and Execution Approach
Purpose	Turn strategy into action by rolling out data governance processes
Key Activities:	• Pilot Program: Roll out pilot programs in selected departments or domains. • Data Stewardship: Operationalize roles to maintain standards and resolve data issues. • Process Documentation: Record how governance activities are performed for consistency. • Training and Enablement: Educate teams on policies, roles, and tools. • Issue Management: Set up mechanisms for reporting and resolving data quality issues.

Phase	Define Data Standards and Policies
Purpose	To develop comprehensive policies and standards that data management over its lifecycle.
Key Activities:	• Data Classification Policy: Categorize data based on sensitivity and business impact. • Data Quality Standards: Define metrics for accuracy, completeness, consistency, and timeliness. • Access and Security Policies: Restrict access based on roles and ensure encryption standards. • Data Lifecycle Management: Specify rules for data creation, usage, archiving, and deletion. • Regulatory Compliance: Align institutional governance policies with relevant national and international regulations. • Implementation guidelines: To ensure these policies are actionable, translate them into step-by-step processes with defined timeframes and required documentation.

Phase	Leverage Technology and Tools
Purpose	To ensure availability and usage of appropriate technology and tools to enhance efficiency, scalability and productivity.
Key Activities:	• Select Governance Tools: Choose platforms for cataloging, lineage tracking, quality monitoring, etc. • Integrate with Existing Architecture: Ensure compatibility with databases, Datawarehouse, Business Intelligence tools, and data lakes. • Enable Automation: Use workflow tools to automate governance tasks (e.g., approvals, validation). • Interoperability: Ensure scalability and interoperability of chosen technologies. • Monitor with Dashboards: Build KPIs into interactive dashboards to track adoption and data quality.

Phase:	Training and Capacity Building
Purpose:	To provide continuous training for stakeholders
Activities:	• Planning & Preparation - Assess training needs, set clear objectives, tailor content by role, align with governance strategy, and create a structured training plan and timeline. • Role-Based Training Design - Define learning outcomes; Create training levels and develop corresponding curriculum • Training Materials and Resources - Develop Presentations, User Guides, Glossary, Case studies, and Use Cases. • Training Delivery - Plan and deliver training through a mix of scheduled sessions, e.g. instructor-led classes, self-paced learning, webinars, and interactive activities. • Practical Exercises & Hands-On Learning - Role-based scenarios and problem-solving tasks enable practice in a test environment. • Ongoing Capacity Building - Provide continuing support through a centralized resource center, advanced training, and mentoring.

Phase	Communication and Change Management
Purpose	Adoption hinges on awareness, transparency, and a culture of data responsibility.
Key Activities:	• Communication Plan: Share updates, goals, and wins through newsletters, meetings, and intranet portals. • Stakeholder Engagement: Continue dialogue with business units and leadership. • Promote a Data Culture: Encourage ownership and data literacy through workshops and campaigns. • Recognize Contributions: Incentivize good governance behaviours and successes. • Awareness: Implement regular awareness campaigns and leadership advocacy, sharing success stories.

Phase	Monitoring, Auditing, and Continuous Improvement
Purpose	To provide for continuous performance tracking and improvement
Key Activities:	• Track KPIs: Monitor adoption rates, data quality trends, and policy compliance. • Conduct Audits: Periodically assess governance practices and adjust based on findings. • Feedback Loops: Create forums for ongoing improvement and user feedback. • Policy Updates: Review and revise policies in response to technology, regulatory or business changes.

Phase:	Governance Deliverables Checklist
Purpose:	To support implementation, ensure these artefacts are produced:

Key Activities:	• Data Governance Charter/Plan • Data Stewardship Guidelines • Data Policies & Standards • Data Dictionary / Business Glossary • Data Governance Stakeholders RACI (Responsible, Accountable, Consulted, and Informed) Matrix • Compliance & Audit Reports • KPI Dashboards • Communication Materials • Training Documentation
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