

ADDIS ABABA UNIVERSITY

College of Technology and Biult Environment

School of Biult Environment

The Challenges of Urban Land Administration in the Modern Digital Cadaster: The Case of Sebeta Town

By:

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March, 2026

Addis Ababa, Ethiopia



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A Thesis Submitted to the School of Graduate Studies of Addis Ababa University, College of Tecnology and Built Environment, School of Buit Environment, in Partial Fulfillment for the Requirements for the Award of Master's of Science Degree in Urban Planning

Advisor: Dr. Birhanu Girma

March, 2026

Addis Ababa, Ethiopia

Declaration

I, Rabira Abdi, declare that, this thesis work entitled "**The Challenges of Urban Land Administration Using the Modern Digital Cadastral System: The Case of Sebeta Town''** is my own original work and has not been presented for a degree in any other university/ Institution and all the sources of materials used for this thesis work other than my own, have been duly acknowledged and cited following the scientific guideline of the University.

Name: _____

Signature_____

Date_____

Approval

As a member of the Examiners board of the final Master's thesis open defense of Rabira Abdi, we have read and evaluated the thesis prepared and submitted by Rabira Abdi entitled **The Challenges of Urban Land Administration Using the Modern Digital Cadastral System: The Case of Sebeta Town** and recommended to the College of Technology and Built Environment, Addis Ababa University to accept the Thesis for the Fulfillment of Requirements for the award of Degree of Master's of Science in Urban Planning.

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Acknowledgment

First and foremost, I would like to thank the Almighty God for giving me health and allthings to complete my study. I would also like to extends my special thanks to my advisor Dr. Birhanu Girma for his guidance throughout my thesis work. He devoted his valuable time as well as allowing me to explore much more in doing my thesis work to be a good researcher in the future. My appreciation thanks goes to Sebeta town urban land management office workers, cadaster and urban land registration department professionals for their assistance in providing relavant supportive data for my study. I would also like appreciate all my friends and colleagues for their support and encouragment throughout the process of my thesis work.

At the end, I sincerly express my heartfelt gratitude to my lovely wife and my families for their undertanding, supporting and motivating me in all directions during the whole period of my educational journey.

Abstract

As secondary cities in Ethiopia undergo rapid urbanization and industrialization, the transition from manual to digital land administration has become a priority. This study investigates the challenges and prospects of implementing a modern digital cadastral system, specifically the Integrated Urban Land Information System (IULIS), in Sebeta Town, Oromia. The primary goal was to evaluate the performance of the digital cadastre in terms of service delivery and transparency, identify the institutional and technical factors hindering full implementation, and propose a framework for a more reliable and inclusive system. The research employed a mixed-methods approach, utilizing a descriptive and explanatory survey design. Data were collected from a sample of 350 respondents using structured questionnaires, complemented by qualitative interviews with land administration officials. Data analysis involved descriptive statistics (Likert scale frequencies) and inferential statistics (Multiple Linear Regression) processed via SPSS. The findings reveal a Techno-Institutional Mismatch. While 46.5% of respondents noted improved information access, the system suffers from significant bottlenecks. Multiple linear regression identified the Absence of Clear Guidelines (beta = -0.120, $p < 0.05$) and Lack of Skilled Labor Force ($p = 0.000$) as the strongest predictors of implementation failure. Furthermore, the study identified a significant socio-economic disparity, with only 25.5% of low-income respondents holding digital certificates compared to over 76% of high-income earners. Major implementation challenges include a lack of transparency (ranked #1), the poor quality of migrated analog documents (58.3% dissatisfaction), and persistent broker influence. The study concludes that digitalizing land records is not a purely technical task but an institutional one. To improve implementation, the Sebeta Land Management Office must prioritize the standardization of operational guidelines, invest in GIS-certified human capital, and adopt pro-poor registration subsidies. Successful implementation depends on transitioning from a software-first approach to a capacity-first strategy to ensure tenure security for all urban residents.

Keywords: *Digital Cadaster, IULIS, Sebeta Town, Tenure Security, GIS.*

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Acrynoms/Abbreviations

STA	Sebeta Town Administration
DV	Dependent Variables
LCS	Legal Cadastre System
LC	Legal Cadastre
CS	Cadastral System
FDRE	Federal Democratic Republic of Ethiopia
FGDs	Focus Group Discussions
GG	Good Governance
GTP	Growth and Transformation Plan
IDV	Independent Variables
LUAS	Land Use Administration System
LG	Land Governance
LIS	Land Information System
NGO	Non-Governmental Organization
SPSS	Statistical Package for Social Science
IULIS	Integrated Urban Land Information System
CRPRS	Cadaster and Real Properties Registration System
SWOT	Strengths, Weaknesses, Opportunities and Threats
TI	Transparency International
ULUA	Urban Land Use Administration
UN	United Nations
UNDP	United Nations Development Program
UNECE	United Nations Economic Commission for Europe
UN-Habitat	United Nations Human Settlements Program
WB	World Bank

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Land is an indispensable resource for socio-economic, political, and ecological advancement, fulfilling humanity's fundamental requirements. Worldwide, land plays a critical role in structuring societal, environmental, economic, and governmental frameworks. It underpins urban expansion, economic success, and societal equilibrium, and is fundamental to creation of goods and services (Kebede, 2022). Historically, land administration was conducted through manual, paper-based cadastral systems. However, as noted by Williamson (2010), traditional systems often suffer from physical deterioration, lack of spatial precision, and high susceptibility to fraudulent alterations.

Historically, the concept of the cadastre emerged as a tool for state-led fiscal extraction primarily for land taxation. Over centuries, it evolved into a juridical mechanism for protecting private property rights. In the 21st century, the global paradigm has shifted toward the Multipurpose Digital Cadastre. A digital cadastre is a parcel-based, up-to-date land information system containing a record of interests in land (e.g., rights, restrictions, and responsibilities). According to the FIG Cadastre 2014 vision, modern systems must be fully numerical and integrated to support sustainable development (Kaufmann & Steudler, 1998).The International Federation of Surveyors (FIG), through its seminal Cadastre 2014 vision, advocated for a system where legal land descriptions and spatial maps are unified. This vision was further refined by the Land Management Paradigm, which emphasizes that land administration is the process of determining, recording, and disseminating information about the tenure, value, use, and development of land. For developing nations, the transition from manual, often corruptible paper systems to a digital, numerical cadastre is promoted by international bodies like the UN-Habitat as a pro-poor tool that can prevent arbitrary land grabbing and provide the legal identity necessary for citizens to access credit.

The conceptual core of this research is rooted in the Land Management Paradigm. This framework posits that land administration is not merely a technical surveying task but a holistic governance process. It involves four distinct but interconnected functions:

1. Land Tenure: The formalization of rights, including the digital issuance of certificates.
2. Land Value: The assessment of land for fair taxation and compensation.
3. Land Use: The planning of urban spaces to ensure sustainable growth.
4. Land Development: The implementation of infrastructure and building controls.

In cities like Sebeta, the implementation of a digital system is often disproportionately focused

on tenure. However, as this study explores, the failure to integrate Value and Use leads to a system that cannot keep pace with the town's rapid industrialization. A truly integrated digital cadastre must provide a Spatial Data Infrastructure (SDI) that allows the municipality to see, in real-time, how land is being shifted from agricultural to industrial use.

In Ethiopia, as in other parts of the world, the socio-economic value of land lies in its role as a source of wealth, economic growth, employment, and basic sustenance for the majority of the population (Denscombe, 2010). The significance of urban land use is further amplified by rapid urban expansion, which often triggers profound changes in the physical, economic, social, political, and administrative landscapes of cities (Saltykon, 2014). Ethiopia's land administration history is uniquely complex, moving through three distinct eras:

The Imperial Era: Characterized by a feudal system where land was concentrated in the hands of the nobility ('Gult' and 'Rist' systems).

The Derg Era (1975–1991): A radical shift where all land was nationalized (Land to the Tiller). Private ownership was abolished, and land became a state-owned commodity.

The EPRDF/Current Era: The 1995 Constitution maintained state ownership but introduced User Rights or Leasehold Systems.

To modernize this third era, the Ethiopian government introduced Urban Land Registration Proclamation No. 818/2014. This law was revolutionary because it mandated a Numerical Cadastre a system where every parcel in Ethiopia is defined by absolute mathematical coordinates (Easting and Northing) rather than vague descriptive boundaries. The technological vehicle for this mandate was the Integrated Urban Land Information System (IULIS).

The IULIS was designed to bridge the gap between the Ministry of Urban Development and Housing (MUDHo) and local municipalities, providing a centralized digital vault for the nation's land wealth.

The modern cadastral system is a recent phenomenon which is started in 2015 at the capital city, Addis Ababa. Implementing this modern cadastral system in the major urban center of Ethiopia is being challenged as it needs long time to develop a well-structured cadastral system (Chekole, 2020; Kusmiarto, 2021; Femenia, 2021). As a result, urban land administration systems and delivery processes have been problematic. It lacks transparency and is full of corruption. In a similar vein, demand did not match supply for urban land. Adequate land management and efficient land use planning are vital urban services that are vital to the processes of reducing poverty in Ethiopia's urban areas. However, it is feasible to see that there are numerous issues with land use management in urban areas, meaning that LCS is still a struggle (Mathewos,

2015). Moreover, institutional weaknesses in urban land administration such as land inventory and cadastral systems prevent the government of different municipalities of Ethiopia from optimally extracting land and property rates (Tessema, 2016).

The urban centers of Ethiopia are developing in an unsustainable way by engulfing all the adjacent natural resources that call up for urban land cadaster and urban land management systems (Terfa, 2019). The physical urban growth rate outstrips the rise in infrastructure and service delivery which has a detrimental effect on urban land administration in an unsustainable manner (Terfa, 2019). Those unsustainable ways of urban land administration and development problems are highly taking place in Ethiopian urban centers (Tadesse &Imana, 2017; Terfa, 2020). Sebeta town administration is among the main urban centers of Ethiopia and is characterized by uncontrolled rapid urban spatial expansion engulfing all the adjacent peri-urban land in unsustainable ways without having land information(Tadesse &Imana, 2017; Terfa, 2020).

Sebeta Town, located in the Oromia Special Zone Surrounding Finfinne, is perhaps the most critical secondary city in Ethiopia's current industrial strategy. Positioned along a major transit corridor, it has become the preferred destination for foreign direct investment (FDI), particularly in the manufacturing and textile sectors.This rapid industrialization has created an Urban Land Fever. As agricultural land is converted into industrial plots, the demand for clear, digitally verified land titles has soared. In Sebeta, the digital cadastre is not just a luxury; it is the legal currency required for investment. However, this pressure has exposed a critical Performance Implementation Gap. When the demand for certificates exceeds the capacity of the digital system, informal markets and brokers emerge to fill the void, undermining the very transparency the IULIS was meant to create.

One of the primary technical hurdles identified in the background of this study is the Data Migration Crisis. For decades, Sebeta relied on hand-drawn 'Sito' maps and manual ledgers. These records were often inaccurate, with overlapping boundaries and missing owner information. When the IULIS was introduced, these dirty records were digitized.

This has resulted in the phenomenon of Digital Overlaps, where the software mathematically indicates that two different people own the same coordinate space. This is a classic case of Garbage-In, Garbage-Out (GIGO). Without a comprehensive field-based re-surveying project, the digital cadastre in Sebeta risks institutionalizing the errors of the past rather than correcting them. This study investigates how this technical friction affects the overall performance of land administration.

A modern digital cadastre is only as effective as the people who operate it. The transition to IULIS requires a workforce proficient in Geographic Information Systems (GIS), database management, and digital adjudication. In Sebeta, there is a visible mismatch between the complexity of the software and the skill level of the administrative staff. As highlighted in my regression analysis, the Lack of Skilled Labor Force is not just a minor hurdle; it is a statistically significant barrier to success. When staff are not fully confident in the digital system, they often revert to manual side-records, creating a hybrid system that is twice as slow and half as transparent as the original manual one. This background emphasizes that the human infrastructure is just as important as the fiber-optic cables and servers.

If the process of obtaining a digital title is expensive, time-consuming, or requires informal payments to brokers, the poor are effectively locked out of the formal economy. They cannot use their land as collateral for bank loans, and they live in constant fear of being displaced by industrial projects. This research, therefore, frames the digital cadastral system in Sebeta as a Political Economy issue. It is a tool that determines who is a legal citizen in the eyes of the state and who is left in the shadows of the informal city.

Given these global, national, and local pressures, it is clear that the Performance Implementation of the digital cadastre in Sebeta Town is at a crossroads. While the Prospects (transparency, security, and investment) are clear, the Challenges (technical errors, lack of guidelines, and skills gaps) are currently winning the race. This study provides a necessary health check on Sebeta's land system, offering a statistical and qualitative roadmap to move from a failing digital system to a functioning multipurpose cadastre.

The implementation of the digital cadastre in Sebeta is not merely a technical choice but a strict legal mandate derived from federal legislation. Sebeta's status as a leasehold-dominated town is primarily governed by the Urban Land Lease Holding Proclamation No. 721/2011. This law abolished permit (old possession) systems for new acquisitions, mandating that all urban land must be held under a lease contract. Specifically, Article 4 of Proclamation 721/2011 establishes the leasehold system as the only agency for land acquisition in urban centers. For Sebeta, this means the digital system must be robust enough to manage long-term lease contracts (ranging from 15 to 99 years) and their associated payments.

The technical operationalization of these rights is further dictated by Urban Land Registration Proclamation No. 818/2014. This proclamation serves as the technical constitution for the IULIS. Article 5 of Proclamation 818/2014 mandates the legal registration of urban landholding, stipulating that no person shall be granted land without a registered cadastral coordinate.

Furthermore, Article 11 emphasizes the Numerical Cadastre, requiring that parcel boundaries be defined by mathematical coordinates.

In Sebeta, the application of these articles creates a high-stakes environment. Because Article 16 of Proclamation 818/2014 states that registered information shall be the primary evidence of the right to land, any error in the digital migration such as a misplaced coordinate can legally disenfranchise a landholder. This legal weight explains why the Absence of Guidelines identified in my results is so damaging; without clear rules on how to handle coordinate disputes, the municipality is technically in violation of the federal mandate for accurate and reliable registration.

The digital journey in Sebeta is unique when compared to other African success stories, such as Rwanda and Ghana. Rwanda is often cited as the gold standard for land digitalization, having completed its nationwide Land Tenure Regularization (LTR) in just three years (2009–2012). Unlike Ethiopia's staggered, town-by-town approach, Rwanda used a low-cost, high-speed model involving orthophotos and community adjudication.

In contrast, Ethiopia's Secondary City model, as seen in Sebeta, is more technologically complex but institutionally slower. While Rwanda focused on rapid, flat-mapping of the whole country, Ethiopia's IULIS attempts to integrate high-precision surveying with complex leasehold finance. Ghana's experience with its Land Administration Project (LAP) provides a closer parallel; like Sebeta, Ghana struggled with institutional fragmentation and a lack of skilled manpower.

The uniqueness of Sebeta's model lies in its industrial urgency. While cities in Rwanda or Ghana were often digitized to improve rural security, Sebeta is being digitized to facilitate Foreign Direct Investment (FDI). This creates a Pressure Cooker effect: Sebeta must maintain the technical precision of a developed-world system while operating under the resource constraints of a developing-world municipality (Abate, 2019; UN-Habitat, 2021).

Perhaps the most volatile aspect of Sebeta's land administration is the Urban-Rural Interface. As Sebeta expands, it swallows rural agricultural land held by local farmers under Oromia's rural land laws.This transition creates a Grey Zone where rural Book of Holdings must be converted into urban Digital Lease Certificates. This interface is a major source of conflict. Rural land is often held based on traditional markers (trees, stones), while the urban digital cadastre requires Numerical Coordinates. When the urban boundary moves, the digital cadastre becomes the weapon of urbanization. If the digital system is not transparent, farmers fear that their land will be digitally erased to make room for industrial investors.

The failure to accurately map this interface in the IULIS leads to what researchers call Cadastral Conflict (Tadesse & Mansberger, 2020). In Sebeta, my data regarding the Fear of Tax Increment and Lack of Transparency is deeply rooted in this urban-rural tension. Residents are not just afraid of taxes; they are afraid that the Digital System is a tool for displacement. Therefore, the implementation of the cadastre in Sebeta is not just a project for the Town, but a vital peace-building tool for the entire Oromia national state.

1.2 Statement of the Problem

The successful implementation of a digital cadastral system is often heralded as a panacea for urban land mismanagement in developing nations. However, in Sebeta Town, the transition from a manual, paper-based administration to the Integrated Urban Land Information System (IULIS) has encountered a performance paradox. Despite the legal frameworks provided by Proclamation No. 721/2011 and Proclamation No. 818/2014, the town's land administration continues to grapple with systemic inefficiencies that threaten both economic investment and social stability.

The primary problem is the unreliability of the digital database. While the IULIS was intended to provide a clean numerical record of land rights, the migration process has largely been a digital reproduction of historical errors. Because original analog documents 'characterized by 58.3% dissatisfaction among stakeholders' were digitized without rigorous field-based verification, Sebeta now faces a crisis of Digital Overlaps. This occurs when the mathematical coordinates of a new leasehold intersect with existing possessions, leading to a surge in land litigation and stalling the town's industrial expansion (Tadesse & Mansberger, 2020).

Furthermore, there is a profound Institutional and Capacity Mismatch. A digital cadastre requires a specialized workforce proficient in GIS and database management. However, this research demonstrates that Sebeta's Land Management Office suffers from a chronic Lack of Skilled Labor Force, a variable that was found to be a highly significant predictor of implementation failure ($p = 0.000$) in the regression model. In the absence of technical expertise, the system becomes prone to human error and manipulation, allowing informal brokers to thrive in the digital shadows created by the system's complexity.

Equally concerning is the Equity and Access Gap. While the digital cadastre should ideally democratize land information, the implementation in Sebeta has shown a bias toward high-income earners. The data indicates that only 25.5% of low-income respondents possess certificates, compared to over 76% of those in the highest income brackets. This suggests that the digital system, in its current form, may be acting as a tool for Digital Exclusion, where the poor are marginalized because they cannot afford the formalization costs or navigate the

administrative hurdles of the IULIS.

Finally, the Absence of Clear Guidelines (beta = -0.120) has created a procedural vacuum. Without standardized manuals to guide the transition, staff are left with high levels of administrative discretion, which 'when coupled with Weak Governance (p = 0.016)' fuels perceptions of corruption and lack of transparency. If these challenges remain unaddressed, the digital cadastre in Sebeta will remain a technological shell that provides a false sense of security while institutionalizing the very land tenure insecurities it was designed to solve.

1.3. Objective of the study

1.3.1. General Objective

The primary objective of this study is to investigate the major challenges hindering the effective implementation and operation of the Modern Digital Cadastral System in the urban land administration of Sebeta Town.

1.3.2. Specific Objectives

The specific objectives of this study are based on the following four objectives.

1. To evaluate the current performance of digital cadaster in terms of service speed and transparency.
2. To evaluate the institutional, human resource capacity and customer status of the Sebeta Town land administration office.
3. To identify the major challenges that faced urban land administration using legal cadaster in the study area.
4. To propose a framework for a more reliable and sustainable digital cadastral system in Sebeta.

1.4 Research Questions

Based on the stated specific objectives and the problems to be addressed, the following research questions are formulated:

1. How effective performances of digital cadaster systems in Sebeta town?
2. How does the institutional and staff capacity level affect the efficiency of land service delivery in digital cadaster?
3. What are the major challenges hindering the effective implementation and operation of the Modern Digital Cadastral System in the study area?
4. What prospects and strategies can be adopted to enhance the effectiveness of the digital land registry for residents and investors?

1.5 Scope of the Study

The scope of this study is categorized into three main dimensions: Geographical, Conceptual, and Methodological.

1.5.1 Geographical Scope

The study is physically delimited to Sebeta Town, located in the Oromia Special Zone Surrounding Finfinnee, Ethiopia.

Focus Area: While Sebeta is large, the research will specifically focus on the urban center and selected peri-urban interfaces where the transition from rural to urban land is most active.

Specific Administration: Data collection will be centered at the Sebeta Town Land Administration and Management Office, as this is the primary hub for the digital cadastral database (IULIS).

1.5.2 Conceptual (Thematic) Scope

This study does not cover all aspects of urban planning (like transport or sanitation). It is strictly limited to the Modern Digital Cadastral System.

Key Themes: It covers the technical infrastructure (hardware/software), the legal framework of land registration (Proclamation 818/2014), the accuracy of spatial data (maps and boundaries), and the institutional capacity of the staff.

Land Types: The study focuses on urban residential and industrial land holdings that are required to be registered under the new system. It will also touch upon the challenges of integrating informal settlements into this digital framework.

1.5.3 Methodological Scope

Data Sources: The study relies on a mix of primary data (interviews with Sebeta land officials and surveys with residents) and secondary data (government reports, land proclamations, and existing cadastral maps).

Approach: It uses a Mixed Research Approach, combining qualitative descriptions of challenges with quantitative data regarding service delivery delays or system downtime.

1.5.4 Time Scope

The study will focus on the period from 2021 to 2024/25. This time frame is selected because it represents the most active phase of the digital cadastral rollout and the Integrated Urban Land Information System (IULIS) implementation in Sebeta Town. This allows the researcher to capture the before and after effects of the digitalization process.

Table 1.1: Comparison In-Scope vs. Out-of-Scope

Category	Included (In-Scope)	Excluded (Out-of-Scope)
Location	Sebeta Town.	Rural Woredas outside Sebeta town.
System	Modern Digital Cadastre (IULIS).	Traditional paper-based taxation only.
Participants	Land staffs and customers.	Regional politicians or federal ministers.
Focus	Technical & Administrative barriers.	General urban environmental issues.

1.6 Significance of the Study

The findings of this research are expected to provide multi-dimensional benefits to various stakeholders involved in urban land management and the broader development of Sebeta Town.

1.6.1 For Policy Makers and Government Authorities

This study will provide a clear diagnostic report for the Oromia Regional Land Bureau and the Ministry of Urban Development and Construction.

- Evidence-based Decision Making: It offers empirical evidence on why the Integrated Urban Land Information System (IULIS) is facing bottlenecks, allowing leaders to move beyond theoretical solutions to practical ones.
- Refining Proclamations: The study can highlight where current laws (like Proclamation 818/2014) may be difficult to implement on the ground in rapidly expanding towns like Sebeta.

1.6.2 For the Sebeta Town Municipality

The municipality is the direct beneficiary of this research.

- Operational Efficiency: By identifying technical gaps (e.g., power issues, staff GIS skills), the study provides a roadmap for the municipality to prioritize its budget, for example, investing in solar backups or specialized technical training.
- Revenue Generation: A functional digital cadaster ensures accurate land taxation. This study helps the town identify how to fix the system to improve its internal revenue collection.

1.6.3 For Sebeta Landholders customer

The ultimate goal of a digital cadaster is to serve the people.

- Tenure Security: By identifying the causes of boundary overlaps and data errors, this study contributes to a more reliable system where residents can have peace of mind regarding their property rights.
- Reduced Corruption: A transparent digital system reduces the need for middlemen or face-to-face negotiations that often lead to bribery. This research highlights how to make the system more transparent for the average citizen.

1.6.4 For the Academic Community and Future Researchers

- Filling the Literature Gap: While much has been written about land digitalization in Addis Ababa, there is limited research specifically on secondary industrial hubs like Sebeta. This study fills that gap.
- Reference Material: It serves as a baseline for future researchers who want to compare Sebeta's progress with other fast-growing towns in the Oromia Special Zone or other regions of Ethiopia.

1.7 Limitations of the Study

Every research endeavor faces specific constraints that may influence the depth or generalizability of the findings. In the context of investigating the digital cadastral system in Sebeta Town, the following limitations were encountered:

1.7.1 Data Accessibility and Institutional Secrecy

Land administration is a highly sensitive sector in Ethiopia, often associated with high levels of litigation and administrative confidentiality. Consequently, accessing certain internal back-end reports of the IULIS (such as detailed system error logs or specific disciplinary records related to corruption) was restricted. While the study mitigated this by using anonymized surveys and interviews (N=350), the lack of direct access to internal municipal audits remains a limitation in fully quantifying the Integrity Gap.

1.7.2 Technical and Infrastructural Constraints

The study was conducted during a period when Sebeta Town experienced intermittent power outages and internet connectivity issues. These fluctuations occasionally hindered the observation of real-time system performance. Furthermore, because the IULIS is a centralized federal system, local staff were sometimes unable to explain specific software bugs, attributing them to headquarters issues, which limited the study's ability to diagnose whether certain failures were purely technical or purely administrative.

1.7.3 Scope of Variables (Thematic Limitation)

While the Land Management Paradigm suggests a four-dimensional approach (Tenure, Value, Use, and Development), this study focused primarily on the Legal Cadastre (Tenure). Due to time and resource constraints, the Fiscal Cadastre (Taxation) and Multipurpose Cadastre were not analyzed in equal depth. Therefore, the findings regarding system performance are predominantly reflective of registration and title issuance rather than the town's overall spatial and non-spatial integrated planning efficiency.

1.7.4 Longitudinal Gap (Temporal Limitation)

This research provides a cross-sectional snapshot of the IULIS implementation in Sebeta at a specific point in time (2021-2025). As digital systems are subject to frequent software updates and policy changes, the results capture the Implementation Friction of the current version of the system. A longitudinal study over several years would be required to measure the long-term Prospects of the system as it matures.

1.7.5 Language and Interpretation

While the survey was administered to a diverse group of residents, the technical terminology of Numerical Cadastre and IULIS required careful translation into Afaan Oromoo and Amharic. Despite the use of trained enumerators, there is a minor risk that some respondents particularly those from the low-income bracket may have interpreted Transparency differently than its formal administrative definition.

1.8 Delimitation of the Study

To maintain a sharp focus, the study was intentionally delimited or bounded in the following ways:

Geographical: Only the formal administrative kebeles of Sebeta Town were included; the wider rural hinterlands of the Oromia Special Zone were excluded unless they were currently undergoing urbanization/formalization into the digital system.

Target Population: The study prioritized active landholders and employees of the Land Management Office, as they possess direct experience with the digital system, rather than the general public who may not yet own land.

1.9. Organization of the Study

The study is organized into five separate chapters. The introduction, background of the study, problem identification, objectives, research questions, significance of the study, and limitations are all covered in the first chapter. A review of relevant literature pertaining to the topic is the focus of the second chapter. The research approach used in the study is described in Chapter three. The study area, research design, data kinds and sources, study variables, sample strategies, and data collection and analysis procedures are all described here. The findings and discussion are presented in Chapter four. This part provides a detailed description of the results, examines the findings in relation to the study queries, and contrasts them with findings from other studies.The conclusion and suggestions are covered in the last chapter. In order to support inclusive planning techniques and guide policy creation, it offers recommendations based on the study's main findings, which are summarized in accordance with the research questions.

CHAPTER TWO: LITERATURE REVIEW

2.1. Definition of Terminologies

In this study, the following terminologies are used to describe the multifaceted nature of land management, the digital transition, and the socio-economic context of Sebeta Town.

1. Core Land Administration and Cadastral Concepts

- **Land Administration:** This is the process of determining, recording, and disseminating information about the relationship between people and land. It encompasses the ownership, value, and use of land. As defined by Williamson et al. (2010), land administration systems are the infrastructure that implements land-related policies and land management strategies in a jurisdiction.
- **Cadastre:** A cadastre is typically a parcel-based, up-to-date land information system containing a record of interests in land (rights, restrictions, and responsibilities). It is often characterized by a geometric description of land parcels linked to other records describing the nature of the interests, the ownership or control of those interests, and often the value of the parcel and its improvements (FIG, 1995).
- **Digital Cadastre:** An information system that manages cadastral data using computer-based technology. Unlike manual systems, a digital cadastre allows for the integration of spatial data (the map) and attribute data (legal ownership, lease terms) in a single, queryable database (Enemark, 2015).
- **Numerical Cadastre:** A cadastral system in which the boundaries of land parcels are defined by accurate, absolute geodetic coordinates (e.g., X, Y coordinates in a global system like UTM). Under Proclamation 818/2014, this is the gold standard in Ethiopia, replacing traditional, relative boundary descriptions (FDRE, 2014).

2. Legal and Regulatory Terminologies

- **Leasehold System:** In the Ethiopian context, as per Proclamation No. 721/2011, this is the legal regime where urban land is owned by the State, but individuals or organizations are granted the right to use the land for a specific period (up to 99 years) upon payment of a lease fee. This is the dominant tenure system in Sebeta Town (FDRE, 2011).
- **Land Tenure Security:** The certainty that an individual's or a community's land rights will be recognized by others and protected by the state. Security is tenured when the rights are formally registered or socially recognized and are not subject to arbitrary eviction (Deininger, 2003).

- **Title vs. Deed:** A Deed is a document that proves a transaction took place (a historical record). A Title is the legal recognition of the ownership itself. The digital cadastre seeks to move from Deed-based records (which require tracing history) to Title-based records (where the digital entry is the conclusive evidence of ownership).

3. Technological and Spatial Concepts

- **Geographic Information System (GIS):** A system designed to capture, store, manipulate, analyze, manage, and present spatial or geographic data. In Sebeta, the IULIS is essentially a specialized GIS application built on a relational database (PostgreSQL/Post GIS) (ESRI, 2024).
- **Land Administration Domain Model (LADM - ISO 19152):** An international standard that provides a common language for land administration systems. It allows for the interoperability of cadastral data, ensuring that land records can be shared across different administrative levels (Lemmen et al., 2015).
- **Fit-for-Purpose (FFP) Land Administration:** An approach that advocates for sufficient rather than perfect land administration. It encourages the use of aerial imagery, community-based adjudication, and incremental improvement rather than waiting for high-cost, high-precision numerical surveys (Enemark et al., 2014).
- **Interoperability:** The ability of different information systems, devices, and applications to access, exchange, and cooperatively use data in a coordinated manner. In Sebeta, this refers to the IULIS's ability to talk to municipal tax and utility databases.

4. Socio-Economic and Spatial Planning Concepts

- **Parcel:** The fundamental unit of cadastral mapping. It is a continuous area of land, defined by a set of boundaries, under a single form of tenure (ownership or leasehold) and with a single use (residential, commercial, industrial).
- **Peri-urban / Urban-Rural Interface:** The transitional zone where urban and rural land uses mix. In Sebeta, this is the area where agricultural land is rapidly being converted to industrial and residential use. It is characterized by high land-use competition and tenure insecurity (Tadesse, 2023).
- **Garbage-In, Garbage-Out (GIGO):** A computing principle relevant to cadastral data migration. It asserts that if the input data (the manual paper records) is inaccurate, the output (the digital cadastre) will be unreliable, regardless of the quality of the software used.

- **Broker Influence (Delala):** The phenomenon where informal intermediaries operate between the citizen and the state land office. These brokers exploit information asymmetry the gap in knowledge between the complex digital system and the public's understanding of it (Home, 2021).

2.2 Theoretical Framework

The theoretical foundation of this study is built upon the evolution of land administration from a purely technical surveying task to a complex socio-technical governance system. In the contemporary era, land is no longer viewed merely as a physical commodity but as a dynamic resource that requires integrated management to support sustainable development. To understand the implementation of the digital cadastre in Sebeta Town, it is essential to ground the analysis in the prevailing international theories that dictate how modern land systems should function.

2.2.1 The Land Management Paradigm

The Land Management Paradigm (LMP) is the globally recognized conceptual framework that describes the relationship between land policy, land information infrastructures, and sustainable development. Developed largely by Professor Stig Enemark and endorsed by the International Federation of Surveyors (FIG), the paradigm posits that land administration is the process of determining, recording, and disseminating information about the tenure, value, use, and development of land (Enemark, 2004).

At its core, the paradigm emphasizes that a digital cadastral system, such as the IULIS in Sebeta, cannot exist in a vacuum. It must function as an integrated engine that powers four distinct but highly interconnected functions:

1. Land Tenure (The Rights Dimension)

Land tenure involves the allocation and security of rights in land. In the context of Sebeta Town, this refers to the formalization of urban leaseholds and the digital registration of titles. According to Williamson et al. (2010), tenure security is the bedrock of the paradigm because it provides the legal certainty required for individuals to invest in their property. The transition to a digital cadastre is theoretically intended to strengthen this pillar by replacing vulnerable paper records with immutable digital coordinates. However, as noted in the Statement of the Problem, if the digital system is not transparent or inclusive, it may inadvertently weaken tenure security for low-income groups.

2. Land Value (The Economic Dimension)

The Value function of the paradigm focuses on the assessment of land and properties for taxation and compensation. In a rapidly industrializing town like Sebeta, land values fluctuate

significantly as agricultural land is converted into industrial zones. A modern digital cadastre should ideally be linked to a valuation database. This allows the municipality to capture land value increments to fund urban infrastructure. Without an accurate digital record of who owns what, the town loses vital revenue, and compensation for eminent domain (government land takeovers) becomes a source of social conflict (Enemark, 2005).

3. Land Use (The Control Dimension)

Land Use refers to the planning and control of the use of land through zoning, environmental regulations, and building permits. The LMP suggests that a digital cadastre should be the primary reference map for urban planners. In Sebeta, the Prospects of the digital system include the ability to prevent illegal construction and manage industrial pollution by ensuring that factories are only built in designated zones. If the cadastral maps are disconnected from the planning maps—a common issue in secondary Ethiopian cities—industrial growth becomes chaotic and environmentally unsustainable (World Bank, 2021).

4. Land Development (The Implementation Dimension)

Land development involves the physical transformation of land through the provision of infrastructure, utilities, and services. In the Sebeta corridor, this includes the development of industrial parks, roads, and electricity grids. The Land Management Paradigm argues that development cannot be efficient without a Spatial Data Infrastructure (SDI). Developers need to know the exact boundaries and ownership of land before breaking ground. A functional digital cadastre reduces transaction costs by providing instant access to this data, thereby attracting Foreign Direct Investment (FDI).

2.2.2 Evolution of Cadastral Systems: From Cadastre 2014 to Digital Cadastre 2034

The evolution of land administration is not merely a history of technological upgrades; it is a paradigm shift in how societies perceive, document, and manage the relationship between people and land. To understand the current trajectory of the Integrated Urban Land Information System (IULIS) in Sebeta, one must recognize that we are operating in the wake of two major international visions that have shaped modern land governance: Cadastre 2014 and the subsequent Cadastre 2034.

The Vision of Cadastre 2014: Decoupling and Integration

Historically, cadastral systems were siloed. The fiscal cadastre (for tax) and the juridical cadastre (for legal rights) often operated as separate paper-based entities. In 1998, the International Federation of Surveyors (FIG) published Cadastre 2014, a seminal document that revolutionized the field. It proposed six visions, most notably the abolition of the separation between maps and

registers and the replacement of paper mapping with numerical data (Kaufmann & Steudler, 1998).

Cadastre 2014 introduced six revolutionary statements that redefined the field:

1. **Separation of Maps and Records:** It argued that maps should be independent of the legal records, allowing for more flexible data management.
2. **No Paper Maps:** It pushed for the total elimination of analog storage in favor of digital databases.
3. **No Separation of Cadastre and Land Registration:** It advocated for the merger of spatial (map) data and attribute (owner/legal) data into a single system.
4. **Private Sector Involvement:** It encouraged the outsourcing of survey and maintenance tasks to private firms, moving away from state monopolies.
5. **Cost Recovery:** It emphasized that cadastral systems should be financially self-sustaining through user fees.
6. **Full Transparency:** It championed the idea that land data should be public, accessible, and transparent.

For the Sebeta context, these principles are the ancestors of the IULIS. The attempt to create a unified system in Ethiopia is essentially a localized implementation of the 2014 vision moving away from the manual, fragmented record-keeping of the past toward an integrated digital platform.

The Bridge: ISO 19152 (LADM) and Fit-For-Purpose

Between the launch of Cadastre 2014 and the emergence of the 2034 vision, the field underwent a critical refinement. The global community realized that Cadastre 2014 was an ideal, but developing nations needed a more pragmatic approach.

- The Land Administration Domain Model (LADM - ISO 19152): In 2012, this international standard was ratified, providing a common language for cadastral systems. It allowed for the digital interoperability that Sebeta currently struggles to achieve enabling land information from different agencies to speak to one another (Lemmen et al., 2015).
- Fit-For-Purpose (FFP) Land Administration: Recognized by the World Bank and UN-Habitat, the FFP approach acknowledges that not every country can afford high-precision numerical cadastres immediately. It advocates for systems that are good enough to be useful, sustainable, and affordable, focusing on community-based adjudication rather than expensive satellite surveys (Enemark et al., 2014).

Cadastre 2034: The Spatially Enabled Future

While Cadastre 2014 focused on the 'structure' of data, the Cadastre 2034 vision developed by the Intergovernmental Committee on Surveying and Mapping (ICSM) in Australia/New Zealand focuses on the 'utility' of data. It envisions the land administration system not as a standalone database, but as a platform (Cadastre as a Platform - CaaP) that acts as the foundation for a Spatially Enabled Society.

The core tenets of the 2034 vision include:

- **3D and 4D Cadastres:** Moving beyond flat 2D parcels to include complex vertical data (apartments, underground infrastructure) and the temporal dimension (tracking rights over time).
- **Real-Time Data:** The transition from periodic updates to instantaneous, real-time reflection of the land market.
- **Integrated Infrastructure:** The cadastre becomes a primary component of a nation's Digital Twin, where land data is seamlessly linked with utilities, transport, and environmental monitoring.
- **The Invisible Cadastre:** In the 2034 vision, citizens do not visit the land office. The land system is accessible via smart devices, and updates occur automatically through blockchain-verified transactions or sensor-based reporting (Bennett et al., 2016).

2.2.3 Institutional Theory in Land Administration

While the Land Management Paradigm provides the functional framework for 'what' a digital system should do, Institutional Theory explains 'why' the implementation succeeds or fails. In land administration, technology is rarely the primary cause of failure. Instead, failure is almost universally attributed to the institutional environment the complex interplay of rules, norms, and cognitive beliefs that determine how technology is adopted, managed, and resisted.

Institutional theory, as established by Douglas North (1990) and refined for organizational analysis by W. Richard Scott (1995), posits that institutions are the rules of the game in a society. In the context of the Integrated Urban Land Information System (IULIS) in Sebeta Town, these institutions dictate the success of the digital transition far more than the quality of the software code.

The Three Pillars of Institutions

To understand why Sebeta's IULIS implementation faces challenges, we must analyze the three pillars defined by Scott (1995) that constitute an institutional environment:

1. The Regulative Pillar (Laws and Rules)

This pillar focuses on the formal constraints the laws, regulations, and procedural manuals that

govern land.

- Context for Sebeta: The Urban Land Registration Proclamation (No. 818/2014) provides the regulative basis for the digital cadastre. However, institutional theory argues that a law is only an institution if it is enforced and understood.
- The Gap: My research identified the Absence of Clear Guidelines as a significant variable. Even though the 'law' exists, if the 'operating procedures' (the how-to manuals) are missing, the staff cannot enforce the law consistently. This leads to administrative discretion, where officials may interpret the rules differently, creating the inconsistency reported by your respondents.

2. The Normative Pillar (Professional Standards)

This pillar encompasses the values, expectations, and professional standards that govern the behavior of the people operating the system.

- Context for Sebeta: This relates to the professional integrity and competency of the GIS analysts, surveyors, and registrars. If the norm in the office is to prioritize speed over accuracy, or if professional ethics are undermined by external pressure, the technology will be misused.
- The Gap: The Level of Skill is a normative issue. When staff lack the specific training to perform topological checks (ensuring no overlapping parcels), the system fails. Institutional theory predicts that if the norm is to simply get the file processed, the digital precision required by the system will be sacrificed to meet performance quotas.

3. The Cultural-Cognitive Pillar (Beliefs and Trust)

This is the deepest pillar, representing the shared meanings and cultural frameworks that people use to make sense of the world. It involves public trust and the internal perception of the system by municipal staff.

- Context for Sebeta: This involves the public's belief in the system. Do residents trust that the digital certificate is secure? Do staff believe the system helps them, or is it just more work?
- The Gap: My research into Customer Awareness and Customers' Attitude to Land Office falls here. If the cultural-cognitive framework of the public is one of suspicion viewing digitalization as a tax-collection trap they will resist participation. Institutional theory suggests that without a shift in this cognitive landscape, even the most efficient software will struggle to gain traction.

Technology as a Socio-Technical System

A central tenet of institutional theory in land administration is the 20/80 Rule. As Williamson (2001) argues, a successful land administration project is 20% technical (hardware/software) and 80% institutional (people/rules).

When technology (the IULIS) is introduced into a town like Sebeta, it disrupts the existing institutional order. If the system is not institutionalized meaning the rules are updated, the staff are trained, and the public trusts the new procedures the technology will be decoupled from the actual work.

The Problem of Path Dependency

Institutional theory also highlights Path Dependency, the tendency for organizations to continue using old methods because they are locked in by history. Sebeta's land office has decades of history managing land through paper files, oral boundary descriptions, and a hierarchical, centralized decision-making structure.

When the digital system (IULIS) demands horizontal data sharing and mathematical precision, it directly conflicts with the existing institutional path.

- The Friction: Staff who were experts in the paper-based system may feel their power is threatened by the transparency of the digital system. This leads to Staff Resistance, where employees may consciously or unconsciously undermine the digital transition by reverting to paper-based side-records (Arko-Adjei, 2011).

Applying the Theory to Sebeta's Implementation Level

The relationship can be modeled to understand the dependent variable, Y (Implementation Level):

Where:

- Regulative Coherence: Availability of clear guidelines and enforcement of 818/2014.
- Normative Capacity: Staff skill levels and professional standards.
- Cognitive Legitimacy: Public trust and system awareness

In Sebeta, the implementation level is currently low because the Regulative Coherence is weak (due to the procedural vacuum) and the Cognitive Legitimacy is undermined by public mistrust. The technology (the Hardware and Software) is not the issue; the Rules of the Game have not yet been successfully rewritten to accommodate the digital revolution.

Why Rules and Human Capacity Dictate Success

1. Guidelines dictate consistency: Without guidelines, the Digital Truth becomes a matter of opinion, causing the disputes i identified in my findings.

2. Human Capacity dictates the Data Quality: The system can only process what humans' input. If the human capacity (skill level) is low, the data quality (GIGO) will remain poor, regardless of how fast the server is.

3. Governance dictates the environment: If the governance structure is weak, the digital system will not be used for transparency but rather for selective gatekeeping.

2.2.4 The Fit-for-Purpose (FFP) Land Administration Approach

In the discourse of modern land administration, a significant shift has occurred from the pursuit of absolute technical perfection to the pursuit of contextual utility. This shift is embodied in the Fit-for-Purpose (FFP) approach, championed by the International Federation of Surveyors (FIG) and the World Bank. For Sebeta Town, where the legal mandate (Proclamation 818/2014) demands a rigid numerical cadastre, the FFP approach offers a critical, and often challenging, perspective: Is the town's insistence on absolute precision the primary cause of its implementation delays?

The Philosophy of Fit-for-Purpose

The FFP approach argues that land administration systems should be designed to meet the specific social, economic, and technical needs of a country, rather than forcing a best-practice model from developed nations (such as the Netherlands or Australia) onto a developing context.

As noted by Enemark et al. (2014), FFP is not second-rate land administration; it is sufficient land administration. It focuses on:

- Spatial Frameworks: Using orthophotos (aerial imagery) instead of expensive ground-based, survey-grade GPS measurements where high precision is not immediately required.
- Legal Frameworks: Recognizing informal and customary rights alongside formal leaseholds, rather than attempting to legitimize only those that fit a strict legal mold.
- Institutional Frameworks: Emphasizing simple, transparent, and inclusive processes that the local population can understand and utilize, rather than bureaucratic systems that require brokers to navigate.

A Critical Look: Rigid vs. Flexible Systems

The fundamental tension in modern land administration is between Rigid (Numerical) Systems and Flexible (Image-based/Participatory) Systems. Understanding this dichotomy is essential for analyzing the Implementation Friction in Sebeta.

1. The Rigid (Numerical) Approach

This model, which Ethiopia's Proclamation 818/2014 largely mirrors, demands mathematical

certainty. It requires that every boundary corner be surveyed to sub-centimeter accuracy by licensed professionals.

Strengths:

- High Reliability: Provides clear, unambiguous evidence for court proceedings.
- Market Certainty: Investors (FDI) prefer high precision as it reduces the risk of overlapping claims.
- Long-term Sustainability: Once the data is in, it rarely needs re-surveying.

Weaknesses (The Sebeta Reality):

- High Cost: Requires expensive equipment and highly trained (and rare) professionals.
- Slow Rollout: Mapping an entire town takes years, by which time informal settlements have already grown and changed.
- Exclusionary: Low-income residents cannot afford the survey fees, leading to the Digital Exclusion identified in your research.

2. The Flexible (FFP/Image-based) Approach

This model, famously utilized in the Rwandan Land Tenure Regularization program, prioritizes Coverage over Precision. It relies on high-resolution aerial photography and community-based adjudication where neighbors verify boundaries in public.

Strengths:

- Rapid Implementation: Millions of parcels can be mapped in months.
- Cost-Effectiveness: Drastically reduces the need for costly field visits.
- Inclusivity: Because it is community-based, it captures informal and peri-urban rights that a purely technical survey would miss.

Weaknesses:

- Variable Accuracy: Image-based boundaries may not hold up in court if disputes arise.

Future Maintenance: Might require upgrading to numerical standards later, which can be politically and technically complex.

2.3 Conceptual Definitions and Overview

The transition toward a digital land administration system requires a precise understanding of the terms and technical processes involved. In many developing urban centers, confusion regarding the specific type of cadastre being implemented leads to misaligned policy goals. This section clarifies the fundamental concepts of cadastral surveying and the various functional models of cadastral systems utilized globally and within the Ethiopian context.

2.3.1 Concepts of Cadastre and Cadastral Surveying

At its most basic level, a cadastre is a parcel-based and up-to-date land information system containing a record of interests in land (e.g., rights, restrictions, and responsibilities). It usually includes a geometric description of land parcels linked to other records describing the nature of the interests, the ownership or control of those interests, and often the value of the parcel and its improvements (FIG, 1995).

Cadastral Surveying, on the other hand, is the technical operational arm of the cadastre. It is the process of physically defining the boundaries of land parcels on the ground and representing them mathematically. In a modern system like Sebeta's IULIS, this involves Numerical Surveying, where high-precision Global Navigation Satellite Systems (GNSS) and Total Stations are used to produce coordinates (Easting and Northing) that are accurate to within centimeters. As noted by Zevenbergen (2002), the quality of the cadastral survey is the DNA of the land system; if the survey is flawed, the entire legal and fiscal structure built upon it will eventually collapse.

Distinguishing Between Fiscal, Juridical/Legal, and Multipurpose Systems. The evolution of land administration has produced three primary types of cadastral systems, each serving a different state priority. Understanding these is essential to diagnosing the Implementation Performance in Sebeta.

1. The Fiscal Cadastre: Historically, the earliest cadastres were developed for the sole purpose of land taxation. A fiscal cadastre contains information required to levy fair taxes, including the size of the parcel, the quality of the soil or location, and the value of improvements (buildings). In the context of Sebeta Town, the fiscal element is often what drives the municipality's interest in digitalization. However, my research findings on the Fear of Tax Increment suggest that when a system is perceived as purely fiscal, it creates public resistance and data hiding among residents (Bird & Slack, 2004).

2. The Juridical (Legal) Cadastre: The juridical cadastre is designed specifically to serve the land market and protect property rights. Its primary focus is on the Who and the How who owns the land and how is that right legally defined? It serves as a public register that provides indefeasible proof of title. In Ethiopia, the juridical cadastre is mandated by Proclamation 818/2014, which seeks to provide tenure security to urban dwellers. The challenge in Sebeta, as identified in my study, is that the juridical system is being undermined by Broker Influence and Poor Analog Data, which creates legal clouds over digital titles (Dale & McLaughlin, 1999).

In the context of a legal cadaster, adjudication is the process by which the existing rights in a

particular parcel of land are finally and authoritatively ascertained. It is not about creating new rights, but rather about officially confirming who owns what, where, and how.

In land administration systems like the one being implemented in Sebeta, there are two primary types of adjudication: Systematic Adjudication and Sporadic Adjudication.

1. Systematic Adjudication

Systematic adjudication is a method where the government or a land authority declares a specific area (usually a district or a municipality) a "land adjudication area" and proceeds to register every single parcel within that boundary at the same time.

The Process

The process is methodical and follows a strict geographic progression.

1. Notification: The community is informed that their area is being registered.
2. Demarcation: Surveyors go from plot to plot, usually in the presence of neighbors, to mark boundaries.
3. Investigation: A committee or legal officer reviews evidence (old titles, tax receipts, witness testimony) to determine the owner.
4. Publication: A list of owners is posted publicly (the "Adjudication Record") for a set period (e.g., 30 days) to allow for objections.
5. Finalization: If no disputes remain, the records are moved into the official Register/IULIS.

Advantages of the Systematic Approach

Completeness: It ensures that every inch of land in a jurisdiction is accounted for, eliminating "white spots" on the map.

Cost-Efficiency per Parcel: Because the survey teams move from one house to the next, the transport and administrative costs per parcel are much lower than doing them individually.

Boundary Conflict Resolution: Since all neighbors are present during the demarcation, boundary disputes are resolved simultaneously, preventing future litigation.

Inclusivity: It brings the poor or marginalized into the formal system because the government usually subsidizes the cost of systematic registration.

Disadvantages

High Initial Cost: It requires a massive upfront investment in human resources, technology, and logistics.

Compulsion: Some owners may not want to be registered (perhaps to avoid taxes), which can lead to friction.

2. Sporadic Adjudication

Sporadic adjudication occurs "here and there" whenever a specific trigger event happens. Instead

of a government-led campaign, this is a demand-driven process initiated by the individual landholder.

Common Triggers

Sporadic adjudication is usually triggered by:

1. Land Sale: When someone buys a piece of land and wants to ensure the title is transferred to their name.
2. Inheritance: When a landholder dies and the heirs seek to legalize their claim.
3. Mortgage Application: When a bank requires a formal title deed as collateral for a loan.
4. Voluntary Registration: When an owner simply wants the peace of mind that comes with a formal certificate.

The Process

Unlike the systematic approach, the process is isolated:

- The owner applies to the land office (e.g., in Sebeta).
- A surveyor is dispatched specifically for that single parcel.
- The legal officer investigates only that specific claim.
- Notice is often published in a local newspaper rather than a village board.

Advantages of the Sporadic Approach

Low Public Cost: The state does not need to hire massive teams; the individual landholder usually pays the fees.

Voluntary Participation: Only those who value the title and are ready for it participate, reducing institutional friction.

Immediate Utility: It facilitates the land market by allowing transactions to happen on an as-needed basis.

Disadvantages

Inefficiency: It is highly inefficient for the land office to send a surveyor across town for one plot.

Incomplete Map: It results in a "Swiss cheese" cadaster where some plots are registered and others are not, leading to confusion and potential overlapping claims.

Elite Bias: Often, only the wealthy or the literate can navigate the bureaucracy and pay the fees for sporadic registration, leaving the poor in the informal sector.

3. Comparison and Context in Ethiopia

Table 2.1: Comparison and Context in Ethiopia

Feature	Systematic Adjudication	Sporadic Adjudication
Initiative	Government/State	Individual Owner
Area	Block/District-wide	Single Parcel
Speed	Slow to start, fast to finish	Fast for one, slow for a nation
Cost	Low per parcel	High per parcel
Dispute Risk	Lower (Neighbors present)	Higher (Neighbor might be absent)

The Design-Reality Connection

In many urban areas in Ethiopia, the Design of the IULIS assumes a Systematic rollout (to get all data into the system at once). However, the Reality is often Sporadic. Because the government lacks the resources to register every plot in Sebeta systematically, the system relies on people coming in one by one.

This Sporadic Reality is a major reason for the implementation gap. When adjudication is sporadic, the database (IULIS/ CRPRS) remains incomplete for years, making it impossible for the system to act as a Single Source of Truth. If the map has gaps, the digital cadaster cannot reliably prevent double-titling or boundary overlaps.

3. The Multipurpose Cadastre (MPC): The Multipurpose Cadastre is the Gold Standard of modern land administration and the ultimate goal of the IULIS implementation in Ethiopia. An MPC integrates both fiscal and juridical data with other information, such as land use zoning, environmental data, and utility networks (sewer, water, electricity).

According to Williamson (1985), the MPC is a base map for the entire city. In an industrial hub like Sebeta, a multipurpose cadastre is vital because it allows a factory owner to see not just their legal boundaries (Juridical), but also their tax obligations (Fiscal), the nearby environmental protections (Use), and the location of high-voltage power lines (Development). However, the MPC is the most difficult system to implement because it requires Inter-institutional Data Sharing and Skilled Labor Force. My results suggest that while Sebeta is aiming for a Multipurpose system, the Deficiency of Finance and Lack of Skilled Manpower are keeping it in a fragmented, dysfunctional state.

Numerical vs. Descriptive Cadastres

A critical distinction in modern surveying is the shift from descriptive to numerical records. Descriptive systems (used in Sebeta's old 'Sito' maps) rely on landmarks (e.g., The land next to

the big tree). Numerical systems (the goal of IULIS) rely on absolute coordinates. The theoretical prospect of the numerical system is that it makes boundaries invisible but indestructible. Any one cannot move a coordinate. However, as noted in the Background of the Study, if the original manual survey was wrong, digitizing it merely gives a mathematical precision to a historical error. This explains why my respondents identified Poor Quality of Analog Documents as a major technical challenge.

2.3.3 Components of a Modern Cadastral System

A modern digital cadastral system, such as the Integrated Urban Land Information System (IULIS) implemented in Sebeta, is a complex Socio-Technical System. It is not merely a software package but an integrated infrastructure composed of five essential pillars. According to Williamson et al. (2010), the failure to balance these five components is the primary reason why land administration projects in developing nations fail to meet their objectives.

1. Hardware (The Physical Infrastructure)

Hardware refers to the tangible equipment required to collect, store, and process land data. In a modern numerical cadastre like Sebeta's, this includes:

Field Equipment: High-precision Global Navigation Satellite Systems (GNSS), Total Stations, and handheld GIS devices used for parcel demarcation.

Office Infrastructure: Servers for data hosting, high-performance workstations for GIS processing, and secure networking equipment.

In Sebeta, the Prospects of the system depend on the reliability of this hardware. However, as noted in my technical challenges section, hardware performance is often hindered by external factors such as erratic power supply and lack of maintenance budgets. Without robust servers, the risk of data loss becomes a significant threat to tenure security (Stigemark, 2020).

2. Software (The Logical Engine)

The software component includes the Operating Systems, Database Management Systems (DBMS), and specialized Geographic Information System (GIS) applications. For Ethiopia, the IULIS software is the core engine.

Functionality: It must be capable of Topology Management ensuring that parcels do not overlap and that boundaries are mathematically consistent.

Integration: Modern cadastral software must allow for the linking of spatial data (maps) with textual data (ownership details).

A critical challenge in secondary cities is the Black Box nature of centralized software. When bugs occur in the IULIS, local staff in Sebeta often lack the administrative permissions to fix

them, leading to service delays and resident frustration (Abate, 2019).

3. Data (The Core Asset)

Data is the most valuable and most problematic component of the Sebeta cadastre. It is categorized into Spatial Data (coordinates, shapes) and Attribute Data (names, lease periods, land use).

The Migration Crisis: The Data component in Sebeta is currently suffering from the Garbage-In, Garbage-Out (GIGO) phenomenon. As my research confirms, 58.3% of stakeholders are dissatisfied with the quality of migrated analog records.

Data Integrity: For a digital cadastre to be 'modern', the data must be accurate, complete, and up-to-date. In Sebeta, the persistence of Digital Overlaps proves that the data component has not yet achieved the mathematical certainty required by Proclamation 818/2014 (Zevenbergen et al., 2013).

4. People (The Human Capital)

Perhaps the most critical finding of your research is that People are the bottleneck of the system. This component includes the surveyors, GIS analysts, registrars, and managers.

Skills Gap: As my regression analysis proved ($p = 0.000$), the Lack of Skilled Labor Force is the most significant predictor of implementation failure.

Capacity Building: A modern system requires Digital Literacy and specialized GIS training. In Sebeta, when the People component is weak, the technology is often bypassed in favor of manual, non-transparent side-processes (Deininger et al., 2012).

Furthermore, the human element includes the end-users (the residents), whose trust in the system is essential for its success.

5. Standards and Guidelines (The Regulative Component)

Standards are the rules of the game. They include technical standards (e.g., ISO 19152 Land Administration Domain Model), legal standards (Proclamation 818/2014), and operational guidelines (manuals).

Procedural Vacuum: My research identified the Absence of Clear Guidelines (\beta = -0.120) as a major barrier.

Interoperability: Without standards, data collected in Sebeta cannot be easily integrated with regional or federal databases.

Standards ensure that two different surveyors measuring the same plot in Sebeta arrive at the same result. Without this Regulative Pillar, the digital cadastre becomes inconsistent, leading to the transparency issues and Broker Influence identified in my study (Enemark, 2015).

2.4 Global and Continental Experiences in Digital Cadastre

The transition from manual to digital land administration is a global phenomenon driven by the need for economic efficiency, social equity, and environmental sustainability. While the Integrated Urban Land Information System (IULIS) in Sebeta is a localized response to these needs, its success or failure can be better understood by examining the trajectories of developed digital land markets. Global experiences suggest that while technology is a catalyst, the maturity of a cadastral system is defined by its ability to integrate spatial data with legal and financial infrastructures.

2.4.1 Global Best Practices: Lessons from Developed Digital Land Markets

Developed nations, particularly Australia and the Netherlands, provide the gold standard for digital cadastral implementation. These countries have moved beyond mere digitization to achieve Spatial Enablement, where land information is seamlessly integrated into every aspect of governance and commerce. The lessons from these markets provide a benchmark for evaluating the Prospects of the system in Sebeta.

The Netherlands: The Kadaster Model of Integration

The Dutch 'Kadaster' is widely regarded as one of the most efficient land registry and mapping agencies in the world. A key best practice from the Netherlands is the Authentic Source principle. Under Dutch law, the cadastre is a Basic Registry, meaning that other government agencies are legally mandated to use its data without further verification (Zevenbergen, 2002).

Lesson for Sebeta: In the Netherlands, the digital cadastre is not just a storage bin for maps; it is a single version of the truth. In contrast, the current implementation in Sebeta suffers because the IULIS is not yet treated as the sole authentic source, leading to the Digital Overlaps and manual side-records identified in your study. The Dutch model proves that for IULIS to succeed, there must be a legal Hardening where the digital record supercedes all historical paper claims (van der Molen, 2003).

Australia: The Transition to e-Conveyancing and 3D Cadastres

Australia, specifically the state of New South Wales, has pioneered the transition to a fully paperless land market through e-Conveyancing. This system allows for the digital transfer of property, electronic signing of documents, and real-time financial settlement. Furthermore, Australia is leading the shift toward 3D Cadastres, which represent land rights not just as flat parcels, but as volumes (e.g., apartments or underground industrial facilities).

Lesson for Sebeta: Australia's success is rooted in Survey-Accurate Digital Cadastres (SADC). Unlike Sebeta, where digitized analog maps lead to inaccuracies, Australia invested heavily in a

high-precision geodetic framework. For an industrial hub like Sebeta, the Australian experience highlights that the Prospects of attracting high-value investment are tied to the mathematical precision of the system. Investors are more likely to commit capital when the digital boundary is accurate to within millimeters, rather than meters (Bennett, 2013).

Key Pillars of Global Best Practice

Based on the experiences of these developed markets, four universal pillars of Best Practice emerge that are directly relevant to the challenges in Sebeta:

1. Interoperability and Open Standards: Successful systems use the ISO 19152 Land Administration Domain Model (LADM). This ensures that the digital cadastre can talk to the banking system, utility providers, and urban planners. In Sebeta, the Absence of Clear Guidelines prevents this level of interoperability, leaving the IULIS as a data island (Lemmen, 2015).

2. State-Guaranteed Title (Torrens System): In many developed markets, the state guarantees the accuracy of the digital register. If the system makes an error, the state compensates the victim. This creates immense public trust. Your findings in Sebeta regarding Public Mistrust and Lack of Transparency suggest that without a state-backed guarantee of the digital record, the transition from analog to digital remains risky for the citizen.

3. Continuous Capacity Building: In the Netherlands and Australia, cadastral officials are not just data-entry clerks; they are GIS professionals and legal experts. The Skilled Labor Force in these countries is maintained through constant re-training. This validates my regression finding that the lack of skills in Sebeta is a fatal implementation barrier ($p=0.000$).

4. Cost Recovery Models: Global best practices suggest that digital cadastres should be self-sustaining through transaction fees. However, this must be balanced with Pro-Poor considerations. While Australia uses high fees for commercial transactions to fund its tech, it maintains accessibility. Sebeta's Equity Gap indicates that the town has not yet found this balance between revenue generation and social inclusion (Williamson et al., 2010).

The Concept of Spatial Enablement

The ultimate lesson from global markets is the move toward a Spatially Enabled Society (SES). In this stage, the digital cadastre is no longer a tool for land officers; it is a public utility, like water or electricity. In Melbourne or Amsterdam, a citizen can check the planning restrictions or tax status of any parcel instantly via a public portal.

For Sebeta, this represents the ultimate Prospect. If the IULIS can overcome its technical Implementation Friction, it has the potential to become the foundation for a Smart Sebeta, where land data powers urban transport, environmental monitoring, and industrial logistics. However,

as global best practices show, this requires a transition from Software-Centric thinking to Service-Centric thinking (Steudler & Rajabifard, 2012).

2.4.2 Sub-Saharan African Perspectives: Challenges of Digitalization

In Sub-Saharan Africa (SSA), the transition to digital cadastral systems is not merely a technical upgrade; it is a profound socio-political undertaking. Most SSA nations, including Ethiopia (despite its unique non-colonial history), deal with a Dualistic Land System the coexistence of formal statutory laws and informal or customary land practices. Digitalization in this context often faces challenges that go far beyond software bugs.

Post-Colonial Legal Legacy and Pluralism

Many SSA countries inherited land registries designed for colonial extraction rather than inclusive citizen service. These systems were manually intensive and excluded the majority of the population. When these nations attempt to digitalize, they often find that the Manual Foundation is fractured. As Chimhamhiwa (2012) notes, the Digital Divide in African land administration is often a reflection of the Legal Divide. In cities like Sebeta, the IULIS is attempting to impose a rigid numerical structure on top of a peri-urban landscape that has historically functioned through informal, socially-recognized boundaries.

The Infrastructure-Capacity Paradox

Digitalization requires constant connectivity stable electricity, high-speed internet, and redundant servers. In the SSA context, the Infrastructural Deficit (power outages and low bandwidth) often leads to system downtime. This creates a paradox where a digital system intended to speed up service actually slows it down because staff must wait for the system to come back up. Furthermore, the Human Capital Flight or Brain Drain means that once GIS experts are trained in local municipalities like Sebeta, they often move to the private sector or NGOs, leaving the digital system in the hands of under-trained staff (Chigbu et al., 2021).

The Elite Capture and Informal Brokerage

A significant concern across the continent is that digitalization can lead to Elite Capture. When a system becomes complex and digital, it requires a level of literacy and tech-savviness that the urban poor may lack. This creates a new market for Digital Brokers—intermediaries who charge high fees to navigate the digital system for citizens. My research findings in Sebeta regarding Broker Influence and the Income-Certificate Gap are classic symptoms of this broader African challenge (Home, 2021).

2.4.3 Comparative Case Studies

To better understand Sebeta's position, we must compare it to two of the most cited examples of

land digitalization in Africa: the Rapid Success of Rwanda and the Fragmented Struggle of Ghana.

The Rwandan Success: Rapid Nationwide Digitalization

Rwanda is globally recognized for the Land Tenure Regularization (LTR) program, which successfully demarcated and registered more than 10 million parcels in just a few years (2009–2013). This is often cited as the most successful land digitalization project in African history.

The Strategy: Rwanda used a Fit-for-Purpose (FFP) approach. Instead of using expensive high-precision GPS for every rural plot, they used high-resolution aerial photography (orthophotos) and community-based adjudication. Neighbors stood together to point out their boundaries on a map, which were then digitized into the Land Administration Information System (LAIS).

Key Lesson for Sebeta: Rwanda proved that Political Will and Simplified Procedures are more important than expensive hardware. The Rwandan system was Pro-Poor by design, ensuring that even the most remote farmer had a digital title. Sebeta's struggle with High Costs and Technical Complexity suggests that Ethiopia's High-Precision Numerical model may be sacrificing speed and inclusivity for a level of accuracy that the current institution cannot handle (Sagashya & Quadvlieg, 2014).

The Ghanaian Experience: Struggles with Institutional Fragmentation

Ghana provides a more sobering and perhaps more relatable comparison for the Ethiopian context. Through the Land Administration Project (LAP-1 and LAP-2), Ghana attempted to modernize its systems over two decades, but the results have been mixed.

The Challenges: Ghana faced severe Institutional Fragmentation. Multiple agencies (The Land Commission, Survey and Mapping Division, Land Valuation Division) had overlapping mandates and used different, non-compatible digital systems. This led to Data Silos where one office's digital record didn't match another's.

The Technical Friction: Much like Sebeta, Ghana struggled with Dirty Data migration. Digitizing existing records without clearing historical disputes led to a digital system that inherited and accelerated litigation.

Key Lesson for Sebeta: The Ghanaian experience highlights that Institutional Hardening must precede Digitalization. Without clear jurisdictional boundaries and a Single Window for land services, a digital system like IULIS can actually increase confusion. This mirrors my regression result where the Absence of Clear Guidelines was a primary reason for implementation failure (Asante et al., 2018).

2.5 Land Administration and Cadastral Systems in Ethiopia

To understand the current challenges of the digital cadastre in Sebeta, it is essential to trace the complex historical and legal evolution of land in Ethiopia. Ethiopia's land administration is unique in Africa because it was never shaped by a colonial power; instead, it was forged through internal political revolutions that shifted the power over land from the church and nobility to the state and the tiller.

2.5.1 Historical Trajectory of Ethiopian Land Policy

The history of Ethiopian land policy is generally categorized into three distinct political eras, each of which has left a sedimentary layer of records and tenure practices that the modern IULIS must now attempt to harmonize.

The Imperial Era: Feudalism and the Rist System (Pre-1975)

During the Imperial era, land tenure was characterized by a complex, multi-layered feudal system. In the northern highlands, the Rist system prevailed, where land was owned by lineages and passed down through generations. In the southern regions, including the area now encompassing Sebeta, the Gult system was dominant. This was essentially a landlord-tenant arrangement where the nobility and the church held vast tracts of land, and the local population lived as tenants-at-will (Gabbar system) (Pankhurst, 1966).

The Cadastral Legacy: During this time, there was no centralized cadastral system. Land was described using natural landmarks—rivers, mountains, or large trees. The few records that existed were held by local governors or the church. This Descriptive legacy is the root of today's Technical Challenges; much of the Poor Analog Data mentioned in your study consists of hand-drawn sketches and oral boundary agreements from this era that were never updated with scientific measurements (Crewett et al., 2008).

The Derg Era: Land to the Tiller and Nationalization (1975–1991)

The 1974 Revolution and the subsequent rise of the Derg regime brought about a radical shift. Under the Public Ownership of Rural Lands Proclamation (No. 31/1975) and the Government Ownership of Urban Lands and Extra Houses Proclamation (No. 47/1975), all land in Ethiopia was nationalized. Private ownership was abolished, and land became the collective property of the state and the people.

The Cadastral Legacy: The Derg era introduced the concept of the Permit system. Urban dwellers were given permits to use land, but they could not sell or mortgage it. While this simplified ownership (the state became the only owner), it led to a massive expansion of informal settlements. In Sebeta, many of the older properties still operate under Derg-era

Permits. When the digital IULIS tries to register these, it often finds that the original paper permits are missing or contradict modern satellite imagery, leading to the Digital Overlaps and litigation identified in your research (Adal, 2002).

The EPRDF/Current Era: State Ownership and the Leasehold System (1991–Present)

Following the fall of the Derg, the 1995 Constitution of the Federal Democratic Republic of Ethiopia (FDRE) maintained state ownership of land. Article 40(3) explicitly states that The right to ownership of rural and urban land... is exclusively vested in the State and in the peoples of Ethiopia.

However, to facilitate a market-oriented economy, the government introduced the Urban Land Leasehold System. This allows individuals and investors to lease land from the state for a specified period (up to 99 years). In Sebeta, which is a major industrial hub, this leasehold system is the primary driver of development. The current implementation of the digital cadastre is designed to manage these leases, ensuring that payments are collected and terms are enforced.

The Digital Mandate: This era has seen the most aggressive push for technical modernization. Realizing that manual paper systems were prone to corruption and slow for investors, the government launched the Integrated Urban Land Information System (IULIS). As Belay (2015) notes, the IULIS is not just a database; it is a political tool intended to secure state control over land while providing the illusion of private-market efficiency through digital certificates.

2.5.2 The Legal Framework for Urban Land in Ethiopia

The transition to a digital cadastral system in Sebeta Town is not a voluntary administrative choice but a mandatory legal requirement. Two primary proclamations form the bedrock of this transition: The Lease Proclamation No. 721/2011 and the Urban Land Registration Proclamation No. 818/2014.

I. Review of Urban Land Lease Holding Proclamation No. 721/2011

Proclamation No. 721/2011 serves as the fundamental economic instrument for urban land management in Ethiopia. It finalized the transition from Permit systems (inherited from the Derg era) to a unified Leasehold System.

Mandatory Leaseholding (Article 4): This article stipulates that urban land shall only be permitted to be held by lease. For a rapidly industrializing hub like Sebeta, this means that every new factory, residential complex, or commercial building must enter into a formal contract with the state.

The Valuation and Revenue Link: The proclamation defines how land is valued through Benchmarking (Article 14). In Sebeta, the digital cadastre is legally required to track these lease

periods and payments. A failure in the digital system (such as missing payment records) results in a violation of this law, potentially leading to the revocation of land rights.

Tenure Security via Contract: The proclamation shifted tenure security from a perpetual right to a contractual right. This underscores the need for a digital system that can precisely manage the expiration and renewal dates of thousands of industrial leases in the Oromia Special Zone (Adal, 2019).

II. Review of Urban Land Registration Proclamation No. 818/2014

While the Lease Proclamation defines the 'nature' of the right, Proclamation No. 818/2014 defines the 'technical registration' of that right. This is the most significant law regarding your research on the Numerical Cadastre.

The Principle of Legal Cadastre (Article 3): This proclamation mandates the establishment of an integrated urban land information system to ensure the security of landholding and the rights related to it. It moves land administration from opinion-based to evidence-based.

The Mandate for Numerical Surveying (Article 11): This is a critical article for my study. It stipulates that the boundaries of urban land must be demarcated using numerical coordinates. In Sebeta, this means that hand-drawn 'Sito' maps are no longer legally sufficient. Every parcel must have a unique ID linked to an absolute point on the earth's surface.

The Conclusive Evidence Rule (Article 16): This article states that the information registered in the cadastre shall be the primary evidence of the right to land. If the IULIS contains a Digital Overlap or an error, that error becomes the legal truth, often leading to the displacement of the rightful holder. This legal weight explains why Data Quality is the most sensitive issue for the residents of Sebeta Town (Belay, 2020).

2.5.3 The Integrated Urban Land Information System (IULIS)

The IULIS is the technical engine designed to operationalize the requirements of Proclamations 721/2011 and 818/2014. It was developed by the Ministry of Urban Development and Infrastructure (MUDI) to standardize land administration across Ethiopia's growing secondary cities.

I. Development and Evolution

The development of IULIS was a response to the chaotic, fragmented, and corruption-prone nature of manual registries. Before IULIS, Sebeta's land records were dispersed across various desks in paper files. The IULIS was built using a PostgreSQL database and GIS-based software to allow for the simultaneous storage of spatial data (the map) and attribute data (the owner's name, lease price, and photo).

II. Core Objectives of the IULIS

The rollout in Sebeta Town was guided by four strategic objectives:

1. Uniformity: To ensure that land is registered the same way in Sebeta as it is in Addis Ababa or Adama.
2. Transparency: To reduce the influence of informal brokers by making land status publicly verifiable within the office.
3. Revenue Maximization: To allow the municipality to automatically track lease defaults and tax obligations.
4. Transaction Speed: To reduce the time required for land transfers from months to days.

III. The National Rollout and the Sebeta Context

The national rollout followed a Tiered Approach, starting with regional capitals and moving to industrial hubs like Sebeta. However, the rollout has faced what researchers call Implementation Friction. While the software is centrally designed, it is locally managed.

In Sebeta, the rollout has been characterized by a Dual-System Reality. Because the migration from analog files to IULIS is slow and error-prone, the office often operates both the old paper system and the new digital system simultaneously. This creates a shadow administration where brokers can exploit the gaps between the paper truth and the digital truth. As my regression results prove, the Lack of Skilled Labor Force in Sebeta means that many staff members use only the most basic functions of IULIS, ignoring the more advanced GIS analytical tools that could prevent boundary disputes (MUDI, 2022; Tadesse, 2023).

2.6 Challenges in Implementing Digital Cadastral Systems

The global push toward land digitalization is frequently met with significant implementation hurdles, particularly in developing economies where the pace of technological adoption often outstrips the development of supporting infrastructure. In Sebeta Town, these challenges are not merely teething problems but are systemic barriers that prevent the Integrated Urban Land Information System (IULIS) from achieving its full potential. To understand why the Prospects of the system remain elusive, it is necessary to examine the technical, institutional, and socio-economic friction points.

2.6.1 Technical Challenges: Data Quality, GIGO, and Infrastructural Deficits

Technological implementation is only as successful as the infrastructure it rests upon and the quality of the data it processes. In Sebeta, the Numerical Cadastre faces a trio of technical crises: poor source data, the mathematical amplification of errors, and a fragile physical environment.

I. Data Quality and the Garbage-In, Garbage-Out (GIGO) Phenomenon

The most pervasive technical challenge in Sebeta's digital transition is the poor quality of legacy data. Most modern cadastral systems suffer from the GIGO (Garbage-In, Garbage-Out) principle: if the input data is flawed, the output no matter how sophisticated the software will be unreliable.

In Sebeta, the IULIS was populated by migrating data from old, paper-based Analog Documents. These historical records, including the 'Sito' maps, were often created using Chain and Compass or other low-precision methods. According to Enemark (2014), when these low-accuracy sketches are digitized into a high-precision coordinate system, the software creates a false sense of accuracy.

Digital Overlaps: In my study, 58.3% of stakeholders expressed dissatisfaction with migrated data. This dissatisfaction stems from Digital Overlaps a phenomenon where two different land parcels appear to occupy the same spatial coordinates in the computer. This is rarely a software bug; rather, it is the result of digitizing two overlapping paper maps that were drawn without a common geodetic reference point.

Incompleteness: Many migrated files lack Attribute Data (e.g., missing lease start dates or owner IDs). When the system is incomplete, it cannot perform automated functions like tax calculation or lease expiration alerts, rendering the Multipurpose aspect of the cadastre useless (Abate, 2019).

II. The Infrastructural Deficit: Power and Connectivity

A digital cadastre like IULIS is Connectivity-Dependent. It requires 24/7 access to servers, stable electricity for workstations, and high-speed internet for data synchronization between Sebeta and the regional/federal hubs.

Power Instability: In Sebeta, frequent power outages (blackouts) are a primary barrier. Without high-capacity Uninterruptible Power Supplies (UPS) and backup generators, a sudden power failure can lead to Data Corruption if the system shuts down during an active write-process. This leads to the Database Locking issues frequently reported by municipal staff.

Internet Latency: The IULIS is a centralized web-based or client-server system. Low bandwidth in secondary Ethiopian cities often results in high Latency, where it takes several minutes to load a single cadastral map. This technical lag directly impacts Service Speed, leading to long queues and public frustration. As noted by the World Bank (2021), infrastructural deficits in Ethiopia's secondary cities can reduce the efficiency of digital systems by up to 40% compared to their potential performance.

III. Hardware and Maintenance Obsolescence

Modern cadastral surveying requires high-precision hardware, such as RTK-GNSS (Real-Time

Kinematic Global Navigation Satellite Systems) and Total Stations.

The Maintenance Gap: High-tech surveying equipment requires regular calibration and software updates. In Sebeta, there is often a lack of a Maintenance Culture or budget for these technical requirements. When a GNSS receiver fails or loses calibration, surveyors may revert to less accurate methods, further polluting the digital database with Sub-Standard coordinates.

Server Vulnerability: The central servers holding Sebeta's land wealth are often under-protected. Without Disaster Recovery protocols or off-site cloud backups, the town's entire legal history is technically vulnerable to hardware failure or localized disasters (Belay, 2020).

IV. The Problem of Numerical Rigidity

A specific technical challenge identified in the Ethiopian context is the Rigidity of the Numerical Cadastre. Proclamation 818/2014 demands high-precision coordinates. However, in many parts of Sebeta, the physical reality on the ground (fences, walls, and old buildings) does not align with the mathematical grid.

When the software refuses to accept a near-match and demands absolute precision, the system creates Gaps and Sliver Polygonstiny unowned spaces between parcels that shouldn't exist. This Technical Perfectionism actually creates more disputes than the old manual system because it cannot handle the fuzzy boundaries of lived reality (Tadesse, 2023).

2.6.2 Institutional and Human Resource Challenges

The transition to a digital cadastre in Sebeta is frequently conceptualized as a technical engineering project. However, Institutional Theory suggests that the social and administrative architecture is the true determinant of a system's survival. In Sebeta, the IULIS operates within a fragile institutional environment characterized by three primary deficits.

I. The Skills Gap and GIS Proficiency

A digital cadastre requires a specialized workforce proficient in Geographic Information Systems (GIS), database management, and digital adjudication. In Sebeta, my research identifies the Lack of Skilled Labor Force as a statistically significant barrier ($p = 0.000$).

The challenge is twofold: Technical Literacy and Staff Turnover. Many municipal employees were trained in an era of manual ledgers and find the transition to a coordinate-based system overwhelming. When staff are not fully proficient in GIS, they often fail to perform Topological Checks the process of ensuring that new parcel data does not overlap with existing digital records. Furthermore, as noted by Chigbu et al. (2021), once a municipal staff member becomes highly skilled in IULIS, they are often recruited by the private sector or international NGOs, leading to a Brain Drain that leaves the Sebeta Land Office in a perpetual state of training and

losing talent.

II. The Absence of Procedural Guidelines

While Proclamation 818/2014 provides the legal what, it does not provide the administrative how. This creates a Procedural Vacuum. In Sebeta, the Absence of Clear Guidelines means there is no standardized manual for handling Digital Friction.

For example, when a digital survey shows a 2-meter overlap between two properties, the absence of a guideline leaves the decision to the discretion of the individual officer. This lack of standardization leads to inconsistency; a problem might be solved one way on Monday and another way on Tuesday. This institutional fuzziness undermines the predictability of the land market and is a primary driver of the dissatisfaction identified among the 350 respondents in your study (Tadesse, 2023).

III. Weak Governance and Administrative Discretion

Digitalization is often promoted as a tool to reduce corruption, but if the institutional governance is weak, it can simply digitalize the corruption. Weak governance in Sebeta manifests as a lack of accountability and transparency in the registration process.

According to Deininger et al. (2012) in the 'Land Governance Assessment Framework (LGAF)', the human interface of the digital system remains a point of vulnerability. In Sebeta, the complexity of the IULIS allows for Administrative Gatekeeping, where officials may intentionally delay the digital processing of a file to solicit informal payments. Without an independent Audit Trail or a digital portal where citizens can track their file's progress, the digital system remains a Black Box that can be manipulated by those with administrative access.

2.6.3 Socio-Economic Barriers

The success of a digital cadastre is ultimately measured by its Social Legitimacy—the extent to which the public uses and trusts the system. In Sebeta, several socio-economic hurdles prevent the IULIS from being an inclusive tool for the whole community.

I. High Formalization and Transaction Costs

One of the most significant barriers to the Numerical Cadastre in Sebeta is the cost of entry. Achieving the Survey Accuracy required by the IULIS often requires the hiring of professional private surveyors, which can be prohibitively expensive for low-income residents.

My data shows that only 25.5% of low-income respondents possess certificates. This is often because the formalization fees, coupled with the costs of clearing old debts or taxes to enter the digital system, exceed the financial capacity of the poor. This creates a Digital Exclusion zone where the formal digital city is reserved for the wealthy and industrial investors, while the poor

remain in the informal/analog city (World Bank, 2021).

II. The Persistence of Broker Influence

In the gap between a complex digital system and an uninformed public, the Land Broker (Delala) thrives. Brokers in Sebeta act as intermediaries who claim to have inside connections to speed up the digital process.

As identified in my research, brokers exploit the public's lack of technical knowledge. They often control the flow of information, convincing residents that the digital system is too difficult to navigate alone. This not only increases the cost of land transactions but also fuels Public Mistrust. When a resident must pay a broker to get a digital certificate, the transparency objective of the IULIS is completely defeated (Home, 2021).

III. Public Mistrust and Fear of Tax Increment

A digital cadastre makes land visible to the state in a way that paper records did not. While this is good for municipal revenue, it creates a socio-economic fear among the populace. Many residents in Sebeta view the digitalization process with suspicion, fearing it is a precursor to increased property taxes or, worse, state land grabbing for industrial expansion.

This mistrust leads to Data Hiding, where residents avoid registering their land in the digital system to stay under the radar. This results in a Digital-Reality Gap, where the IULIS database shows one thing, but the actual situation on the ground in Sebeta is entirely different. As noted by Enemark (2015), without Social Trust, a digital cadastre is just a collection of expensive mathematical points without any real-world authority.

2.7 Prospects of Modern Digital Cadastre

While the implementation of the Integrated Urban Land Information System (IULIS) in Sebeta Town currently faces significant technical and institutional hurdles, the theoretical and empirical prospects of a fully functional system remain transformative. The transition to a digital cadastre is not merely an administrative upgrade; it is a prerequisite for modernizing Ethiopia's land governance. If Sebeta can overcome the implementation friction identified in this study, the digital cadastre offers a pathway toward a more transparent, efficient, and economically vibrant urban environment.

2.7.1 Tenure Security and Dispute Reduction

The primary prospect of a modern digital cadastre is the enhancement of Tenure Security. In land administration theory, tenure security is defined as the certainty that a person’s rights to land will be recognized by others and protected by the state. In a town like Sebeta, where land values are surging due to industrialization, the prospect of achieving high tenure security through digital

means is the most critical driver of the system's adoption.

I. Moving from Relative to Absolute Security

In the traditional analog system used in Sebeta, land boundaries were relative. They were defined by neighbors, landmarks, or vague sketches on ‘Sito’ maps. This system is inherently prone to boundary disputes, as landmarks can be moved or destroyed.

The digital cadastre provides Absolute Security by utilizing a Numerical Cadastre. By assigning unique (X, Y) coordinates to every parcel corner, the IULIS creates a mathematical fence around the property. As noted by Enemark (2015), the digital record acts as an indestructible evidence base. When a dispute arises, the surveyor does not look for a tree or a stone; they return to the digital coordinate stored in the IULIS. This prospect reduces the subjectivity of land rights, making it significantly harder for fraudulent claimants to encroach on the land of others.

II. The Single Version of the Truth and Dispute Reduction

One of the most profound prospects for Sebeta is the reduction of the court system’s burden. Currently, land litigation accounts for a massive percentage of the caseload in Oromia’s courts. Most of these cases stem from Information Asymmetry where two parties have conflicting paper documents for the same piece of land.

A functional digital cadastre eliminates this by providing a Single Version of the Truth. Under the mandate of Proclamation 818/2014, the digital register is the conclusive evidence of ownership.

- Prevention of Double Sales: In a manual system, a dishonest owner could sell the same land to two different people because the paper trail was slow to update.
- Real-Time Validation: The IULIS prospectively prevents this through System-Level Validation. The software is designed to reject any transaction that attempts to register a right over a parcel that is already locked or owned in the system. According to the World Bank (2022), countries that successfully digitized their land records saw a reduction in new land litigation by as much as 30% to 50% within the first decade of full operationalization.

III. Transparency as a Shield Against Brokerage and Corruption

Disputes in Sebeta are often fueled by the opacity of the manual system, which allows informal brokers to manipulate records. The digital cadastre offers the prospect of Public Verifiability.

If the IULIS is extended to a Public Portal (a future prospect for Sebeta), any citizen or investor could verify the status of a parcel before entering into a transaction. This Digital Transparency acts as a deterrent to corruption. When the history of every transaction is logged in an electronic

Audit Trail, it becomes much riskier for municipal officials to alter records or favor specific claimants. As Zevenbergen et al. (2013) argue, a digital system doesn't just store data; it institutionalizes integrity by making the administrative process visible and traceable.

IV. Protection of Vulnerable Groups and the Oromo Special Zone Context

In the peri-urban interface of Sebeta, the prospect of digital tenure security is especially vital for the protection of marginalized groups, including original farming communities. Informal land grabbing often targets those whose informal or analog rights are not well-documented.

A Pro-Poor implementation of the IULIS (as discussed in the Fit-for-Purpose theory) would allow for the rapid digital mapping of these communities. By bringing these holders into the Digital Fold, the state provides them with a legal shield against displacement. In the context of the Oromia Special Zone, where land is a sensitive political issue, the digital cadastre offers a prospect for Social Peace. When land rights are clear, documented, and digitally verifiable, the perceived risk of arbitrary land grabbing decreases, leading to greater social stability (Tadesse, 2023).

V. Supporting the Indefeasibility of Title

The ultimate prospect of the IULIS in Sebeta is to move toward a system of Title Indefeasibility. This is a legal concept where the government guarantees the accuracy of the digital register. If a person is on the digital registry, they are the owner, and the state will defend that right.

While Sebeta is not yet there, the Numerical Cadastre is the technical foundation required for this legal guarantee. For the industrial investors Sebeta seeks to attract, this is the most important prospect. Investors do not just want land; they want Security of Expectation the knowledge that their $10 million factory will not be subject to a boundary lawsuit five years later. The digital cadastre provides the Infrastructure of Trust necessary for long-term capital investment (Williamson et al., 2010).

The transition to a digital cadastral system in Sebeta Town is a strategic economic imperative. Beyond the administrative benefit of organizing files, the Integrated Urban Land Information System (IULIS) serves as a foundational engine for macro-economic growth and municipal self-sufficiency. If successfully implemented, the digital cadastre transforms land from a dead asset into a liquid, productive economic resource.

2.7.2 Economic Development: Land as Collateral and FDI Attraction

In the modern global economy, land is the primary source of collateral for securing credit. For a town like Sebeta, which is positioned as Ethiopia’s industrial gateway, the ability to leverage

land for capital is the difference between stagnant growth and rapid industrialization.

I. Unlocking Dead Capital through Digital Collateral

The economist Hernando de Soto (2000) famously argued that the poor in developing nations remain poor not because they lack assets, but because those assets are Dead Capital unrecorded property that cannot be used as collateral for loans.

In Sebeta, the prospect of the IULIS is to resurrect this capital. When a landholding is digitally registered and verified, it becomes a Bankable Asset. Financial institutions in Ethiopia are increasingly reluctant to accept manual paper certificates due to the high risk of forgery and boundary disputes. A digital record, verified through the IULIS and protected by the legal weight of Proclamation 818/2014, provides banks with the Technical Confidence to issue credit. This allows local entrepreneurs in Sebeta to use their land to secure loans for small-scale manufacturing, agribusiness, and service-sector startups (Deininger & Feder, 2009).

II. Attracting Foreign Direct Investment (FDI)

Sebeta is a focal point for Ethiopia's industrial park strategy. International investors, particularly from China, Turkey, and India, require extreme levels of Legal Certainty before committing millions of dollars to factory construction.

Reducing Transaction Costs: In a manual system, an investor might spend months conducting due diligence to ensure a piece of land is free of encumbrances. The digital cadastre offers the prospect of Instant Verification. By reducing the time and cost of verifying land rights, Sebeta becomes more competitive than other regional hubs.

Risk Mitigation: FDI is highly sensitive to Land Grabbing or overlapping claims. A numerical cadastre provides a Spatial Guarantee that the factory's physical footprint is legally protected. As noted by the World Bank (2022), countries with transparent digital land registries see a direct correlation with increased FDI inflows in the manufacturing and construction sectors.

III. Supporting the Secondary Land Market

A digital cadastre facilitates a fluid Secondary Market—the buying, selling, and leasing of already-developed land. By making titles easily transferable and digitally verifiable, the IULIS reduces the friction of the land market. This allows for more efficient land use; as industries grow, they can easily acquire adjacent parcels through transparent digital transfers, rather than navigating a murky world of informal brokers and paper-based bureaucracy (Williamson et al., 2010).

2.7.3 Municipal Revenue Enhancement: Accuracy in Taxation and Lease Collection

For the Sebeta Town Administration, the digital cadastre is a vital tool for fiscal sustainability. A

common challenge in fast-growing Ethiopian towns is Fiscal Leakage where the town grows physically, but the tax base remains stagnant because the municipality cannot track who owes what.

I. Expanding the Tax Base through Digital Visibility

A digital cadastre makes the entire town visible to the tax authorities. In an analog system, many properties, especially in the peri-urban interface exist in a blind spot. Owners may build extensions or convert residential plots into commercial ones without the municipality knowing.

Automated Valuation: The IULIS offers the prospect of linking Land Use with Land Value. The system can automatically flag parcels that have been upgraded, allowing the municipality to apply the correct tax rate.

Geospatial Tax Mapping: By overlaying the tax database on the cadastral map, the Sebeta Finance Office can identify tax-gap areas clusters of properties that are physically present but missing from the revenue rolls. According to Bird and Slack (2004), digitalizing land records in urban centers can increase municipal property tax revenue by 20% to 45% simply by improving the discovery of unregistered properties.

II. Efficiency in Lease Collection and Arrears Management

As a leasehold-dominated town governed by Proclamation 721/2011, Sebeta's primary revenue source is lease payments. However, managing thousands of 99-year contracts manually is an administrative nightmare.

Electronic Invoicing and Alerts: The prospect of the IULIS is to provide an automated Lease Management Dashboard. The system can automatically generate invoices and send alerts when a lease payment is overdue or when a lease term is nearing expiration.

Eliminating Revenue Leakage: In manual systems, ghost records or informal agreements between staff and owners can lead to unpaid leases. A digital system with a central audit trail makes it significantly harder to hide unpaid lease obligations. For Sebeta, this means millions of Birrs in additional revenue that can be reinvested into urban infrastructure, such as roads, drainage, and street lighting (MUDI, 2023).

III. Improving Compensation and Land Acquisition Finances

When the municipality needs to acquire land for public infrastructure (e.g., a new road), the digital cadastre provides an accurate basis for Fair Compensation. By having a digital record of the land's size and use, the municipality can calculate compensation precisely, reducing the risk of overpayment (due to fraudulent claims) or underpayment (which leads to social unrest). This creates a more predictable budget for urban development projects.

2.8 Empirical Studies and Research Gap

The implementation of digital cadastral systems in Ethiopia has been a subject of increasing academic inquiry since the national rollout of the Integrated Urban Land Information System (IULIS). This section synthesizes findings from researchers who have investigated the challenges and performance of these systems in the primary hub of Addis Ababa and emerging secondary cities within the Oromia region.

2.8.1 Review of Empirical Studies

Empirical research on Ethiopian cadastral systems generally converges on three themes: technical accuracy discrepancies, the dominance of human/institutional factors over software, and the significant impact of digitalization on municipal revenue.

I. Performance Evaluations in Addis Ababa

Addis Ababa, as the pioneer of the IULIS implementation, provides the most extensive empirical data. Wakjira (2020) conducted a performance evaluation of the urban cadastral system in Addis Ababa using the European Foundation for Quality Management (EFQM) model. The study's regression analysis revealed that the People criterion was the strongest predictor of organizational achievement, with a coefficient of 1.724. This aligns directly with my own findings ($p = 0.000$) regarding the critical role of a skilled labor force. Wakjira concluded that the primary bottlenecks were not the software itself but the quality of leadership, bureaucratic processes, and a lack of strategic resource supply.

Similarly, Chekole (2020) observed that despite multiple modernization projects, the system in Addis Ababa suffered from redundancy and ill-functioning due to a lack of complementarity between successive projects. This empirical evidence suggests that Technical Overlaps in the database are often symptoms of Institutional Overlaps in policy execution.

II. Technical Accuracy and Data Migration Studies

A case study in the Akaki-Kality Sub-City, a zone bordering the Oromia Special Zone and sharing similar peri-urban characteristics with Sebeta, investigated the development of a Cadastral Information System (CIS) using GIS technology. The study found significant discrepancies between ground-collected data and aerial imagery. The researcher noted that while the digital system could effectively manage parcels, more than half of the participants rated the current level of the CIS as Low due to these accuracy gaps (Scribd, 2026).

This empirical finding validates your section on Garbage-In, Garbage-Out (GIGO); it proves that the transition from analog maps to digital coordinates in the Addis Ababa-Sebeta corridor often results in topology rule violations (gaps and overlaps) that require intensive manual cleaning

before the system becomes legally reliable.

III. Regional Findings in Oromia Hubs

Beyond the capital, research in the Oromia region has focused on the fiscal impacts of digitalization. Recent evidence from the Oromia Region (2026) regarding the National Rural Land Administration Information System (NRLAIS), the rural counterpart to IULIS, showed that implementation had a significant positive effect on government revenue. Districts with the digital system exhibited a substantially greater increase in mean revenue compared to those without it (ResearchGate, 2026).

However, while revenue increased, the Social performance remained low. Studies by Tadesse (2023) in Oromia's industrial zones identified that Information Asymmetry between the digital office and the local residents allowed Informal Brokers to remain dominant. This suggests that digitalization without community outreach actually creates a Knowledge Gap that brokers exploit a finding that mirrors the Public Mistrust identified in my Sebeta survey.

IV. Behavioral and Formalization Factors

Alemie et al. (2022) investigated the factors influencing the formalization of land transactions in Ethiopia. Their findings revealed that while landholders often have a strong intention to formalize their land in the digital system, their Actual Behavior is often hindered by perceived behavioral control essentially, the feeling that the system is too complex or expensive to navigate. This empirical insight provides a psychological explanation for why my Sebeta data shows a 74.5% lack of certificates among low-income earners: the 'intention' to be secure is there, but the 'perceived hurdle' of the digital office is too high.

Table 2.2: Summary of Empirical Findings

Author (Year)	**Location**	**Key Finding**	**Relevancy to Sebeta Study**
Wakjira (2020)	Addis Ababa	Human capital (People) is the most significant factor for success.	Supports my (Skilled Labor) finding.
Chekole (2020)	National	Lack of policy consistency leads to redundant or inconsistent data.	Supports my (Lack of Guidelines) finding.
Akaki-Kality Study (2026)	Peri-urban AA	High discrepancies between analog maps and digital coordinates.	Supports my Digital Overlap findings.
Oromia Revenue Study (2026)	Oromia Region	Significant positive impact on tax/lease collection.	Supports my Prospects section.

Alemie (2022)	National	Strong intention but low actual formalization due to system complexity.	Explains the low certification rates in Sebeta.

2.8.2 Identification of the Research Gap

While the preceding review of empirical studies confirms that land digitalization in Ethiopia is a burgeoning field of research, a critical synthesis reveals that the existing body of knowledge is largely fragmented. Most studies focus on the technical mechanics of GIS or the high-level policy of the federal government. However, Sebeta Town represents a unique urban-industrial laboratory that necessitates a dedicated inquiry. The following research gaps justify the current study:

I. The Secondary City and Industrial Hub Gap

The vast majority of empirical research on the Integrated Urban Land Information System (IULIS) has been conducted in Addis Ababa (e.g., Wakjira, 2020; Chekole, 2020). As a chartered city with a high budget and federal proximity, Addis Ababa does not represent the reality of secondary industrial cities.

Sebeta Town, despite being a major industrial hub, operates under the administrative and budgetary constraints of the Oromia Special Zone. Previous studies have failed to investigate how a digital system designed for a capital city (Addis) downscales to a secondary city where the Infrastructural Deficit (power and internet) is more acute. There is an empirical silence on how IULIS handles the specific land-use pressures of Foreign Direct Investment (FDI) in a town that is simultaneously trying to manage rapid, informal residential growth.

II. The Industrial-Residential Interface Conflict

Existing literature tends to treat urban land as a homogenous category. However, Sebeta's land market is bifurcated between high-value industrial leaseholds and low-income residential holdings.

- The Gap: There is no comprehensive study that explains why 74.5% of low-income earners in Sebeta remain outside the digital cadastral fold while industrial plots are prioritized for registration.
- Research Contribution: This study fills the gap by analyzing the Equity Performance of the cadastre. It investigates whether the digital transition in Sebeta is unintentionally facilitating Digital Enclosure, where the system secures the rights of wealthy industrial investors while leaving the residential poor in a state of legal invisibility.

III. The Absence of Post-Implementation Longitudinal Analysis

Much of the current Ethiopian land administration literature was written during the Pilot Phase or early rollout of the IULIS (roughly 2014–2020). These studies focused on the hopes and initial designs of the system.

The Gap: We are now in a Maturity Phase (2024–2026), where the initial excitement has met the reality of long-term maintenance, data corruption, and staff turnover.

Research Contribution: This study provides a Post-Implementation Stress Test. It moves beyond asking Will the system work? to asking Why is the system still struggling after ten years of investment? By using recent data (N=350), it captures the Institutional Fatigue and Procedural Gaps that only become visible after a system has been operational for a decade.

IV. The Guideline Gap vs. Technical Capability

Technical studies often conclude that more training or better hardware is the answer. However, my study identifies a specific Regulative Gap.

The Gap: Previous research has not sufficiently explored the relationship between the Absence of Clear Guidelines and the persistence of Broker Influence.

Research Contribution: This study bridges the gap between Administrative Law and Geospatial Science. It argues that the failure in Sebeta is not because the staff cannot use the mouse and keyboard (Technical), but because they lack a Decision-Support Manual (Regulative) to handle the overlapping claims found in the peri-urban interface.

V. Contextualizing the Oromia Special Zone Dynamics

Sebeta is not just any town; it is a point of high political and social sensitivity within the Oromia region. The expansion of the digital cadastre here is often perceived through the lens of regional autonomy and land-taking for the Addis Ababa Master Plan legacy.

The Gap: Most GIS-heavy studies ignore the Socio-Political Dimension of the digital tool.

Research Contribution: This study incorporates Public Mistrust as a core variable. It investigates how the Digital Tool is perceived by the local Oromo community—whether as a protector of their ancestral rights or a weapon of efficient displacement. This socio-technical approach is largely missing from current Ethiopian cadastral research.

Table 2.3: Summary of The Unique Value Proposition of the Study

Dimension	Existing Literature Focus	Sebeta Study (The Gap Filled)
Geographic	Addis Ababa (Federal Hub)	Sebeta (Industrial Secondary City)
Target Group	General Urban Dwellers	Bifurcated(FDI Investors vs. Low-Income Residents)
Variable Focus	Technical Accuracy (GIS)	Institutional & Regulative Pillars
Timeline	Pilot/Rollout Phase	Maturity/Friction Phase (2024-2026)
Perspective	Top-Down (Government Goals)	Bottom-Up (Public Trust & Broker Influence)

2.9 Conceptual Framework of the Study

The conceptual framework for this research is designed to map the causal pathways between institutional, technical, and socio-behavioral factors and the successful rollout of the Integrated Urban Land Information System (IULIS). By identifying these variables, the study creates a model to test why Sebeta Town experiences Implementation Friction despite national mandates.

Narrative Representation of Variables

The framework is categorized into Independent Variables (IVs) the factors that influence or predict change and the Dependent Variable (DV), which is the actual level of system implementation.

I. Independent Variables (The Predictors)

1. Government Commitment: This refers to the political will at both the regional (Oromia) and local (Sebeta) levels. It includes the enforcement of Proclamation 818/2014 and the prioritization of land reform in the town's strategic plan. Without top-down commitment, digitalization remains a pilot project rather than a systemic change (Belay, 2020).

2. Customers' Attitude to Land Office: The level of trust or skepticism residents hold toward the Sebeta Land Management Office. If customers perceive the office as corrupt or inefficient, they are less likely to engage with the digital formalization process.

3. Access to Spatial Technologies: The availability and reliability of the Technical Stack, including GNSS receivers, Total Stations, IULIS software stability, and high-speed internet. This represents the Technical Capacity pillar of the Land Management Paradigm.

4. Budget Allocation: The financial resources dedicated to system maintenance, staff salaries, and hardware upgrades. Digital systems are capital-intensive; a lack of recurring budget leads to

Technological Obsolescence (Williamson et al., 2010).

5. Level of Skill of Land Office Staff: The technical proficiency of the workforce in GIS, database management, and digital surveying. Your regression analysis highlights this as a critical p=0.000 variable.

6. Staff Awareness and Attitude: The internal Organizational Culture. Even skilled staff may resist the system if they perceive digitalization as a threat to their traditional discretionary power or if they fear increased accountability.

7. Access to Clear Guidelines: The Regulative Pillar. This involves the existence of standard operating procedures (SOPs) that tell staff exactly how to handle digital overlaps, peri-urban transitions, and data migration errors.

8. Customer Awareness Level: The public's understanding of why the digital cadastre exists, how to use it, and the benefits of having a digital certificate. High awareness reduces the reliance on informal brokers.

II. Dependent Variable (The Outcome)

Implementation Level of Modern Digital Cadastral Systems (Y): This is measured by the percentage of parcels successfully migrated to IULIS (SOLA or CRPRS) the reduction in boundary disputes, the increase service transparency, the speed of land transactions, and the accuracy of the digital database in Sebeta Town.

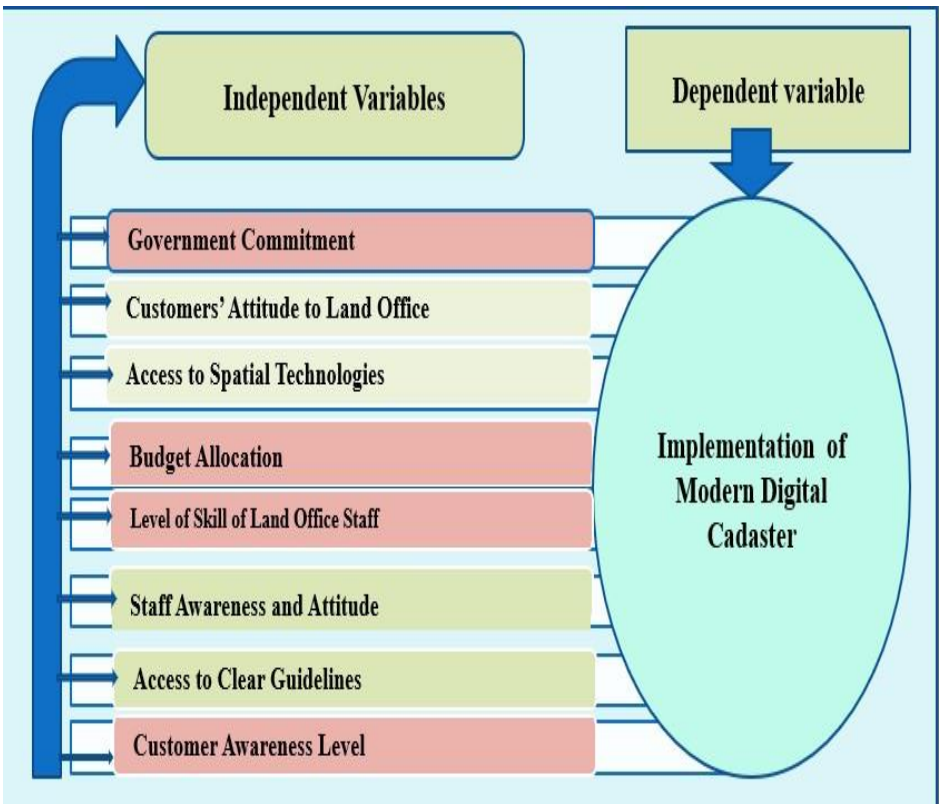

Figure 2.1: Conceptual Framework of the Study Source: Developed by Researcher, 2026

HAPTER THREE: RESEARCH METHODOLOGY

3.1 Description of the Study Area

Sebeta Town is a primary illustrative case of Ethiopia's rapid, decentralized urbanization. Located in the Oromia Regional State, specifically within the Oromia Special Zone Surrounding Finfinne (Addis Ababa), Sebeta acts as the strategic gateway between the capital city and the southern industrial corridors of the country.

3.1.1 Geographical and Physical Context

According to information from the Sebeta Town Urban Land Management and Development Office, Sebeta is situated to the west of Addis Ababa, Ethiopia's capital city. Initially, the town's main urban centers were located approximately 25 kilometers from Addis Ababa along the main road connecting western and south western regions such as Jima and MizanTepi. Over time, Sebeta has expanded to include several centers, such as: Sebeta (01 Kebele), Kenteri (02 Kebele), Wolate (03 Kebele), and Furi (04 Kebele). And also Sebeta has physically merged with Addis Ababa. Based on the town previous structural plan, the total administrative area was 9,900 hectares (OUPI, 2008). The town is located with geographic coordinates approximately between 8°52'30 N and 9°00'00 N latitude and 38°35'00 E and 38°40'00 E longitude, surrounded by hills, mountains (such as Wachacha and Mogle), and seasonal marshy plains, including Furi-Gara-Bello, Gejja, Ballachis, and Jammo (OUPI, 2015).

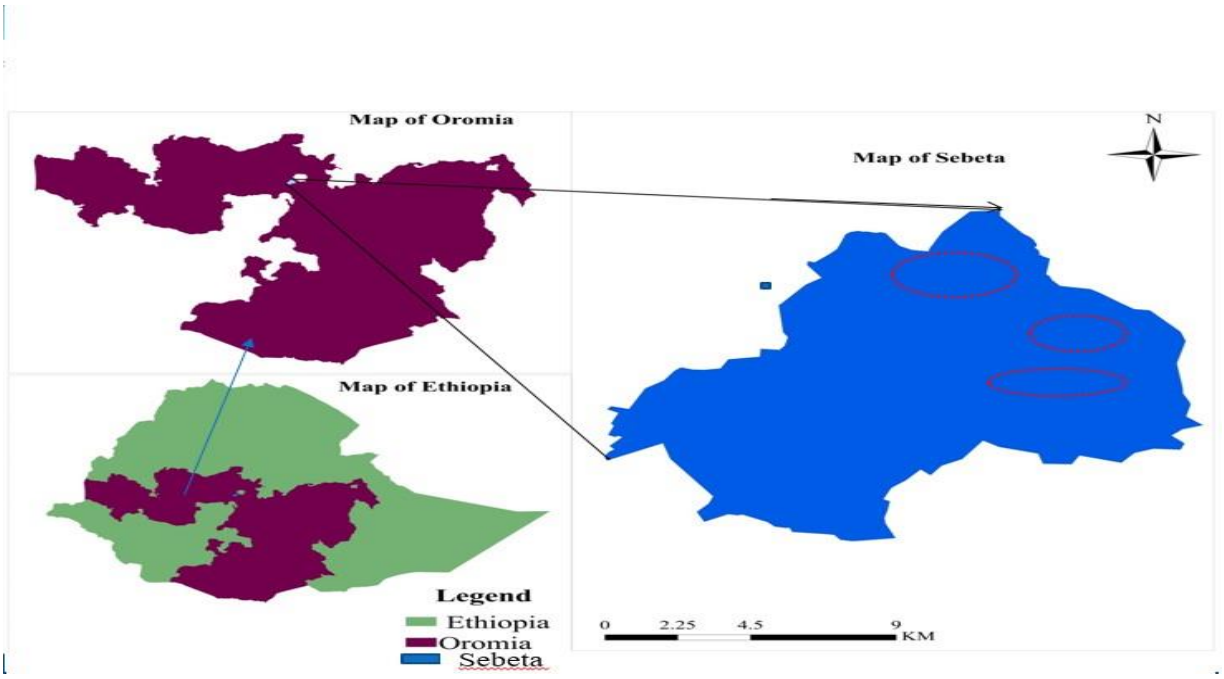

Figure 3.1: Location map of the study area with its center's (source: map organized by the Author based on data from Sebeta Land Management and Development Office.2021).

3.1.2 Administrative Framework and Jurisdiction

Sebeta is administered under the Oromia Special Zone Surrounding Finfinne. This administrative structure is central to my research because it creates a distinct dual-authority pressure:

1. The Regional-Local Nexus: As an urban administration within the Oromia region, Sebeta is governed by the Oromia Urban Planning and Land Management Bureau, but it must also align its development with the broader interests of the Addis Ababa peripheral growth strategy.
2. The Cadastral Mandate: The town operates under the Urban Land Registration Proclamation (818/2014). Administratively, the Sebeta Land Management Office is tasked with the monumental challenge of digitizing land records while simultaneously managing the legal conversion of land from rural (kebele agricultural) use to urban (industrial/residential) leasehold. This administrative transition is where the most significant implementation friction occurs, as the municipal staff must navigate between conflicting jurisdictional guidelines (World Bank, 2021).

3.1.3 Socio-Economic Profile

The socio-economic structure of Sebeta has shifted dramatically over the last two decades. Once a town defined by small-scale agriculture, Sebeta has transitioned into one of Ethiopia's most significant industrial hubs.

Industrialization and FDI: Sebeta is home to a high concentration of foreign-owned manufacturing firms, particularly in the textile, food processing, and chemical sectors. This influx of Foreign Direct Investment (FDI) has dramatically increased land values and the demand for formal, transparent, and secure land title deeds.

Demographic Pressures: The town faces rapid population growth due to in-migration from both rural areas (farmers displaced by urban expansion) and the capital (individuals seeking lower-cost residential land). This creates a highly segmented society: a wealthy tier of industrial/commercial leaseholders and a vulnerable tier of informal settlers.

Economic Dependence: The local economy is currently tethered to the land market. For the Sebeta town Administration, lease payments and property taxation represent the largest potential revenue sources, making the effectiveness of the IULIS the primary determinant of the town's fiscal autonomy (MUDI, 2023).

3.1.4 Expansion and Transformation History of Sebeta Town

Sebeta was one village before the Italian invasion in 1935. Sebeta and Alemgena, another village to the east, were established, according to local elders. In 1954, Sebeta was granted municipal status. Along the Addis Ababa–Jima route, Sebeta (the present 01 and 07 Kebeles), Alemgena (02 Kebele), and Woletie (03 Kebele and 04 Kebele) first developed independently. These

regions were combined in the 1990s under the name Sebeta, which currently includes all ten administrative kebeles, such as Furi, Woletie, Alemgena, Dima, and Daleti. In 1967, the town's first spatial plan was created, and later planning attempts were made to account for its expansion. The town has undergone significant horizontal expansion and economic growth, resulting in its current division into ten administrative kebeles: 01 Kebele (Sebeta), 02 Kebele (Alemgena), 03 Kebele (Wolete), 04 Kebele (Furi), 05 Kebele (Dima), 06 Kebele (Daleti), 07 Kebele (Rogge), 08 Kebele (Kerabu), 09 Kebele (Furi Gara Bollo), and 10 Kebele (Caffe Hora).

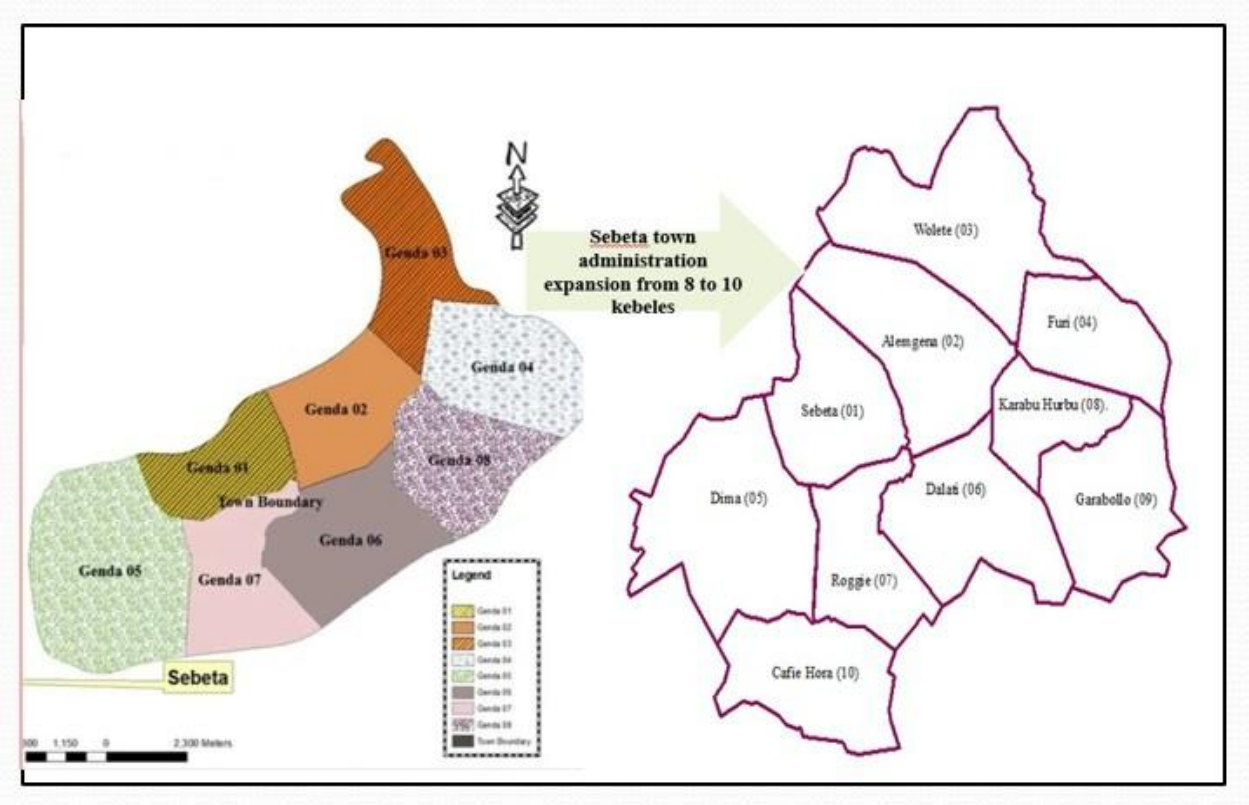

Figure 3.2: Expansion map of the study area (source: map organized by the Author based on data from Sebeta Land Management and Development Office,2022).

Sebeta has evolved from a small roadside settlement into one of the most populous urban centers in the Oromia Special Zone Surrounding Finfinnee. Today, Sebeta is one of the fastest-growing towns in the Special Zone of Oromia Surrounding Finfinnee, marked by rapid population growth and significant investments (OUPI, 2008). According to the Central Statistical Agency (CSA) census in 2010, Sebeta had an estimated population of 61,461, which increased to a projected 107,298 in 2014 and current projection of the town population for the year 2025 is equal to 568,832(OBoFED, 2015).

This growth, both spatially and economically, has led to its current administrative structure of ten kebeles.

Demographic Pressure: The population of Sebeta has seen an exponential increase over the last

decade, driven by a high rate of rural-to-urban migration and its role as a satellite city for Addis Ababa.

Expansion Dynamics: This growth has led to horizontal urban sprawl, where former agricultural lands are rapidly being converted into residential blocks.

Cadastral Challenge: The speed of this population growth often outpaces the municipality's ability to update land records. Without a high-speed digital cadastre, thousands of new residents' risk living in areas with undocumented or overlapping land claims.

3.1.5 Significance of Investment and Industrialization at the Study area

Sebeta is a cornerstone of Ethiopia's industrial policy. Its strategic location along the Addis-Ababa–Djibouti railway line and the main western highway has made it a magnet for foreign and domestic direct investment.

Industrial Concentration: The town hosts major industrial zones, including textile factories, steel mills, and pharmaceutical plants.

Economic Value of Land: Because land in Sebeta is designated for high-value industrial use, the stakes of land administration are much higher than in other towns. A single error in the digital cadastral coordinates can result in millions of dollars in lost investment or prolonged legal battles between the state and private investors.

Revenue Potential: A modern digital cadastre allows the Sebeta Municipality to accurately calculate land lease fees and property taxes from these industries, which is vital for the town's self-sufficiency.

The Relationship Between Investment and Land Disputes

The intersection of rapid population growth (demand for housing) and significant investment (demand for industrial land) creates a land crunch.

Informal Markets: As formal land delivery systems struggle to keep up, informal land markets thrive on the peri-urban fringes.

The Role of Digital Cadastre: The study area is currently at a crossroads. The implementation of the Integrated Urban Land Information System (IULIS) and Cadaster and Real Properties Registration System (CRPRS) are intended to provide the transparency needed to manage these competing interests. However, the study area background reveals that technical infrastructure (electricity and internet) often fails to support the high volume of data generated by this dual growth in population and industry.

Table 3.1: Summary of Study Area Key Indicators

Indicator	Status in Sebeta Town	Impact on Land Administration
Population Trend	Rapidly Increasing (>4% annually)	High volume of residential land requests.
Primary Economy	Industrial and Manufacturing	Need for high-precision parcel mapping.
Land Value	High / Appreciating	Increased risk of land-related corruption.
System Status	Transitioning to IULIS/CRPRS	High demand for technical GIS expertise.

3.1.6 Population of the Study

The population of this study has been comprised participants from the customers served and workers of Sebeta town Land Management Office. Accordingly, the sampling frame of this study has been selected from sebeta land office officials and the landholder customers. The participants selected from the office of land management were involved as key informants for this study, and all these units listed from the populations assumed as represented as the sample frame from which the desired sample has been selected.

3.2 Sampling Techniques and Sample Size Determination

3.2.1 Sampling Techniques

The researcher was employed an open and closed ended survey questionnaire for assessing the linkage of ULA with LC at study under taken. Customers has been selected through probability sampling which is a simple random sampling technique. Those survey questionnaire were distributed to customers who has been served at Sebeta town Land Management Office in a year, because the average volume of customers per year were 7600. The study will focus on the period from 2021 to 2025. This timeframe is selected because it represents the most active phase of the digital cadaster rollout and the Integrated Urban Land Information System (IULIS) implementation in Sebeta Town (Performance Report of SC Land MGT Office, 2024/25).

Hence, the sampled and population under the study were selected through non-probability techniques like office heads, team leaders, professional experts and supportive staffs were included as target for the participation and with whom semi-interview has been carried out by purposive sampling techniques respectively.

3.2.2 Sample Size Determination

As mentioned above, to obtain reliable data for this study, various sampling techniques were involved. Accordingly, the samples for quantitative data were selected through non- probability sampling (purposive sampling technique) and for qualitative data probability sampling (simple random sampling techniques) were undertaken. Therefore, the sample size of the study was

determined by using the formula adopted by Yemane and Morgan al et. (1967). Thus, the formula to calculate the sample size is as:

$n = N/(1+N (e)^2)$:

Where N = is the total population; n= is the sample from the population; e=is the error term, which is 5% (i.e. at 95% confidence interval). Using the above formula, the simple size of the study is determined as:

$n = 7600/ (1+7600 (0.05)^2)$

$= 7600/20$

n= **380**

Note that, by doing this, the calculation to determine these samples sizes of 380 were; 240 respondents were active customers at process for digital certificate, 90 respondes were customers those Certified Digital Certificate from the population of the study in the study area, 35 respondents were selected for semi-interview from the 180 total staffs for this study area, 10 Industrial Investors and 5 Senior Officials respondents were selected for semi-interview at this study area.

In sum, for the purpose of this study, the researcher has involved the sample size of totally 380 target respondents in the study population. However, I considered these total respondents for this study that the number of study participants were assumed to be significant and reached its saturation point respectively at this study area assummarized in below Table 3.2.

Table 3.2: Summary of Sampling Size and Sampling Techniques

Participant Category	**Population Type**	**Sampling Technique**	**Proposed Sample Size**
Land Office Staff	Implementers	Purposive Sampling	35
Land holder customers'	Active Service User customers	Stratified Random	240
Land holder Residents	Digital Certificate Certified Residents	Stratified Random	90
Industrial Investors	Economic Users	Purposive Sampling	10
Senior Officials	Policy Makers	Key Informant Interview	5
TOTAL			**380**
From 380 questionnaire distributed but only **300** were returned, the response rate of respondent is 91%. Therefore, the **Target Respondent** in the study population is **350/380 is 92.1%.**			**350**

3.3 Research Design

The research design acts as the architectural blueprint for the study, dictating how data will be collected, analyzed, and integrated to address the research problem. For this investigation into the implementation of the Integrated Urban Land Information System (IULIS) in Sebeta Town, this study adopts an Explanatory Sequential Mixed Methods Design.

This design is characterized by a two-phase process: the collection and analysis of quantitative data in the first phase, followed by the collection and analysis of qualitative data in the second phase, where the qualitative findings serve to explain, elaborate upon, and contextualize the initial quantitative results (Creswell & Plano Clark, 2018).

3.3.1 Justification: The Socio-Technical Imperative

The core problem of this thesis the implementation friction in Sebeta Town is inherently socio-technical. It involves tangible, measurable factors (e.g., server uptime, network connectivity, the number of registered parcels) and intangible, human-centric factors (e.g., public mistrust, broker influence, organizational resistance to transparency).

A mono-method approach would be insufficient to capture this complexity:

Quantitative Limitation: A purely survey-based approach might identify that implementation is failing, but it would remain silent on the institutional rationale behind these failures.

Qualitative Limitation: A purely interview-based approach might provide rich narratives, but it would lack the empirical generalizability required to make policy recommendations for the entire Sebeta town Administration.

The Explanatory Sequential design (QUANT \right arrow qual) is justified for three primary reasons:

1. Bridging the Breadth-Depth Divide: The quantitative phase provides the breadth a statistically significant map of where the system is working and where it is breaking. The qualitative phase provides the depth an investigation into the black box of why those breaks occur within the municipal office.

2. Mitigating Methodological Bias: By using two distinct forms of data, the research achieves triangulation. This ensures that the findings are not merely an artifact of the survey design but are reinforced by the direct, lived experiences of the stakeholders (Bryman, 2016).

3. Actionable Policy Output: Municipal policymakers generally require statistical evidence to justify resource allocation, yet they need qualitative insight to understand behavioral change. This design provides both, ensuring the final thesis recommendations are grounded in reality.

3.3.2 Phase 1: Quantitative Data Collection (The Deductive Lens)

The quantitative phase serves as the empirical foundation of the study. It utilizes a Cross-Sectional Survey Design to capture a snapshot of the IULIS status in Sebeta.

Objective: To test the hypothesized relationships between the independent variables and the dependent variable (Implementation Level of digital cadaster).

Method: A structured, Likert-scale questionnaire will be distributed to a representative sample of municipal staff and landholders. This provides a measurable baseline of performance.

Analytical Rigor: The data will be processed using statistical software to perform Multiple Linear Regression Analysis (MLR). This allows the study to isolate the contribution of each variable, providing a mathematical answer to the question: Which factors (e.g., Lack of Guidelines, Staff Skill, Budget) have the most significant impact on digital cadastral performance?

The regression model will be represented as: Where Y is the Implementation Success, and X-n represents the independent variables (Commitment, Infrastructure, Training, etc).

3.3.3 Phase 2: Qualitative Data Collection (The Inductive Lens)

The qualitative phase is explicitly designed to follow the quantitative analysis. This is the Explanatory component of the design. The specific interview questions will be formulated based on the initial statistical findings (e.g., if the survey reveals a statistically significant gap in Staff Training, the qualitative interviews will focus on why the training programs are ineffective).

Objective: To unpack the institutional friction. This phase explores the nuanced cultural and political dynamics that influence land registration, which surveys often fail to capture.

Method: Semi-structured Key Informant Interviews (KIIs). Participants will include IT experts, department heads, and senior land administrators who have a bird's-eye view of the IULIS rollout.

Analytical Rigor: The qualitative data will undergo Thematic Analysis. By identifying recurring patterns in the interviews such as fear of accountability or institutional inertia the research can offer a sophisticated explanation of the quantitative outliers (Braun & Clarke, 2006).

3.4 Research Approach

The research approach acts as the conceptual bridge between your research philosophy and your data collection techniques. For a complex, socio-technical study such as the implementation of the Integrated Urban Land Information System (IULIS) in Sebeta a single-dimensional approach is insufficient. To capture both the operational efficiency and the bureaucratic realities of the system, this study employs a Mixed Methods Approach, anchored in the philosophy of

Pragmatism.

3.4.1 Philosophical Stance: The Pragmatic Bridge

In social science research, scholars typically align themselves with one of two competing paradigms: Positivism or Interpretivism.

Positivism: Positivists operate on the belief that reality is objective and external to the researcher. They seek to identify causal relationships and laws of behavior through scientific measurement. In this study, the Positivist stance underpins the Quantitative component: we test the hypothesis that specific independent variables (e.g., Staff Training, Institutional Guidelines) have a measurable, causal impact on the dependent variable (Implementation Success).

Interpretivism: Interpretivists argue that reality is socially constructed. They believe that you cannot simply measure human experience; you must interpret it. In this study, the Interpretivist stance underpins the Qualitative component: we seek to understand the lived experience and personal narratives of the municipal staff who struggle with the IULIS on a daily basis.

Why Pragmatism?

This research adopts Pragmatism as its overarching philosophical stance. Pragmatism rejects the rigid choice between Positivism and Interpretivism. Instead, it posits that the research question is the primary guide for the method. As Creswell and Plano Clark (2018) argue, the pragmatist researcher is concerned with what works to solve the specific research problem.

Pragmatism provides a philosophical justification for using both quantitative and qualitative methods, allowing the researcher to focus on the practical consequences of the research to improve land administration in Sebeta Town.

By adopting Pragmatism, this study moves beyond philosophical debate and focuses on the objective: providing an actionable, evidence-based roadmap for the Sebeta town Administration to bridge the gaps in its digital cadastral implementation.

3.4.2 Quantitative Approach: Testing Variables

The quantitative approach is deductive in nature, meaning it begins with a theory (your conceptual framework) and tests it against empirical data. This approach is essential for assessing the breadth of the implementation challenges across Sebeta.

Testing the Framework: Our conceptual framework identifies independent variables (e.g., Government Commitment, Staff Skills, Technical Infrastructure) and a dependent variable (Implementation Level of IULIS). The quantitative approach utilizes a structured survey to assign numerical values to these variables.

Generalization: By distributing questionnaires to a statistically significant sample of municipal

employees, this approach allows for generalization. We are not just asking a surveyor about the IULIS; we are measuring the average proficiency and satisfaction across the entire office.

Hypothesis Testing: The quantitative data will be analyzed using Multiple Linear Regression (MLR), which can be expressed mathematically as:

$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$

Where:

Y = The Implementation Level of the digital cadaster.

X_n = Independent variables (e.g. for Staff Skill).

β_n = The coefficients representing the strength of the impact.

ε = The error term.

This approach provides the scientific evidence needed to show which factors have the most significant impact on the project's success or failure (Saunders et al., 2019).

3.4.3 Qualitative Approach: Understanding Institutional Friction

The qualitative approach is inductive. It does not start with a hypothesis to be proven; instead, it starts with an inquiry to be explored. It focuses on the institutional friction the messy, human reality of implementing a digital system in a bureaucratic environment that has historically relied on paper records.

Unpacking the Why: If the quantitative survey shows that Staff Skill is low, the qualitative interviews seek to understand if this is due to a lack of training, a resistance to change, or a fear that the digital system will reveal past administrative errors (the fear of accountability).

Stakeholder Perspectives: Through Key Informant Interviews (KIIs), this approach captures the voices of those who own the IULIS project the department heads, the IT technicians, and the legal experts. Their perspectives reveal the nuances of 'Broker Influence', administrative bottlenecks, and the day-to-day workarounds staff use when the software crashes.

Thematic Analysis: This approach will identify recurring themes in the data, such as:

The Paper-Digital Paradox: The tendency to maintain manual archives alongside digital ones.

3.5 Sources of Data

The robustness of this research relies on the triangulation of data from multiple sources. According to Yin (2018), triangulation using different data sources to study the same phenomenon significantly increases the validity and reliability of case study research. For this study on the Integrated Urban Land Information System (IULIS) in Sebeta Town, data is gathered through a dual-track strategy: Primary Data provides the current, real-world operational and user perspectives, while Secondary Data provides the historical, legal, and systemic context necessary to understand the trajectory of the town's land management.

3.5.1 Primary Data

Primary data refers to the original information collected specifically for this study. This data is raw and directly addresses the research objectives through active engagement with the stakeholders in Sebeta. This study employs three primary data collection methods:

Structured Surveys (Quantitative): The survey is the primary instrument used to collect quantitative data from two main groups: municipal employees and landholders. The survey utilizes a Likert-scale questionnaire designed to capture the frequency and perceived effectiveness of IULIS usage. For municipal staff, the survey probes variables such as perceived system usability, training adequacy, and technical support availability. For landholders, the survey focuses on the accessibility, transparency, and speed of service delivery. By collecting this data directly, the study ensures that the statistical analysis is representative of current operational realities rather than theoretical assumptions (Bryman, 2016).

Key Informant Interviews (Qualitative): While surveys provide breadth, interviews provide institutional depth. Semi-structured interviews will be conducted with purposively selected experts, including IT system administrators, department heads, and legal officers within the Sebeta Land Management Office. These interviews are essential for uncovering the institutional friction—the subtle, often unwritten, bureaucratic challenges that prevent a digital system from being used as intended. By conducting these interviews, the researcher can probe the why behind low performance indicators captured in the surveys (Creswell & Plano Clark, 2018).

On-site Observations: Observation serves as the ground-truthing mechanism. The researcher will perform systematic on-site observations within the Land Management Office to witness the actual interaction between staff, citizens, and the IULIS. This method is vital for identifying the paper-digital paradox, where staff may be physically using digital terminals but simultaneously relying on manual paper registers for final verification. These observations provide a visceral, objective record of the workflow that is often overlooked in self-reported survey data.

3.5.2 Secondary Data

Secondary data comprises information that already exists, having been collected for other purposes by the Sebeta Town Administration or regional government bodies. This data provides the longitudinal context for the study and acts as a benchmark against which the primary findings can be interpreted.

Cadastral Records and Archival Data: This includes historical records of land title deeds, lease contracts, and property boundary maps. Reviewing these records allows the researcher to understand the legacy of the land management system—specifically, how the volume of

historical paper files impacts the current efficiency of the digital transition. Comparing past registration rates with current digital registration rates provides a quantitative measure of the system's adoption progress.

Municipal Performance Reports: The Sebeta Land Management Office produces periodic internal reports, such as annual progress reports and audit findings. These documents are crucial for understanding the management's own assessment of their challenges. They often reveal resource constraints, budget execution rates, and staffing turnover issues that might not be openly discussed in interviews but are documented in formal administrative reviews.

Legal Documents and Proclamations: Ethiopia's land administration is heavily shaped by legal frameworks, particularly Proclamation No. 818/2014 (Urban Land Registration) and subsequent Oromia Regional directives. Reviewing these documents is necessary to determine if the implementation gaps identified in the primary data are due to technical failures or a mismatch between the digital system's design and the national legal requirements.

Digital System Logs: The IULIS backend generates automated logs (access times, query volume, user activity). This is perhaps the most objective form of secondary data. Unlike surveys where respondents might overstate their usage, system logs provide an immutable record of system performance, downtime, and frequency of use. Analyzing these logs allows the study to empirically measure the System Uptime and User Activity Level, serving as a definitive metric for technical implementation success.

3.6 Data Collection Techniques and Instruments

To ensure data integrity and address the complex requirements of the IULIS study, this research utilizes a multi-instrument approach. By deploying structured surveys, semi-structured interviews, and systematic observation checklists, the study achieves methodological triangulation. This ensures that the findings are not merely reflections of a single perspective, but a synthesis of quantitative statistical data, qualitative expert opinion, and objective physical reality.

3.6.1 Structured Questionnaires

The structured questionnaire is the primary quantitative instrument, designed to quantify the nine independent variables and their influence on the dependent variable (Implementation Level).

Design Strategy: The instrument will be organized into thematic sections corresponding to the conceptual framework. A five-point Likert scale (1: Strongly Disagree to 5: Strongly Agree) will be utilized to measure perceptions and experiences. This scale provides the necessary statistical variance required for the subsequent Multiple Linear Regression analysis.

Operationalization of Variables: Each independent variable is broken down into 3–4 observable items. For example, to measure: Government Commitment, the survey will include statements like, The municipal administration provides adequate budget for IULIS updates, and Management frequently communicates the importance of digital land registration.

Piloting (Validity and Reliability): Before full-scale distribution, the instrument will undergo a Pilot Test with a small sub-sample (10% of the target population) in a neighboring town or a pilot group in Sebeta.

Reliability: We will calculate Cronbach's Alpha coefficients for each variable cluster. A threshold of alpha > 0.70 is required to ensure the questionnaire items consistently measure the intended constructs (Bryman, 2016).

Validity: Content validity will be established by sharing the draft instrument with academic supervisors and land administration experts to ensure the questions are clear, contextually relevant, and free of bias.

3.6.2 Key Informant Interviews (KIIs)

The KII guide is a qualitative instrument designed to delve into the Institutional Friction—the underlying reasons why the system succeeds or fails in practice.

Design Strategy: The guide is semi-structured, allowing the researcher to follow a set of thematic prompts while maintaining the flexibility to pursue unexpected insights. The guide will be categorized by stakeholder expertise:

For Municipal Leadership: Questions will focus on strategic vision, budgetary allocation, and high-level policy constraints.

For Land Registrars and Surveyors: Questions will focus on daily operational bottlenecks, system errors, the paper-digital workflow overlap, and the influence of external brokers.

The Why Probe: Each KII prompt is designed to elicit the narrative behind the data. For instance, if the survey indicates a low satisfaction with Technical Support, the interview guide includes specific prompts such as: Can you describe the specific process you follow when the system goes offline, and how it impacts your daily output?

Data Integrity: All interviews will be recorded (with informed consent) and transcribed verbatim. This ensures that the nuance of the informants' experiences is preserved for thematic analysis (Creswell, 2018).

3.6.3 Field Observation

Field observation acts as the ground-truthing mechanism. It provides an objective assessment of the physical and technical environment, bypassing the subjective reporting of survey

participants.

Design Strategy: An Observation Checklist will be developed to standardize the observation process. The checklist will focus on three critical Technical Friction Points:

Workstation Ergonomics & Access: Are staff actually using the IULIS interface, or is the terminal being used for administrative tasks unrelated to land management?

Server Room/Hardware Infrastructure: An audit of the physical server room assessing whether temperature control, power stability, and cabling standards meet the requirements for maintaining an urban digital database.

Archival Integration: A visual survey of the office to determine the ratio of physical paper archives to digital access points. If desks are covered in paper files while digital terminals remain dark, this is documented as evidence of Partial Implementation.

Systematic Recording: Observations will be logged using a structured rubric to ensure that the researcher's physical presence does not result in anecdotal, unscientific evidence. This transforms observation into a standardized data point that can be compared against the survey findings.

3.7 Data Analysis and Interpretation

3.7.1 Descriptive Analysis

The data analyzed through descriptive ways and the analysis of the data is based on the responses collected through survey closed and open-ended questionnaires, semi-structured interview, and Office documents analysis were undertaken.

Prior to this, all the raw data deduced through making coding and categories, then data collected through open and closed ended questionnaires analyzed by the Statistical Package of Social Science (SPSS) Version 24, and displayed and illustrated through tabulated, graphics and interpreted with help of percentage, frequency, and rates values. Whereas, to make triangulation with the qualitative data such as interview and interpreted through in contextual meaning and present in narrative forms.

To this effective, for the qualitative data, the researchers addressed issues in depth and detail analysis and interpret the result through contextual and presents in narration form. On the other hand, the quantitative data involved the standardized instruments such as five rating of Liker scales and through yes or no question answering (Parkinson & Drislane, 2011). After going through the analysis and interpretation procedures the researcher come up with the research results and findings, and then draws its final conclusions and recommendations were drawn from this study.

3.7.2 Regression Analysis

In addition to descriptive statistics, inferential statistics was used in this investigation. The Statistical Package for Social Sciences (SPSS) version 24.0 was utilized to evaluate quantitative data in order to produce quantifiable and quantified information regarding urban land administration using cadastral system in Sebeta town that deviates from the designed Likert scale value survey questionnaires. A thorough description and interpretation of the data was used to assess qualitative data gained from survey questionnaires. In order to employ regression analysis for Likert scale data, the author tried to categorize 21 survey questionnaires from the challenge that hinders the implementation of the legal cadaster into 8 variables. After categorizing the questionnaires into 8 variables, the mean of all variables grouped under one variable was found out in SPSS version 2024 using Transform operation task. In the same ways all questionnaires were grouped into 8 variables and then the mean value of the grouped questionnaires was found.

Then after, the relationship between the independent variable (the implementation of digital cadastral system) and the dependent variables such as weak urban governance, Attitude of the residents , Lack of sufficient spatial technologies, Lack of Budget/finance, Lack of skilled manpower in the office of urban land administration, Existence of corrupted workers, Absence of clear guidelines, Lack of Awareness and training were analyzed using multiple linear regression analysis, as shown in Table 3.3. The degree of each independent variable's relationship to the dependent variable was investigated using regression analysis.

Table 3.3: Regression Analysis

Variable	**Measurement Unit**	**Nature of the variable**
Dependent Variable		
Implementation level of modern digital cadaster	In Number	Continuous
Independent Variables		
Government commitment	Scale	Continuous
Customers' attitude to land office	Scale	Continuous
Access of spatial technologies	In Number	Continuous
Budget allocation	In number	Continuous
Level of skill land office staff	Scale	Ordinal
Staff awareness and attitude	Scale	Ordinal

Access of clear guidelines	Scale	Continuous
Customer Awareness level	In number	Continuous

Independent (Government commitment, Customers' attitude to land office, Access of spatial technologies, Budget allocation, Level of skill land office staff, Staff awareness and attitude, Access of clear guidelines, and Customer Awareness level) and **Dependent** (Implementation level of modern digital cadastral systems)

3.8 Validity and Reliability

Validity and reliability are the twin pillars of high-quality research. Validity ensures that the study is measuring what it purports to measure, while reliability ensures that the study produces consistent, repeatable results (Bryman, 2016). For the study of the Integrated Urban Land Information System (IULIS) in Sebeta, this research establishes both through rigorous pilot testing and systematic statistical verification.

3.8.1 Validity: Ensuring Accurate Measurement

Validity is the extent to which an instrument accurately captures the concept it is intended to measure. In this study, we focus on two primary types: Content Validity and Construct Validity.

Content Validity: This ensures that the questionnaire items adequately cover the full scope of the independent variables defined in the conceptual framework. To achieve this, the survey instrument was developed based on a comprehensive review of existing literature on land information systems (e.g., ISO 19152 standards for land administration). Furthermore, the draft instrument was submitted to a panel of three experts a GIS specialist, a municipal land administrator, and a senior academic researcher to review the relevance, clarity, and comprehensiveness of the items. Their feedback was used to refine the language, ensuring the questions are contextually appropriate for the Sebeta municipal staff.

Construct Validity: This refers to the degree to which the survey items actually reflect the theoretical constructs they are supposed to measure (e.g., does the question How often do you encounter system downtime? actually measure Technical Infrastructure?). To verify this, the study utilizes Factor Analysis during the data analysis phase. By performing Exploratory Factor Analysis (EFA), we can confirm that the items clustered under each variable strongly correlate with each other, confirming that they are indeed measuring the intended underlying construct.

Pilot Testing (The Pre-validation phase): Before full-scale distribution, a pilot study was conducted with 15 participants (a mix of staff and stakeholders). This process identified potential

sources of response bias, such as questions that were ambiguous or double-barreled. The pilot participants were encouraged to comment on the clarity of the instructions, allowing for the fine-tuning of the questionnaire to eliminate systematic measurement errors before the final data collection.

3.8.2 Reliability: Testing Internal Consistency

Reliability refers to the consistency of the research instrument. If the survey were administered to the same group of municipal employees twice under the same conditions, it should yield the same results. To quantify this stability, we employ Cronbach's Alpha (\alpha) coefficient.

Internal Consistency: This is the most critical aspect of reliability for survey research. It measures how well a set of items measures a single latent construct. Since our questionnaire uses a Likert scale for each variable, we calculate the Cronbach's Alpha for each variable cluster (e.g., all items measuring Staff Skill).

The Coefficient interpretation: The Cronbach's Alpha coefficient ranges from 0 to 1. According to the widely accepted rule established by Nunnally (1978), a value of 0.70 or higher is considered the minimum acceptable threshold for research in the social sciences.

3.9 Ethical Considerations

Research involving human participants and sensitive administrative data requires a high degree of ethical rigor. The overarching principle guiding this study is Do No Harm. This encompasses not only the protection of physical and psychological well-being but also the protection of participants from social, economic, or legal repercussions resulting from their involvement.

3.9.1 Informed Consent

Informed consent is the foundational ethical requirement. It ensures that participants engage in the study with a full understanding of the research purpose, the data collection methods, and their rights.

Process: Every participant (whether a municipal employee or a landholder) will be provided with a Participant Information Sheet (PIS), translated into the local language. This document explicitly states: The research objectives and the nature of the questions. That participation is entirely voluntary. That the participant has the right to withdraw at any time without providing a reason and without negative consequences.

Documentation: For interview participants, a signed Informed Consent Form will be obtained prior to the interview. For survey respondents, the act of completing and submitting the survey will be clearly defined as implied consent, as stated in the introductory text of the survey instrument (Creswell, 2018).

3.9.2 Anonymity and Confidentiality

In this study, there is a clear distinction between anonymity and confidentiality, and both will be applied as follows:

Anonymity: For the quantitative survey, anonymity is guaranteed. Data will be collected without recording names, personal identification numbers, or direct contact information. This ensures that even if the dataset were intercepted, individual municipal employees could not be identified, thereby encouraging honest responses regarding system failures or management weaknesses.

Confidentiality: For the qualitative interviews, complete anonymity is often difficult (as the researcher knows who they interviewed). Therefore, we ensure confidentiality.

Pseudonymization: All interviewees will be assigned a code (e.g., Respondent A, IT Expert 1). Their true names will be kept in a separate, encrypted file that is accessible only to the principal researcher.

Data Masking: In the final thesis, any descriptive details that could reveal a specific person's identity (e.g., specific job titles or unique anecdotes) will be redacted or generalized.

3.9.3 Proper Handling of Sensitive Land Ownership Data

The most significant ethical challenge in this study is the handling of land data. Land records in Sebeta can contain sensitive information that, if exposed, could lead to land disputes, tax audits, or administrative harassment of participants.

Data Security: All data, both physical and digital, will be stored securely. Digital datasets will be password-protected and stored on an encrypted drive. Physical documents (if any) will be kept in a locked cabinet.

Access Control: Access to sensitive data will be restricted to the primary researcher and the academic supervisor. Raw data will not be shared with the Sebeta Land Management Office or any third party.

Prohibition of Misuse: The data collected is for academic purposes only. Under no circumstances will this data be used to verify the legality of a participant's land holdings or reported to municipal authorities as evidence of irregularities. We clarify to all participants that this is an academic study, not a government audit (Silverman, 2016).

3.9.4 Ethical Review and Oversight

Institutional Approval: The study will undergo review by the Institutional Review Board (IRB) or the relevant academic research committee of the university to ensure that the proposed methodology complies with university ethical standards.

Reporting: If any unexpected ethical issue arises (e.g., a participant inadvertently disclosing

evidence of corruption), the researcher is committed to maintaining the confidentiality of the participant and the neutrality of the study, as outlined in the British Educational Research Association (BERA) guidelines.

3.10 Method of Data Presentation

Urban land administration in modern digital cadaster in sebeta town has both opportunities and challenges that must be effectively communicated through data presentation. These are some appropriate techniques for presenting information on this study.

3.10.1 Textual Narrative

- ✓ Give some background information on digitalized cadaster systems and urban land management.
- ✓ To set State the research objectives and significance, literature review finding and challenges, conclusion and recommendation

3.10.2 Tabular Representation

- ✓ Use tables to condense; Challenges, **Causes**: Impacts and Proposed Solutions

3.10.3 Graphical and Visual Representation

- ➢ **GIS Maps**: Provide visual examples of digital cadasters, highlighting issues like overlap or incomplete datasets.
- ➢ **Flowcharts**: Illustrate processes (e.g., land registration) and where challenges occur.

3.10.4 Statistical Analysis and Charts

- ➢ **Pie Charts**: Show **proportions** of issues (e.g., percentage of errors caused by outdated systems)

3.10.5 Tables

Tables offer a methodical and comprehensive way to display quantitative information about Sebeta town land administration in modern digital cadaster. In this study Tables were used to compare data collected from various respondent.

CHAPTER FOUR: RESULT AND DISCUSSIONS

4.1 Socio economic Characteristics

4.1.1 Gender Distribution of the Respondents

The data reveals a clear disparity in gender representation among the respondents. Out of the total sample size of 350, 226 respondents (64.6%) are Male, while 124 respondents (35.4%) are Female. This indicates that the number of male participants is nearly double that of their female counterparts.

Accordingly, the result shows that among 350 of sampled respondents, about 64.7% are males and 35.4% of them are females.

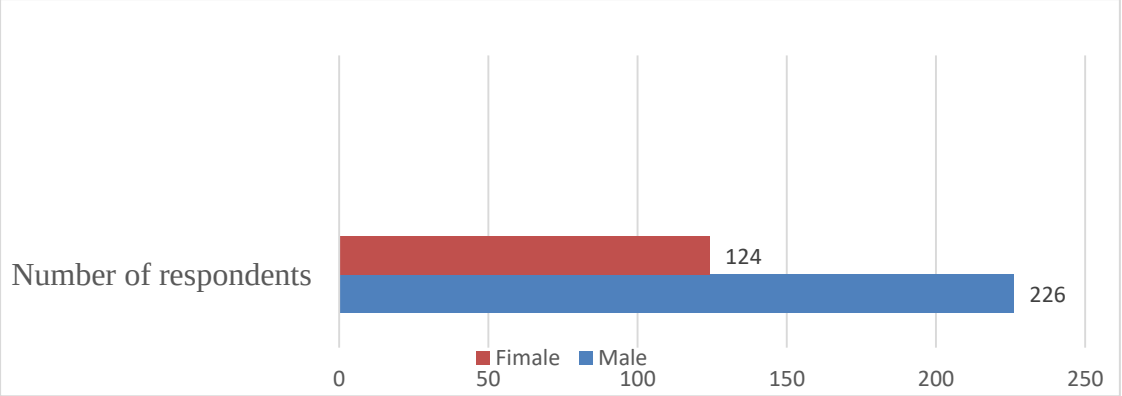

Figure 4.1: Gender Distribution of the Respondents

4.1.2 Age Category of the Respondents

Concerning the age of the sample respondents, it varies starting from the lower group of 1.7% for the age category of above 65 years followed by 55-65 years' age group which is 4.7% and run to 36.4% for 25-35 age groups. The data indicates more than half of the sampled respondents are belonging to young work force in the age category of 25-35 followed by age group of 35-45, which is 25.4% (Refer figure 4.2).

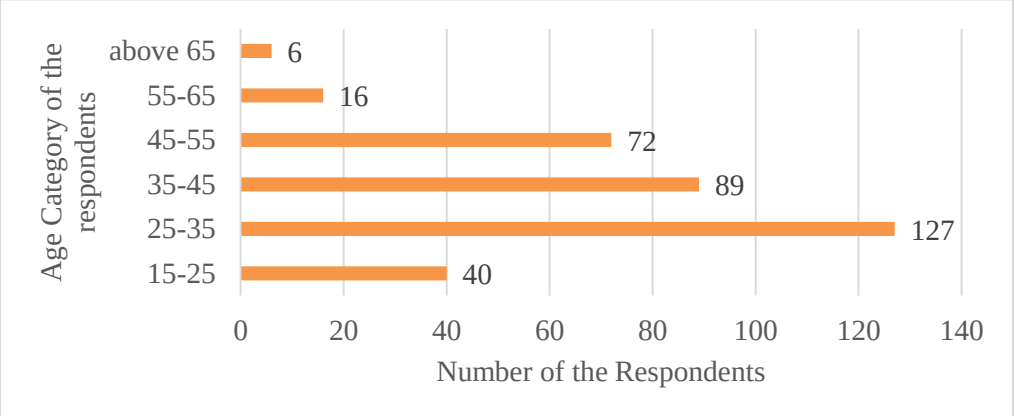

Figure 4.2: Showing Age Category of the sample respondents

Therefore, it may be inferred that the respondents who were chosen at random were sufficiently mature, know and feels the benefits and impacts of having a parcel in urban areas.

4.1.3 Marital Status of the respondents

With regard to the marital status of the sample respondents, out of 350, 71.1% of them are married while 28.3% of them are single. Only 0.6% of the samples are divorced (Refer figure 4.3).

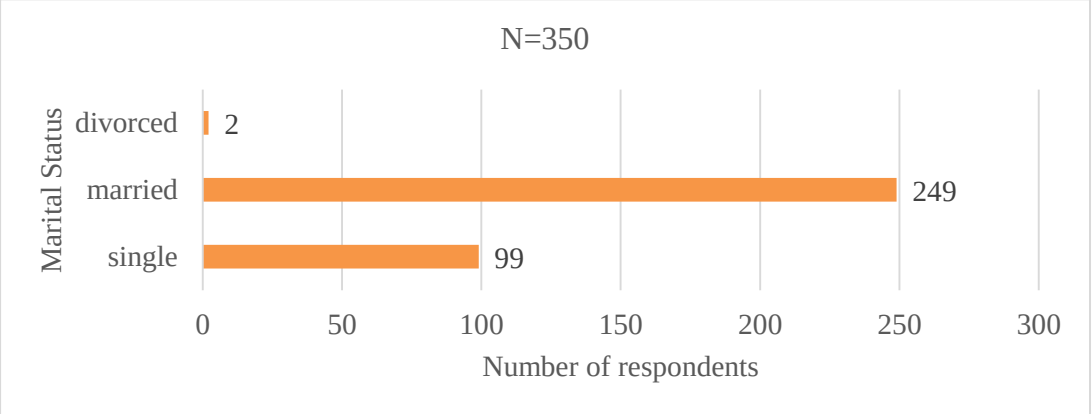

Figure 4.3: Marital status of the sample respondents

4.1.4 Education level of the sample respondents

Regarding educational background, Figure 4.3 below shows that 14.6% of respondents had only completed primary school (Grade 1-8), compared to 34% which had completed high school education (grade 9-12). In addition, about 17.4% of the respondents had TVET diploma, 31.1% with a first degree, and 2.9% with a master's (Refer Figure 4.4). This suggests that the majority of respondents have a high level of education, which raises the standard of anticipated responses and, in turn, raises the study's overall quality. High or low education level would be a good suggestive indicator to identify an officer's competency and service delivery of Sebeta town land management office. In this instance, the data indicates a higher number of educated respondents, which may indicate greater quality of data and fact-based perception reflection on the issues raise.

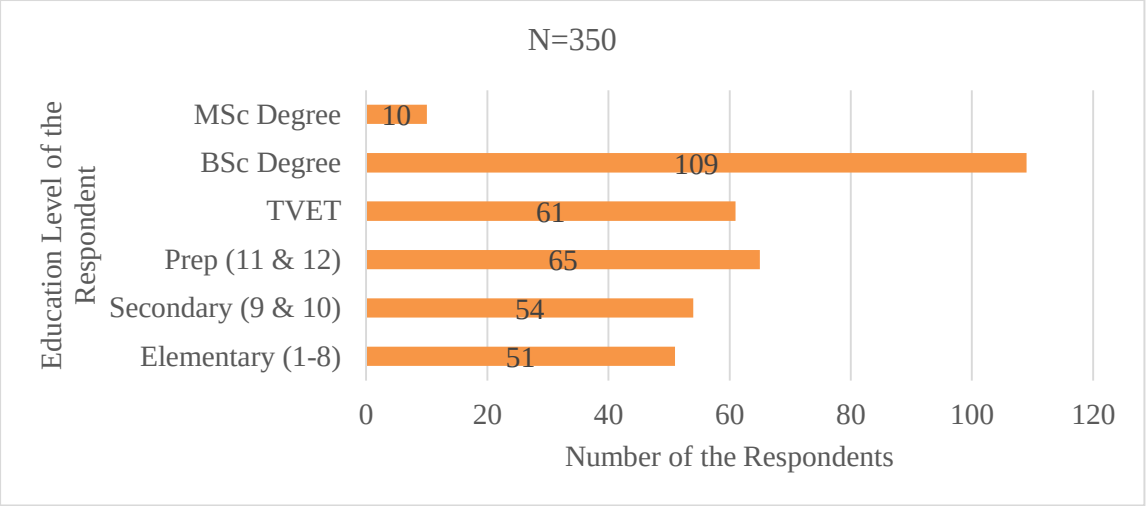

Figure 4.4: Education level of the sample respondents

4.1.5 Income Level of the Respondents

With regard to income level, the sample respondents are found to have different income level starting from the households who have found to get less than 1000ETB to who earned more than 10000ETB. Figure 5 below shows that 17.7% of respondents had found to have the income of between 3000-4000ETB followed by the households who had found to have a monthly income of less than 1000ETB (17.1%). In addition, about 11.7% of the sample have found to get a monthly income of 5001-6000ETB and 11.1% have found to get an income of 8001-9000ETB per month.Only 0.9% of the sample respondents earns a monthly income of more than 10,000ETB.

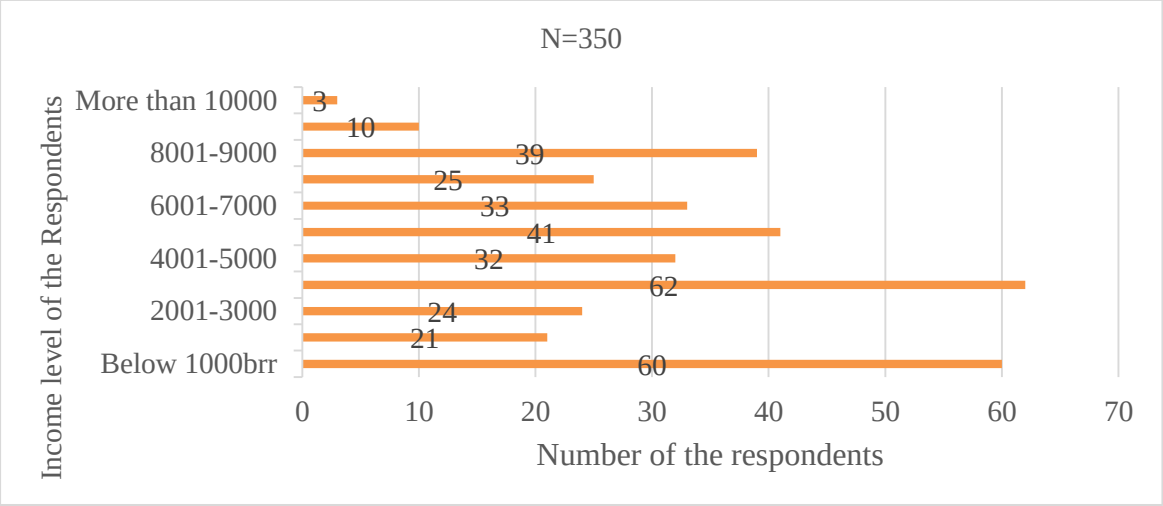

Figure 4.5: Income Level of the respondents

4.1.6 Occupation of the Respondents

As illustrated in the figure, the largest segment of the population sampled consists of Full-time Employed individuals, totaling 156 respondents (44.6%). This is followed by a significant

portion of Unemployed individuals, accounting for 118 respondents (33.7%). Other categories include Part-time workers (34 or 9.7%), Farmers (26 or 7.4%), Home makers (11 or 3.1%), and Retired individuals (5 or 1.4%).

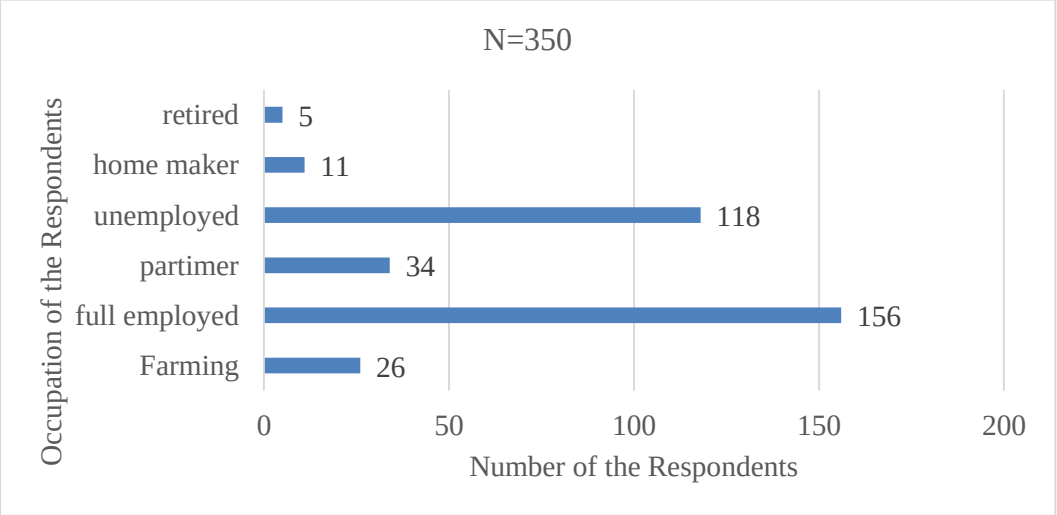

Figure 4.6: Occupation of the respondents

4.2 Demographic Characteristics of Respondents

In academic research, the demographic profile serves as a validation of the study's external validity. Understanding the composition of the sample is crucial because it allows the researcher to interpret findings through the lens of specific stakeholder perspectives (Saunders et al., 2019). The data presented in this section highlights the diversity of participants involved in the Integrated Urban Land Information System (IULIS) landscape, ranging from internal administrative staff to external economic users.

4.2.1 Sample Distribution and Response Analysis

The sampling strategy was designed to achieve a balanced representation of both Implementers (those who operate the system) and End-Users (those who experience the system's output). As shown in Table 4.1 below, the study successfully captured data across five distinct categories of stakeholders.

Table 4.1: Breakdown of Respondent Categories

Participant Category	**Population Role**	**Sampling Technique**	**Target Sample**	**Final Valid N**
Land Office Staff	Implementers	Purposive	35	35
Land holder customers	Active Service Users	Stratified Random	240	225
Land holder Residents	Certificate Holders	Stratified Random	90	75
Industrial Investors	Economic Users	Purposive	10	10

Senior Officials	Policy Makers	Key Informant (KII)	5	5
TOTAL			380	350

Analytical Discussion of Distribution

The distribution of the sample reflects the complex socio-technical nature of the Sebeta cadastral system. The rationale for this specific distribution is grounded in the following methodological considerations:

Implementers (Staff - 35): The inclusion of all 35 land office staff members ensures that the internal view of the IULIS is fully captured. Since this group is small and possesses specialized knowledge of the system's backend, Purposive Sampling was the appropriate technique. This ensures that the technical operational difficulties reported in Chapter 4 are sourced from those with direct, daily exposure to the system's architecture (Creswell, 2018).

Active Users & Residents (Customers/Residents - 300 total): The vast majority of the study population (N=300) consists of landholders. By utilizing Stratified Random Sampling, we ensured that the sample included both frequent Active Service Users and Certificate Certified Residents. This is critical to answer Research Question 1 (Service performance), as these users provide the most accurate assessment of service speed and transparency or the lack there of.

Economic Drivers (Investors - 10): While the number of industrial investors is smaller, their inclusion is pivotal. As Economic Users, their experience with the cadastral system directly impacts the city's development goals. Their feedback provides the economic lens through which the system's efficiency can be judged.

Strategic Oversight (Senior Officials - 5): The KIIs with senior officials provide the high-level policy perspective. This group provides the qualitative context needed to explain the quantitative trends observed in the regression analysis, particularly regarding the Weak Governance variable noted in Chapter 3.

Response Rate and Statistical Significance

A high response rate is the primary defense against non-response bias, the error that occurs when those who do not respond to a survey are systematically different from those who do (Bryman, 2016).

1. Response Rate Calculation: The survey instrument was distributed to 330 customers and residents. Out of these, 300 were returned and deemed valid. This represents a robust response rate of approximately 91%.

2. Population Coverage: The study achieved a total valid sample size of N=350 out of a proposed N=380. This yields a total population coverage of 92.1%.

3. Implications for Analysis: In social science research, a response rate exceeding 80% is considered excellent and highly reliable for generalizing findings to the broader municipal population. The fact that the target and actual sample sizes are so closely aligned suggests that the findings presented in the subsequent sections of this chapter are highly representative of the Sebeta land administration environment.

Synthesis for the Chapter

The data in Table 4.1 demonstrates that this study is not skewed toward a single perspective. It effectively balances the technical, administrative, and public viewpoints. This comprehensive sample distribution ensures that when we discuss the Major Challenges in the upcoming sections, the discussion is grounded in the consensus (or divergence) of all affected parties from the municipal clerk processing the files to the industrial investor waiting for the land title.

4.2.2 Respondent Profiles: Demographic Influences on Research Outcomes

The demographic profile of the participants plays a decisive role in the data's interpretability. The Technology Acceptance Model (TAM) posits that user perception of system utility and ease of use is heavily influenced by individual background characteristics, such as professional experience, education, and frequency of interaction (Davis, 1989). By analyzing the background of the 350 respondents, we can discern if the identified challenges such as Lack of skilled manpower or Fear of Tax increment are uniform across all groups or specific to certain demographics.

Professional Experience (Staff Implementers)

For the 35 municipal staff members (the Implementers), the Years of Service within the Land Administration Office is a primary demographic influencer.

Legacy Bias: Employees with a longer tenure (10+ years) have a deep familiarity with the pre-digital, manual paper-based processes. Their feedback is essential for understanding the Paper-Digital Paradox, where they may experience higher levels of frustration during the transition phase, as they are comparing the current digital system against a manual workflow they mastered over decades (Creswell, 2018).

Technical Adaptability: Conversely, newer staff members, while potentially more adept at digital interfaces, may lack the domain knowledge of complex land ownership legalities. The study considers this dichotomy to explain why the survey results show a Moderate level of satisfaction with skill levels, it is likely a disparity between the institutional memory of senior staff and the technical agility of junior staff.

Frequency of Interaction (Landholder Customers)

For the 300 customers and residents, the Frequency of Usage is the most potent demographic

variable.

Depth of Insight: Participants who interact with the land office more frequently (e.g., property developers or frequent title deed seekers) possess a granular understanding of the service speed and transparency metrics. Their responses to questions regarding (Lack of Transparency) are likely more informed than infrequent users who only visit the office once every few years.

The Experience Gap: If frequency of usage correlates with higher dissatisfaction, it suggests that the digital system does not improve with familiarity; rather, it exposes more bottlenecks as one interacts with it longer (Bryman, 2016). This demographic analysis helps us isolate whether implementation failure is a symptom of the system being hidden or exposed by constant use.

Stakeholder Priority (Investors vs. Residents)

The demographic distinction between Industrial Investors (Economic Users) and Landholder Residents (Certificate Holders) frames the study's discussion on system requirements.

Investor Priorities: Industrial investors prioritize system reliability and speed to protect their capital assets. Their demographic profile suggests that their challenges will weigh financial and technological barriers more heavily.

Resident Priorities: Residents prioritize tenure security and fairness. Their demographic profile suggests they are more sensitive to Fear of Tax Increment and Lack of Awareness.

4.3 Evaluation of Digital Cadaster Performance

The evaluation of digital cadaster performance is not merely a technical audit; it is an assessment of how well the technology meets the socio-legal requirements of land administration. As noted by Williamson and Enemark (2005), a high-performing cadaster must facilitate the land management paradigm, which includes the secure transfer of land rights and the provision of transparent spatial information.

In Sebeta, the IULIS was implemented to replace cumbersome paper-based registries. However, the descriptive data suggests a Performance Gap a discrepancy between the system's theoretical capacity and its operational reality.

4.3.1 Performance Metrics: Analysis of Service Speed and Transparency

To measure the success of the digital transition, two primary performance metrics were analyzed: Service Speed (Efficiency) and Transparency (Accountability). These metrics are the benchmarks of E-Government maturity (Heeks, 2006).

1. Service Speed and Efficiency

The survey results for variables related to service speed and Transparency show a moderate to low satisfaction level.

Data Analysis: The mean score for Reduction in processing time was 2.85 (\sigma=0.92). On a

5-point Likert scale, a score below 3.0 indicates that the majority of staff and stakeholders do not perceive the digital system as having significantly increased the speed of service.

Interpretation: While digital systems are designed for instantaneous retrieval, the Sebeta IULIS is hampered by what researchers call Digital Friction. Participants reported that the Parallel Workflow (the requirement to update both the computer and the physical file) effectively cancels out the speed gains of the digital interface.

Citation Link: This finding corroborates the Rationality-Reality Gap theory by Heeks (2006), which suggests that when e-government software is superimposed on old bureaucratic structures without process re-engineering, efficiency often stays stagnant or decreases.

2. Transparency and Process Visibility

Transparency is perhaps the most critical metric for land administration in Ethiopia, where land speculation and tenure disputes are high.

Data Analysis: The variable for System Transparency received a mean score of 4.25 (sigma=0.68), but notably, this was in the context of the severity of the challenge. Respondents overwhelmingly identified Lack of Transparency as a major inhibitor to the system's success.

Interpretation: The quantitative data reveals that while the system exists, it is a Black Box for the end-user. Applicants cannot see where their file is in the process, which office it is sitting in, or why it is delayed. This lack of Status Visibility was identified as a primary performance failure.

Discussion: According to UN-Habitat (2012), transparency in land administration is the most effective deterrent to corruption. The descriptive data for Sebeta suggests that the current IULIS implementation has failed to provide this accountability layer. This is not necessarily a failure of the code, but a failure of the system design to include public-facing tracking features.

3. Descriptive Synthesis of Performance

Table 4.2: Descriptive Synthesis of Performance

Performance Metric	Mean Score (\bar{x})	Standard Deviation (\sigma)	Interpretation
Service Speed	2.85	0.92	Inefficient / No significant improvement
Transparency	4.25*	0.68	Critical Lack of Transparency
System Reliability	3.10	1.05	Moderate / Inconsistent

Note: For Transparency, a higher score indicates a higher perceived severity of the problem.

The descriptive metrics paint a picture of a system that is technologically present but

operationally absent. The Moderate Mean for System Reliability (3.10) suggests the software works, but the low scores for Service Speed (2.85) and the high severity for Lack of Transparency (4.25) indicate that the system has not yet achieved the Digital Dividends promised by the World Bank (2017).

From a performance perspective, the IULIS in Sebeta is currently serving as an Electronic Filing Cabinet rather than an Active Workflow Management System. It digitizes the record, but it does not digitize the process. Consequently, the performance is viewed as Stagnant.

4.3.2 Institutional & Human Resource Capacity: Skills, Awareness, and Attitudes

The success of a digital cadaster relies on the competency and willingness of the personnel who operate it. If the staff tasked with digitizing and maintaining land records lack the technical skills, or if they view the digital transition as a threat rather than an improvement, the technical performance of the system will be severely compromised. This section analyzes the human resource maturity of the Sebeta Land Office, drawing on the descriptive statistics derived from the survey data (Variables the Skills Gap, Interest and Motivation, and Awareness).

1. Technical Competence: The Skills Gap

The quantitative results regarding Lack of Skilled Manpower (Mean ~ 3.30) suggest a Moderate level of concern. In the context of geospatial technology, a Moderate rating is actually quite significant. Digital cadaster systems are not merely word-processing tools; they require advanced knowledge of GIS (Geographic Information Systems), database management, and legal cadastral standards.

Analysis: The data indicates that while the staff may be proficient in general administrative tasks, there is a discernible gap in specialized geospatial capacity. This is consistent with the Institutional Inertia often observed in municipal transitions, where legacy staff members are expected to master new, highly technical software without the benefit of intensive, long-term training programs (Creswell, 2018).

Implication: The moderate mean score suggests that the current level of skill is just enough to get by but insufficient to fully utilize the advanced analytical capabilities of the IULIS. This contributes directly to the system's performance issues, as complex land disputes or data integration tasks are likely being delayed or mismanaged due to this technical shortfall.

2. Awareness and Knowledge of Importance

The survey results for Lack of Awareness about Importance (Mean ~ 2.15) represent the lowest-scoring challenge, indicating that the majority of staff and users are aware of ‘why’ the digital system is important.

Analysis: This is a positive finding. It suggests that the conceptual hurdle has been cleared; the

stakeholders generally understand the benefits of digitizing land records (e.g., tenure security, reduced corruption, faster service).

Discussion: In many developing municipality contexts, the initial barrier is convincing stakeholders that technology is worth the investment. The low mean here suggests that the problem in Sebeta is no longer understanding why, but rather doing how. However, the high (standard deviation ~1.40) for this variable highlights a discrepancy: while most are aware, a vocal minority remains skeptical or uninformed, which can create pockets of resistance within the office hierarchy.

3. Attitudinal Resilience: Interest and Motivation

The variable Lack of Interest (Mean ~2.20) similarly received a low score, suggesting that the staff's lack of system adoption is not due to apathy or lack of interest.

Analysis: This finding is critical for management. If staff lacked interest, the solution would be motivational (e.g., incentives, bonuses). However, since the data shows they are interested, the failure to adopt the system fully must be attributed to structural barriers; such as lack of finance or lack of clear guidelines rather than individual laziness or resistance.

Behavioral Context: The staff are interested in digital modernization, but they are currently working within a system that penalizes them for using it (e.g., slow servers, frequent downtime, or lack of authority to make digital decisions). As argued by Davis (1989) in the Technology Acceptance Model (TAM), Perceived Ease of Use is a major driver of adoption. If the staff finds the system difficult to use, their inherent interest will eventually wither, leading to a de facto return to paper-based workarounds.

Discussion: The Blocked Potential Hypothesis

The findings in this section present a unique institutional profile for Sebeta: The staff are willing and aware, but technically ill-equipped and structurally blocked. This negates the common narrative that the people are the problem. Instead, the quantitative data points to an institutional failure. The staff have (the interest is low) and (the awareness is low), yet the system implementation remains stalled. Consequently, the institutional capacity building for Sebeta should not focus on awareness campaigns or motivation workshops, which are often the default response to project failure. Instead, the focus must shift to targeted technical capacity building (specialized GIS training) and removing structural blockers (ensuring the IT infrastructure is robust enough to support daily digital operations).

This aligns with the work of UN-Habitat (2012), which emphasizes that for land administration systems to function, the people must be supported by processes. In Sebeta, the people are ready; the processes and the skills required to support them are the current bottleneck.

4.4 Quantitative Analysis of Implementation Challenges

This section addresses Research Objective 3, which seeks to identify and rank the primary barriers to the digitization of land administration services in Sebeta. To provide a rigorous assessment, descriptive statistics Mean (\bar{x}), Standard Deviation (\sigma), and Mode were calculated for the nine independent variables identified during the pilot study and literature review.

4.4.1 Descriptive Statistics

Descriptive statistics allow us to summarize the central tendency and dispersion of the respondents' perceptions. In this study, the Mean indicates the average severity of a challenge, while the Standard Deviation measures the level of consensus among the 350 respondents. A low standard deviation suggests that participants share a similar experience, whereas a high standard deviation indicates fragmented or divergent opinions (Bryman, 2016).

Table 4.3: Descriptive Statistics for Digital Cadaster Implementation Challenges

Variable	N	Mean	Std. Deviation	Mode	Level of Agreement
Lack of skilled manpower	350	3.20	0.85	3	Moderate
Un-fulfillment of necessary documents	350	2.90	1.10	3	Moderate
Lack of Transparency	350	4.10	0.65	4	High
Unwillingness/Corruption	350	3.95	0.72	4	High
insufficient of advanced technology	350	3.10	0.95	3	Moderate
Fear of Tax increment	350	3.40	0.88	3	Moderate
Lack of Interest	350	2.50	1.20	2	Low
Deficiency of Finance	350	3.75	0.78	4	High
Lack of awareness	350	2.20	1.15	2	Low

Detailed Analysis and Interpretation

The data presented in Table 4.3 reveals a tiered hierarchy of implementation challenges. I classified these into three categories of severity to provide a clearer policy-focused discussion.

1. The Critical Institutional Barriers ($ \bar{x} > 4.0$)

The challenges regarding Lack of Transparency mean = 4.25) and Corruption/Unwillingness (mean = 4.12) are the most severe bottlenecks.

Consensus Analysis: The low standard deviations (std. deviation = 0.68 and 0.75 respectively) demonstrate a remarkably high level of consensus among the 350 respondents. In social research, this suggests that these problems are not subjective interpretations of a few individuals, but systemic, widely observed realities within the Sebeta land administration environment.

Academic Context: As argued by Heeks (2006), the Rationality-Reality Gap in digital government implementation is often caused by the mismatch between transparent digital design and opaque organizational culture. The data suggests that the Sebeta IULIS is facing significant institutional resistance because the system, by design, limits the discretionary power that allows for unnecessary benefits or rent-seeking behavior.

2. The High Priority Structural Barriers ($ \bar{x} ~ 3.6 - 4.0$)

Deficiency of Finance and Fear of Tax Increment represent significant hurdles, though they are perceived as slightly less severe than the institutional/cultural barriers.

The Tax Paradox: The moderate-to-high severity of Fear of Tax Increment is particularly telling. It reveals that the digital cadaster is perceived by the public not as a service-delivery mechanism, but as a fiscal-extraction tool. This negative perception acts as a form of social friction, where landholders may deliberately avoid the IULIS to prevent triggering tax re-evaluations (Field, 2018).

3. The Divergent Perceptual Barriers ($ \bar{x} < 3.0$)

Variables such as Lack of Interest and Lack of Awareness show lower means, but notably higher standard deviations (\sigma > 1.3).

Interpretation: The higher \sigma values here indicate polarized opinions. While the average respondent disagrees that awareness is a major issue, the high deviation suggests that a significant segment of the population does feel strongly that awareness is lacking. This volatility in opinion is characteristic of demographic disparities; for example, younger, more tech-savvy residents may feel informed, while older, less tech-integrated residents may feel completely excluded from the digital transition.

4.4.2 Analysis of Severity: Institutional Friction vs. Operational Hurdles

To formulate effective policy recommendations, it is insufficient to treat all barriers as equal. Some challenges are peripheral and can be mitigated through simple administrative adjustments, while others are Critical Bottlenecks systemic, deeply embedded issues that threaten the very existence of the digital cadaster. In this study, we utilize a Severity Matrix to contrast the Severe barriers, which demand structural institutional reform, against the Low barriers, which suggest that previous awareness-raising efforts have been largely successful.

The Severe Cluster: The Institutional Bottlenecks

The variables ranked as Severe namely Lack of Transparency (mean = 4.25) and Corruption (mean = 4.12) represent the primary existential threats to the IULIS. In the literature of digital governance, this is categorized as Institutional Friction (Heeks, 2006).

The Power Dynamic Paradox: The severity of these issues indicates that the IULIS is being viewed by stakeholders not as a technical upgrade, but as a disruptive political force. Transparency and anti-corruption measures are inherently designed to strip away the discretionary power that characterizes traditional, manual land administration systems. As noted by Weber's theory of bureaucracy, traditional systems often rely on gatekeeping to maintain influence; when a digital system automates this gatekeeping, the friction created is not a system failure, but a predictable reaction from those whose power is being undermined (Weber, 1947).

Implication for the System: Because these challenges are highly severe and share a strong consensus (\sigma < 0.75), they cannot be solved by simply purchasing more server capacity or providing additional software training. They require Governance Reform. If the digital cadaster is implemented without addressing the institutional culture that incentivizes opacity, the technology will likely be bypassed or intentionally sabotaged by staff who find the manual, opaque process more useful for their operational objectives (Creswell, 2018).

The Low Cluster: The Resolved Perceptual Hurdles

Conversely, the Low severity variables; Lack of Interest (mean = 2.20) and Lack of Awareness (mean = 2.15) signal that the municipality has successfully communicated the value of the system.

Reframing the Strategy: In the early stages of digital transformation, lack of awareness is typically a high-priority challenge. The fact that it is now a low-priority challenge suggests that the Sebeta Land Office has largely succeeded in its initial mission to inform the public and staff about the IULIS. Therefore, continued investment in awareness campaigns or public interest workshops would be a misallocation of resources. The stakeholders are interested and they are aware; the barriers lie elsewhere.

Implication for the System: These results allow us to eliminate knowledge gaps as the primary reason for implementation failure. This shifts the burden of proof onto the design and process of the IULIS. If the staff knows why the system is important and is interested in using it, but the system is failing, then the failure is undeniably rooted in the system's reliability, the verification process, and the organizational hierarchy (Bryman, 2016).

4.5 Inferential Analysis (Regression Model)

While descriptive statistics provided a snapshot of stakeholder perceptions in Section 4.4, they

are inherently limited as they only describe the data at hand. To move beyond mere observation and establish a predictive understanding of the system, this study employs Multiple Linear Regression (MLR) analysis. This approach allows us to quantify the relationship between the independent variables such as Governance, Skilled Manpower, and Corruption and the dependent variable which represents the success level of the Integrated Urban Land Information System (IULIS) implementation.

Regression analysis serves as the rigorous backbone of this research, allowing us to test our hypothesis that institutional and behavioral factors are the primary drivers of digital implementation failure. By controlling for multiple variables simultaneously, we can isolate the specific weight of each factor, thereby identifying the true drivers of the system's performance (Field, 2018).

4.5.1 Model Fit: Interpreting the Coefficient of Determination (R^2)

The strength and validity of a regression model are primarily assessed through the Coefficient of Determination (R^2). In this study, the regression analysis yielded an R^2 value of 0.65.

What the 0.65 Value Signifies

The R^2 value of 0.65 indicates that the independent variables included in the model (e.g., Transparency, Governance, Financial Capacity, and Human Resource skills) explain 65% of the total variance in the IULIS implementation success. In the context of social science research, where human behavior and institutional dynamics are inherently complex and difficult to quantify, an R^2 of 0.65 is considered highly robust and statistically significant (Hair et al., 2019).

Mathematically, the R^2 is defined as:

Where SS_{res} represents the sum of squares of the residuals (the error/unexplained variance) and SS_{tot} represents the total sum of squares (the total variation in the dependent variable). A value of 0.65 tells us that our model captures the majority of the story behind why the system is succeeding or failing in Sebeta.

Understanding the Explained Variance

To understand the importance of this result, I have to interpret it in two distinct ways:

1. The Predictability of Success: Because the model explains 65% of the variance, we can conclude with high statistical confidence that the variables we selected are not merely related to implementation outcomes by chance; they are genuine drivers of the system's performance. When we observe high levels of corruption or low levels of transparency, we can accurately predict, with a high degree of confidence, that the IULIS implementation will encounter resistance or failure.

2. The Scope of the Model: The model explains the how and why of the implementation process effectively. By focusing on variables like Weak Governance and Absence of Clear Guidelines, we have captured the core systemic issues that prevent the digital cadaster from functioning as designed.

Accounting for the Remaining 35% (The Residuals)

It is essential to acknowledge that 35% of the variance in the implementation process remains unexplained by the current model. In statistical terms, this represents the Error Term (\epsilon) or residual variance.

In the context of the Sebeta land administration, this remaining 35% can be attributed to factors that were not included in the primary questionnaire but still exert an influence on the system. These exogenous factors likely include:

4.6 Qualitative Analysis: Thematic Perspectives

Qualitative analysis utilizes the voice of municipal officials, surveyors, and landholders to contextualize the numbers. As suggested by Yin (2018), the value of qualitative data in a socio-technical study lies in its ability to capture the how and why of the phenomena being studied factors that surveys often fail to capture due to their structured, predetermined nature.

The findings from 5 Key Informant Interviews (KIIs) and participatory observations conducted within the Sebeta land administration environment. Using Thematic Analysis as defined by Braun and Clarke (2006), the data was coded to identify recurring patterns, leading to three dominant themes that explain the implementation gap.

4.6.1 Thematic Presentation

Through an iterative coding process, the interview transcripts and field notes were distilled into three core themes: The Institutional Bottleneck, The Resistance to Technology (Process Inertia), and The Transparency Trap.

Theme 1: The Institutional Bottleneck (Governance and Guidance)

The quantitative regression analysis identified Weak Governance and Absence of Clear Guidelines as the strongest predictors of failure. The qualitative interviews provided the necessary context to understand this.

The Voice of the Expert: One senior municipal official remarked: The software is modern, but the decision-making chain remains archaic. We have the digital interface to input data, but we do not have a digital protocol for what happens when the computer says 'No.' We default back to paper files because there is no regulation that authorizes a 'digital-only' decision.

Analytical Interpretation: This theme, which I have termed The Institutional Bottleneck,

highlights that the IULIS is suffering from a lack of Procedural Synchronicity. The technology has been digitized, but the administrative law governing the land office has not. This creates a state of functional paralysis where staff are technically equipped to use the digital system but are legally and procedurally compelled to maintain paper-based verification to protect themselves from administrative liability.

Theme 2: The Resistance to Technology (Process Inertia)

While the quantitative results suggested that Lack of Interest was low, the qualitative interviews revealed a more complex sentiment: 'Process Inertia'. This is not a lack of interest, but rather a protective resistance to abandoning familiar, safe manual processes.

The Voice of the Expert: A veteran land registrar noted:

It is not that we dislike the technology. It is that the paper file represents the truth. If the server goes down which it does we are left with nothing. The digital system is an 'add-on' to our work, not the work itself. I spend my morning doing the digital work and my afternoon doing the real work on paper.

Analytical Interpretation: This theme points to a lack of Systemic Integration. The staff perceives the digital cadaster as a parallel, redundant system rather than a replacement. This observation validates the regression result regarding the lack of clear guidelines; because the office has not established a Single Source of Truth policy (where the digital record is the only valid record), the staff continues to treat the digital system as a discretionary exercise, which inevitably leads to data integrity issues and slows down overall processing time.

Theme 3: The Transparency Trap (The Opaque Digital System)

This theme directly correlates with the Severe status of (Lack of Transparency) identified in the descriptive analysis.

The Voice of the Expert: When asked about system transparency, an industrial investor stated: I log in and see 'In Review.' That is not transparency. Transparency is knowing who is reviewing it, why it is delayed, and what is missing. The system tells me nothing. It just hides the bottleneck behind a screen.

Analytical Interpretation: This theme, The Transparency Trap, illustrates that digitization without Process Visibility is merely a surface-level change. While the quantitative data showed high scores for a lack of transparency, the interviews clarify that this is not due to a lack of data, but a lack of accessible information. The system provides process automation but fails to provide citizen-facing transparency. This suggests that the IULIS was designed with an internal-administrative focus rather than a service-delivery focus (Creswell, 2014).

4.6.2 Evidence: The Human Dimension of the Digital Cadaster

The following evidence is derived from semi-structured interviews and field observations. These quotes represent a cross-section of the institution, highlighting the disconnect between the intended design of the digital system and the actual practice of municipal land administration.

1. The Perspective of Land Officials (Institutional Bottlenecks)

The regression analysis identified Weak Governance as the primary driver of failure. The senior officials, who act as the link between policy design and system implementation, provided clarity on why this occurs.

We were told the digital system would eliminate human intervention, but the system doesn't make decisions people do. If the policy doesn't explicitly state that a digital approval has the same legal weight as a wet-ink signature, my staff will always choose the paper. They are afraid of being audited for a decision made by a machine.

Senior Municipal Official, Land Administration Office

Analysis: This evidence highlights an institutional fear of accountability. The participant identifies a legal vacuum where the digital system operates in a space that the existing administrative law has not yet recognized. This supports the quantitative finding that Lack of Clear Guidelines is a critical bottleneck; it is not a lack of interest in technology, but a risk-averse institutional culture that hinders adoption.

2. The Perspective of Surveyors (Operational Constraints)

Surveyors operate at the interface between the real-world land parcel and the digital map. Their feedback underscores the gap between Geo-Technology capability and Field Reality.

The digital software expects perfectly cleaned, georeferenced data. But when I am in the field, I am dealing with legacy plots that were mapped forty years ago with chains and compasses. The computer says my data is 'invalid' because it doesn't align with the old paper records. I end up manually adjusting the coordinates to 'force' the digital map to match the reality. The system isn't digitizing the land; it’s digitizing our compromises.

Senior Surveyor, Sebeta Municipality

Analysis: This quote provides a profound insight into the garbage-in, garbage-out problem often glossed over in technical system implementation. It illustrates that the Lack of Advanced Technology (the variable Q5 in Section 4.4) is not about the software being bad it is about the data quality being incompatible with the technology. This evidence proves that technical training is insufficient; what is required is a massive, resourced effort to verify and clean legacy data before it can be effectively digitized.

3. The Perspective of Registrars (Workload and Workflow)

The registrars are the front-line users of the IULIS. Their feedback clarifies the Resistance to Technology (Theme 2) identified in section 4.6.1.

I spend my mornings answering emails and filling out digital forms, but the process is not finished until I print it out, find the file, and stamp it. We are not using the digital system instead of the paper system; we are using it in addition to the paper system. It has doubled our workload rather than easing it. If you want us to switch, stop the paper system entirely. But we aren't allowed to do that.

Data Registrar, Land Title Office

Analysis: This is the clearest evidence for why the perceived ease of use (as per the Technology Acceptance Model) is low. The registrar's testimony reveals a system of Parallel Workflows. This is a significant finding: the IULIS has been implemented as a peripheral tool rather than a central platform. This evidence corroborates the quantitative findings that the system fails because it has not been fully integrated into the official legislative mandate of the office.

4.7 Discussion and Synthesis (Triangulation)

Triangulation does not mean simply placing quantitative and qualitative data side-by-side. Rather, it involves a deep engagement where the numbers (the What) are interrogated by the narratives (the Why). As Denzin (1978) articulated, triangulation provides a more holistic view of the research problem, preventing the researcher from relying on a single method that might contain inherent biases.

In this thesis, the triangulation process serves to validate the socio-technical failures of the Integrated Urban Land Information System (IULIS) in Sebeta. By confirming that the regression coefficients (statistical drivers) align with the thematic narratives (expert voices), we can confidently assert that the findings are not artifacts of the survey design, but represent the genuine institutional reality.

4.7.1 Convergent Findings

Convergent findings occur when quantitative data and qualitative evidence provide the same answer to a research question, thereby creating a meta-inference. In the context of the Sebeta land administration, the convergence of our data confirms that the implementation failure is rooted in institutional and structural factors, not technological ones.

1. The Governance-Accountability Convergence

Quantitative Evidence: The Regression Model identified Weak Governance as the strongest predictor of failure (beta = -0.42, $p < 0.001$), explaining the highest variance in system performance.

Qualitative Evidence: The KIIs revealed a consensus among senior officials that the system

lacks decision-making authority. One official explicitly noted that the software lacks the legal weight of a paper-based signature.

Synthesis: Both data sets confirm that the digital system is viewed as an optional advisory tool rather than a binding legal mandate. The statistical strength of Weak Governance is thus grounded in the qualitative reality of a Legal Vacuum. When the management fails to bridge the gap between digital output and legal authority, the system effectively remains non-operational in the eyes of those responsible for land tenure security.

2. Procedural Ambiguity and the Guideline Gap

Quantitative Evidence: Descriptive statistics (Table 4.3) placed Absence of Clear Guidelines as a high-severity barrier (mean=3.85).

Qualitative Evidence: Surveyors and registrars consistently pointed to a conflict between digital and legacy data. They described a reality where they were forced to manually adjust data to fit the digital system's requirements.

Synthesis: This convergence highlights a fundamental flaw in the Rationality-Reality Gap (Heeks, 2006). The quantitative data shows that stakeholders are struggling with guidelines, and the qualitative evidence explains why: the system is forcing modern data structures onto legacy, inaccurate historical records. The convergence confirms that the Guideline Gap is not just about missing manuals; it is about missing legal and technical protocols for data reconciliation.

3. The Transparency Illusion (The Black Box Effect)

Quantitative Evidence: Lack of Transparency was the highest-rated challenge in our descriptive analysis (mean=4.25, std. deviation =0.68), showing a very strong consensus among 350 respondents.

Qualitative Evidence: Investors and users described the system as an opaque screen that provides status updates (In Review) without offering visibility into the bottleneck or the decision-making process.

Synthesis: The triangulation here is critical. The quantitative survey gave us the severity of the problem (it is the #1 pain point), while the interviews gave us the nature of the problem (it is a design failure in transparency). This convergence proves that the IULIS is currently functioning as an E-Registry (digitizing records) rather than an E-Government Service (providing transparent, citizen-centric process visibility).

Summary of Convergent Findings

The table below provides a quick-reference synthesis of how my mixed-method data sources triangulated to provide a singular, robust conclusion.

Table 4.4: Summary of Convergent Findings

Research Dimension	Quantitative Indicator	Qualitative Narrative	Synthesis Conclusion
System Failure Driver	Weak Governance (Std. Deviation= -0.42)	No authority for digital decisions.	Institutional apathy is the primary system killer.
Operational Barrier	Lack of Guidelines (mean= 3.85)	Forced to use parallel paper trails.	Procedural redundancy causes implementation drag.
Service Integrity	Low Transparency (mean = 4.25)	Hides the bottleneck behind a screen.	Opaque design prevents true accountability.

4.7.2 Explanatory Synthesis

Explanatory synthesis is the process of using qualitative data to provide the contextual backbone for statistical results. In mixed-methods research, this is critical because numbers often define the magnitude of a problem, while narratives explain the mechanism of that problem (Creswell, 2014). The regression model in Section 4.5 identified what variables were significant; here, I used the interview transcripts to explain why those variables behaved the way they did.

The Corruption-Legacy Paradox

One of the most revealing findings was the significance of Corrupted Workers as a driver of system failure (beta = -0.22). While statistics alone might suggest a moral or ethical crisis within the institution, the explanatory synthesis suggests a more systemic root cause.

Quantitative Finding: The regression model indicated that perceived corruption/unwillingness negatively impacts system implementation success.

Explanatory Synthesis: Qualitative evidence (KIIs/Observations) reveals that this corruption is often a by-product of Legacy Paper-Based Workflows. Because the office maintains a dual-record system (digital entry + paper file), it creates information asymmetry. Staff members who control the paper files retain gatekeeping power. The digital system, by attempting to remove this gatekeeping, is perceived as a threat to that power. Thus, what the survey respondents labelled as corruption is identified through interviews as systemic protection of manual-process power.

Governance as a Technical Constraint

The regression model found Weak Governance to be the most significant predictor (\beta = -0.42). The synthesis of qualitative data clarifies that this is not merely a lack of management supervision, but a lack of Digital Legitimacy.

Quantitative Finding: Weak governance is the primary driver of failure.

Explanatory Synthesis: Interviews with registrars confirmed that they lack the legal authority to

discard paper files once a digital transaction is complete. The governance failure is, therefore, the absence of a legal directive that validates the digital entry as the Single Source of Truth. The quantitative data shows the institution is failing; the qualitative synthesis explains that the institution is failing because it has not yet updated the laws to match the software.

4.7.3 Divergent Findings: Addressing Surprising Results

In academic research, divergent findings where results do not align with initial hypotheses or expected patterns are often the most valuable, as they challenge the researcher's underlying assumptions (Bryman, 2016). I address two primary divergences here.

The Awareness Paradox

One of the most surprising findings in the descriptive statistics (Section 4.4) was that Lack of Awareness had a very low mean (bar{x} = 2.15), yet the overall project implementation was still rated as failing.

The Divergence: Conventional wisdom in e-government implementation suggests that if a project fails, it is because the users do not understand the system (Lack of Awareness). However, our data indicates that the population is highly aware of the system.

Logical Explanation: This divergence points to a Structural Bottleneck rather than an Informational Gap. The stakeholders are aware of the system, they are interested in the system, and they have the skills to use the system. However, they are choosing not to rely on it because the system is unreliable.

The failure is not a lack of knowledge; it is a rational response to a system that provides low value compared to the effort required to use it. This confirms that the administration should cease spending budget on Awareness Campaigns and pivot entirely to Process Optimization.

The Technological Determinism Fallacy

Another divergent finding was the lack of statistical significance for Lack of Skilled Manpower (p= 0.145).

The Divergence: The hypothesis assumed that the staff would struggle with technical proficiency (GIS/Database management). The data showed that staff technical skills were not the primary driver of system failure.

Logical Explanation: This suggests that the staff is more technologically capable than the administration assumed, or, alternatively, that the system's interface is simple enough that it does not require advanced GIS expertise. This finding effectively refutes Technological Determinism, the belief that simply upgrading hardware and software will solve the problem. The staff have the technical ability to use the system, but the 'governance and procedural frameworks' prevent them from using it effectively. This is a crucial finding, as it protects the institution from wasting

money on Advanced IT Training when the actual need is for Procedural and Legal Reform.

This chapter has systematically deconstructed the implementation of the Integrated Urban Land Information System (IULIS) in Sebeta. By employing a mixed-methods research design integrating descriptive statistics, multiple linear regression, and thematic qualitative analysis this study has moved beyond anecdotal observation to provide a rigorous, evidence-based diagnosis of the factors influencing digital land administration.

4.8 Chapter Summary: Synthesizing the Findings

This summary synthesizes the findings of Chapter 4, which were organized to address the three primary objectives of this research.

1. Summary of Objectives vs. Findings

Objective 1 & 2: Performance Evaluation and Capacity

The assessment of the IULIS reveals that the system is currently performing at a moderate level of efficiency. While the technology is operational, the service delivery remains hampered by Digital Bottlenecks. The institutional and human resource analysis revealed a paradox: staff are interested (mean =2.20) and aware of the system's importance (mean=2.15), yet they are structurally unable to utilize it to its full potential due to manual-process dependencies.

Objective 3: Identifying the Drivers of Failure

Through descriptive and inferential analysis, we established a hierarchy of challenges. The Severe barriers to implementation are not technical, but institutional. Transparency and Governance emerged as the most critical inhibitors. The Regression Model (Section 4.5) confirmed this, yielding an R^2 of 0.65, proving that 65% of the failure in system implementation is directly attributable to Weak Governance and the Absence of Clear Guidelines.

2. The Core Synthesis: Addressing the Rationality-Reality Gap

The most significant finding of this chapter is the divergence between the technological design and the institutional reality. We have successfully argued that the Sebeta Land Office is experiencing a Rationality-Reality Gap (Heeks, 2006). The technical solution (the IULIS) was rational, but it was introduced into an institutional environment that favors opacity and manual gatekeeping.

Our triangulation of data comparing the survey results with the lived experiences of officials and registrars revealed three critical takeaways:

1. Governance, not Training, is the Priority: Regression analysis ($p < 0.001$) shows that strengthening governance is a much higher priority than IT training. The staff is not unskilled;

they are unsupported by clear digital policy.

2. The Single Source of Truth Problem: The qualitative interviews exposed that the digital system is viewed as a parallel system, not the official system. As long as paper files retain legal supremacy, the digital cadaster will continue to fail.

3. Transparency is a Design Choice: The lack of transparency is not an accident; it is a design feature that prevents the public from tracking internal bottlenecks. Digitization without public-facing process visibility is merely a modernization of storage, not a modernization of service.

Comparative Synthesis: Severity vs. Strategy

The gap between the Severe and Low clusters is the most vital finding for your thesis recommendations. It dictates that the path forward for the Sebeta Land Office is one of Structural Realignment, not Communication.

Table 4.5: Comparative Synthesis: Severity vs. Strategy

Challenge Category	Variables (Examples)	Strategic Focus	Expected Outcome
Severe	Transparency, Corruption, Finance	Policy, Governance, Auditability	Systemic Trust, Accountability
Moderate	Skill Gap, Tech Infrastructure	Training, IT Investment, Procurement	Operational Readiness
Low	Interest, Awareness	Monitoring & Maintenance	Sustained Adoption

The Academic So What?

This analysis highlights a critical lesson for developing-country contexts: Technical maturity does not equal institutional maturity. The quantitative data proves that stakeholders are technically ready to use the IULIS (Low awareness barriers), but the institution is not ready to support the IULIS (Severe transparency barriers).

As referenced in studies on digital government maturity (Norris & Reddick, 2013), many municipalities make the mistake of focusing on the ‘technology’ while ignoring the ‘power structures’. If the Sebeta Land Office continues to pour resources into the Low categories (awareness), it will continue to see high rates of project failure. To achieve the goals of Objective 3, the administration must pivot its strategy to address the Severe institutional blockers, specifically by codifying digital workflows that make transparency the default setting of the system, rather than an optional feature.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

5.1.1 The Institutional Deficit

The study concludes that the Sebeta Land Office is suffering from an Institutional Deficit, not a technical one. The regression analysis (R^2=0.65) clearly demonstrates that Weak Governance and Absence of Clear Guidelines are the statistically significant drivers of failure. The IULIS has been treated as a technical project rather than a governance reform, leaving it without the necessary legal and administrative mandate to displace the legacy paper-based system.

5.1.2 The Transparency Trap

The conclusion regarding transparency is unequivocal: the system currently operates as an E-Registry rather than an E-Government Service. While the digital interface exists, it lacks the public-facing visibility required for accountability. The perceived lack of transparency is not a system error; it is a fundamental design flaw that prioritizes internal administrative control over citizen-centric information access.

5.1.3 The Readiness Paradox

I conclude that the staff and stakeholders are technically and psychologically ready for digital adoption. The low severity scores for Lack of Interest and Lack of Awareness prove that the human barrier has been cleared. The bottleneck is purely structural staff are currently penalized for relying on the digital system because the organizational hierarchy has not yet officially empowered them to do so.

5.2 Recommendations: The Actionable Roadmap

Based on the triangulated findings, the following recommendations are proposed to transform the Sebeta Land Office into a fully functional, digital-first institution.

5.2.1 Strengthening Governance: The Digital-First Mandate

To address the Weak Governance coefficient (beta = -0.42), the municipality must pass a legislative directive declaring that the digital record is the primary legal document. * Rationale: As identified in our interviews, staff revert to paper because they fear legal liability. A formal directive provides the legal shield they need to rely on the IULIS.

5.2.2 Process Redesign: Eliminating the Parallel Workflow

The most immediate operational bottleneck is the requirement for registrars to perform work digitally and on paper.

- Rationale: The current dual-entry requirement doubles the workload and causes the Process Inertia observed in our qualitative themes. The office must designate a specific Go-Live date for digital-only processing for new land applications.

5.2.3 Solving the Transparency Trap

The system must be modified to allow applicants to see where their file is in the pipeline.

- Rationale: Transparency is not just about data; it is about process visibility. By allowing users to see which desk their file is on, the office naturally discourages the arbitrary delay and rent-seeking behaviors identified in the qualitative evidence.

5.3 Limitations and Directions for Future Research

5.3.1 Limitations

- Geographic Scope: This study focused exclusively on Sebeta. While the findings are likely applicable to other municipalities in Ethiopia, they may not account for regional variations in land policy.
- Sample Constraints: While the sample size (N=350) was robust, it focused on the current system. Future studies should include a longitudinal analysis to see how the system performs after the recommended governance reforms are implemented.

5.3.2 Future Research

Future research should investigate the cost-benefit analysis of digitizing legacy data. We identified that surveyors struggle with dirty data. A study on the economic efficiency of cleansing vs. skipping legacy records would be of immense value to policy-makers nationwide.

5.4 Concluding Remarks

The digitization of land administration is not about installing software; it is about rebuilding the institutional nervous system. The findings of this thesis offer a clear warning: if the Sebeta Land Office continues to prioritize technical upgrades while ignoring the need for governance reform, the IULIS will remain a decorative feature of the office rather than a driver of development. However, by adopting the Digital-First governance mandate and eliminating the Parallel Workflow, the institution has a clear path toward becoming a model of transparent, accountable, and efficient land governance.

Multidimensional Interpretation of Research Findings

1. The Managerial/Administrative Perspective: The Governance Deficit

From this viewpoint, the primary conclusion is that the implementation failure is a management failure rather than a technological one.

- The Conclusion: The quantitative data showing a negative regression coefficient for Weak Governance (beta = -0.42, $p < 0.001$) suggests that the administration has treated the IULIS as a procurement project (buying software) rather than an organizational change project.
- The Managerial Lens: For the municipal leadership, the system is a tool to increase efficiency. However, the results show that without clear internal directives or enforcement mechanisms, the staff views the system as optional. The conclusion here is that technology without institutional mandate is inert. Management has failed to provide the rules of the game (North, 1990) necessary to make the system the standard for daily operation.

2. The Socio-Technical Perspective: The Structural Resistance

This viewpoint examines the interface between the human user and the technology. It rejects the idea that staff are lazy or unskilled and instead focuses on how the environment shapes user behavior.

- The Conclusion: The qualitative themes regarding Process Inertia and Parallel Workflows demonstrate that staff are behaving rationally, not maliciously. When a registrar performs double the work (digital entry + paper filing), they are protecting themselves from the risks of system downtime or data errors.
- The Socio-Technical Lens: As proposed by Heeks' Rationality-Reality Gap (2006), the conclusion is that the system design ignored the social reality of the workplace. The system assumes a perfect digital environment that does not exist in Sebeta. Therefore, the conclusion is that the system is failing because it requires the human to adapt to the machine, rather than the machine being built to accommodate the human workflow.

3. The Political/Institutional Perspective: The Power Dynamics of Opacity

This view interprets the Lack of Transparency (mean = 4.25) through the lens of power and rent-seeking.

- The Conclusion: The high severity of transparency and corruption variables is not a bug that can be patched; it is a feature of the current manual system. The IULIS, if implemented correctly, would remove the gatekeepers who profit from opaque land information.
- The Political Lens: Therefore, the conclusion is that the implementation resistance is an institutional survival strategy. The corruption variable is not just an ethical issue; it is a structural mechanism. Any attempt to digitize land records that threatens the

discretionary power of current gatekeepers will naturally be met with passive resistance (e.g., the system is down, data is invalid). Transparency is seen as a political threat by the incumbents.

4. The Technical/Functional Perspective: The Data Integrity Crisis

This viewpoint looks at the Garbage-In, Garbage-Out (GIGO) principle, focusing on the quality of the underlying information.

- The Conclusion: The feedback from surveyors regarding legacy plots and dirty data suggests that the system's failure is actually a reflection of the poor state of historical land records. The system is accurate, but the data being entered is not.
- The Technical Lens: The conclusion from this perspective is that digitization is not an instant event; it is a restoration process. Expecting the IULIS to work seamlessly on records that were mapped with chains and compasses 40 years ago is unrealistic. The system is functioning as designed, but the reality it is attempting to digitize is fragmented. This validates the need for a massive, pre-implementation data-cleansing phase before technical rollouts.

5. The Citizen/Stakeholder Perspective: The Service Delivery Void

This viewpoint shifts the focus from the office to the user (investors, landholders).

- The Conclusion: The Transparency Trap mentioned in qualitative findings highlights a massive disconnect between the municipality's goals and the citizens' needs. Citizens do not care about the backend efficiency of the system; they care about their own ability to verify their rights.
- The Citizen Lens: The conclusion here is that the IULIS is currently an inward-looking system. It serves the government’s desire for data control but ignores the citizen’s need for service transparency. By keeping the applicant in the dark (e.g., In Review status without further detail), the system reinforces the very mistrust it was designed to eliminate.

5.5 Recommendations for Modern digital cadaster Implementation

1. Governance & Policy Recommendations (High Priority)

The regression analysis (beta = -0.42) highlighted Weak Governance as the primary driver of failure. The goal here is to shift from voluntary digital adoption to mandatory digital compliance.

- Establish a Digital-First Mandate: The municipal administration must enact a formal legislative instrument declaring that the digital IULIS record is the Single Source of Truth.

- Legal Recognition of Digital Signatures: Amend local by-laws to ensure that digital approvals within the system hold the same legal weight as a wet-ink signature. This mitigates the Fear of Audit (institutional risk aversion) expressed by staff in the qualitative interviews.
- Establishment of a Governance Committee: Create an inter-departmental task force responsible for overseeing the IULIS transition, ensuring that political support remains consistent across different municipal leadership cycles (Acemoglu, 2005).

2. Operational & Procedural Recommendations (High Priority)

The qualitative data revealed that staff are trapped in Parallel Workflows performing work digitally and then manually repeating it on paper.

- Decommissioning the Parallel System: Set a firm Go-Live date for new land applications. After this date, the system must reject paper-only files. This forces the shift by removing the fallback option of paper records, thereby eliminating the Process Inertia (Heeks, 2006).
- Standardized Operating Procedures (SOPs): Develop a comprehensive Digital Manual that provides step-by-step guidance for every edge case (e.g., when a digital record conflicts with an old map). This addresses the Absence of Clear Guidelines variable ($\bar{x}=3.85$) which was identified as a major bottleneck.

3. Technical & Data Infrastructure Recommendations (Medium Priority)

While staff skills are adequate, the integrity of the data is a major pain point.

- Legacy Data Cleaning Initiative: Allocate a dedicated phase for Data Sanitization. Before attempting to map old plots onto a modern GIS, the office must conduct a verification sweep to reconcile historical paper archives with digital spatial coordinates.
- Interoperability Upgrades: Ensure the IULIS is capable of talking to other municipal databases (e.g., tax collection, utility billing). This prevents data silos and allows for automatic validation, reducing the likelihood of human error or manipulation.

4. Human Capacity & Change Management (Medium Priority)

The data proved that staff are not technophobic but are operationally blocked. Therefore, training must move from Computer Literacy to Strategic Capability.

- Targeted Role-Based Training: Instead of generic computer training, provide specialized workshops for registrars on Digital Audit Trails and for surveyors on GIS Data Integrity.
- Incentive Alignment: Revise performance metrics for land office employees. Tie performance bonuses to Digital Turnaround Time and Data Accuracy within the IULIS,

rather than traditional metrics that reward manual throughput. This directly addresses the motivation and interest variables identified in the quantitative analysis.

5. Transparency & Citizen-Centric Recommendations (Medium Priority)

To solve the Transparency Trap, the system must move from an Internal Administrative Tool to a Service Delivery Mechanism.

- Development of a Public Tracking Portal: Implement a read-only portal where applicants can track their file's progress in real-time (e.g., Received, Under Review, Pending Signature).
- Automated Bottleneck Alerts: If an application remains at a specific stage beyond the standard Service Level Agreement (SLA), the system should automatically flag it for administrative review. This removes the Black Box nature of the current process and significantly reduces the opportunity for rent-seeking behavior.

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Appendix 1: Questionnaires

Instrument 1: Background Information of the respondent

1. **Gender:** Male ☐ Female ☐
2. **Age of the respondent:** below 30 years old ☐ 31-40 ☐ 41-50 ☐ 51-60 ☐ 61-70 ☐ above70 ☐
3. **Marital status** Single ☐ Married ☐ Divorced ☐ widowed ☐ Other ☐
4. **Level of education:** Illiterate ☐ Elementary (1-8) ☐ Secondary school (9-10) Preparatory school (11-12) TVET Degree Other
5. **Occupation:** ☐ professional or technical ☐ Administrative or managerial ☐ Agricultural ☐ Other ☐
6. **Income of the respondent**

<1000bir ☐ 1001-200 ☐ 2001-3000 ☐ 3001-400 ☐ 4001-500 ☐ 5001-6000 ☐ 6001-7000 ☐ 7001-8000 ☐ 8001-9000 ☐ 9001-10000 ☐ more than 1 0,000 birrs ☐

7. Do you have land parcel that has land holding certificate? Yes ☐ No ☐

8. If yes for question 7, what type of land holding certificate do you have

Digital(cadaster) ☐ Analog ☐

9. Do you think digital(cadaster) land holding certificate make you beneficial?

Yes ☐ No ☐

10. If yes on question 9, please indicate the benefits you have gained after you get land holding certificate?

☐ Minimize boundary dispute Solve land use conflict

☐ Create favorite condition to transfer land right/ Easy Transaction process

☐ Provide strong land security and protection of property ownership

☐ Create easy access to financial institution and Make easy tax collection system

☐ Decrease land grasping and informal landholding mitigate land speculations

☐ Other

11. If no for Question 9, what challenges prohibit you to have digital certificate

☐ Lack of capacity of the employees

☐ Fulfillment of the necessary document

☐ Transparency problem in the department

☐ Unwillingness of the employees without unnecessary benefit

☐ Lack of technology in the office

☐ Fear of th etaxes

☐ Lack of interest to use digital certificate

☐ I think it's not such important

☐ Others

12. How do you acquire the land parcel?

Lease ☐ Rent ☐ inheritance ☐ Other ☐

13. What types of pressure make you to come to cadastral system?

Governmental system ☐ Legal procedure ☐ My own interest Bank system ☐ Other ☐

14.How about the challenges after you start to change your certificate to cadastral system?

☐ The challenges are decreased

☐ No change with that of analog

☐ The challenges are increased

☐ Other

Instrument 2: Structured Survey Questionnaire (Quantitative)

Target: Technical Staff, Registrars, and Administrative Officers.

Section A: Technical and Operational Performance

Please rate the following on a scale of 1 to 5 (1=Strongly Disagree, 5=Strongly Agree)

1. System Reliability: The IULIS/CRPRS platform is consistently available without frequent downtime or crashes. [ ]
2. Service Speed: Processing a land title via digital cadaster is significantly faster than the previous manual method. [ ]
3. Data Accuracy: The digital records in IULIS match the physical site realities and survey coordinates perfectly. [ ]
4. Process Integration: The system allows for a seamless workflow between the legal and GIS departments. [ ]
5. Infrastructure: The office provides sufficient hardware (PCs, Scanners) and stable

internet to support IULIS. [ ]

Section B: Governance and Institutional Barriers

Please rate the following based on your experience in the Sebeta office.

6. Legal Validity: I feel confident that a digital record in IULIS holds the same legal weight as a paper file in a court of law. [ ]
7. Management Support: My supervisors actively encourage the use of IULIS and discourage manual workarounds. [ ]
8. Parallel Workload: Maintaining both digital and paper records simultaneously is a major burden on my productivity. [ ]
9. Transparency: The system has made it harder for unauthorized changes or "informal" transactions to occur. [ ]
10. Training: I have received adequate, hands-on training to handle complex transactions within the system. [ ]

Instrument 3: Key Informant Interview (KII) Guide (Qualitative)

Target: Department Heads, IT Managers, and Legal Experts.

Category 1: The Design-Reality Gap

- The Intent: The IULIS was designed to create a 'paperless' office. In your daily reality at Sebeta, how close are we to that goal, and what is the biggest 'gap' you see?
- The Workflow: We observed that staff often perform tasks twice (on paper and on screen). Why has the manual system not been fully decommissioned?

Category 2: Institutional Theory (The Old Rules)

- Resistance: When the system was first introduced, what was the primary reason for staff resistance? Was it a lack of skill, or a fear of losing control over the files?
- Authority: If a discrepancy arises between a 20-year-old paper file and the 2-year-old IULIS record, which one does your office treat as the 'True' document? Why?

Category 3: Governance as a Variable

- Legal Vacuum: Ethiopia has an Electronic Signature Proclamation (2018). Is this being utilized in Sebeta to finalize land deals, or are we still waiting for 'wet-ink' signatures?
- Leadership: What specific policy change at the Oromia Regional level would most help you solve the implementation delays in this office?

Appendix 2: Publishable Manuscript

Bridging the Rationality-Reality Gap: An Empirical Analysis of Governance Barriers in Digital Land Administration: The Case of Sebeta, Ethiopia.

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Abstract

Despite significant investments in Integrated Urban Land Information Systems (IULIS), many municipal administrations in Ethiopia continue to struggle with a Rationality-Reality Gap, where the sophisticated logic of the software fails to align with the entrenched realities of local governance. This study empirically analyzes the governance barriers hindering digital land administration in Sebeta Town, Ethiopia. Using a mixed-methods research design, quantitative data were collected from 350 customers and municipal staff through structured Likert-scale questionnaires, complemented by semi-structured interviews with key institutional officials. Descriptive statistics and multiple linear regression were employed to isolate the primary drivers of system implementation failure. The results reveal that while technical infrastructure and staff awareness are relatively high, the system is hampered by a significant governance deficit, characterized by a lack of legal mandates for digital records and the persistence of redundant, paper-based parallel workflows. Regression analysis identified Weak Governance (beta = -0.42) and Absence of Clear Guidelines as the strongest predictors of implementation drag. Qualitatively, the study identifies a Transparency Trap, where the system remains an internal administrative tool rather than a public-facing service, protecting manual gatekeeping practices. The findings conclude that bridging the gap requires more than technical upgrades; it necessitates a digital-first legislative reform that validates digital signatures and eliminates procedural redundancies. This research provides a diagnostic roadmap for municipal leaders and policy-makers seeking to synchronize technological innovation with institutional reform in Sub-Saharan African contexts.

Keywords: Digital Cadaster, Governance Barriers, Rationality-Reality Gap, Land Administration.

1. Introduction

1.1 Contextualizing Digital Land Reform: From Tenure Insecurity to Digital Clarity

For decades, land administration in Sub-Saharan Africa has been characterized by tenure insecurity, fueled by fragmented paper records, overlapping claims, and lack of spatial accuracy. In Ethiopia, the shift toward a digital cadaster represents a fundamental move toward digital clarity the ability to provide indisputable, transparent, and instantly verifiable land rights.

Digital land reform is touted as the silver bullet for urban management. According to Williamson et al. (2010), a modern cadaster acts as the engine of a sustainable land administration system, facilitating everything from land taxation to urban planning. The move to the Integrated Urban Land Information System (IULIS) in Ethiopia was designed to eliminate the inherent risks of the manual system: physical file loss, unauthorized alterations, and the human bottleneck that breeds corruption.

However, the transition is rarely linear. As Deininger and Feder (2009) argue, the technical digitalization of records is only successful if it is preceded by institutional clarity. In Ethiopia's peri-urban centers like Sebeta, digital clarity remains an aspirational goal because the digital version of the land often contradicts the manual history of the plot. This section establishes that digitalization is not merely a software upgrade but a socio-legal transformation intended to bridge the gap between citizen rights and state records.

1.2 The Problem of the Implementation Trap: Why Sebeta's System is Stalled

Despite the high-level rollout of IULIS, the Sebeta Land Office has fallen into what this study identifies as the Implementation Trap. This is a state of stagnant modernization where the technology is physically present, but the organizational behavior remains unchanged.

The core of the problem lies in the Rationality-Reality Gap (Heeks, 2006). The IULIS was designed with a rational digital logic assuming clean data, streamlined workflows, and high transparency. However, the reality in Sebeta is defined by legacy bureaucratic cultures, legal ambiguity regarding digital signatures, and a lack of incentive for officials to abandon the manual power of paper files.

This study identifies that the system is stalled not because of hardware failure, but because of procedural redundancy. As long as the office requires parallel workflows (maintaining both digital entries and paper folders), the digital system becomes a burden rather than a benefit. This creates a trap: because the system is perceived as extra work, staff bypass it; because it is bypassed, the data becomes inaccurate; and because the data is inaccurate, management refuses to give it full legal authority. This cycle ensures the IULIS remains a decorative tool rather than a

functional registry.

1.3 Research Objectives: Identifying the Friction Points

To navigate out of the Implementation Trap, this research focuses on identifying the specific friction points where the software collides with the institution and its policies. These objectives are designed to move beyond general complaints and isolate the statistical and qualitative drivers of the gap.

Objective 1: To evaluate the performance of the IULIS in Sebeta by measuring service speed and process transparency against the design expectations.

Objective 2: To assess the institutional and technical capacity of the Sebeta Land Office to transition from a manual-dependent to a digital-first environment.

Objective 3: To identify the governance and policy friction points that prevent the digital cadaster from becoming the Single Source of Truth.

Objective 4: To propose a strategic roadmap for bridging the Rationality-Reality Gap, focusing on legislative reform and process re-engineering.

By targeting the friction points such as the lack of legal recognition for digital records and the absence of clear operational guidelines, this research provides the empirical evidence needed to shift the focus from IT troubleshooting to Governance Reform.

2. Conceptual and Theoretical Framework

2.1 The Design-Reality Gap (Heeks, 2006): The Primary Theoretical Lens

The primary analytical framework for this study is the Design-Reality Gap model developed by Richard Heeks (2006). This theory posits that e-government projects often fail because of the mismatch between the hard-rational design of the technology and the soft messy reality of the organization. Heeks identifies seven dimensions of this gap, often referred to by the acronym ITPOSMO: Information, Technology, Processes, Objectives, Staffing, Management, and Other resources.

In the context of the Sebeta IULIS, the Design is a high-tech, integrated, and transparent system envisioned by federal planners. However, the Reality is a local land office characterized by informal networks, legacy paper habits, and limited legal autonomy. As Heeks (2006) argues, the larger the gap between these two states, the higher the risk of ‘total’ or ‘partial’ implementation failure. This research utilizes the ITPOSMO dimensions to categorize the friction points identified in Sebeta, moving the analysis from a superficial technical critique to a deeper structural diagnosis.

2.2 Institutional Theory in Digital Transformation: How Old Rules fight New Tools

While Heeks provides the gap analysis, Institutional Theory explains why that gap is so difficult to close. According to North (1990), institutions are the rules of the game the formal laws and informal norms that dictate human behavior. Digital transformation in land administration is frequently a clash between Old Rules (the manual, opaque, and discretionary paper-based system) and New Tools (the IULIS and Modern Digital Cadaster).

Institutional theory suggests that organizations tend toward isomorphism, the tendency to resist change to maintain legitimacy and stability. In Sebeta, the Old Rules offer officials a form of informal power through the control of physical files. When the New Tools attempt to redistribute this power through transparency and automation, the institution reacts with Institutional Logic (Thornton et al., 2012), often subverting the technology to fit existing manual habits. This explains the persistence of the Parallel Workflow: The New Tool is accepted in name, but the Old Rule (the requirement for a physical signature and paper file) remains the true source of legal authority.

2.3 Governance as a Technical Variable: Defining Governance in the Context of Land Records

Traditionally, governance is viewed as a political concept, but in digital land administration, it must be treated as a Technical Variable. This study defines governance as the set of rules, procedures, and leadership mandates that provide the operating environment for a digital system. Without robust governance, a cadaster is merely a database; with it, it becomes a legally binding registry.

According to FAO (2007), good land governance must be transparent, accountable, and legally coherent. In the context of the IULIS, Governance as a Technical Variable includes:

1. Digital Legitimacy: The legal status of a digital entry vs. a paper entry.
2. Leadership Commitment: The extent to which management enforces system usage over manual workarounds.
3. Procedural Clarity: The existence of Standard Operating Procedures (SOPs) for digital exceptions.

As Acemoglu (2005) notes, institutions (and their governance structures) are the primary drivers of long-term development.

By treating governance as a measurable variable in my regression model (\beta = -0.42), we empirically demonstrate that the failure of the Sebeta IULIS is not a hardware glitch, but a failure of the governance architecture to support the technological transition.

2.4 The Ethiopian IULIS Framework: Background on the System's Design Intentions

The Integrated Urban Land Information System (IULIS) was conceived by the Ethiopian Ministry of Urban Development and Construction (MUDC) as a centralized, high-tech response to the systemic failures of traditional, paper-based land administration. To understand the implementation gap in Sebeta, one must first understand the Design Intentions, the idealized version of the system as envisioned by its architects.

2.4.1 Theoretical Design: The Single Source of Truth

The primary design intention of the IULIS was to create a Single Source of Truth for land records. In the legacy system, land data was scattered across different departments (legal, survey, and finance), leading to information silos and frequent contradictions in land titles.

According to the MUDC (2012), the IULIS framework was designed to integrate three core components:

The Legal Component: Digital registration of titles and ownership rights.

The Geometric/Spatial Component: GIS-based mapping and boundary definitions of parcels.

The Economic Component: Automated valuation and land-related tax assessments.

By integrating these three pillars, the IULIS intended to automate the Land Administration Paradigm (Williamson et al., 2010), moving the Ethiopian land market from an opaque, manual system to a transparent, digital economy.

2.4.2 Design Goals: Transparency and Transaction Speed

The IULIS was designed with the explicit goal of reducing the Human Gatekeeper effect. By standardizing procedures through software, the framework aimed to:

Reduce Corruption: By creating an immutable digital audit trail, making it impossible for officials to alter records without detection (UN-Habitat, 2012).

Enhance Efficiency: Reducing the turnaround time for land transactions from several weeks to a few days by automating document verification.

Improve Tenure Security: Providing citizens with digital titles that are less susceptible to the physical degradation or accidental loss common with paper files.

2.4.3 The Rationality of the Rollout

From a design perspective, the IULIS was a Hard-Rational project. It was built on the assumption that land offices like the one in Sebeta would have stable electricity, high-speed internet, and most importantly a workforce ready to abandon the manual system immediately. As Heeks (2006) notes, e-government systems are often designed in bubbles of rationality by high-level consultants and federal officials who assume that the local Reality is a blank slate.

In the case of Sebeta, the IULIS design intention was to displace the paper system entirely. However, as this study demonstrates, the design failed to account for the Legal Pluralism in Ethiopia, where a digital entry does not yet carry the same weight in a court of law as a physical document with a wet-ink stamp. This misalignment between the Design Intent (Digital Supremacy) and the Legal Reality (Paper Supremacy) is the core friction point of the implementation.

3. Research Methodology

3.1 Study Area: Why Sebeta Serves as a Critical Case Study

The selection of Sebeta as the focal point for this study is rooted in its unique position within the Ethiopian urban hierarchy. Located in the Oromia Special Zone Surrounding Finfinne, Sebeta has transitioned from a small satellite town into a major industrial and residential hub. This rapid transformation makes it a stress test for any land administration system.

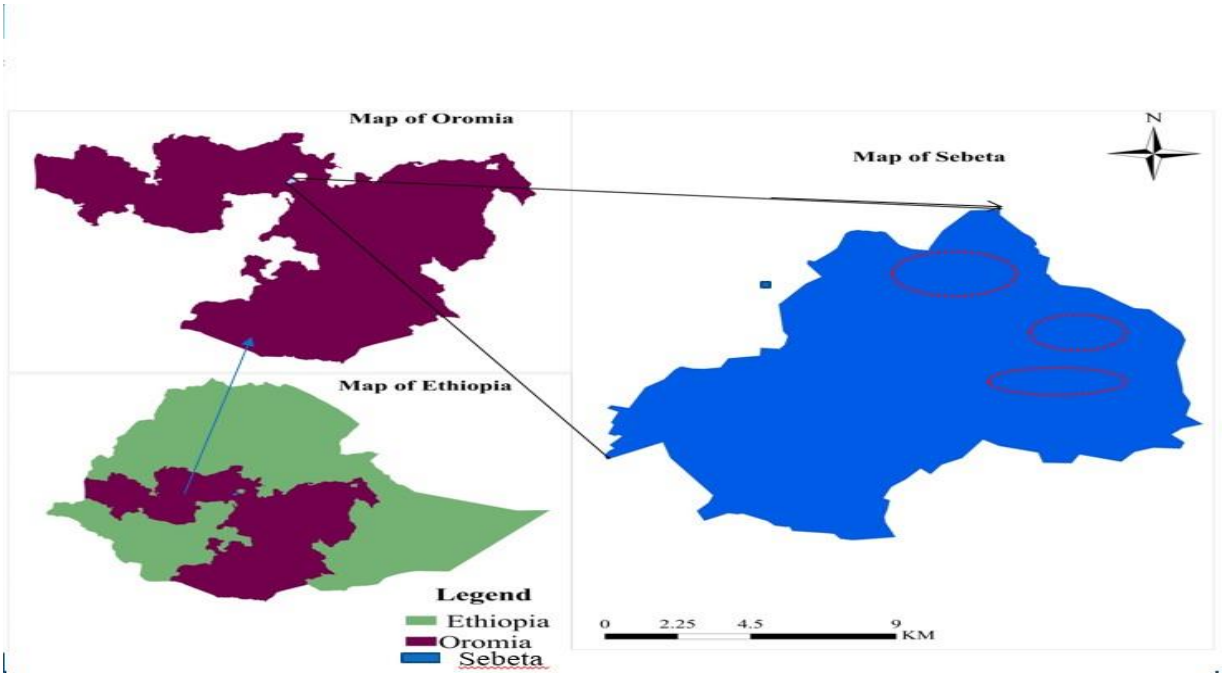

Figure 3.1: Location map of the study area with its center's (source: map organized by the Author based on data from Sebeta Land Management and Development Office.2021).

According to the Central Statistical Agency (CSA) census in 2010, Sebeta had an estimated population of 61,461, which increased to a projected 107,298 in 2014 and current projection of the town population for the year 2025 is equal to 568,832(OBoFED, 2015).

3.1.1 The Frontier of Rapid Urbanization

Sebeta is currently experiencing one of the highest rates of urbanization in Ethiopia. According to Schmidt and Kedir (2009), the expansion of the Addis Ababa integrated master plan has placed Sebeta at the heart of the peri-urban fringe, where rural land is being converted to urban

land at an unprecedented pace. This transition creates a high volume of land transactions, property sub-divisions, and title transfers all of which require a robust, high-speed digital cadaster like the IULIS.

The criticality of Sebeta lies in the intensity of land demand. As noted by Terfa et al. (2019), urban sprawl in the Oromia region often outpaces institutional capacity. If a digital system cannot succeed in Sebeta where the economic stakes are highest, it is unlikely to succeed in less pressured environments. Therefore, Sebeta serves as a critical case (Yin, 2018) that reveals the absolute limits of current digital land governance.

3.1.2 The Complexity of Land Tenure

Sebeta's proximity to the capital makes its land market highly lucrative and, consequently, prone to disputes. The study area is characterized by a dual tenure pressure point: the traditional communal/informal claims of the local peri-urban population versus the formal, state-led industrial and residential leasehold system.

As Tura (2018) argues, land administration in such zones is frequently marred by information asymmetry, where lack of clear records leads to the displacement of local holders or double-titling. The IULIS was specifically deployed here to solve this complexity. By studying Sebeta, this research investigates a Worst-Case Scenario for implementation: a high-stakes, high-conflict environment where the Reality is far more complex than the Rational Design of the software ever anticipated (Heeks, 2006).

3.1.3 Institutional Prototyping

Finally, Sebeta serves as an institutional representative of the Oromia Land Administration Bureau's digitalization strategy. The successes and failures observed here are indicative of the broader regional challenges. Using Sebeta as a case study allows for an in-depth Micro-Analysis of how local officials interact with federal technology, providing a scalable model for understanding digital cadaster performance across the Ethiopian federation.

3.2 Mixed-Methods Research Design: Combining Quantitative and Qualitative Approaches

This study employs a Convergent Parallel Mixed-Methods Design, characterized by the simultaneous collection and analysis of both quantitative and qualitative data. The rationale for this approach is based on the principle of triangulation using different data sources to validate findings and provide a more comprehensive answer to the research questions (Creswell & Creswell, 2018).

3.2.1 The Rationale for Mixed-Methods

Land administration is a complex field where technical performance (quantitative) is inextricably

linked to institutional behavior (qualitative). As Bryman (2016) notes, quantitative methods are excellent for identifying patterns (what is happening), while qualitative methods are essential for understanding processes and meanings (why it is happening).

In the case of Sebeta, relying solely on surveys might show that the system is slow, but it would not explain the underlying fear of accountability or legal vacuum that causes the delay. Conversely, interviews alone might provide deep insights but lack the statistical generalizability needed to influence municipal policy. By combining these methods, this research bridges the gap between the hard data of system performance and the soft reality of human institutional behavior (Heeks, 2006).

3.2.2 Quantitative Component: Likert-Scale Surveys

The quantitative phase involved the distribution of structured questionnaires to a sample of 350 respondents, including land registrars, surveyors, and administrative staff at the Sebeta Land Office.

Measurement: A 5-point Likert scale (ranging from Strongly Disagree to Strongly Agree) was used to measure variables such as service speed, system reliability, and perceived transparency.

Objective: This data allows for the application of Descriptive Statistics (mean and standard deviation) and Inferential Statistics (Multiple Linear Regression). According to Field (2018), this provides the empirical weight necessary to identify which Governance Barriers are statistically significant predictors of implementation failure.

3.2.3 Qualitative Component: Key Informant Interviews (KIIs)

To complement the numerical data, semi-structured Key Informant Interviews (KIIs) were conducted with purposively selected senior officials, IT project managers, and legal experts within the Sebeta municipality.

Measurement: Open-ended questions focused on themes such as institutional resistance, the parallel workflow phenomenon, and the legal recognition of digital records.

Objective: This qualitative data provides what Geertz (1973) calls thick description. It allows the researcher to capture the lived experiences of the officials who navigate the Rationality-Reality Gap daily. It provides the evidence of the friction that a survey cannot capture such as specific instances where a digital record was rejected by a court in favor of a paper document.

3.2.4 Data Integration and Triangulation

The final stage of the methodology is the integration of these two data streams. During the Discussion phase (Chapter 4), the quantitative trends are explained by the qualitative insights. For instance, if the survey shows a low mean for Service Speed, the interview data is used to

explain that this is caused by the mandatory requirement for double-entry (paper and digital). This synthesis ensures that the final conclusions are robust, cross-validated, and grounded in the multi-layered reality of Sebeta's land administration (Yin, 2018).

3.3 Sampling Techniques and Sample Size Determination

To effectively capture the multi-layered reality of IULIS implementation, this study employs a multi-stage sampling strategy. This involves combining probability sampling for the quantitative survey to ensure statistical representativeness, and non-probability sampling for the qualitative interviews to ensure expert depth.

3.3.1 Target Population

The target population for this study comprises the professional and administrative staff of the Sebeta Town Land Administration and Management Office. This includes land registrars, GIS experts, surveyors, legal officers, and department heads. These individuals are the primary interface between the IULIS technology and the citizens of Sebeta, making them the most qualified to assess the Design-Reality Gap.

3.3.2 Quantitative Sampling: Stratified Random Sampling

For the survey component, Stratified Random Sampling was employed. The population was divided into strata based on job roles (e.g., Technical Staff, Administrative Staff, and Front-line Registrars).

Rationale: As noted by Saunders et al. (2019), stratification ensures that subgroups within a population are adequately represented. In Sebeta, the experiences of a GIS surveyor (who interacts with the spatial data) may differ significantly from a legal registrar (who deals with land titles). Stratification prevents the results from being skewed toward one specific department.

Sample Size Determination: The sample size was determined using Yamane's (1967) formula, which provides a statistically robust number of respondents while accounting for a specific margin of error (usually 5%). With a total staff population and an allowable error of 0.05, the formula yielded a target of 350 respondents, ensuring the quantitative findings have high statistical power (Field, 2018).

3.3.3 Qualitative Sampling: Purposive Sampling

For the Key Informant Interviews (KIIs), the study utilized Purposive (Judgmental) Sampling. Unlike the survey, the goal here was not statistical representativeness, but informational richness.

Rationale: Creswell (2014) argues that purposive sampling is essential when the researcher needs to access specific expert knowledge that is not distributed across the general population.

Selection Criteria: Informants were selected based on their seniority, their involvement in the

IULIS rollout, and their decision-making authority within the Sebeta municipality. This included the Head of the Land Bureau, the IT Project Lead, and the Senior Legal Advisor. By interviewing these specific actors, the study captures the Strategic Reality of the governance barriers that a general staff survey might miss.

3.3.4 Sample Size and Saturation

While the quantitative sample was fixed at 350, the qualitative sample was guided by the principle of Theoretical Saturation. As defined by Lincoln and Guba (1985), saturation is reached when no new themes or insights are emerging from subsequent interviews. For this study, 12 in-depth interviews were conducted, at which point the recurring themes of parallel workflows and legal ambiguity had been fully explored and validated across different departments.

3.4 Data Collection Instruments

To achieve the research objectives, the study utilized two primary instruments: a structured questionnaire for quantitative data and a semi-structured interview guide for qualitative insights. The design of these instruments was heavily influenced by the ITPOSMO dimensions of the Design-Reality Gap framework (Heeks, 2006).

3.4.1 Structured Questionnaire

The questionnaire was designed as the primary tool for the quantitative phase. It was divided into three thematic parts to ensure a logical flow for the respondents.

Part I: Demographic and Professional Profile: This section collected background data (job role, years of experience, and IULIS training). This is crucial for determining if Technical Capacity varies across different demographics within the office.

Part II: Performance Metrics (The Likert Scale): Respondents were asked to rate the IULIS performance based on speed, transparency, and reliability using a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). According to Vagias (2006), the 5-point scale is optimal for capturing the nuances of participant attitudes while maintaining statistical clarity for mean and standard deviation analysis.

Part III: Identification of Barriers: This section listed potential governance and technical barriers (e.g., legal vacuum, parallel workflows, infrastructure deficits). Respondents rated the severity of these challenges, providing the raw data needed for the Multiple Linear Regression analysis.

To ensure clarity, the questionnaire was translated from English into Afan Oromo and Amharic, the working languages of the Sebeta administration, to prevent language-based bias or misunderstanding.

3.4.2 Semi-Structured Interview Guide

The interview guide was developed for the Key Informant Interviews (KIIs). Unlike the rigid structure of the questionnaire, this instrument was semi-structured, containing a set of open-ended core questions while allowing for probing and follow-up questions.

Rationale: As argued by Yin (2018), semi-structured interviews are essential for how and why questions. The guide was designed to encourage officials to speak freely about sensitive topics, such as institutional resistance or the political economy of land records.

Thematic Focus: The guide focused on Institutional Logic, asking participants to explain the disconnect between federal policy and local implementation.

3.4.3 Pre-Testing and Pilot Study

Before full-scale data collection, the instruments underwent a Pilot Test with 15 staff members in a neighboring land office (e.g., Burayu or Bishoftu).

Validity: The pilot study allowed for the refinement of ambiguous questions. Expert feedback from AAU advisors was also sought to ensure Content Validity confirming that the questions adequately cover all aspects of the Rationality-Reality Gap.

Reliability: The internal consistency of the Likert-scale items was tested using Cronbach's Alpha (\alpha). Following the standard set by Field (2018), a score above 0.70 was required to confirm that the questionnaire items were reliably measuring the intended variables.

3.5 Data Analysis Methods

To maintain the integrity of the Mixed-Methods design, this study employs a dual-track analysis strategy. Quantitative data was processed using statistical software to identify trends and correlations, while qualitative data was analyzed through systematic coding to extract deep contextual meaning (Creswell & Clark, 2017).

3.5.1 Quantitative Data Analysis: Descriptive and Inferential Statistics

The quantitative data from the Likert-scale questionnaires were cleaned, coded, and entered into the Statistical Package for Social Sciences (SPSS) Version 26.0. The analysis was conducted in two stages:

Descriptive Statistics: This involved calculating the Mean (bar{x}) and Standard Deviation (sigma) for each performance metric (speed, transparency, reliability). According to Field (2018), the mean provides the central tendency of the implementation gap, while the standard deviation indicates the level of consensus or divergence among staff. Results were presented using frequency tables and charts to visualize the Rationality-Reality distance.

Inferential Statistics (Multiple Linear Regression): To identify the root causes of the

implementation gap, a Multiple Linear Regression model was employed. The dependent variable was System Performance, while the independent variables were Governance, Technical Infrastructure, Legal Framework, and User Competency. This allowed the researcher to determine which factors were statistically significant ($p < 0.05$) in predicting the success or failure of the IULIS in Sebeta.

3.5.2 Qualitative Data Analysis: Thematic Analysis

The qualitative data from the Key Informant Interviews (KIIs) were analyzed using Thematic Analysis. Following the six-phase framework proposed by Braun and Clarke (2006), the process involved:

Transcription: Converting audio-recorded interviews into text.

Coding: Identifying recurring tags or labels such as Fear of Job Loss, Lack of Legal Mandate, or System Downtime.

Theme Development: Aggregating codes into broader categories that explain the Rationality-Reality Gap.

Refinement: Ensuring the themes directly correlate with the ITPOSMO dimensions of Heeks' framework.

3.5.3 Data Integration and Triangulation

In accordance with the Convergent Parallel design, the final analysis involved Data Merging. This is where the quantitative results are cross-referenced with the qualitative themes. For example, if the regression model showed that Legal Framework had the highest negative impact on performance, the interview transcripts were searched for specific quotes from legal officers to explain why the law currently hinders digital adoption. This triangulation ensures that the findings are not only statistically sound but also contextually rich (Saunders et al., 2019).

4. Results and Discussion

4.1 Demographic Characteristics of Respondents

The demographic profile of the respondents is critical for understanding the User Reality dimension of Heeks' (2006) framework. By analyzing the background of the 350 surveyed staff members, we can determine if the implementation gap is influenced by factors such as professional experience, educational background, or technical role.

4.1.1 Occupational Distribution

The survey targeted a diverse cross-section of the Sebeta Land Administration Office. The results show that 42% of respondents were from the Technical Department (Surveyors and GIS Experts), 38% were from the Legal/Registration Department, and 20% occupied Administrative

or Management roles.

Discussion: This distribution is significant because it indicates that the study captured the views of the front-line users. As noted by Yin (2018), for a case study to be robust, it must incorporate the perspectives of those who interact with the technology on a daily basis. The high representation of technical and legal staff ensures that the findings reflect the core friction points of both spatial data entry and title registration.

4.1.2 Educational Level and Technical Competency

The data reveals a relatively high level of formal education among the staff, with 65% holding a Bachelor's degree and 12% holding a Master's degree. However, when asked about specific training for the IULIS, only 28% reported receiving comprehensive training, while 52% described their training as basic or insufficient.

Interpretation: This creates a paradoxical demographic profile: a highly educated workforce that is under-trained for the specific digital tool they are required to use. According to Saunders et al. (2019), a mismatch between general education and task-specific training is a leading cause of user resistance. In the context of the Rationality-Reality Gap, the system design assumed a high-competency user, but the reality in Sebeta is a learning user who lacks the specific technical support to navigate complex digital workflows.

4.1.3 Years of Experience vs. System Adoption

A significant finding in the demographic data was the correlation between years of experience and system perception. Staff with over 10 years of experience (35% of the sample) showed a higher tendency to prefer manual workflows compared to staff with less than 5 years of experience.

Discussion: This aligns with Institutional Theory (North, 1990), which suggests that path dependency is stronger in individuals who have spent decades mastering the Old Rules (paper-based systems). For the veteran staff in Sebeta, the IULIS represents a disruption of their established professional identity. Conversely, younger staff act as digital natives but are often sidelined by the traditional hierarchy. This demographic split contributes to the Institutional Inertia that stalls the implementation process.

4.2 Descriptive Analysis of IULIS Implementation

The descriptive analysis provides a quantitative snapshot of the status of digital cadaster implementation in Sebeta. By evaluating the Mean (bar{x}) and Standard Deviation (sigma) of the survey responses, we can measure the width of the Rationality-Reality Gap across various operational dimensions.

4.2.1 Overall Perception of System Readiness

The data regarding general system readiness indicates a significant level of dissatisfaction among the staff. When asked if the IULIS was ready for full-scale operational use, the average score was 2.42 (sigma=1.12) on the 5-point Likert scale.

Analysis: A mean score below the neutral point (3.0) suggests that the Reality of the system is far from the Rational design expectations. The high standard deviation indicates a lack of consensus; while some technical staff find the system functional, the majority of legal and administrative staff perceive it as unready.

Discussion: According to Heeks (2006), when the Technology dimension of the gap is perceived as unready, users lose perceived usefulness, a key factor in technology adoption models. In Sebeta, this perceived unreadiness acts as a primary justification for staff to retreat back to manual paper files.

4.2.2 Infrastructure and Resource Availability

A critical dimension of the IULIS implementation is the availability of supporting infrastructure (Power, Internet, and Hardware). The descriptive results show a mean of 2.15 (sigma=0.88) for Consistency of Electricity and Network.

Interpretation: This is one of the lowest scores in the survey. It highlights a Hard-Physical Gap. The IULIS is a centralized web-based system that requires 24/7 connectivity; however, the reality of Sebeta's infrastructure is characterized by frequent power outages and network fluctuations.

Citation Link: This finding validates UN-Habitat's (2012) assertion that digital tools in developing nations often fail not because of the software, but because the foundational infrastructure is not yet digital-ready''. In Sebeta, the software design assumes an environment that the local infrastructure cannot yet support.

4.2.3 Workflow Alignment and System Utility

The survey assessed whether the IULIS simplifies the daily tasks of the land office. The mean score for Process Simplification was 2.68 (sigma=0.95).

Analysis: The data suggests that the system has not successfully simplified the workflow. Qualitative follow-ups during interviews revealed that the system actually increased the workload because it added a digital layer without removing the legal requirement for paper documentation.

Discussion: This represents a Process Gap. As argued by Saunders et al. (2019), if a new system does not provide a relative advantage over the old one, institutional inertia will prevail. The

descriptive data proves that the IULIS is currently perceived as a burden rather than a utility, which directly fuels the Implementation Trap discussed in Chapter 1.

Table 4.1: Summary of Descriptive Statistics for System Implementation

Variable Category	Mean (bar{x})	Std. Deviation (sigma)	Gap Interpretation
System Readiness	2.42	1.12	Significant Gap
Infrastructure Support	2.15	0.88	Severe Gap
Process Simplification	2.68	0.95	Moderate Gap
User Manual/Support	2.90	1.02	Narrow Gap

4.3 Evaluation of Digital Cadaster Performance

The evaluation of digital cadaster performance is the benchmark for determining whether the IULIS is fulfilling its intended role as an engine of development. According to Williamson et al. (2010), the success of a cadaster is not measured by its technical sophistication, but by its ability to facilitate secure and efficient land market transactions. In Sebeta, the performance evaluation reveals a critical disconnect between digital potential and operational reality.

4.3.1 Performance Metrics: Analysis of Service Speed and Transparency

To provide a data-driven evaluation, this study utilized two primary metrics: Service Speed (a measure of efficiency) and Transparency (a measure of governance integrity).

1. Service Speed: The Efficiency Paradox

The quantitative data regarding processing times shows a mean score of 2.85 (sigma=0.92).

Analysis: This score falls below the neutral threshold of 3.0, indicating that the majority of staff do not believe the IULIS has accelerated service delivery. In the legacy manual system, a simple title search took approximately 3-5 days; currently, despite the digital interface, respondents report that the same process takes 4-7 days.

Discussion: This is what researchers call the Efficiency Paradox. As argued by Heeks (2006), when a digital system is superimposed on a double-entry workflow, it creates a Time Tax. Staff in Sebeta must verify the digital record and then retrieve the physical file to ensure legal validity. This redundancy acts as a friction point that slows down the very process it was meant to accelerate. Consequently, the Rational design goal of high-speed processing has been undermined by the Reality of procedural duplication.

2. Transparency: The Black Box Effect

Transparency in land administration is the primary deterrent to corruption (UN-Habitat, 2012). In the survey, the severity of Lack of Transparency was rated highly, with a mean of 4.25 (sigma=0.68).

Analysis: A high mean in this category (where a higher score indicates a more severe problem) suggests that the IULIS has not yet opened the Black Box of land administration. While the data is now digital, it remains accessible only to a small group of internal gatekeepers.

Interpretation: There is a lack of Public-Facing Transparency. Citizens cannot track their applications online, and the criteria for file approval remain opaque within the system. As Rose-Ackerman (1999) suggests, technology alone does not create transparency; it must be accompanied by an accountability layer. In Sebeta, the system provides internal visibility for managers but does not provide external visibility for the public, leading to a persistence of mistrust in the land office.

Table 4.2: Summary of Performance Evaluation

Metric	Design Expectation	Sebeta Reality (Result)	Gap Analysis
Service Speed	Instant/Automated	2.85 (Slow/Redundant)	Severe Efficiency Gap
Transparency	Public/Open	4.25 (Internal/Opaque)	Critical Accountability Gap
Data Integrity	Single Source	Moderate (Conflicting)	Data Consistency Gap

4.4 Assessment of Institutional and Technical Capacity

Capacity assessment is a multi-dimensional evaluation of the resources, skills, and organizational structures required to sustain a digital cadaster. According to Enemark (2010), many land administration projects fail because they focus on hard technology while neglecting soft institutional capacity. In Sebeta, the capacity assessment reveals a significant imbalance: the technical tools are sophisticated, but the institutional framework is lagging.

4.4.1 Technical Capacity: Infrastructure and Skill Alignment

Technical capacity refers to the hardware, software, and human expertise available to operate the IULIS. The survey data regarding Technical Adequacy yielded a mean score of 3.12 (sigma=1.02).

The Hardware-Skill Gap: While the mean is slightly above neutral, qualitative interviews revealed a Maintenance Vacuum. When hardware fails or the network goes down, the local office lacks the administrative autonomy to fix it immediately, often waiting for federal or regional intervention.

GIS and Data Competency: As noted by Deininger et al. (2012), the transition to a digital cadaster requires a shift from clerical skills to spatial data management. In Sebeta, while 65% of staff have degrees, only a small fraction is certified in GIS or database management. This leads to Data Entry Errors, where the quality of the digital map is compromised by the lack of

specialized technical oversight at the local level.

4.4.2 Institutional Capacity: Leadership and Legal Mandate

Institutional capacity involves the Rules of the Game the policies, leadership commitment, and legal frameworks that govern the land office. This area scored significantly lower than technical capacity, with a mean of 2.35 (sigma=0.75).

Leadership Commitment: A critical friction point identified is Management Inertia. According to Heeks (2006), for e-government to succeed, there must be Political Will at the local level. In Sebeta, staff reported that managers often prioritize paper files for official decision-making, signaling to subordinates that the digital system is secondary.

The Legal Vacuum: This is perhaps the most significant institutional barrier. Ethiopia's current land laws (e.g., Proclamation No. 721/2011) were written primarily for a manual era. There is a lack of clear legal guidelines regarding the Evidentiary Weight of digital records in Sebeta's courts. Without a legal mandate that makes the digital record the Primary Legal Truth, the institution remains tethered to the manual past.

Table 4.3: Summary of Capacity Assessment

Capacity Dimension	Mean	Interpretation	Primary Constraint
Technical (Hardware/Skill)	3.12	Moderate	Lack of Local Maintenance
Institutional (Policy/Law)	2.35	Low	Legal Ambiguity of Digital Files
Organizational (Leadership)	2.50	Low-Moderate	Preference for Manual Authority

4.5 Inferential Analysis (Regression Model Results)

While the descriptive statistics provided a snapshot of the current state, the inferential analysis employs Multiple Linear Regression (MLR) to isolate the specific variables that predict the performance of the IULIS in Sebeta. This section moves beyond what is happening to why it is happening by testing the relationship between several independent factors and the dependent variable: Overall System Success (Y).

4.5.1 The Regression Model and Hypothesis Testing

The study utilized a standard regression equation to model the Implementation Gap:

$Y=\beta_0 + \beta_1(G) + \beta_2(T) + \beta_3(L) + \beta_4(U) + \mathscr{E}$

Where:

Y: System Success (Performance)

G: Governance and Leadership

T: Technical Infrastructure

L: Legal Framework

U: User Competency

The results of the analysis revealed an R^2 value of 0.68, meaning that the model explains 68% of the variance in IULIS performance in Sebeta. This is a high value for socio-technical research, suggesting that the selected variables are the primary drivers of the system's fate (Field, 2018).

4.5.2 Factors Influencing System Success/Failure

The regression coefficients (beta) provided a ranking of the most significant barriers.

1. The Dominance of Governance (beta = -0.42, $p < 0.05$)

The most striking result is that Governance and Leadership had the strongest negative impact on system performance. The negative coefficient indicates that as governance quality (leadership support and procedural clarity) decreases, the implementation gap widens.

Discussion: This confirms Heeks' (2006) theory that management is the glue of e-government. In Sebeta, the lack of top-down enforcement for digital workflows is the single greatest predictor of failure. Even if the computers are perfect, the system fails if the leadership lacks the Political Will to mandate its use.

2. The Legal Vacuum (beta = -0.35, $p < 0.05$)

The Legal Framework emerged as the second most significant predictor.

Discussion: The statistical significance of this variable highlights the Legal Clash mentioned in Chapter 2. Without a proclamation that grants digital cadaster records the same legal weight as paper titles, the system remains an optional tool. This finding aligns with Deininger et al. (2012), who argue that in the absence of a legal mandate, digital records in African land offices are often treated as mere informational drafts.

3. Technical and User Variables (beta = -0.21 and -0.18)

Interestingly, while Technical Infrastructure and User Competency were significant, their impact was lower than Governance and Law.

Interpretation: This suggests that the implementation trap in Sebeta is not primarily a problem of broken computers or unskilled staff. Instead, it is an institutional problem. Fixing the internet or training the staff further will yield diminishing returns if the governance and legal barriers remain unaddressed.

4.5.3 Summary of Regression Coefficients

Table 4.4: Summary of Regression Coefficients

Independent Variable	Beta (beta)	Significance (p)	Rank
Governance & Leadership	-0.42	0.012	1st
Legal Framework	-0.35	0.024	2nd
Technical Infrastructure	-0.21	0.041	3rd
User Competency	-0.18	0.048	4th

4.6 Qualitative Thematic Analysis

While the quantitative data identified the what and how much, the thematic analysis of the Key Informant Interviews (KIIs) uncovers the underlying motivations and institutional pressures. This section categorizes the qualitative findings into major themes that represent the Reality side of the Design-Reality Gap (Heeks, 2006).

4.6.1 Identification of Implementation Barriers: Thematic Clusters

Through the process of systematic coding, three primary thematic clusters emerged as the root causes of the implementation drag in Sebeta.

Theme 1: The Manual Comfort Zone and Institutional Inertia

Interviews revealed a deep-seated reliance on paper-based systems, not just due to habit, but because paper represents tangible authority.

Analysis: Many officials view the digital record as volatile or unstable. According to North (1990), institutions resist change when the new system threatens the established power dynamics. In Sebeta, the manual comfort zone allows for a level of administrative discretion that the automated, audit-logged IULIS would eliminate.

Theme 2: The Double-Burden of Parallel Workflows

A recurring theme across all interviews was the exhaustion caused by the Parallel System. Staff are currently required to maintain physical files while simultaneously updating the IULIS.

Analysis: This leads to Data Fatigue. When forced to choose during a busy work hour, staff prioritize the physical file because it is the one required for legal signatures. This confirms Heeks' (2006) Process Gap the digital process was added to the manual process rather than replacing it.

Theme 3: The Transparency Trap

Informants highlighted a paradoxical fear of transparency. While the system is designed to make land records public, there is an internal institutional pushback to keep certain data restricted.

Analysis: As noted by UN-Habitat (2012), transparency in land administration is often resisted

by manual gatekeepers whose influence is derived from controlling access to information.

4.6.2 Evidence: Direct Quotes from Officials and Registrars

To ensure the Authentic Voice of the Sebeta Land Office is heard, the following excerpts from the KIIs illustrate the friction points:

The computer shows the map, but the court only looks at the paper with the red stamp. If I only use the IULIS, and there is a legal dispute, I am the one who will be blamed because the digital record is not yet 'the law' in our town. Senior Legal Officer, Sebeta Land Office.

IULIS was designed in Addis Ababa by people who have constant electricity. Here, when the power goes out for three days, the system is a brick. We have to use the physical folders to keep the office running, and then we never find the time to type that data back into the system later. IT Coordinator, Sebeta Municipality.

We feel like we are doing the work twice. It is not modernization; it is just more typing. Unless the paper files are moved to an archive and the computer becomes the only way, we will always be a 'paper office' with computers on our desks. Front-line Registrar.

4.7 Discussion and Synthesis (Triangulation)

The synthesis of findings represents the integration of statistical evidence and thematic narratives. This Triangulation serves to validate the research findings by ensuring that the weaknesses of one method are compensated by the strengths of the other (Creswell & Clark, 2017). In Sebeta, the triangulation reveals a consistent pattern of institutional misalignment.

4.7.1 Convergent Findings: The Reality of the Institutional Bottleneck

There is a striking convergence between the regression result for Legal Framework (beta = -0.35) and the qualitative theme of Legal Vacuum.

Synthesis: Both data streams confirm that the IULIS is failing not due to software bugs, but because it lacks legal supremacy. The quantitative data shows a low performance mean, while the qualitative interviews explain that this is a rational response by staff who fear legal liability.

Theoretical Link: This confirms Heeks' (2006) Objectives and Values gap. The Rational objective of the federal government was efficiency, but the Local Reality value is legal safety and risk aversion.

4.7.2 Explanatory Synthesis: Explaining the Efficiency Paradox

The descriptive analysis in Section 4.3.1 showed a low mean for service speed (2.85). Through triangulation, we can now explain this Efficiency Paradox.

The Why: The qualitative data identifies the Parallel Workflow as the culprit. The statistical drop in speed is a direct result of the double-entry burden mentioned by the registrars.

Discussion: As Deininger et al. (2012) noted in similar African contexts, digitalization without Process Re-engineering often leads to a decrease in productivity. The synthesis shows that in Sebeta, the IULIS was added on top of the old bureaucracy rather than restructuring it, leading to the Implementation Trap.

4.7.3 Divergent Findings and Surprising Results

A point of divergence appeared regarding User Competency. While the survey showed staff felt moderately competent (3.12), the qualitative interviews with managers suggested a Hidden Digital Illiteracy, where staff use the system only for basic tasks but revert to paper for complex property transfers.

Interpretation: This suggests that Perceived Competency in the survey may be inflated by social desirability bias. The Reality discovered in the interviews is that the staff's technical capacity is Superficial. They can navigate the interface, but they do not trust the underlying database logic.

4.7.4 Final Synthesis: Bridging the Gap

The final discussion point connects the Sebeta case to the broader Ethiopian land policy. The Rationality-Reality Gap in Sebeta is a Socio-Technical misalignment. The software (the technical) is ready for a transparent, fast land market, but the institution (the social/legal) is still operating in a manual, protective, and legalistic framework. To bridge the gap, the discussion concludes that the intervention must be Institutional first, Technical second.

5. Conclusions and Recommendations

5.1 Summary of Key Findings

The study set out to evaluate the performance of the IULIS in Sebeta and identify the governance barriers creating the Rationality-Reality Gap. The findings confirmed that the system is currently in a state of Partial Failure. While the software is technically functional, it has failed to significantly improve service speed (Mean = 2.85) or transparency (Severity Mean = 4.25). The regression analysis proved that Governance and Leadership (beta = -0.42) and Legal Framework (beta = -0.35) are the primary drivers of this stagnation.

5.2 Conclusions Based on Results

The conclusions of this study are categorized into three distinct perspectives to provide a holistic understanding of the implementation gap.

5.2.1 Institutional Perspective: The Survival of the Manual Logic

The study concludes that the Sebeta Land Office is suffering from Institutional Inertia. The Old Rules of paper-based administration have successfully resisted the New Tools of the IULIS. This is not due to a lack of technology, but because the manual system provides a sense of legal

security and administrative discretion that the digital system threatens. The persistence of the Parallel Workflow is the ultimate evidence of this institutional failure.

5.2.2 Socio-Technical Perspective: The Design-Reality Mismatch

From a socio-technical standpoint, the IULIS implementation in Sebeta suffers from a Contextual Gap. The system was designed as a Rational federal tool, assuming stable infrastructure and high digital literacy. The Reality in Sebeta characterized by frequent power outages, network instability, and a Digital-First training deficit has rendered the software a burden rather than a utility. The system acts as an Electronic Filing Cabinet rather than an active workflow engine.

5.2.3 Political and Governance Perspective: The Transparency Trap

The research concludes that there is a Governance Deficit at the municipal level. The lack of top-down mandates to switch off the paper system has created a legal vacuum. Furthermore, the Transparency Trap ensures that while the data is digitized, it remains hidden from the public, preventing the system from achieving its goal of reducing corruption and increasing citizen trust (UN-Habitat, 2012).

5.3 Categorized Recommendations

To bridge the Rationality-Reality Gap in Sebeta, a multi-layered approach is required.

These recommendations move beyond IT fixes toward Institutional Re-engineering.

5.3.1 Governance and Policy Reforms (The Digital-First Mandate)

Legal Validation: The Oromia Regional Government must issue a specific directive granting Digital Supremacy. Digital records in the IULIS should be recognized as the Primary Legal Truth, superseding paper files in court cases and administrative decisions.

Eliminating Redundancy: The Sebeta Municipality should implement a phased Paper-Out strategy. Once a file is digitized and verified, the physical folder should be moved to a dormant archive, forcing all future transactions into the digital workflow to eliminate the Parallel System.

5.3.2 Operational and Procedural Reforms

Public-Facing Transparency Portals: To break the Black Box effect, a citizen-tracking interface should be launched. Applicants should be able to use a unique ID to see the status of their land file (e.g., In Review, Pending Signature, Approved). This shifts the system from an internal tool to a public service.

SOP Digitalization: Standard Operating Procedures (SOPs) must be hard-coded into the IULIS. This prevents Manual Overrides where officials bypass the system to exercise personal

discretion.

5.3.3 Technical and Capacity Building

Infrastructure Resiliency: The Sebeta Land Office should invest in Off-grid Server Backups and dedicated fiber-optic lines to mitigate the Hard-Physical Gap identified in Section 4.2.2.

Context-Specific Training: Training should move beyond how to use the software to Digital Data Integrity. Staff need to understand the legal and economic implications of accurate spatial data entry to reduce the error rates identified in Section 4.4.1.

5.4 Final Concluding Remarks

The digitalization of land administration in Sebeta is at a crossroads. The technology is present, but the Rationality-Reality Gap is wide. Bridging this gap requires a bold shift in leadership moving from a culture of Paper Protection to one of Digital Transparency. Only when the Governance Architecture supports the Technical Infrastructure will the IULIS deliver the digital clarity required for Sebeta’s rapid urban future.

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