AFRICA UNIVERSITY

(A United Methodist-Related University)

EFFECTIVENESS OF EXISTING SPATIAL DATA INFRASTRUCTURE IN FOSTERING SOUND LAND ADMINISTRATION AND MANAGEMENT IN THE CITY OF HARARE

BY

LAURENCE MUSHAYABASA

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF EXECUTIVE MASTER OF BUSINESS ADMINISTRATION IN THE COLLEGE OF BUSINESS AND MANAGEMENT SCIENCES

2025

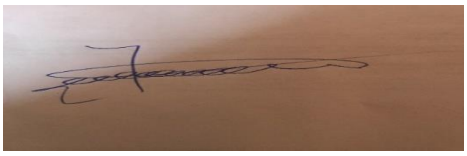
Abstract

The study sought to assess the effectiveness of existing spatial data infrastructure (SDI) in fostering sound land administration and management in the City of Harare. The key challenge that the research pursued to address was poor land administration and management in the City of Harare which led to poor service delivery. The study aimed to establish existing SDI frameworks for land administration and management in the City of Harare, determine the effectiveness of existing spatial data infrastructure frameworks in fostering sound land administration and management in the City of Harare, analyse the factors influencing the effectiveness of the existing spatial data infrastructure frameworks in fostering sound land administration and management in the City of Harare, and to develop effective spatial data infrastructure frameworks for sound land administration and management in the City of Harare. The research used mixed research methodology, which aided in obtaining a more profound understanding of the research phenomenon that could not be fully comprehended via the use of a single qualitative or quantitative research study method. Data was collected from a cross-section sample of 90 stakeholder participants within the City of Harare. Stakeholders comprised of the employees at the Deeds Registry Office, Department of the Surveyor General, City of Harare, and those in some land related organisations. The study made assumptions that there is an intertwined nexus between willingness to establish an effective SDI on the part of the City of Harare and the relationship between the central government and the City of Harare. The study was more concerned with the test of significance, and they were all found to be statistically significant with a P-Value of 0.292 which is greater than the significance level of 0.05. indicating that the responses regarding the level of vision by the government are not significantly skewed towards either "High" or "Very High." The findings reinforce and buttress the necessity for policymakers to address the shortcomings of the existing SDI in the administration and management of land in the City of Harare through embracing legal, technical, institutional and financial frameworks.

Keywords: Innovation, Integration, Technology, Adaptability, Sustainability.

Declaration

I declare that this dissertation is my original work except where sources have been cited and acknowledged. The work has never been submitted, nor will it ever be submitted to another university for the award of a degree.



Laurence Mushayabasa

Student's Full Name Student's Signature (14/04/2025)

Dr Tawanda Nyikadzino

Main Supervisor's Full Name Supervisor's Signature (14/04/25)

Copyright

Acknowledgments

I am humbled and grateful to Dr. Tawanda Nyikadzino, my supervisor for his guidance throughout the dissertation. His in-depth knowledge about the research topic is amazing.

Dedication

To my wife Vera, for being my pillar of strength and support.

List of Acronyms and Abbreviations

ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
ANRDL	Australian Natural Resources Data Library
ASDD	Australian Spatial Data Directory
BPC	Botswana Power Corporation
BTC	Botswana Telecommunication Corporation
CSI	Committee for Spatial Information
DCPR	Data Capture Project Register
DSG	Department of the Surveyor General
EMC	Electronic Metadata Catalogue
EU	European Union
FDI	Foreign Direct Investment
FTLRP	Fast Track Land Reform Programme
GCB	Government Computer Bureau
GI	Geospatial Information
GIS	Geographical Information Systems
GIS	Geographical Information Systems
GPS	Global Positioning Systems
ICT	Information Communication Technology
LIMS	Land Information Management Systems
LIS	Land Information Systems
NDP	National Development Plan
NDS 1	National Development Strategy 1
NGIS	National Geographic Information Systems
NSDI	National Spatial Data Infrastructure
NSIF	National Spatial Information Framework

OSP	Office of Spatial Policy
RTCP Act	Regional Town and Country Planning Act [Chapter 29:12]
SAGI	South Africa Geo Information Management Systems
SASDI	South Africa Spatial Data Infrastructure Sciences
SDGs	Sustainable Development Goals
SDI	Spatial Data Infrastructure
SIDA	Swedish International Development Agency
SIZ	Survey Institute of Zimbabwe
TSP	Transitional Stabilization Programme
ZACC	Zimbabwe Anti-Corruption Commission
ZIE	Zimbabwe Institute of Engineers
ZIMSTATS	Zimbabwe National Statistics Agency
ZIRUP	Zimbabwe Institute of Regional and Urban Planning
ZLC	Zimbabwe Land Commission
ZNHSP	Zimbabwe National Human Settlement Policy

Table of Contents

List of Tables

List of Figures

CHAPTER 1 INTRODUCTION

1.1 Introduction

This chapter provides the foundation of the study. It focuses on the background of the study, statement of the problem, research objectives, research questions, assumptions, significance of the study, delimitations of the study and limitations of the study.

1.2 Background to the Study

In the global south, land based economic activities are heavily reliant on land, and therefore, the economic performance of most developing countries is thus underpinned to the land sector. Agriculture, mining, livestock, forestry, and tourism are the economic mainstay of developing countries, and these land based economic activities enable them to participate in the global economy (Breunig *et al*., 2020).

Since almost all social and economic activities are land related, information about location, tenure, physical characteristics, and other relevant land related data over land is crucial for planning, policy formulation, timely and equitable service delivery to citizens. It is therefore imperative that the management of the land sector be granted the attention it deserves to unlock value of the national economies (Ozoudeh *et al*., 2024).

A Spatial Data Infrastructure (SDI) is an enabling mechanism that allows efficient and effective sharing, dissemination of data and creation of beneficiated land related products and services. The rationale behind the establishment of a SDI it to create a platform for land related users, the rationale being to establish sustainable and efficient land administration and management (Ali, 2021).

Many countries in both the global north and south have started the process of developing SDIs to improve their spatial data assets notwithstanding the terminology used in different countries to describe it. The establishment of SDIs mostly in the global south, however, lack adequate funding and political will from the highest level of government because of the low level of awareness of the importance of spatial data and information in decision making. Developed countries have made significant progress in the implementation of SDIs. The successes have been attributed to the availability of funding, high level of technological advancement, political will and support and highly trained personnel (Ali, 2021, Dangermond & Goodchild, 2020).

There are many countries in Africa that have started the process of developing SDIs to improve their spatial data assets notwithstanding the terminology used in different countries to describe it. The establishment of SDIs in most African countries lack adequate funding and political will from the highest level of government because- of the low level of awareness of the importance of spatial data and information in decision making (Coetzee *et al*., 2020, Kavvada *et al*., 2020).

In 2014 a survey based on web searches and data from the United Nations Department of Economic and Social Affairs E-Government was carried out to review the status of SDI in eight African countries. The SDI - Readiness methodology was used to compute the SDI – Readiness index, and the following indices were found; Senegal (0.69). Rwanda (0.65), South Africa (0.64), Ghana (0.61), Tanzania (0.33), Zimbabwe (0.33), Botswana (0.35), and Malawi (0.38). Senegal, Rwanda, South Africa, and Ghana had higher indices, while Tanzania, Zimbabwe, Botswana, and Malawi had lower indices (Kalogianni *et al*., 2020).

The Reserve Bank of Zimbabwe (RBZ) in its 2006 Annual Report noted that Land Information Management Systems in Zimbabwe are still inefficient as evidenced by poor database management by all local authorities. There is generally consensus among policy makers and technocrats that the current administration and management of land information in Zimbabwe cannot handle large volumes of spatial data (Survey Institute of Zimbabwe, 2010).

The current land management systems have failed to capture the imaginations of politicians, investors, and technocrats in seeing it as a platform, strategy, or approach. As a result, land-based investment inflows have been at an all-time low for more than three decades now. If the current situation is not addressed users and producers of land information will continue not being able to gather enough, robust, dependable, and reliable data sets at the right time (Chigudu & Chirisa, 2020).

In the City of Harare, land administration and management are a challenge due to the existing institutional, technical and legal frameworks in place. Although there are various statutes like the Regional, Town and Country Planning Act (Chapter 29:12), Deeds Registry Act (Chapter 20:05), Land survey Act (Chapter 20:12) among others that advocate for efficient and effective administration and management of land information, the unavailability of accurate and updated land information is an indication that barriers to effective SDIs exist. It is within this background that the study seeks to understand the effectiveness of existing SDIs in fostering sound land administration and management in City of Harare.

1.3 Statement of the Problem

The current land administration and management systems used in Zimbabwe are archaic and outdated and can no longer handle large volumes of land information. The nation at large and local authorities countrywide, including the City of Harare, are still stuck with ineffective and manual land administration and management systems (Zimbabwe Land Commission, 2020).

If not addressed the lack of effective land administration and management systems will continue limiting efficient land administration and management, hence, compromising service delivery. This status quo if not abated will compromise the country's land administration and management system and capacity, including that of City of Harare, in addressing security and quality matters relating to modern day land administration and management systems (Kamusoko *et al*., 2021).

The absence of functional SDIs has forced decision makers within the Zimbabwean government and local authorities to make critical decisions based on little or no information at all. The "Fast Track Land Reform Programme" (FTLRP) of the early 2000s proved that the current land administration and management systems cannot handle large volumes of spatial data. Land use conflicts, boundary disputes, loss and misplacement of land records continue unabated and have been blamed on the manual-based systems in Zimbabwe. This has and will continue negatively affecting land based economic activities resulting in a low Gross Domestic Product (GDP) (Chigudu & Chirisa, 2020).

The goal of this study was to assess the effectiveness of existing spatial data infrastructure frameworks within the City of Harare to foster sound land administration

and management. The research study will inform policymakers and technocrats in both central government and local authorities in coming up with effective SDIs. All land-related stakeholders and the public will receive enhanced service delivery once the nation, local authorities and the City of Harare have established effective SDIs.

1.4 Purpose of the Study

The study aims to assess the effectiveness of the existing spatial data infrastructure frameworks in fostering sound land administration and management in the City of Harare.

1.5 Research Objectives

- To establish existing spatial data infrastructure frameworks for land administration and management in the City of Harare.
- To determine the effectiveness of existing spatial data infrastructure frameworks in fostering sound land administration and management in the City of Harare.
- To analyse the factors influencing the effectiveness of the existing spatial data infrastructure frameworks in fostering sound land administration and management in the City of Harare.
- To develop effective spatial data infrastructure frameworks to foster sound land administration and management in the City of Harare.

1.6 Research Questions

What are the existing spatial data infrastructure frameworks for land administration and management in the City of Harare?

How effective are the existing spatial data infrastructure frameworks in fostering sound land administration and management in the City of Harare?

What are the factors influencing the effectiveness of the existing spatial data infrastructure frameworks in fostering sound land administration and management in the City of Harare?

How can the existing spatial data infrastructure frameworks be strengthened to foster sound land administration and management in the City of Harare?

1.7 Assumptions

The research study assumed that the City of Harare faces a lot of challenges in land administration and management. The researcher also assumed that there is an intertwined nexus between willingness to establish an effective SDI on the part of the City of Harare and the relationship between the central government and the City of Harare. The research was also centred on the assumption that the participants of the research notably land related institutions and stakeholders will be easy to find, and they will participate in the interviews in an honest and sincere manner.

1.8 Significance of Study

This study was informed by the need to understand constraints in effective land administration and management. Research about effective land administration and management which were previously conducted by Chigudi & Chirisa (2020) were mainly national and this research sought to understand how the unique characteristics

in land administration and management of the City of Harare are hampering the effective management and administration of land.

Many stakeholders notably land-related institutions, policy makers, government ministries, property developers and land related consultants and local authorities will benefit from the study. The study will add to the body of knowledge already available on Zimbabwe's land administration and management systems in local authorities. The study will therefore offer a more thorough comprehension of the existing policy frameworks on land administration and management, policy's effects on establishment of SDIs, local governance, service delivery, and opportunities and challenges. The study's conclusions will help guide the City of Harare on policy and practice on the development of a sustainable and robust SDI.

The results of this study will give government organisations and policymakers ideas and suggestions on how to enhance land administration and management and service delivery in the City of Harare and throughout Zimbabwean local authorities, both rural and urban. SDIs implementation opportunities and problems were also be noted.

On the academia, the study will have academic value since it will serve as a foundation for future investigations into how City of Harare and other local authorities at large are affected by land administration and management policies. The study's conclusions and suggestions will serve as a guide for further research and may contribute to the creation of highly qualified public administrators and well-researched initiatives.

Finally, but just as importantly, this study will raise the profile of Africa University by enhancing its standing in terms of research proficiency.

1.9 Delimitation of Study

The study adopted the Mixed Method research paradigm, that is, both the quantitative and qualitative paradigms were applied in this research study. The study was confined to land related government departments in Harare, the City of Harare's departments of Town Planning, Works and private consultants working in the land and related fields in Harare. The study focused on constraints in fostering sound land administration and management in the City of Harare. The study focused on the period from January 2025 to March 2025. Figure 1.2 below shows the central business district of Harare.

Figure 1.2: Central Business District of Harare

Source: Google Earth, 2020

1.10 Limitation of Study

Limitations to any research study are inevitable. Similarly, this research study encountered several challenges which were beyond the researcher's control. However, measures were be taken to mitigate the effects of the limitations of the study on the overall research findings.

The City of Harare is currently under an investigation that is being carried out by a Commission of Enquiry that was appointed by the President of Zimbabwe. Land issues are the main reasons that led to the current investigation. Research participants were inevitably skeptical and afraid to participate fully, and they mostly withheld some information fearing victimisation or that the information they may give will be used against them.

To circumvent this challenge, the researcher disclosed the purpose of the research to the participants and assured them confidentiality. This enabled them to understand from the onset that the information they were sharing was solely going to be used for academic purposes and their anonymity will be prioritized throughout the research.

The danger of Covid 19 is not yet over, and cholera out breaks are quite frequent within the boundaries of City of Harare. The researcher and the research participants were highly likely exposed to contracting Covid 19 and other communicable diseases like cholera. The researcher therefore exercised social distance and made use of face shields, masks and used hand sanitizers to prevent contracting Covid 19 and communicable diseases like cholera respectively.

CHAPTER 2 REVIEW OF RELATED LITERATURE

2.1 Introduction

The previous chapter set the tone for the research study, and this chapter sought to review literature which relates to the research study. The review of literature related to assessing the effectiveness of the existing spatial data infrastructure frameworks for land administration and management in the City of Harare and other jurisdictions. This assessment gave the researcher a platform to discuss ideas previously researched, thereby helping the researcher to close the knowledge gap. Reviewing related literature enabled the researcher to link the data related to the topic thereby leading into creation of new knowledge making use of the existing knowledge.

2.2 Theoretical Framework

The Systems Theory theoretical framework provided a lens through which the study was looked at, as well as the questions that were asked around and about the study area. The Systems Theory was developed in the 1940s from biology (Luhmann, 1991). The Systems Approach Theory is a vantage point from which the researcher viewed a whole, a web of relationships, rather than focusing on the detail of any piece. Events and processes were viewed and seen in the larger context of a pattern that is unfolding over time. All organisations that deal with land related information, and all their operations and processes were viewed and looked at holistically (Okoli & Schabram, 2011, Lunenburg, 2010).

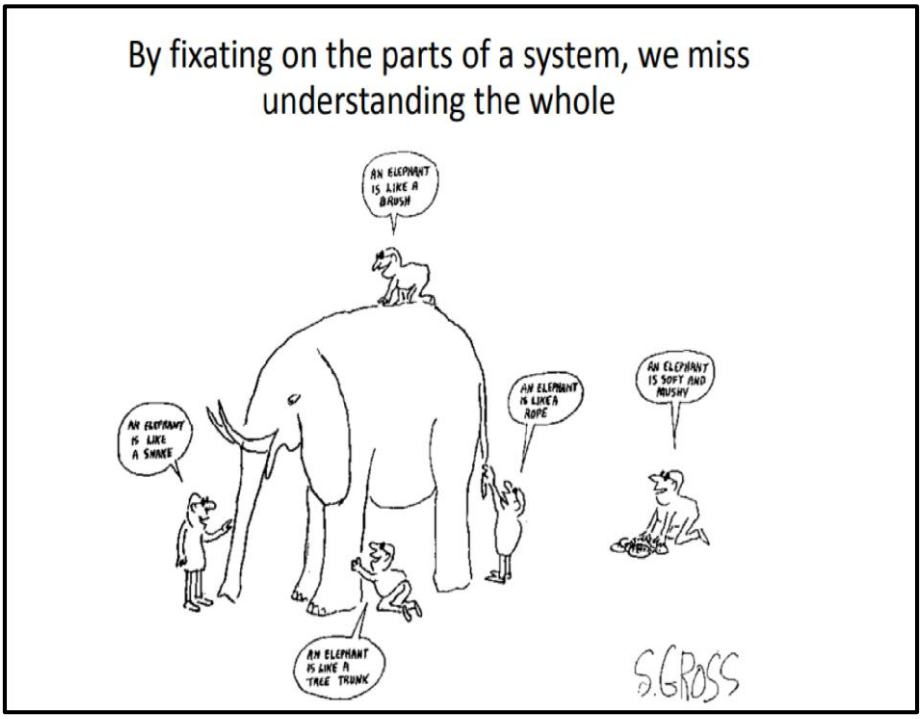
Cabrera & Cabrera (2023) unpacked and defined the Systems Theory as an integrated and interdisciplinary theory that deals with the nature of complex systems in nature, society, and science. The Theory can be used to study, investigate and describe any

group of objects that work in collaboration towards a common purpose and/or goal. The Theory puts emphasis on the complex relationships and dependencies that shape behavior and outcomes. The terms Systems Theory and Cybernetics are also used interchangeably and are widely used as synonyms. Post *et al*., (2020) popularised the term Cybernetic Systems and used the term to describe a proper subset of the class of general systems, namely those systems that include feedback loops.

The Systems theory assumes that complex systems are made up of interconnected parts, and the interactions between these parts are crucial for understanding the system's behaviour and functioning. The Theory also assumes that the whole is greater than the sum of its parts and that the system's behaviour cannot be understood by simply examining its individual components in isolation. According to Jackson (2020), the main components of the Systems Theory are Open and Closed Systems, Feedback Loops, Self-Organisation, Purposiveness, Dynamic and Adaptive, Hierarchical Structure, Equifinality, Environmental Influence. The environment plays a significant role in the manifestation and behaviour of a system.

Looking at land related organisations and their operations as parts isolated from each other is satirically presented in the following Figure 2.1 below. The elephant is the research problem under study, and the people defining the problem differently are the organisations that use land related information.

Figure 2.1: Systems Approach Theory



Source: Senge, 2020

2.3 Relevance of Theoretical Framework to the Study

The City of Harare, Department of the Surveyor General's office (DSG), Deeds Registrar's office as well as other players in land information were looked at and examined as a system. This theoretical approach sees and understands systems as wholes rather than as isolated and disintegrated collections of parts. This approach sees a system as interconnections that create emerging patterns at the end of the day. The Systems Theory is used in research to improve client care and outcomes by better diagnosing problems in the different levels of analysis as well as developing more sophisticated treatment approaches that include these different ecological factors (Habersang *et al*., 2019).

The Systems Theoretical Approach framework assisted the researcher to view the units of analysis's systems from a broader perspective. This entailed examining their

organisational operational systems and overall structures. This approach therefore assisted in identifying the real causes of issues in land information related organisations, thereby informing the study where to focus to address land information related challenges.

This study, therefore, not only viewed SDI as a panacea to land information related challenges, but also as a sustainable means and holistic system that would integrate the operations of all land information related organisations. The theoretical framework espoused and brought to fore the study by the researcher as well as influencing the practice and direction of the study. The Systems Approach theoretical framework also contributed to the research approach underpinned by the mixed methods.

2.4 Literature Review

2.4.1 Understanding SDI and its fundamental dimensions

The concept about spatial data infrastructure is basically a framework of technologies, policies, and institutional arrangements that provides the creation, exchange, and use of geospatial data and the related information (Karakol & Cömert, 2022, Zuberi *et al*., 2025).

SDI interfaces widely with Geographic Information System (GIS), Geographic Positioning Systems (GPS), Remote Sensing and other geospatial technologies (Schindler & Kanai, 2021, Kotsev *et al*., 2020).

A spatial data infrastructure assists and facilitates sharing and management of spatial data among different people of the spatial data community. SDIs are developed at local and national levels. The government makes certain policies and initiatives that aid in the development of SDIs (Zuberi *et al*., 2025, Karakol & Cömert, 2022).

2.4.2 Rational for the establishment of SDI in local government

Mwange et al., (2016) avers that SDI is applied in urban planning, public health, transportation logistics, environmental management and economics. By identifying patterns and trends, local governments and stakeholders can make informed decisions, optimise resources and can manage disasters and reduce risks.

Chigudu & Chirisa (2020) assert that SDI and data analytics are revolutionizing public sector governance and urban planning by providing innovative tools for data-driven decision-making. Integration of SDI and data analytics can address complex challenges in resource management, crisis response, environmental sustainability, and urban development. SDI enables spatial data collection, visualization, and analysis, while advanced data analytics, including predictive models and machine learning, enriches decision-making processes by uncovering actionable insights from diverse datasets (Ozoudeh *et al*., 2024).

2.4.3 Types of SDIs established in local governments across the globe

According to Dangermond & Goodchild (2020) current development progress of SDI initiatives shows that SDI is understood differently by stakeholders from different disciplines and across the globe. In this regard, researchers and various land-related agencies have attempted to capture the nature of SDI in definitions produced in various contexts. Under current circumstances local governments of different nations should settle on fundamental datasets that are required to meet their common interests, to what standards they should be collected and maintained, and what the priorities are for their collection (Kalogianni *et al*., 2020, Scott & Rajabifard, 2017).

2.4.4 Benefits of SDI in land administration and management in local government

Spatial Data Infrastructures offer numerous benefits. SDIs improve efficiency in data collection and processing, support decision-making processes, encourage data sharing, reduce data redundancy, and enhance spatial data access and interoperability (Hu & Li, 2017, Maphale, 2019).

SDI fosters collaborative governance models, and increased stakeholder engagement resulting in transparent, efficient, and sustainable urban governance. By embracing SDI, public sector entities can better anticipate and address societal needs, paving the way for more resilient and inclusive communities. Future opportunities of SDI include leveraging artificial intelligence, expanding GIS use cases, and fostering international collaboration to further enhance public sector and urban planning outcomes (Mulder *et al*., 2020, Mwange *et al*., 2016).

2.4.5 Effectiveness of established SDI in enhancing effective land administration and management

SDIs are cornerstones of modern geospatial management and they enhancing decision making across all sectors in local governments. SDIs have also been known to drive innovation and economic growth, hence supporting sustainable development and environmental protection and management (Schindler & Kanai, 2021).SDI enables the harmonization and seamless utilisation of spatial data from various systems, thereby enabling stakeholders to access and share information easily. This promotes collaboration and enables comprehensive analysis, and it supports holistic decision-making processes (Kotsev *et al*., 2020, Yigitcanlar *et al*., 2022).

2.4.6 Factors influencing the effectiveness of SDI in enhancing effective land administration and management in local government

According to Alkaabi *et al*., (2023) critical factors to the development of SDI are data and metadata, networks and access mechanisms, standards, regulation, financing, human resources and institutional, technical and legal frameworks. The main purpose of a SDI is to create an effective and efficient interface between the producers and suppliers of geospatial data, as well as with those who need and utilise core data sets, thematic and value-added data and information. Establishing an SDI is a technical process that entails a long process with many stages, involving many rounds of multiple stakeholder participation and coordination, involving legal and institutional processes along the way (Maphale, 2019, Sjoukema, 2021).

Kraak & Ormeling (2020) raised several issues that are imperative to do for any country that intends successfully establishing a sound land administration and management framework. Largely, the problems facing the developing countries have generally a lot of similarities, being lack of political support, lack of skilled manpower and lack of adequate funding, inter alia. Peculiar and specific conditions under the system under which the SDI is being established must be understood and be familiar with. The problems are simply not technical; it is the human dimension that will determine the success or failure of the SDI programme (Ali, 2021, Sousa, 2023).

2.4.7 Case studies

2.4.7.1 Status of SDI in Botswana

The Department of Surveys and Mapping (DSM), which is equivalent to the Department of the Surveyor General in Zimbabwe, took it upon itself to champion the

establishment of an SDI in Botswana. The Botswana Government launched its NSDI in January 2003 signifying the importance the government attached to this initiative, and out of the realisation that sharing of spatial data needed to be coordinated. The main objective of the project was to establish of a technical institutional framework and platform within Government that will co-ordinate all GIS data and information (Mpale, 2019, Makanga & Smit, 2010, Maphale & Smit, 2020).

The first phase in the establishment of the NSDI involved providing the first technical facility (metadata) services, by establishment of institutional bodies and setting up of a standards framework. The second phase was to ensure that the institutional bodies that were formed in the first phase are operationalised particularly the secretariat (Arnold *et al*., 2021).

The first phase of the NSDI project was completed in 2004, and the second phase was supposed to start immediately. However, the second phase did not commence as planned, and is yet to commence. The first phase had a fair share of successes in that the committees were successfully set up. The coordination unit and technical committees were successfully established, and the coordination unit has a full-time employee who looks at the day-to-day operations of the project (Manisa & Nkwae, 2007).

2.4.7.2 Status of SDI in South Africa

The promulgation of the Spatial Data Infrastructure Act (No. 54 of 2003) gave birth to the South African Spatial Data Infrastructure (SASDI). The main purpose and mandate of the SASDI is to promote, coordinate and ensure collaboration among spatial data producers, from the local level to the national level (Mpale, 2019).

South Africa managed to establish and put in place vibrant and efficient policy, institutional and technical frameworks for the implementation of SASDI. It was however noted that the country lacked adequate financial support, a clearing house and reasonable stakeholder participation and there is still much to be achieved in establishing a national spatial data infrastructure (NSDI)" (Mpale, 2019).

2.4.7.3 Status of SDI in Australia

Developed countries have made significant progress in the implementation of SDIs. The successes have been attributed to the availability of funding, high level of technological advancement, political will and support and highly trained personnel (Scott & Rajabifard, 2017). Australia is a world leader in GIS, standards development and SDIs, with strong technical research support from the University of Melbourne. The country has also strong surveying and mapping organisations at controlled and administered at State level. Its strong collaboration with New Zealand has seen the formation of a Spatial Information Council (ANZLIC) between the two countries (Cooper *et al*., 2004).

Though the general implementation and funding of SDI is done by the Australian government and Geoscience Australia, commercial mapping agencies such as IndexGeo (Pty) Ltd and PSMA Australia Ltd also play pivotal and important roles. There are more than twenty private sector companies are involved in value-adding SDI related products, hence the dynamics and matrices of multiple role players are evident in the operationalization of SDI.

2.5 Summary

The main purpose of an SDI is to create an effective and efficient interface between the producers and suppliers of geospatial data, as well as with those who need and utilise core data sets, thematic and value-added data and information. Establishing an SDI is a technical process that entails a long process with many stages, involving many rounds of multiple stakeholder participation and coordination, involving legal and institutional processes along the way (Maphale, 2019, Ali & Imran, 2021).

Challenges in establishing ban effective SDI are simply not technical; it is the human dimension that will determine the success or failure of the SDI programme (Smith & Mennis, 2020). Institutional, legal and technical, political will and funding issues are important in establishing an effective SDI (Crompvoets *et al*., 2013).

CHAPTER 3 METHODOLOGY

3.1 Introduction

The previous chapter investigated the review of literature as a way of trying to expose the research gap that justifies carrying out this study. In this chapter the study presents the research methodology that the researcher adopted describes the research technique, building on the theoretical framework that was established in the preceding chapter. It describes how the research questions were answered and provides justification for the methods used to collect the data. The philosophical viewpoint, research design, data sources, collection techniques, processing, analysis, and interpretation are all specifically covered in this chapter. Lastly, it discusses the study's ethical considerations.

3.2 Research design

To fully answer the research objectives, the study's research methodology employed a mixed-methods approach, combining quantitative and qualitative techniques. The pragmatic research philosophy, which stresses practical problem-solving by utilizing a variety of data gathering techniques to create a comprehensive understanding of the study problem, provides the foundation for the implementation of a mixed-methods design (Creswell & Poth, 2018). To collect structured data that can be statistically evaluated and provide a comprehensive picture of the trends, patterns, and correlations within the research population, the quantitative component of the design uses questionnaires. Generalizability and the discovery of noteworthy patterns within the broader sample are made possible by this method (Bryman, 2016).

Conversely, the qualitative component uses interviews to delve deeply into viewpoints and collect more detailed, situation-specific information from individuals. A balanced

approach to data collecting and analysis is ensured by the design's integration of both data kinds, which is essential for answering intricate research problems that cannot be adequately investigated with a single methodology (Tashakkori & Teddlie, 2010). In addition to expanding the area of data collecting, the use of questionnaires, interviews, and desk research triangulates the results from several sources, improving the validity and reliability of the study findings. Triangulation lessens any biases associated with depending solely on one approach and enhances the validity of the study's findings (Fetters, Curry, & Creswell, 2013, Cameron, 2021).

The researcher selected the mixed methods approach because of the nature of the research problem and the matters being addressed. This method helped to capture data that needs both explanations from different informants and relevant numeric data. Researching on the effectiveness of existing SDI in sound land administration and management in the City of Harare required information on the legal, institutional, socioeconomic characteristics and political development activities in land related organisations and how these interact. This required qualitative approaches for data collection and analysis. On the other hand, quantitative data on the measurements of all sorts and statistics on the numbers and distribution of certain activities among users of land related information are critical components.

The researcher adopted a two-pronged approach which collected both forms of data almost simultaneously and then integrating the data in the analysis and interpretation of the research study results. Any contradictions or inconsistencies were noted and subjected to further probing.

3.3 Population and Sampling

3.3.1 Study Population

According to Creswell (2014) study population refers to a group of individuals or items that share one or more characteristics from which data can be gathered and analysed. The study population in this research comprised selected organisations involved in the use and generation of land related information in Zimbabwe with a special focus on the City of Harare. The research participants included the Department of the Surveyor General (DSG), the Deeds Registry Office and the City of Harare. The information obtained from the study population and literature review was used to assess the effectiveness of existing spatial data infrastructure in fostering sound land administration and management in the city of Harare.

3.3.2 Sampling Techniques

Sampling refers to a process where the researcher must carefully choose the target population from which he/she wishes to collect data from to conduct a research study (Bhatacherjee, 2012). Sampling methods are closely related to the unit of analysis in a research problem, and the researcher will take reasonable care to avoid biased sampling.

Creswell (2014) argues that there is no universal formula for calculating the size of a sample. He however contends that; it is a known fact that the larger the size of the sample the more representative the information given about the population. It is also argued on the other hand that, above a certain size, little extra information is obtained by increasing the size.

The sample size was determined by using Roscoe (1975) 'rule of thumb' for determining sample size which states that a sample size larger than 30 and smaller than 500 are appropriate for most research studies. Based on this, 100 questionnaires were distributed to users of land related information as well as to relevant key informants who are not necessarily involved with land information.

The study sample was determined using the Krejcie and Morgan (1970) sample size as shown in table 3.1 below.

Table 3.1 Sample size determination table

Total	Sample	Total	Sample	Total	Sample
10 ⇒	10	220 ⇒	140	1200 ⇒	291
15 ⇒	14	230 ⇒	144	1300 ⇒	297
20 ⇒	19	240 ⇒	148	1400 ⇒	302
25 ⇒	24	250 ⇒	152	1500 ⇒	306
30 ⇒	28	260 ⇒	155	1600 ⇒	310
35 ⇒	32	270 ⇒	159	1700 ⇒	313
40 ⇒	36	280 ⇒	162	1800 ⇒	317
45 ⇒	40	290 ⇒	165	1900 ⇒	320
50 ⇒	44	300 ⇒	169	2000 ⇒	322
55 ⇒	48	320 ⇒	175	2200 ⇒	327
60 ⇒	52	340 ⇒	181	2400 ⇒	331
65 ⇒	56	360 ⇒	186	2600 ⇒	335
70 ⇒	59	380 ⇒	191	2800 ⇒	338
75 ⇒	63	400 ⇒	196	3000 ⇒	341
80 ⇒	66	420 ⇒	201	3500 ⇒	346
85 ⇒	70	440 ⇒	205	4000 ⇒	351
90 ⇒	73	460 ⇒	210	4500 ⇒	354
95 ⇒	76	480 ⇒	214	5000 ⇒	357
100 ⇒	80	500 ⇒	217	6000 ⇒	361
110 ⇒	86	550 ⇒	226	7000 ⇒	364
120 ⇒	92	600 ⇒	234	8000 ⇒	367
130 ⇒	97	650 ⇒	242	9000 ⇒	368
140 ⇒	103	700 ⇒	248	10000 ⇒	370
150 ⇒	108	750 ⇒	254	15000 ⇒	375
160 ⇒	113	800 ⇒	260	20000 ⇒	377
170 ⇒	118	850 ⇒	265	30000 ⇒	379
180 ⇒	123	900 ⇒	269	40000 ⇒	380
190 ⇒	127	950 ⇒	274	50000 ⇒	381
200 ⇒	132	1000 ⇒	278	75000 ⇒	382
210 ⇒	136	1100 ⇒	285	100000 ⇒	384

Source: Krejcie and Morgan, 1970

The sampling technique used for quantitative data was stratified random sampling which sampling technique used for qualitative data was purposive sampling. To ensure representation and increase the accuracy of results, stratified random sampling splits a population into subgroups (called strata) depending on shared features. Then, random

samples are taken from each stratum. The advantages of this approach include the possibility of a more representative sample, enhanced precision, and the capacity to examine subgroups.

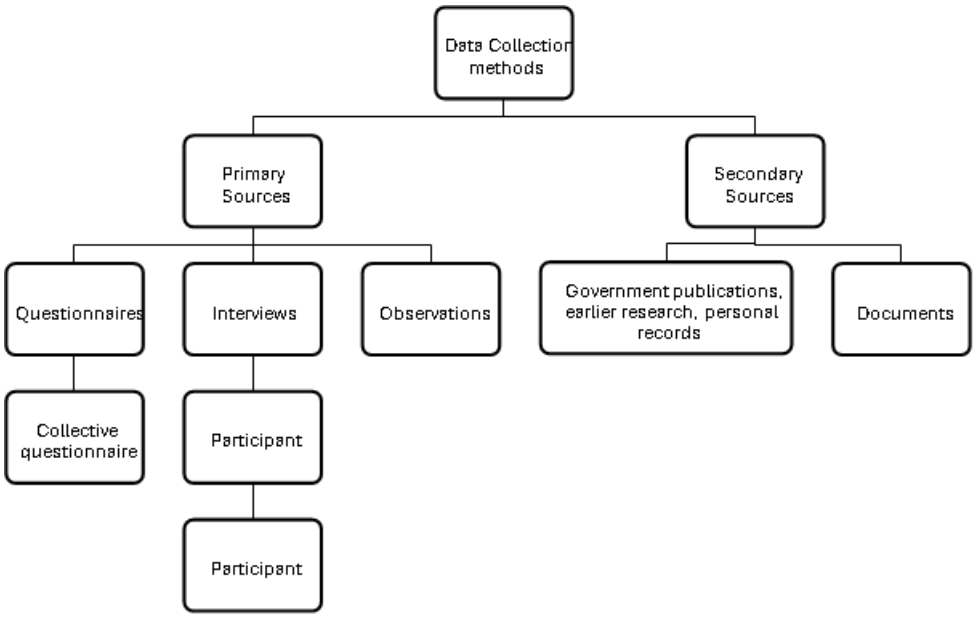
Using a non-probability sampling technique called purposeful sampling, sometimes referred to as judgmental or selective sampling, researchers deliberately choose participants based on traits or standards pertinent to their research issue to gain a deeper knowledge and more focused insights.

3.4 Data Collection Instruments

Data collection is part of a long and elaborate process of planning, designing, and execution in research study. There are two types of data collection methods namely, primary and secondary. Primary data collection involves the study of a subject through firsthand observation and investigation, this comes from the researcher's observations or experience, or from the information the researcher gathers personally from other people. Secondary data collection involves the collection of information from studies that other researchers have made of a subject, and secondary data can be accessed from libraries and the internet (Bhatacherjee, 2012).

Both primary and secondary data was collected from the identified strata during field work. The research instruments adopted in this research study comprised of both qualitative and quantitative instruments. These ensured that data matched the research objectives and comprehensively mined in a reliable and valid manner. Figure 3.1 summaries data collection methods that were applied in this research study.

Figure 3.1: Data collection procedure



Source: Saunders, 2009

3.4.1 Qualitative Methods

3.4.1.1 Interviews

Interviews are conversations with a purpose. They are a more personalized form of data collection method. In this research study, interviews were relevant because of their ability to yield data in quantity and quality quickly as elaborated by Creswell (2014). The method was used to obtain data from the DSG, the City of Harare and Deeds Registry's Office. The method was useful in obtaining information on the effectiveness of existing SDI in sound land administration and management in the City of Harare, resources allocations required as well as institutional and legal logistical frameworks. Although this method (semi-structured interviews) results in a lack of comparability of one interview with another, Kothari (2004) argues that this method is a central technique of collecting information in the case of exploratory research studies, which was the case with this research.

Face-to-face interviews with the selected respondents were made at times and placed most convenient and suitable to the selected respondents. Follow up telephone interviews were made to get further information where the researcher may not have understood or required clarification on certain issues.

3.4.1.2. Observations

Observations entail a systematic noting of events, behaviours, and artefacts in a social setting chosen for a study. Observation as an instrument was suitable for this research study because it allowed the collection of data where and when an event was happening. More so, it did not rely on the respondent's ability or willingness to provide information. In this research study, observations were used to witness the activities taking place in the selected places and among individuals in the study area. It also enabled the researcher to observe and note the elements, and their state, that took place in the organisations and from individuals selected (Vandenbroucke *et al*., 2013).

Field notes were used to complement the interviews and observations. This method, as supported by Kothari (2004), eliminated subjective bias. In addition to that, the observation method was provided data on the effectiveness of existing SDI in fostering sound land administration and management in the City of Harare. It should however be noted that the observation technique of data gathering limited the researcher to what can be seen only, a weakness that was covered by questionnaires and interviews.

It is also noteworthy that the observation technique was also further curtailed by the current cholera outbreak where access and direct contact with participants was a major challenge. The researcher however complied and observed all prescribed safety guidelines and protocols by doing strict hand sanitisation and always wearing a face

mask. The researcher, having worked in the City of Harare before, used his connections to easily get data from the City of Harare.

3.5 Analysis and Organisation of Data

Since the study used both quantitative and qualitative methods, two methods of data analysis were used. Quantitative data was analysed through descriptive statistics and inferential statistical procedures using the SPSS computer software, data analytics and business intelligence. Data was analysed using SPSS and a number of statistical tests were carried out namely the correlations, regressions and ANOVA.

Qualitative data from in-depth interviews was analysed through thematic narrative analysis. Analysed data was then presented in the form of tables, graphs, pie charts, maps and photographs. Themes were established and then grouped into similar categories and then discussed with reference to relevant literature.

Table 2 shows the research design matrix which provides a summary of the chapter by presenting, against each objective, the research question, data collection technique, type of data collected, source of data and the way the data was analysed.

3.6 Data Analysis Procedure and Types of Tests

A well-structured strategy is necessary for the analysis of data from a study that uses both quantitative (questionnaires) and qualitative (interviews and desk research) data gathering methods. Depending on the type of data, different tests and procedures must be used. The procedures and test kinds utilized for both quantitative and qualitative data analysis are described below.

3.6.1 Quantitative Data Analysis (Questionnaires)

Procedure:

Data Cleaning and Preparation: Data cleaning is the initial stage of quantitative data analysis. This entails verifying that every response is legitimate and looking for any missing, conflicting, or outlier data items. Responses that are inconsistent or incomplete may be eliminated or appropriately imputed.

Descriptive Statistics: Descriptive statistics, such as frequencies, percentages, means, and standard deviations, were computed in order to obtain a preliminary knowledge of the dataset. These statistics aided in data summation and the discovery of distributions, trends, and patterns.

Reliability Testing: Cronbach's alpha was used to assess the reliability of any multiple-item scales (such as Likert scale items) that were included in the questionnaire. This metric evaluated the scale's items' internal consistency.

Tests:

Chi-Square Test: A Chi-Square test for independence was performed in order to investigate the link between categorical variables. This was used, for instance, to investigate if the effectiveness of SDI and the availability of specific basic datasets (such as height datum and geodetic control points) are significantly correlated.

3.6.2 Qualitative data analysis

Thematic Analysis: Based on the research questions and objectives, the coded data was arranged into themes. The researcher got profound insights into the experiences, viewpoints, and actions of participants by using thematic analysis to find patterns in the data that are pertinent to the study's emphasis. Content Analysis: The secondary data for desk research was reviewed using content analysis. To understand the text in

light of the research objectives, it was first methodically analyzed and then categorized into themes or subjects.

3.7 Ethical Consideration

Researchers need to anticipate ethical issues that may arise during research studies. Research involves collecting data from people and about people (Creswell, Vicky, & Plan, 2011). Researchers need to protect their research participants, develop rapport and trust with them, promote and uphold highest degree of integrity of research, guard against acts of misconduct, and cope with cross cutting social challenges (Luneburg, 2010).

The researcher considered all ethical and confidentiality requirements of research by complying and adhering to all protocols and regulations governing confidentiality in research work. Participants were informed of their right to consent and participate voluntarily.

A permission letter was obtained from the Africa University Research Committee (AUREC) introducing the researcher and explaining the purpose of the survey to the respondents and the researcher therefore treated all respondents with honesty and respect (Gourmelon et al., 2019).

The researcher safeguarded the participants' rights and welfare. The researcher started by giving each responder a thorough explanation of the study's goals, methods, possible dangers, and advantages to get their informed permission. The researcher then clarified that their involvement was completely voluntary and that they could leave at any time without facing any repercussions.

The researcher took several safety measures to preserve data security and confidentiality. All information gathered was safely saved, and only authorized staff was able to access it. Where required, the identity of the participants was made anonymous to avoid any connection between their answers and their private data. The researcher assured them that the data they submitted would only be utilized for scholarly research and would be reported in a manner that respected their privacy.

Respondents were not put through any emotional, psychological, or bodily suffering because of the way the study was set up. Inquiries were phrased in a way that was kind and non-intrusive, especially when discussing delicate subjects.

3.8 Summary

This chapter mainly focused on research methodology and techniques and data collection instruments that were used in the research study. Ethics were part and parcel of this research study, and they were considered. The next chapter, Chapter 4 will focus on the presentation, examination and scrutiny of the research outcomes in line with the research objectives.

CHAPTER 4 DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter addresses the research objectives and questions by presenting, analyzing, and interpreting data gathered from land-related information users and non-users. Data analytics methods, artificial intelligence, SPSS version 26, and visual aids like frequency tables, pie charts, and bar graphs were used to analyze the data. An overview of land-related information collection, distribution, processing, and storage is provided in this chapter. To assess the effectiveness of existing SDI for the management and administration of land within the City of Harare, the chapter also examines the prerequisites for frameworks and enabling variables that create a database pertaining to land. After the results are analyzed and presented in accordance with the study questions and objectives, their implications are discussed.

4.2 Questionnaire response rate

Ninety of the one hundred questionnaires that were provided were filled out and returned, giving the study a 90% response rate. Strong participant engagement is indicated by this high response rate, which also improves the accuracy of the data gathered. Since it reduces the possibility of non-response bias and guarantees that the results are more representative of the target population, a response rate of 70% or more is typically regarded as sufficient for survey research (Dillman *et al*., 2014). The high degree of involvement indicates that participants thought the subject was important and were eager to share their opinions, which supports the validity of the study's findings (Groves *et al*., 2009, Baruch & Holtom, 2008).

Table 4.1: Questionnaire response rate

Category	Number of Questionnaires	Percentage (%)
Distributed	100	100%
Responded	90	90%
Not Responded	10	10%

Source: Study Results, 2025

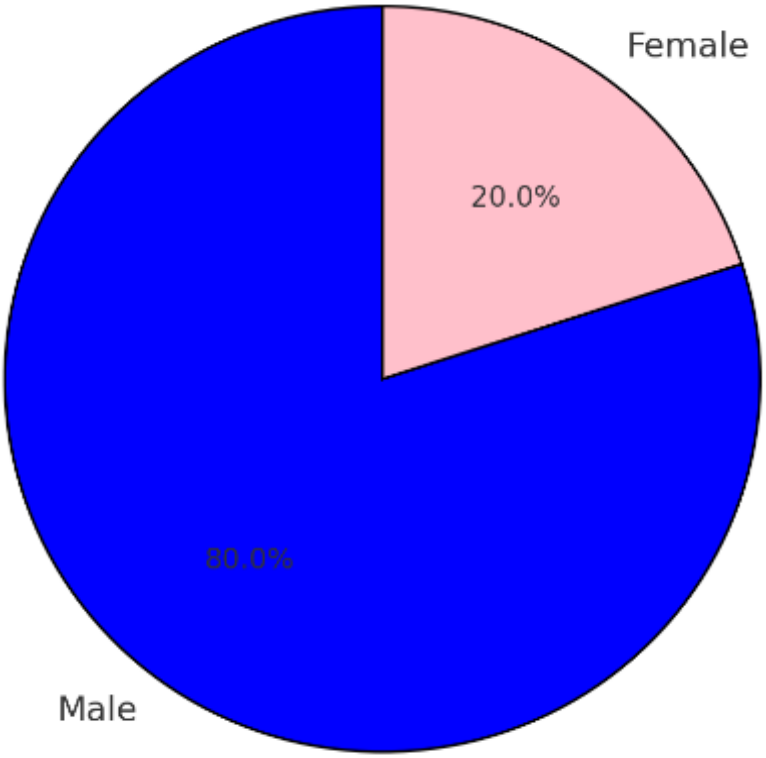
4.3 Demographic data

Researchers can evaluate potential biases, increase generalizability, and strengthen the validity of the study by analyzing these factors (Creswell & Creswell, 2018). Additionally, demographic insights facilitate subgroup comparisons, allowing for a deeper exploration of how different characteristics influence responses and outcomes (Bryman, 2016). Demographic analysis is therefore a crucial step in enhancing the validity and relevance of study findings.

4.3.1 Gender of respondents

The gender breakdown of the respondents shows that only 18 (20%) of the respondents were female, with the bulk (72, 80%) being male. The substantial gender gap indicates that men are the study's preponderant participants. The results may reflect the broader societal or occupational trends in the sector under study, where male participation is higher. Knowing the distribution of genders is essential for determining whether the data is representative and whether gender affects how people respond to important research factors.

Figure 4.1: Gender representation in the study



Source: Study Results, 2025

80% of respondents were men and only 20% were women, indicating a notable gender imbalance in the study population. Men appear to be the study's most prevalent participants, which may be indicative of larger cultural patterns surrounding the use and access of information about land. According to Agarwal (2003), gender dynamics are crucial in determining how people view resource control, decision-making, and land ownership. Women's underrepresentation may be a sign of current obstacles that prevent them from participating fully in land-related activities, such as socioeconomic factors, legal constraints, or cultural norms (FAO, 2020).

Studies have revealed that men often have greater access to property, financial resources, and institutional support, while women may face systemic barriers in gaining land rights and participating in decision-making processes (Deininger &

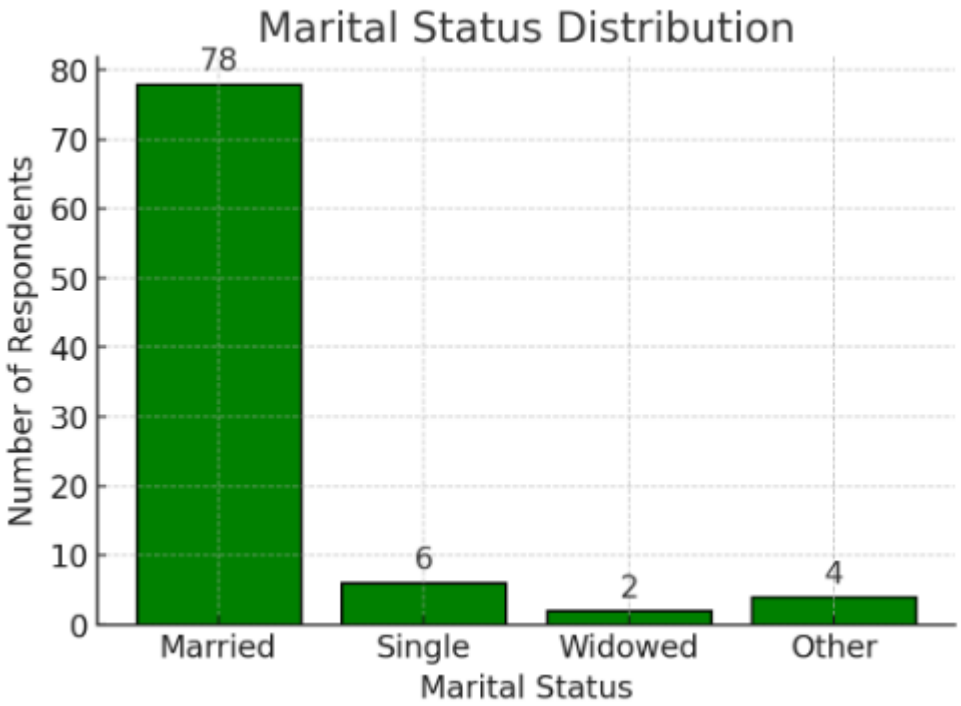
Feder, 2009). Data interpretation may also be impacted by gender differences in land-related issues since responses that are dominated by men might not adequately reflect the difficulties and experiences that women encounter when trying to access and use land information (Meinzen-Dick *et al.,* 2019).

It is crucial to comprehend gender disparities in research to guarantee inclusive policy recommendations and interventions. Scholars stress that to encourage fair access and participation, gender-sensitive methods must be incorporated into information systems and land governance (Quisumbing *et al*., 2014). By considering the different needs of men and women, these disparities can be addressed and land management techniques can become more sustainable and effective.

4.3.2 Marital status of participants

The marital status data shows that most respondents were married (78 respondents, 86.7%), followed by single individuals (6 respondents, 6.7%). Widows made up a small percentage of the respondents (2 respondents, 2.2%), and "Other" accounted for 4 respondents (4.4%). The study sample may be predominantly composed of people with family responsibilities, as indicated by the high percentage of married respondents. This could affect how people view information pertaining to property. Furthermore, marital status is a significant demographic factor since it influences access to opportunities, resource ownership, and decision-making.

Figure 4.2: Marital status of participants



Source: Study Results, 2025

According to the distribution of marital status, most respondents (86.7%) are married, while only a tiny percentage are widowed (2.2%), single (6.7%), or categorized as "Other" (4.4%). This implies that people with family responsibilities make up most of the study population, which may have an impact on their priorities, viewpoints, and decision-making when it comes to land-related information. Babbie (2020) asserts that marital status is a significant demographic factor because it influences the access and use of resources and can influence social and economic behaviors.

Married persons frequently have higher financial stability and long-term planning perspectives, which may alter their engagement with land-related concerns (Creswell & Creswell, 2018). Furthermore, research indicates that marital status can affect willingness to adopt new information systems or technologies, investment priorities, and security perceptions (Bryman, 2016). The low proportion of respondents who were

widowed or single raises the possibility that the study population is biased in favor of people who have established households and are more likely to be actively engaged in land-related activities.

Comprehending the composition of marital status aids in placing research findings in context because responses may be influenced by variations in social responsibilities, financial security, and decision-making processes (Saunders, Lewis, & Thornhill, 2019). This demographic knowledge is therefore crucial for analyzing trends and making sure that policy suggestions consider the viewpoints of minority groups within the study population while also attending to the demands of the dominant group.

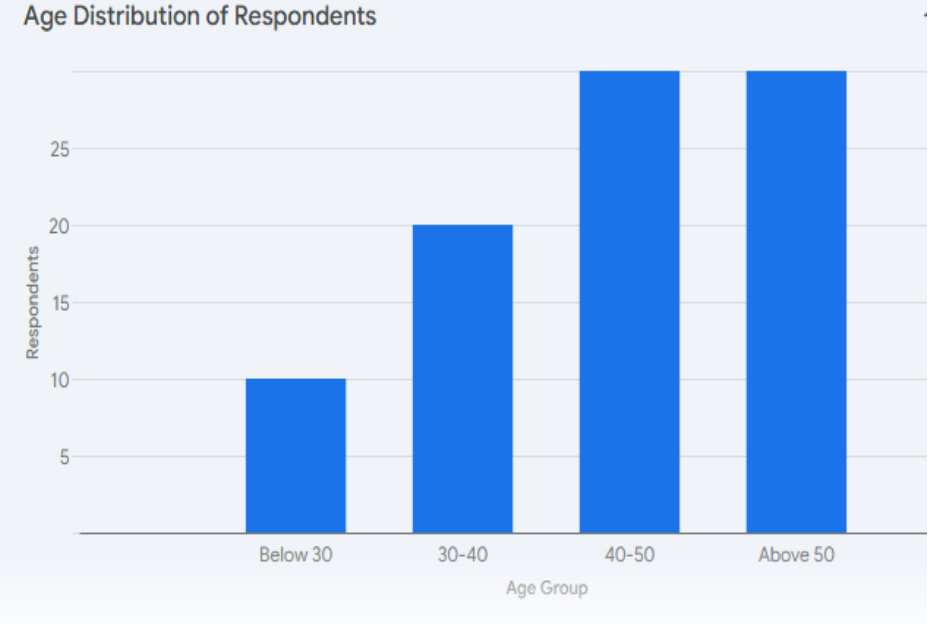
Research revealed a lack of equitable representation in terms of age and gender, despite the Zimbabwean Constitution's section 17's advocacy for gender balance. According to the results, there are no women in positions of decision-making when it comes to matters involving land information. It became clear from the literature research and document analysis that South Africa and Rwanda have taken gender equity seriously and sincerely, as evidenced by the fact that both NSDI committees contain an equal number of female decision-makers and committee members. Gender equality has also been shown to be advanced in Australia and other affluent nations.

4.3.3 Age distribution of respondents

According to the age distribution, most respondents (30 people) are between the ages of 40 and 50, with those over 50 coming in second (30 people). This suggests that middle-aged and older people make up a sizable component of the research group. According to studies, aging affects how people see the world, make decisions, and adjust to new technologies (Rogers, 2003). Due to socioeconomic hurdles, a lack of ownership rights, or lower interest levels, the reduced presence of younger respondents

(10 people under 30 and 20 between 30 and 40) may indicate limited youth participation in land-related topics (FAO, 2021).

Figure 4.3: Age of respondents



Source: Study results, 2025

The fact that older generations tend to own land and make decisions, which is a pattern seen in many countries, may potentially be the reason for the larger percentage of older respondents (Deininger & Byerlee, 2011). Since different age groups may have varied requirements, goals, and levels of participation with land information systems, it is crucial to understand the age composition to customize policy responses.

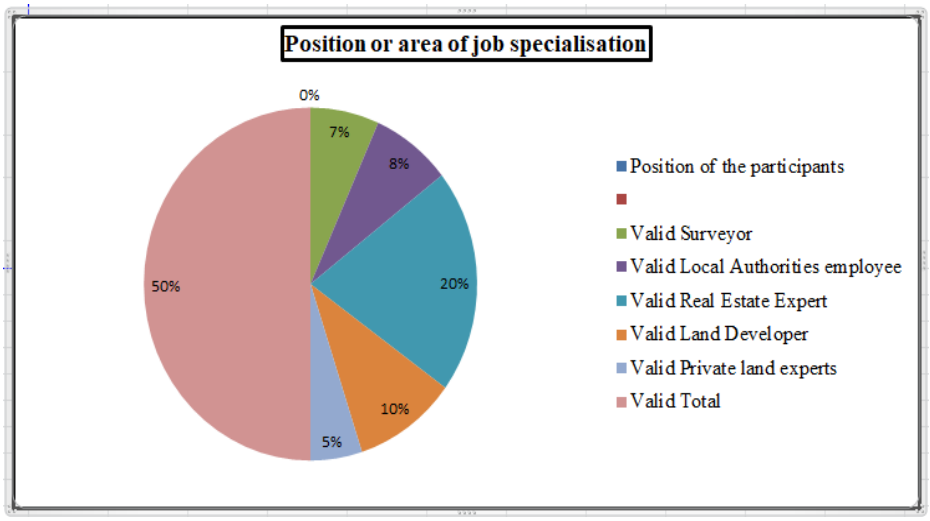
4.4 Representation of participants

The distribution of participants according to their demographic positions is shown by the statistics. Surveyors are the least represented group, accounting for 12 (13.3%) of the 90 responses. Despite being relatively low, this statistic indicates that the study's main focus is not on surveyors' roles. With 14 participants, or 15.6% of the total population, employees of local authorities make up the next largest group.

Additionally, this category is modestly represented, suggesting that local authorities are a significant but non-dominant part of the study.

Real estate professionals make up the largest group in the sample, comprising 41.1% of all respondents. Real estate professionals make up most respondents (37), which may indicate that the poll is focused on the land development or real estate industries. Land developers come next, accounting for 18 participants and 20% of the respondents. This is a sizeable amount, demonstrating the important part land developers play in the survey or study's setting. With just nine members, or 10% of the total, the private land experts make up the smallest group. Even though they are the least represented, this could mean that private land specialists are either less common or less essential to the goals of the study.

Figure 4.4: Position or job area specification



Source: Study results, 2025

By the time we get to the land developer group, the cumulative percentage has already risen to 90 percent. This indicates that most participants are either land developers, real estate professionals, or employees of the local government, with the remaining 10% being private land specialists. Surveyors and private land specialists are

underrepresented in the distribution, which shows a populace largely interested in real estate and land development.

Due in large part to the study area's importance to their day-to-day activities, participants in the City of Harare, the DSG's office, and the Deeds office demonstrated a great deal of interest in the research topic, as evidenced by the high response rate. Since they made up the main informant strata, the high response rate was beneficial to the survey's findings.

It follows that the data from the interviews meets the requirements of the study questions given the 90% response rate in the targeted interviews, particularly the positive responses from the key informants. The response rate and the makeup of the interviewees are displayed in Figure 6 above.

The approach of this research is very consistent with the Botswana and South African experiences in their NSDIs establishment trajectory in that this research survey was also broad and all encompassing.

Botswana set up a National GIS Coordinating Committee (NGIS) committee in 2002 to set up a National Spatial Data Infrastructure NSDI. The committee was made up of a wide range of representatives from the following organisations; Government Computer Bureau (GCB), Department of Surveys and Mapping, Department of Water Affairs, Department of Crop production and forestry, Department of Lands, Central Statistical Office, Botswana Power Corporation (BPC), Department of Town and Country Planning, Botswana Telecommunication Corporation (BTC), Ministry of Local Government and the University of Botswana and other private stakeholders were included in the GIS user group (Tembo & Manisa, 2003).

The South African NSDI was framed, designed and premised to align and dovetail with the national outcomes outlined in the National Development Plan (NDP). The NDP aims to eliminate poverty and reduce inequality in South Africa by 2030. Equally the same, this research linked the proposed NSDI to global and national development frameworks, that is, the SDGs, Africa Agenda 2063, Zimbabwe National Vision 2030 and the NDS 1: 2021 – 2025 to operationalize it.

Australia, Botswana and South Africa have also gone further by involving the academia and the private sector at very high levels in the setting up of their NSDIs, and that inclusivity has seen these countries tapping into a rich wealth of material, financial and skills resources.

Australia gets strong technical research support from the University of Melbourne, and there are more than twenty private sector companies involved in value-adding its SDI related products. The academia and the private sector have been left out in Zimbabwe in the SDI initiative. This is however not advisable since universities and polytechnics are research engines and the private sector are sources of financial and material support.

The establishment of an effective SDI in the administration and management of land in the City of Harare stands a greater chance of success given the country's highly skilled professionals and relatively many institutions of higher learning which can be taken advantage of as engines of research. The private consultants in the land information fraternity expressed a lot of willingness to be included in the SDI establishment efforts, and that on its own indicates greater chances of success in the establishment of an effective SDI in the administration and management of land in the City of Harare.

It is therefore advisable that the SDI steering committee in Zimbabwe also follows the winning prescriptions and procedures adopted by South Africa, Australian and Botswana given that their experiences have proven to yield positive results so far.

4.5 Factors that influence Spatial Data Infrastructure – Readiness

The information presented provides a thorough analysis of the current status of spatial data infrastructure (SDI) in the City of Harare, emphasizing three key areas: institutional leadership in coordinating SDI activities, the legal framework assisting SDI initiatives, and the government's vision for SDI development. When evaluating the city's dedication to putting in place efficient SDI systems that can influence urban planning and development, these elements are essential.

According to the data, all respondents (100%) think that the government has a high or very high vision for the growth of SDI. Of these, 44.4% said the vision was high, and 55.6% thought it was extremely high. This suggests that the administration is well conscious of and committed to the significance of SDI in Harare.

Since it guarantees the required political will and support for these projects, a positive government vision is crucial for the successful implementation of SDI systems. This trend is supported by international research, as studies by Sui and Elwood (2021) and Elwood (2020) demonstrate that governments all over the world are giving the creation of spatial data systems a higher priority to improve urban planning and governance. There appears to be a strong commitment to incorporating SDI into urban planning and decision-making processes in Harare, as indicated by most respondents' faith in the government's lofty goal. This could support more intelligent and effective development.

According to the data, all respondents (100%) believe that the leadership in the institutions that coordinate SDI operations is either high or very high, with half of them giving it a high rating and the other half a very high rating. Harare's fair and favorable evaluation of its institutional leadership suggests that SDI has a competent and successful management structure.

However, there are further difficulties with the legal framework that supports SDI projects in Harare. The legal backing for SDI was judged as medium by most respondents (67.8%), low by 28.9%, and strong by just 3.3%. This implies that although there is a legal framework in place to encourage the growth of SDI, it is thought to be inadequate or undeveloped. Since it offers the precise rules, data access guidelines, and institutional mandates required for SDI systems to operate, a robust legal framework is essential to the program's success.

According to Binns *et al*. (2021), the growth of SDI may encounter several obstacles in the absence of an efficient legal framework, such as problems with data sharing, privacy issues, and unclear governance structures. The city's full potential for SDI development may be hampered by legal framework inadequacies, as indicated by Harare's medium and low ratings for legal assistance. The data presents a mixed picture of Harare's SDI success overall. Even while the government has a clear and good goal and strong institutional leadership, the legal framework clearly needs to be improved to support SDI activities more strongly. The entire potential of SDI in Harare and the efficient use of spatial data for urban planning and development may depend on filling these legal support deficiencies.

Chi-Square Goodness of Fit

The study will perform the Chi-Square Goodness of Fit test for each table to determine if the observed frequencies differ significantly from an expected uniform distribution.

Here are the results of the Chi-Square Goodness of Fit tests:

Table 4.2: Chi-Square Goodness of Fit

Variable	Chi-Square Statistic	P-value
Vision	1.111111	2.918405e-01
Leadership	0.000000	1.000000e+00
Legal Environment	56.866667	4.482912e-13

Vision Test Results:

- Chi-Square Statistic: 1.111
- P-value: 0.292

Leadership Test Results:

- Chi-Square Statistic: 0.0
- P-value: 1.0

Legal Environment Test Results:

- Chi-Square Statistic: 56.867
- P-value: 4.483e-13

Interpretation:

Vision: The p-value (0.292) is greater than the significance level of 0.05. This indicates that there is no statistically significant difference between the observed frequencies and a uniform distribution. In other words, the responses regarding the level of vision by the government are not significantly skewed towards either "High" or "Very High."

Leadership: The p-value (1.0) is much greater than 0.05. This shows a perfect fit to a uniform distribution, meaning the responses are evenly split between "High" and "Very High" levels of leadership.

Legal Environment: The p-value (4.483e-13) is far less than 0.05. This indicates a statistically significant difference between the observed frequencies and a uniform distribution. The responses are not evenly distributed across "Low," "Medium," and "High," with a clear concentration in the "Medium" category.

4.6 Role of NSDI in Land Information Management Systems (LIMS)

Participants were interviewed on their knowledge of what they know about the role of SDI in land information management, and their opinion on the government awareness campaign and drive on the establishment of a SDI. Out of the 75 participants interviewed, 70 participants, which is 93%, responded that there was no awareness campaign that was being done by government to conscientize stakeholders about what SDI is and about its intended establishment.

Out of the 12 participants interviewed at the Surveyor General's office, 5 participants, which is 42% of the total participants at the Surveyor General's, responded that the awareness campaign by government about SDI establishment was low. Some town

planners and land surveyors in the private practice were even not aware of any existing initiative to establish a SDI in the City of Harare, though they had a better understanding of the role of SDI in Land information management.

Out of the 90 respondents who participated in the research (80%), did not know the role of SDI in land information management, whilst 5 respondents (7%) at the DSG had a high understanding of the role of SDI in land information management. 15 respondents (13%) had a fair understanding of the role of SDI in land information management.

The awareness responses indicated that the government is not doing enough to drive the agenda of establishing a SDI. There is either no political will or lack of effective innovative means to reach out to both stakeholders and stockholders among land related information generators and users.

4.7 Causes and Impacts of Land Information Management Malpractices

The researcher visited key informants' workplaces and observed gross flouting of laid down procedures and regulations by officials in connivance with members of the public who use land related information. At the DSG digital and manual spatial information was observed being sold to the public without the proceeds being credited to the department.

At the Deeds office fraudulent activities were also noted where deeds searches were done by members of the public and payment being paid directly to officials. The researcher also witnessed a case of a fake Deed of Transfer (title deed) document that had all official features of the department save for the ownership details.

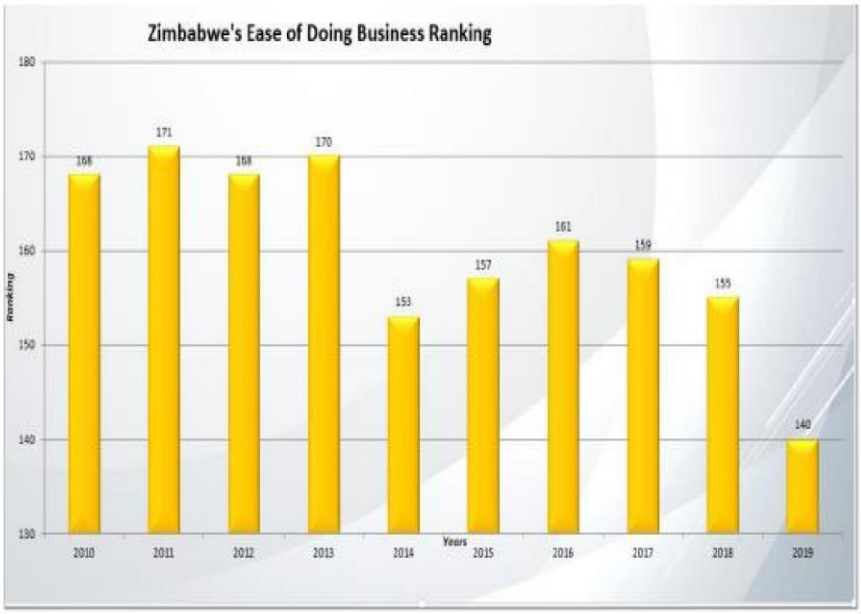
At the City of Harare, the researcher went through selected council minutes from the period 2018 to 2021. The researcher also read articles, newspapers and court judgements relating to malpractices within the City of Harare with respect to land matters. Of all court cases that the researcher researched on, 97% of the cases were land related malpractices mostly relating to illegal subdivision of land, illegal land sales, and illegal developments on undesignated and unsuitable sites.

The 'laissez affair', lackadaisical approach and engagements in malpractices in land related transactions have been observed to have been attributed to outdated and manual working procedure manuals and guiding frameworks, as well as high transaction costs. Malpractices have also been observed to emanate from lack of institutional linkages among key informant organisations.

There is no linkage or network that facilitates sharing of information among the DSG, Deeds offices and the City of Harare. Any of the key informant organisations cannot tell what happens in the other organisations with respect to information that would have been accessed by members of the public.

It was observed that the time that was taken for a member of the public to get a service without malpractice ranges from 45 minutes to an hour, whist it took less than 10 minutes when a malpractice was done. Members of the public generally do not want to wait for long to get a service and would rather engage in malpractices to get a service. Overally the country's ease of doing business has not been favourable for a long time due to some international political backlash after the Fast Track Land Reform Programme (FTLRP), and corruption among other factors as shown in Figure 4.5.

Figure 4.5: Zimbabwe's Ease of Doing Business



Source: World Bank, 2021

Security of information is generally compromised and there is a very high risk that important and confidential information can be easily manipulated and accessed by members of the public with criminal inclination if malpractices continue unabated regarding land related information.

The situation that was observed can also be of national security risk since a lot of land related confidential information is kept especially at the DSG and the Deeds office. Further to the national security risk, the forging of Title Deeds for example has a high risk of having people losing large sums of investments to fraudsters. There is also loss of reputation, public confidence and good image of the DSG, Deeds office, the City of Harare and the country at large if land related malpractices continue unabated.

From the observations made above, the researcher avers and contends that, it is highly likely that officials who are carrying out malpractices within the key informant organisations would resist the establishment of a SDI in the City of Harare, preferring

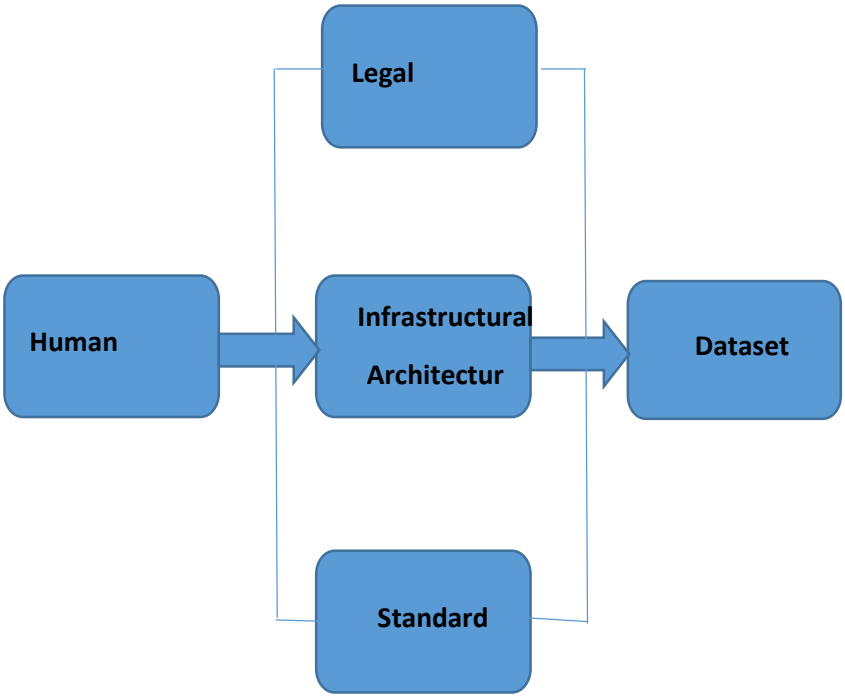
a status quo, unless the above recommendations and those that are proffered in the following sections in this research are adopted and implemented.

4.8 SDI Components

From the research findings, the researcher noted some inputs which are pertinent in the establishment of a SDI which are namely, the legal framework, infrastructure (hardware and software), datasets, standards (regulatory framework) and human resources which the researcher termed the 'building blocks'.

Figure 4.6 summaries the 'building blocks' which are necessary and critical for the establishment of a SDI.

Figure 4.6: The Building Blocks of a SDI



Source: Adapted Rajabifard *et al.*, 2002

Though approaches may differ in the process of establishing SDIs among different countries, a national vision, principles, and working groups are imperative, and the

same approach is recommended in the establishment of an effective SDI in the administration and management of land in the City of Harare.

4.9 Human Resources in Land Information Management Systems

The interface between people and other components of SDI create a formidable force to reckon with in the establishment of a SDI. The researcher noted a deficiency in zeal and enthusiasm among lower-level staff members of key informant organisations with respect to the establishment of a SDI in the City of Harare. There is basically a shortage in appropriate and relevant technical skills and knowledge relating to demands of establishing a SDI, which is a key factor that determines the success of establishing an effective SDI.

The experience and technical skills with regards to operationalising a SDI in the City of Harare has revealed that there is a need for managers and staff, who can deal effectively with the system. There is lack of adequate Information Technology knowledge and skills in order for an effective SDI to be established.

A positive factor was however noted in that, most of the senior staff members in key informant organisations are keen and willing to learn and adopt SDI related technology. Leadership responsibility in spearheading the SDI has been cited by participants as key and paramount, without which, the establishment of an effective SDI in the City of Harare remains a pipe dream, and the researcher had a consensus with the participants' views in this regard. There is therefore need to reconstitute and reconfigure the current SDI steering committee so that it becomes integrative and encompass other land related professionals other than land surveyors only.

The Botswana NSDI project was a partnership between the Botswana government and the Swedish International Development Agency, hence consultants from Swedesurvey (Swedish company) were engaged to kick start the project.

The South Africa Spatial Data Infrastructure (SASDI} was a collaborative process between the South African Government and the Dutch entity Land Portal. The Australian SDI establishment process was also a collaborative process with the New Zealand government and Melbourne University.

These collaborative processes help to tap into skilled and expert advice, of which from the analysis that was made from the research findings, lacks in the Zimbabwean SDI establishment processes. There is also need to partner with other countries and organisations which have successfully established and implemented SDIs in their countries.

4.10 Legislative Framework in Land Management Information Systems

The legal framework refers to the existence of a legal environment that leads to a national SDI being legally embedded. And this consists of legal instruments like Acts of parliament, policies, directives and commitments. From document analysis and interview responses by the participants, there is no legal framework that legitimises and gives legal force to the establishment of a SDI in Zimbabwe and in the City of Harare.

From some document analysis, it has been observed that Section 7(1b) of the Land Survey Act provides for the idea of establishing a SDI and designates the DSG as a leading and controlling authority for that matter. The Land Survey Act is the only statute that currently, though distantly, provides for the establishment of a SDI. There

is also a steering committee that was set up to see the process of establishing the SDI, and the committee is chaired by the DSG.

At a Survey Institute of Zimbabwe conference that was held at Mandel Training centre in Harare in 2010, it was proposed that a Spatial Information Act be promulgated, and the Bill precedent to the enactment of the Act is yet to be crafted. There is therefore no Act to date that can adequately be used to give a legal framework to the SDI establishment.

4.11 DSG

The DSG falls under the Ministry of Lands, Agriculture, Fisheries, Water and Rural Resettlement. The department was established through an Act of Parliament, The Act outlines the duties of the Surveyor General (SG) as well as those of the land surveys. It also outlines the procedures for the survey of land for registration of title. The DSG's main responsibility is to supervise the survey and charting of land in Zimbabwe.

Though the Land Survey Act (Chapter 20:12) relates with other land related statutes, it is principally regulatory and only showcasing in most cases the complexity of the DSG's mandate. As a result the Act promotes the fragmentation of land information management systems across several organisations, and in the process exacerbates the impairment of smooth process flow of the land delivery process.

4.12 Deeds Office

The Deeds Registry falls within the Ministry of Justice, Legal and Parliamentary Affairs. It is mandated to keep records of all land transactions in Zimbabwe. The Deeds Registry office was established through the Deeds Registry Act, 1996. The Act

however falls short of looking at land information as a commodity that can be inter operated among organisations, as well as being shared in the form of datasets.

4.13 The City of Harare

The City of Harare is established by the Urban Councils Act (Chapter 29: 15) and falls within the Ministry of Local Government and Public Works. Land related functions of urban councils are mostly governed by the Regional, Town and Country Planning Act (Chapter 29:12) (RTCP Act). The RTCP Act is however devoid of mentioning an integrated information gathering and sharing process with other land related organisations. The Act only mentions of consulting the Surveyor General and Registrar of Deeds during subdivisions and consolidations and Cancellation of a General Plan for example.

The Land Survey Act, Deeds Act and the RTCP Act are still based on a relatively narrow land administration paradigm centred on land registration, cadastral surveying, spatial planning and mapping. The current land administration system in Zimbabwe therefore lacks in efficiency, effectiveness and a holistic approach, and cannot currently address the issue of establishing a NSDI without amendments.

From document analysis and interviews, it was observed that there is a lot of fragmentation of land administration activities across key informant organisations, and as result there are numerous steps and multiple actors in the entire land transaction business flow.

It is quite evident from the South African and Botswana case studies that a framework that guides and directs how the SDI should be administered and governed is necessary for a successful establishment of a SDI, set ups which are presently absent from the Zimbabwean SDI initiative landscape.

It is recommended that a working group on the legal framework be created, and the working group must be tasked, inter alia to interrogate the existing legal frameworks that govern land information management systems in Zimbabwe with a view of formulating new laws and reviewing the existing ones. Therefore, the proposed laws and regulations should provide for land related organisations to be housed under one ministry with a single statute governing the gathering, storage, management and sharing of land related information. The Land Survey Act, Deeds Registry Act and the RTCP Act must be collapsed into one single statute that provides for the gathering, storage, management and sharing of land related information.

4.14 Standards in Land Management Information Systems

From the research findings, a conspicuous absence of a regulatory framework for spatial data standards was noted. The DSG and local authorities use different notations and symbols to represent similar features. Spatial datasets and metadata, it was observed is not uniform among the users of spatial data and information. Participants at the DSG contended that the lack of existing standard spatial data results in inefficiencies, incompatibility, lack of interoperability and portability of spatial data among users.

The absence of standards in key land information organisations makes the use of appropriate spatial information technology, acquisition of accurate and relevant data and its dissemination difficult. The establishment of a SDI within the City of Harare therefore requires standardisation of spatial datasets.

In Botswana the NGCC established working groups that were tasked to deal with different components of the NSDI. A working group that was tasked to deal with the component of standards had the responsibility of analysing areas in which standards

are needed for the National GIS. The group also interrogated suitable standards that may be used in consultation with the Geospatial Information (GI) community. After the above tasks, the group then disseminated information about the proposed standards and then promoted the use of established standards. A continuous process of reviewing the established standards is ongoing, and any necessary changes or additions are considered.

The Zimbabwean government through the SDI steering committee must set up a working group that should come up with uniform and standardised datasets across all land related organisations that collect, acquire, use and disseminate land related information.

The researcher recommends that the standards that will be proposed must not only satisfy and meet local needs, but must be international in outlook, in line with the dictates of the global environment and Africa Agenda 2063.

4.15 Open-Source Software

Open-source software is considered as the "way forward" in the establishment of SDIs because of its flexibility and adaptability to local conditions and languages than proprietary software, and in this research, it has been found out open-source software is appropriate and convenient for the establishment of a SDI in Zimbabwe, and the researcher recommends that the SDI steering committee considers adopting it.

The costs of acquiring a proprietary software licence for establishing a SDI have been found to be more than open-source software, and other developing countries like Botswana, Kenya, Rwanda and South Africa have adopted the open-source software because of its convenience, affordability and compatibility with other software and hardware systems.

4.16 One-Stop-Shop concept

A one stop shop concept can be described as a computer based “front office” where land related services like land registration, deeds searches, filing property tax, town planning searches, inter alia are offered to the public at one spot at a click of button. This concept fulfills and works in the interest of “ease of doing business”. The concept reduces bureaucracy and therefore also addresses the issue of corruption and malpractices during land related transactions.

Professional staff in the key land related organisations are the ones who liaise across organisations among each other for example, and not the users of land information. There will be no travelling to City of Harare, Deeds Office and the DSG by the users of land information for example. Users of land information will only have two interactions with land administration, that is, when they present their documents to the profession staff members and when they come to collect their completed documents from one physical location.

There is no such concept at the moment in the City of Harare, however South Africa has managed to create the one stop shop concept in its land transactions. The South African experience has proved to reduce the challenges faced by stakeholders and users, for example individuals, land surveyors, real estate practitioners, town planners, local authorities and other users of in acquiring, gathering and analysing land data or datasets and then integrating them into one single consistent dataset.

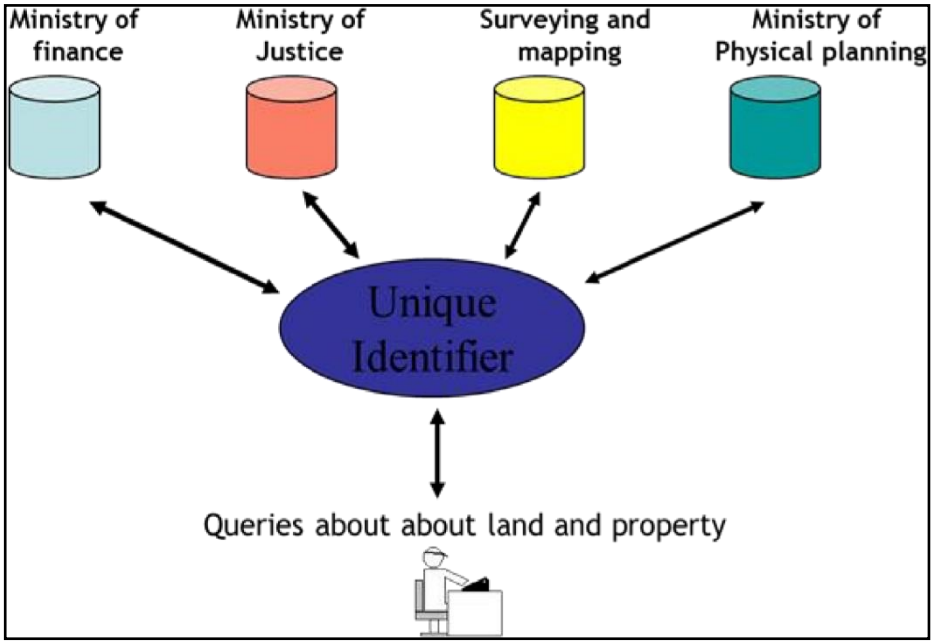
Observations and findings that were made at the DSG, Deeds office and the City of Harare are that the transactions that are made at these organisations are in most cases complicated, time consuming, and tend to confuse the users. Further to that, the organisations are physically distant from each other, and the users have to travel from

one organisation to the other to complete their transactions. It was observed that these inconveniences are the major causes of corruption and practices in the land transaction processes.

The "One Stop Shop" computer-based concept is therefore recommended and proposed where land information and related services can be accessed from one physical location.

The "one stop shop" concept can be graphically represented by figure 4.7.

Figure 4.7: One Stop Shop Concept



Source: Nyoni and Nyamudeza, 2014

4.17 Discussion and Interpretation

The Systems Approach Theory provided an overview of the state of Land Information Management Systems in Zimbabwe. The theoretical framework also provided a lens through which the state of existing linkages and relationships among key land related organisations, the private sector, non-governmental organisations and private

individuals as far as the concept of establishing a SDI in the City of Harare is concerned was examined. The theoretical framework revealed a disjuncture and a disconnection currently among stakeholders, land information users, government and key land related organisations as far as the initiative and process of establishing a SDI in the City of Harare is concerned.

Admittedly, socio-economic and political environments differ among countries, but the literature review gave some invaluable insights on similarities and differences that should be applied and considered in the process of establishing a SDI in the City of Harare. Botswana and South Africa share common historical backgrounds and challenges with the City of Harare as far as the need for establishing a SDI is concerned, whilst Australia went through very different experiences in its SDI establishment trajectory. The Australian case study gave an insight of how an ideal SDI should look like.

The research methodology and instruments that were explained in Chapter 3 provided research findings and evidence that managed to provide the researcher with information and a position on how to forster an effective SDI in land management and administration in the City of Harare. The research findings showed that Zimbabwe has more similarities than differences with South Africa and Botswana as far as its initiatives and efforts to establish a SDI in the City of Harare are concerned. What differs are the financial resources and political support and will, but the legal, human resources, institutional set ups and historical contexts are similar.

Zimbabwe has a National Vision that supports the establishment of a SDI through the NDS 1 Digital Economy thematic cluster, which South Africa similarly had through its National Development Programme (NDP). Zimbabwe has also a huge pool of

research institutions comprising of various universities and polytechnics; hence the necessary skills and expertise are available to enable the establishment of a robust, effective and sustainable SDI in the City of Harare.

Zimbabwe has a SDI steering committee which is similar to Botswana's GNCC and South Africa's Committee for Spatial Information (CSI), it however needs to be strengthened further by including a wider range of stakeholders and also advocating for a legal framework to guide the process of establishing a SDI in the City Harare.

The steering committee is also recommended to set up working groups so that all components of the SDI will be addressed adequately. From the researcher findings, it is quite evident that there is a very strong possibility that the establishment of an effective SDI in the administration and management of land in the City of Harare is quite feasible.

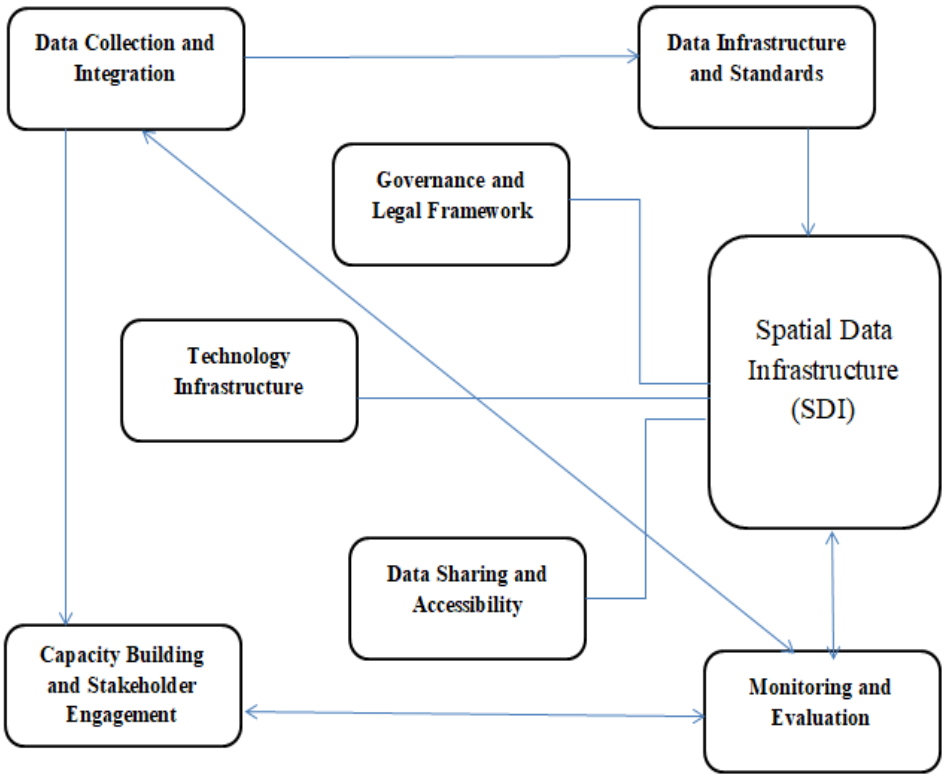
4.18 Proposed framework for Spatial Data Infrastructure for the City of Harare

To foster sound land administration and management in the City of Harare, a robust Spatial Data Infrastructure (SDI) framework is essential. This framework will integrate spatial data, technology, policy, and governance structures, ensuring efficient land management processes such as land use planning, property rights management, urban development, and sustainable resource management.

The implementation of a robust Spatial Data Infrastructure (SDI) framework in the City of Harare is crucial for addressing the complexities of urban land administration and management. By integrating spatial data, technology, policy, and governance structures, the City of Harare can streamline critical land management processes such as land use planning, property rights management, urban development, and sustainable resource management.

This will allow the city to efficiently allocate land, monitor urban growth, and ensure sustainable development. The importance of an SDI framework is particularly evident when considering the success of similar initiatives in other cities. In Singapore SDI was successfully integrated into its urban planning processes, enabling efficient land use, environmental monitoring, and property rights management. By adopting a similar framework, the City of Harare can enhance its governance and management of land, ensuring transparency and accountability while also fostering sustainable growth. Moreover, the SDI framework would foster greater collaboration between government agencies, local stakeholders, and citizens, improving the overall efficiency of urban management and resource allocation. In the long term, this will enable Harare to address urbanization challenges effectively, safeguard public resources, and create a more livable, resilient city. The following figure 4.8 below shows the proposed SDI framework for the City of Harare.

Figure 4.8: Proposed framework for SDI for Harare



Source: Study Results, 2025

The Spatial Data Infrastructure (SDI) framework for the City of Harare will operate through the integration of various geospatial data, technology platforms, governance structures, and policies aimed at improving land administration and management. At the core of this framework is the use of Geographic Information Systems (GIS), remote sensing technologies, and spatial databases that will store, analyze, and share spatial data across relevant stakeholders. GIS platforms will enable the city to visualize and interpret complex land data, helping urban planners, government officials, and other stakeholders make informed decisions about land use, infrastructure development, and environmental management (Ahmad & Ali, 2023).

One of the key components of the SDI framework will be the creation of a centralized, accessible geospatial data repository. This will house a wide range of spatial data,

including land tenure information, cadastral maps, environmental data, transportation networks, and infrastructure planning documents. By centralizing this information, Harare can avoid data fragmentation and ensure that all stakeholders have access to accurate and up-to-date information.

A similar approach has been successfully implemented in cities like Singapore, where the government developed a centralized platform to support land management, resource monitoring, and urban development (Lim *et al*., 2021). In Harare, such a platform will facilitate data sharing between public institutions, private developers, and the public, enhancing collaboration and transparency in decision-making.

The SDI framework will also require the establishment of strong governance structures that can regulate data collection, sharing, and use. This includes developing policies that define standards for data quality, accessibility, and security. The establishment of clear roles and responsibilities for various agencies within the SDI ecosystem will ensure that spatial data is managed effectively.

Technological infrastructure will also play a critical role in the operation of the SDI framework. The city will need to invest in the necessary hardware, software, and network systems that support the storage, processing, and sharing of spatial data. This includes setting up cloud-based platforms and servers to make the data more accessible to various users, including urban planners, surveyors, and the public. Additionally, capacity building programs will be crucial in ensuring that local government officials, planners, and other stakeholders are well-equipped to use these technologies. According to the United Nations (2014), developing local capacity in geospatial technologies is key to ensuring the sustainability of SDI initiatives.

Finally, an important aspect of the SDI framework will be the involvement of stakeholders in land management decisions. Public participation will be encouraged by providing access to spatial data, allowing citizens and community groups to engage in the planning process. This participatory approach will help address issues related to land disputes and ensure that development is aligned with the needs of the population. Studies have shown that involving the public in spatial planning can lead to more sustainable and inclusive urban development outcomes (Nunes & Camboim, 2025).

4.19 Summary

The research findings pointed out to the fragmented approach to land related data collection, gathering and lack of information sharing. As a result, land information users suffer from poor land information service delivery. It was also found out that the SDI steering committee required establishing working groups for various thematic areas of the SDI. The availability of foundational datasets supporting SDI in enterprises was examined in this chapter. It showed how these datasets were distributed among the many respondents and emphasized how important they are to creating a successful SDI system. The next chapter will give an overview of the research study, and then give recommendations based on the research findings.

CHAPTER 5 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter summarizes the main research findings considering the objectives of the study and pertinent literature. It analyzes the empirical results considering theoretical viewpoints and highlights the advantages and disadvantages of the current SDI framework while critically analyzing its impact on land governance. Lastly, it provides actionable suggestions for legislators, urban planners, and other interested parties to strengthen SDI's contribution to Harare's sustainable land management and administration.

5.2 Discussion

The study's conclusions provide important new information about the availability and function of foundational datasets that underpin SDI in businesses, especially in the fields of land administration and management. These results are consistent with the growing understanding that, in the modern data-driven environment, SDI is an essential element of successful land administration and management and decision-making (Rajabifard *et al*., 2020).

Decision-making in areas like urbanization, transportation, and environmental management will also be improved by integrating extensive datasets into SDI frameworks (Chen *et al*., 2021, Schade *et al*., 2022). Furthermore, integrating institutional and legal frameworks to support SDI can greatly enhance data exchange and accessibility, which will help with urban management and governance.

5.2.1 Existing SDI in the City of Harare

The research study, inter alia, sought to establish existing SDI frameworks in the City of Harare in land administration and management. The analysis, examination and investigation of the existing SDI in the City of Harare in land administration and

management was done within the human resources, legal, standards, technical and institutional frameworks. None of these frameworks were found to be in place to an extent of effectively managing and administering land in the City of Harare.

5.2.2 Effectiveness of existing SDI frameworks in the City of Harare.

There are virtually no effective existing SDI frameworks in the City of Harare for effective land administration and management. For example, there are no institutional linkages among key informant organisations to facilitate sharing of information among the DSG, Deeds offices and at the City of Harare, and none of the key informant organisations can tell what happens in the other organisations with respect to information movement.

5.2.3 Factors influencing the effectiveness of the existing SDI in the City of Harare.

Human capital, legal, institutional and technical frameworks are key in the establishment of an effective SDI in the City of Harare in the administration and management of land. Political will and funding are also pertinent factors that have also been found to be pillars that influence the effectiveness of SDI in the City of Harare.

5.2.4 Development of effective SDI frameworks to foster sound land administration & management in the City of Harare

It is imperative that, first and foremost, the establishment of a steering committee and the promulgation of the Spatial Information Act must be prioritised. The development of the SDI frameworks must of necessity be done within the dictates of National

Development Programmes, National Vision 2030 and National Development Strategies 1 and 2 so that the necessary funding and political are available.

5.3 Conclusions

The researcher analysed and interpreted the study findings and concluded that there are no existing and effective SDI frameworks in the City of Harare that fosters sound land administration and management. The research study identified the main factors that influence the effectiveness of SDI in land administration and management in the City of Harare as legal, technical, institutional, human capita, political will and funding.

The research study pointed to the fact that there must be a legal framework that gives legal force to the whole process, that is, during and after the setting up of an effective SDI in the City of Harare. The SDI steering committee, through its various working groups, must be able to address and cover all components of the SDI.

5.4 Implications

The implications of this research study make the enactment of new statutes imperative to operationalise the proposed SDI. There will also be a necessity to align existing statutes with each other that deal with land. The research findings also point to the need to reconfigure human capital capabilities, financial resources, political will and support in the process of establishing an effective SDI in the City of Harare. This study offers insightful information about the function of SDI in urban development, planning, and governance. Urban planners, legislators, GIS specialists, legal professionals, and academics in the fields of information technology, environmental

management, and urban studies are among the stakeholders for whom the findings have consequences.

5.5 Recommendations

The researcher recommends the following for the implementation and establishment of an effective SDI in the City of Harare for sound administration and management of land.

- A new Act of Parliament that gives a legal mandate and framework in the establishment and administration of an SDI must be promulgated.
- An all-encompassing SDI steering committee with a legal mandate, mission and vision, must be established to coordinate the development, implementation and maintenance of the SDI in the City of Harare.
- The NSDI steering committee must set up working groups that cover all components of the SDI.
- The SDI must be an integral part and tied to the National Vision 2030 and Development Strategies NDS 1: 2021-2025 and NDS 2: 2026-2030.

5.6 Suggestions for Further Research

The main limitation to this research study was the scope of the research area which is very broad and therefore required a lot of funding and a long study period. Resources and time were very limited and as a result not all facets and areas of the study topic could be adequately covered. Establishing an effective SDI in the City of Harare needs a lot of financial resources and the mobilisation of financial resources, and the funding modalities need separate studies on their own. The economics of running a SDI therefore need further research.

Another area of further research is to study how politics affects the establishment of a SDI. It has been noted in literature review that political buy-in is very critical in the success or failure of establishing a SDI. It is not only the technical and financial issues at play in the successful establishment of a SDI, but non-technical issues also which are socio-political in nature.

List of References

Adair, E. C., Parton, W. J., King, J. Y., Brandt, L. A., & Lin, Y. (2017). Accounting for photodegradation dramatically improves prediction of carbon losses in dryland systems. *Ecosphere*, *8*(7), e01892.

African Union (2015). Africa Agenda 2063 Addis Abba, Ethiopia.

Agarwal, B. (2003). Gender and land rights revisited: Exploring new prospects via the state, family and market. *Journal of agrarian change*, *3*(1-2), 184-224.

Ali, A. (2021). The evolution of national spatial data infrastructure in Pakistan-implementation challenges and the way forward.

Ali, A., & Imran, M. (2021). *National Spatial Data Infrastructure vs. Cadastre System for Economic Development: Evidence from Pakistan. Land 2021, 10, 188*.

Alkaabi, K., Mehmood, K., Bhatacharyya, P., & Aldhaheri, H. (2023). Sustainable development goals from theory to practice using spatial data infrastructure: A case study of UAEU undergraduate students. *Sustainability*, *15*(16), 12394.

Anderssohn, M., Schwedhelm, E., Lüneburg, N., Vasan, R. S., & Böger, R. H. (2010). Asymmetric dimethylarginine as a mediator of vascular dysfunction and a marker of cardiovascular disease and mortality: an intriguing interaction with diabetes mellitus. *Diabetes and Vascular Disease Research*, *7*(2), 105-118.

Arnold, L. M., McMeekin, D. A., Ivánová, I., & Armstrong, K. (2021). Knowledge on-demand: a function of the future spatial knowledge infrastructure. *Journal of Spatial Science*, *66*(3), 365-382.

Babbie, E. R. (2020). *The practice of social research*. Cengage A

Baker, R. S. (2019). Challenges for the future of educational data mining: The Baker learning analytics prizes. *Journal of educational data mining*, *11*(1), 1-17.

Baruch, Y., & Holtom, B. C. (2008). Survey response rate levels and trends in organizational research. *Human relations*, *61*(8), 1139-1160.

Berman, P. S., Jones, J., Udry, J. R., & National Longitudinal Study of Adolescent Health. (2020). Research design. The SAGE Handbook of Political Science, 437.

Bhattacherjee, A. (2012). *Social science research: Principles, methods, and practices*. University of South Florida.

Binns, C. W., Lee, M. K., Maycock, B., Torheim, L. E., Nanishi, K., & Duong, D. T. T. (2021). Climate change, food supply, and dietary guidelines. *Annual review of public health*, *42*(1), 233-255.

Breunig, M., Bradley, P. E., Jahn, M., Kuper, P., Mazroob, N., Rösch, N., ... & Jadidi, M. (2020). Geospatial data management research: Progress and future directions. *ISPRS International Journal of Geo-Information*, *9*(2), 95.

Breunig, M., Bradley, P. E., Jahn, M., Kuper, P., Mazroob, N., Rösch, N., ... & Jadidi, M. (2020). Geospatial data management research: Progress and future directions. *ISPRS International Journal of Geo-Information*, *9*(2), 95.

Bryman, A. (2016). *Social research methods*. Oxford: Oxford University Press.

Cabrera, D., & Cabrera, L. (2023). What is systems thinking?. In *Learning, design, and technology: An international compendium of theory, research, practice, and policy* (pp. 1495-1522). Cham: Springer International Publishing.

Cameron, P. J. (2021). Graphs defined on groups. *arXiv preprint arXiv:2102.11177*.

Chali, M. T., Eshete, S. K., & Debela, K. L. (2022). Learning how research design methods work: A review of Creswell's research design: Qualitative, quantitative and mixed methods approaches. The Qualitative Report, 27(12), 2956-2960.

Chigudu, A., & Chirisa, I. (2020). The quest for a sustainable spatial planning framework in Zimbabwe and Zambia. *Land use policy*, *92*, 104442.

Coe, R., Waring, M., Hedges, L. V., & Ashley, L. D. (Eds.). (2021). *Research methods and methodologies in education*. Sage.

Constitution of Zimbabwe (2013). Government Printers, Harare, GOZ.

Creswell, J. W. (2014). *Research Design: Qualitative, Quantitative and Mixed Methods Approaches* (4th ed.). Thousand Oaks, CA: Sage

Creswell, J. W., & Plano Clark, V. L. (2023). Revisiting mixed methods research designs twenty years later. *Handbook of mixed methods research designs*, *1*(1), 21-36.

Crompton, S. W. (2016). *The Handy Boston Answer Book*. Visible Ink Press.

Crompvoets, J.; Vancauwenberghe, G.; Ho, S.; Masser, I.; de Vries, W.T. (2013*). Governance of national spatial data infrastructures in Europe.* Int. J. Spat. Data Infrastruct. Res., 13, 253–285. [Google Scholar]

Dangermond, J., & Goodchild, M. F. (2020). Building geospatial infrastructure. *Geo-Spatial Information Science*, *23*(1), 1-9. Attah, R. U., Gil.

Deininger, K., & Byerlee, D. (2011). The rise of large farms in land abundant countries: Do they have a future?. *World Bank Policy Research Working Paper*, (5588).

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). Internet, phone, mail, and mixed-mode surveys: The tailored design method. *Indianapolis, Indiana*.

Dodgson, J. E. (2017). About research: Qualitative methodologies. *Journal of human lactation*, *33*(2), 355-358.

Elwood, S. (2022). Toward a fourth generation critical GIS: Extraordinary politics. *ACME: An International Journal for Critical Geographies*, *21*(4), 436-447.

Fuyane, N. (2021). Research methodology choice dilemma: A conceptual note to emerging researchers. *International Journal of Business and Management Studies*, *2*(2), 29-43.

Gourmelon, F., Noucher, M., Georis-Creuseveau, J., Amelot, X., Gautreau, P., Le Campion, G. & Rouan, M. (2019). An integrated conceptual framework for SDI research: experiences from French case studies. *International Journal of Data Infrastructures Research*, *14*, 54-82.

Gregar, J. (2023). Research design (qualitative, quantitative and mixed methods approaches). *Research Design*, *8*.

Habersang, S., Küberling-Jost, J., Reihlen, M. and Seckler, C. (2019). 'A process perspective on organizational failure: A qualitative meta-analysis'. *Journal of Management Studies*, 56, 19–56.

Hu, Y., & Li, W. (2017). Spatial data infrastructures. *arXiv preprint arXiv:1707.03969*.

Jackson, M. C. (2020). How we understand "complexity" makes a difference: Lessons from critical systems thinking and the Covid-19 pandemic in the UK. *Systems*, *8*(4), 52.

Kalogianni, E., van Oosterom, P., Dimopoulou, E., & Lemmen, C. (2020). 3D land administration: A review and a future vision in the context of the spatial development lifecycle. *ISPRS international journal of geo-information*, *9*(2), 107.

Kamusoko, C., Kamusoko, O. W., Chikati, E., & Gamba, J. (2021). Mapping urban and peri-urban land cover in Zimbabwe: challenges and opportunities. *Geomatics*, *1*(1), 114-147.

Karakol, D., & Cömert, Ç. (2022). Architecture for semantic web service composition in spatial data infrastructures. *Survey Review*, *54*(382), 1-16.

Kavvada, A., Metternicht, G., Kerblat, F., Mudau, N., Haldorson, M., Laldaparsad, S., ... & Chuvieco, E. (2020). Towards delivering on the sustainable development goals using earth observations. *Remote Sensing of Environment*, *247*, 111930.

Kothari, C. R. (2004). Research methodology: Methods and techniques. *New Age International*.

Kothari, C.R. (2019) *Research Methodology: Methods and Techniques*. 4th Edition, New Age International Publishers, New Delhi.

Kotsev, A., Minghini, M., Tomas, R., Cetl, V., & Lutz, M. (2020). From spatial data infrastructures to data spaces—A technological perspective on the evolution of European SDIs. *ISPRS International Journal of Geo-Information*, *9*(3), 176.

Kraak, M. J., & Ormeling, F. (2020). *Cartography: visualization of geospatial data*. CRC Press.

Labib, S. M., Lindley, S., & Huck, J. J. (2020). Spatial dimensions of the influence of urban green-blue spaces on human health: A systematic review. *Environmental research*, *180*, 108869.

Levitt, H. M., Bamberg, M., Creswell, J. W., Frost, D. M., Josselson, R., & Suárez-Orozco, C. (2018). Journal article reporting standards for qualitative primary, qualitative meta-analytic, and mixed methods research in psychology: The APA Publications and Communications Board task force report. *American Psychologist*, *73*(1), 26.

Makanga, P.; Smit, J. (2010). A review of the status of the spatial data Infrastructure in Africa. *Afr. Comput. J.*, 45, 18–25. [Google Scholar] [CrossRef][Green Version]

Manisa and Nkwae (2007). *Developing Botswana Spatial Data Infrastructure: From Concept to Reality*, Botswana.

Maphale, L. (2019). Constraints *Oriented Approaches in Advancing Spatial Data Infrastructure: Case of Southern African Customs Union*. Ph.D. Thesis, University of Cape Town, Cape Town, South Africa [Google Scholar]

Maphale, L., & Smit, J. L. (2020). A theoretical proposition for spatial data infrastructure on-going improvement. *ISPRS International Journal of Geo-Information*, *10*(1), 9.

Meinzen-Dick, R., Quisumbing, A., Doss, C., & Theis, S. (2019). Women's land rights as a pathway to poverty reduction: Framework and review of available evidence. *Agricultural systems*, *172*, 72-82.

Mulder, A. E., Wiersma, G., & Van Loenen, B. (2020). Status of national open spatial data infrastructures: A comparison across continents. *International Journal of Spatial Data Infrastructures Research*, *15*, 56-87.

Mwange, C.; Mulaku, G.C.; Siriba, D.N. (2016) *Reviewing the status of national spatial data infrastructures in Africa*. Surv. Rev. 50, 191–200. [Google Scholar] [CrossRef]

National Development Strategy 1 (2021-2025). (2020). Government Printers, Harare, GOZ.

National Development Strategy 1. (2020) *Towards a Prosperous & Empowered Upper Middle-Income Society by 2030*. Government Printers, Harare, GOZ.

Núñez-Andrés, M. A., Lantada Zarzosa, N., & Martínez-Llario, J. (2022). Spatial data infrastructure (SDI) for inventory rockfalls with fragmentation information. *Natural Hazards*, *112*(3), 2649-2672.

Oluwaseun, O. J., Oluwatosin, O. L., & Oluwasoga, F. A. (2018). Microbial Analysis of Processed Foods Stored in Domestic Refrigerators of Selected Eateries in Ile-Ife, Osun State, Nigeria. *Amer. J. of Biosci. and Bioeng*, *6*(3), 21-26.

Ozoudeh, I., Garba, B. M. P., & Iwuanyanwu, O. (2024). Leveraging geographic information systems and data analytics for enhanced public sector decision-making and urban planning. *Magna Sci Adv Res Rev*, *12*(2), 152-63.

Post, C., Sarala, R., Gatrell, C., & Prescott, J. E. (2020). Advancing theory with review articles. *Journal of Management Studies*, *57*(2), 351-376.

Quisumbing, A. R., Meinzen-Dick, R., Raney, T. L., Croppenstedt, A., Behrman, J. A., & Peterman, A. (2014). Gender in agriculture. *Springer*, *102072*(630.717), 444.

Reserve Bank of Zimbabwe Annual Report. (2006). Harare, Zimbabwe.

Rogers, S. L., Howieson, J., & Neame, C. (2018). I understand you feel that way, but I feel this way: The benefits of I-language and communicating perspective during conflict. *PeerJ*, *6*, e4831.

Sahin, I., & Thompson, A. (2006). Using Rogers' theory to interpret instructional computer use by COE faculty. *Journal of Research on Technology in Education*, *39*(1), 81-104.

Schindler, S., & Kanai, J. M. (2021). Getting the territory right: Infrastructure-led development and the re-emergence of spatial planning strategies. In *Planning Regional Futures* (pp. 75-98). Routledge.

Scott, G.; Rajabifard, A. (2017) *Sustainable development and geospatial information: A strategic framework for integrating a global policy agenda into national geospatial capabilities*. Geo Spat. Inf. Sci. 20, 59–76. [Google Scholar] [CrossRef][Green Version]

Senge, P. M. (2020). Commentary: Why practicing a system's perspective is easier said than done. *Applied Developmental Science*, *24*(1), 57-61.

Silverman, J., Kurtz, S., & Draper, J. (2016). *Skills for communicating with patients*. crc press.

Fetters, M. D., Curry, L. A., & Creswell, J. W. (2013). Achieving integration in mixed methods designs—principles and practices. *Health services research*, *48*(6pt2), 2134-2156.

Sjoukema, J. W. (2021). *Governance dynamics of spatial data infrastructures* (Doctoral dissertation, Wageningen University and Research).

Smith, C. D., & Mennis, J. (2020). Incorporating geographic information science and technology in response to the COVID-19 pandemic. *Preventing chronic disease*, *17*, E58.

Spatial Data Infrastructure Act, ([Act No. 54, SA, 2003). South Africa.

Sui, D., Goodchild, M., & Elwood, S. (2012). Volunteered geographic information, the exaflood, and the growing digital divide. In *Crowdsourcing geographic knowledge: Volunteered geographic information (VGI) in theory and practice* (pp. 1-12). Dordrecht: Springer Netherlands.

Survey Institute of Zimbabwe (SIZ) conference. (2010). Mandel Training Centre, Harare, Zimbabwe.

Sustainable Development Goals (SDGs). (2015). United Nations, New York, USA.

Taherdoost, H. (2021). Data collection methods and tools for research; a step-by-step guide to choose data collection technique for academic and business research projects. *International Journal of Academic Research in Management (IJARM)*, *10*(1), 10-38.

Tashakkori, A., & Teddlie, C. (2010). Putting the human back in ‘‘human research methodology’’: The researcher in mixed methods research. *Journal of mixed methods research*, *4*(4), 271-277.

Vandenbroucke, F., Cantillon, B., Van Mechelen, N., Goedemé, T., & Van Lancker, A. (2013). The EU and minimum income protection: Clarifying the policy conundrum. In *Minimum income protection in flux* (pp. 271-317). London: Palgrave Macmillan UK.

Vision 2030. (2020). Government Printers, Harare, GOZ.

Yigitcanlar, T., Degirmenci, K., Butler, L., & Desouza, K. C. (2022). What are the key factors affecting smart city transformation readiness? Evidence from Australian cities. *Cities*, *120*, 103434.

Zhang, X. H., Chen, J., Han, M. Z., Huang, H., Jiang, E. L., Jiang, M. & Huang, X. J. (2021). The consensus from The Chinese Society of Hematology on indications, conditioning regimens and donor selection for allogeneic hematopoietic stem cell transplantation: 2021 update. *Journal of hematology & oncology*, *14*, 1-20.

Zimbabwe Land Commission Report. (2020), Government Printers, Harare, Zimbabwe.

Zuberi, H. A., Khan, U. S., Umair, M., & Chaudhry, A. M. R. A. (2025). *Web Based Geospatial Data Repository* (Doctoral dissertation, Institute of Geographical Information Systems (IGIS)).

List of Appendices

Appendix 1 Informed Consent Guide

My name is **LAURENCE MUSHAYABASA**, an **EXECUTIVE MASTER OF BUSINESS ADMINISTRATION** final year student from **AFRICA UNIVERSITY'S COLLEGE OF BUSINESS AND MANAGEMENT SCIENCES.** I am carrying out **A STUDY ON EFFECTIVENESS OF EXISTING SPATIAL DATA INFRASTRUCTURE IN FOSTERING SOUND LAND ADMINISTRATION AND MANAGEMENT IN THE CITY OF HARARE.**

I am kindly asking you to participate in this study by answering **AND** filling in **THE ATTACHED QUESTIONNAIRE**

What you should know about the study:

Purpose of the study:
The purpose of the study is **TO FIND OUT THE EFFECTIVENESS OF EXISTING SPATIAL DATA INFRASTRUCTURE IN FOSTERING SOUND LAND ADMINISTRATION AND MANAGEMENT IN THE CITY OF HARARE.**

You were selected for the study because **YOU ARE A LAND RELATED INFORMATION GENERATOR AND USER AND ONE LOCAL AUTHORITY, DEEDS REGISTRY OFFICE, SURVEYOR GENERAL'S OFFICE, ESTATE AGENTS, TOWN PLANNERS AND OTHER PRIVATE PLAYERS IN THE LAND INFORMATION INDUSTRY WILL ALSO PARTICIPATE IN THIS RESEARCH STUDY.**

Procedures and duration
If you decide to participate you will **BE ADVISED OF THE INTERVIEW IN ADVANCE AND THE FINAL RESEARCH OUTCOME WILL BE SHARED WITH YOU.** It is expected that this will take about **30 MINUTES.**

Risks and discomforts
Describe any reasonable foreseeable risks, discomforts or inconveniences to the subject/participant (including legal, health, economic or psychological and outline how these will be adressed.)

Benefits and/or compensation
THE RESEARCH OUTCOME IS EXPECTED TO INFORM AND ADVISE DECISION MAKERS PERTAINING TO THE USE, SHARING AND STORAGE OF LAND INFORMATION.

Confidentiality
STRICT CONFIDENTIALITY WILL BE MAINTAINED BEFORE, DURING AND AFTER THE PARTICIPATION. YOUR ANSWERS AND DETAILS OF PARTICIPANTS WILL BE MAINTAINED THROUGHOUT.

Voluntary participation
Participation in this study is voluntary. If participant decides not to participate in this study, their decision will not affect their future relationship with **THE RESEARCHER**. If they

chose to participate, they are free to withdraw their consent and to discontinue participation without penalty.

Offer to answer questions

Before you sign this form, please ask any questions on any aspect of this study that is unclear to you. You may take as much time as necessary to think it over.

Authorisation

If you have decided to participate in this study please sign this form in the space provide below as an indication that you have read and understood the information provided above and have agreed to participate.

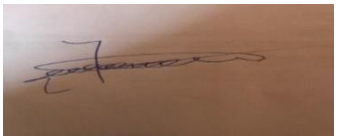
Name of Research Participant (please print) Date

Signature of Research Participant or legally authorised representative

If you have any questions concerning this study or consent form beyond those answered by the researcher including questions about the research, your rights as a research participant, or if you feel that you have been treated unfairly and would like to talk to someone other than the researcher, please feel free to contact the Africa University Research Ethics Committee on telephone (020) 60075 or 60026 extension 2156 email aurec@africau.edu

Name of Researcher –

LAURENCE MUSHAYABASA----------



Appendix 2 AUREC Approval

"Investing in Africa's future"

AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE (AUREC)

P.O. Box 1320 Mutare, Zimbabwe, Off Nyanga Road, Old Mutare-Tel (+263-20) 60075/60026/61611 Fax: (+263 20) 61785 Website: www.africau.edu

Ref: AU 3646/25

4 March 2024

LAURENCE MUSHAYABASA

C/O Africa University
Box 1320
MUTARE

RE: ***EFFECTIVENESS OF EXISTING SPATIAL DATA INFRASTRUCTURE IN FOSTERING SOUND LAND ADMINISTRATION AND MANAGEMENT IN THE CITY OF HARARE***

Thank you for the above-titled proposal you submitted to the Africa University Research Ethics Committee for review. Please be advised that AUREC has reviewed and approved your application to conduct the above research.

The approval is based on the following. a) Research proposal

- **APPROVAL NUMBER** AUREC 3646/25

  This number should be used on all correspondences, consent forms, and appropriate document

- **AUREC MEETING DATE** NA
- **APPROVAL DATE** March 3, 2025
- **EXPIRATION DATE** March 3, 2026
- **TYPE OF MEETING**: Expedited

After the expiration date, this research may only continue upon renewal. A progress report on a standard AUREC form should be

submitted a month before the expiration date for renewal purposes.

- **SERIOUS ADVERSE EVENTS** All serious problems concerning subject safety must be reported to AUREC within 3 working days on the standard AUREC form.
- **MODIFICATIONS** Prior AUREC approval is required before implementing any changes in the proposal (including changes in the consent documents)
- **TERMINATION OF STUDY** Upon termination of the study a report has to be submitted to AUREC.

Yours Faithfully

MARY CHINZOU
FOR CHAIRPERSON
AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE.

Appendix 3 Questionnaire Survey Instrument

My name is Mr Laurence Mushayabasa, I am an Executive Master of Business Administration student at Africa University. I am carrying out a research study titled:

EFFECTIVENESS OF EXISTING SPATIAL DATA INFRASTRUCTURE IN FOSTERING SOUND LAND ADMINISTRATION AND MANAGEMENT IN THE CITY OF HARARE, and I am kindly asking for your views and opinions relating to the above research topic.

During this research study, I will interview some organisations and individuals involved with land-related information. All data and information will be treated with confidentiality and will be used for academic purposes only. I appreciate your cooperation and support by answering the following questions.

1. Questionnaire Identification (Do not fill in this section)

Questionnaire Number…… Date Submitted……Date Returned…….

Result: Completed/Refused/No response/ (other)

1. Participant

Title: Mr/Mrs/Ms/ Hon/Dr/Prof/ Other (specify**) Tick where applicable.**

Your

name……

……

Designation……

…… Sex…… Male

……...Female……

Age……...

Marital status……Married/Single

Name of organisation (where applicable)

……...

Email

address……

…….

Contact telephone

number……

Website

address……

……

2. Type of organisation/individual (Tick what is applicable)

Which of the following best describes you/your organisation:

Govt ministry or department/Local Authority/Private Company/Private individual/NGO/Parastatal/Academic or research institution/ Other (Specify).

2.1 Are you/is your organisation responsible for formulating and implementing land information data or information: **YES/NO** (Tick applicable).

2.2 Do you/does your organisation exchange any land related data or information with other organisations or individuals: **YES/NO** (Tick applicable).

3. Factors that influence Spatial Data Infrastructure – Readiness

3.1 Vision: This involves setting clear priorities and defining a strategy or policy to achieve this vision.

What is the level of vision by the government regarding the importance and development of a Spatial Data Infrastructure in the City of Harare?

Tick only one applicable answer

None	Low	Medium	High	Very High

3.2 Institutional leadership: Refers to the leadership within the institutional framework and an SDI requires one or more institutions that coordinate these activities.

What is the level of leadership within the institutional framework of one or more institutions that coordinate the activities relating to the SDI in the City of Harare? **Tick only one applicable answer**

None	Low	Medium	High	Very High

3.3 Legal environment: refers to creation of a legal environment that leads to SDI being legally embedded. Consists of legal instruments – laws, policies, directives and commitments.

What is the level of legal environment support to the SDI initiative in the City of Harare? **Tick only one applicable answer**

None	Low	Medium	High	Very High

4. Fundamental datasets

Which fundamental datasets that support the SDI are available in your organisation/ do you have? **Tick only one applicable answer**

☐ Geodetic control points

☐ Height datum

Aerial photography ☐

Satellite imagery ☐

Spot heights ☐

Land tenure ☐

Street address ☐

Roads ☐

Railways ☐

Road centrelines ☐

Populated centres ☐

5. Fundamental dataset formats availability

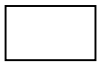
Are the available fundamental datasets in digital format?

1. Complete/total availability of core spatial datasets in digital format ☐

Partial availability of core spatial datasets in digital format

at levels that are insufficient for being a decisive factor ☐

2. Availability of some core spatial datasets in digital format for some areas of responsibility
3. Availability of very few core spatial datasets in digital formats



4. No availability of any core spatial datasets in digital format

6. Metadata availability Metadata: refers to the content of core spatial data (data about data), or descriptions of any database contents.

What is the level of metadata to support the SDI in the City of Harare? **Tick only one applicable answer**

None	Low	Medium	High	Very High

7. Culture/education on SDI

Culture/education on SDI: Refers to the capacity building and awareness of the impact of spatial data on the well-functioning of society.

What is the level of culture/education that supports the SDI in the City of Harare? **Tick only one applicable answer**

None	Low	Medium	High	Very High

8. SDI Champion (Individual leadership)

SDI leadership: SDI needs an entity which promotes, and coordinates the development of a SDI

What is the presence of such leadership in the SDI initiative in your organisation? **Tick only one applicable answer**

None	Low	Medium	High	Very High

9. Availability of commercial spatially related software

Commercial (in- house) spatially related software refers to the level of commercial or in-house software availability that forms a key aspect of a SDI

What is the level of availability of commercial or in-house spatially related software that supports the SDI in your organisation? **Tick only one applicable answer**

None	Low	Medium	High	Very High

10. Government Funding

What is the government's role/level of financing the SDI initiative in the City of Harare? **Tick only one applicable answer**

None	Low	Medium	High	Very High

11. Private sector funding

What is the level of contribution to finance the City of Harare SDI initiative by your organisation? **Tick only one applicable answer**

None	Low	Medium	High	Very High

12. General

What do you think the government and the private sector can do to address the issue of establishing a SDI in the City of Harare……...

……

Do you have any comments with respect to the research topic or any other related

matter……

…….

Thank you, ngiyabonga, ndatenda