ASSESSMENT OF LAND INFORMATION SYSTEM FOR LAND ADMINISTRATION: A CASE STUDY OF GHANA

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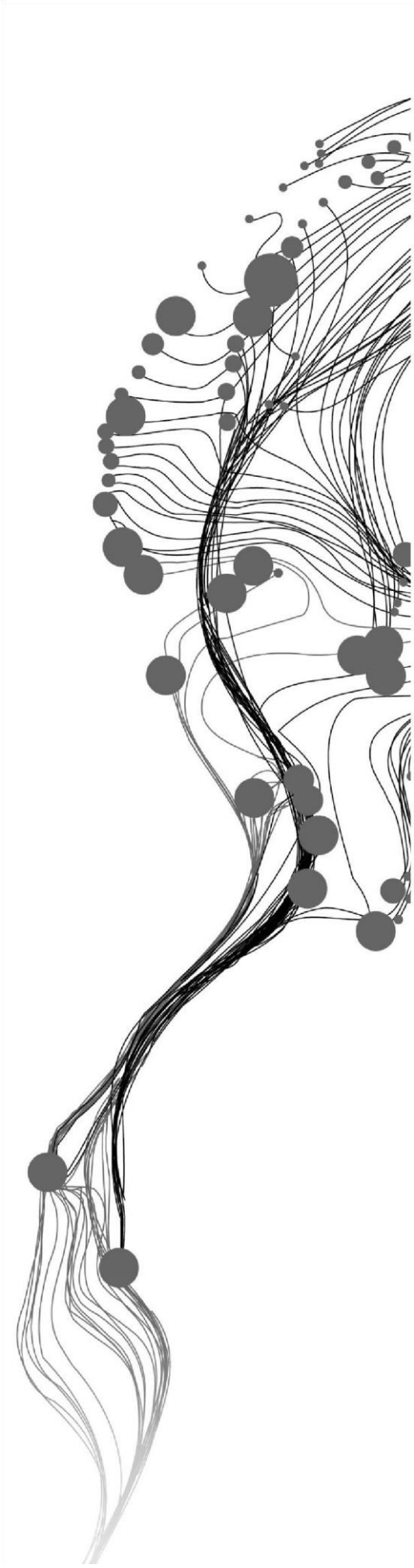

ASSESSMENT OF LAND INFORMATION SYSTEM FOR LAND ADMINISTRATION: A CASE STUDY OF GHANA

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Thesis submitted to the Faculty of Geo-Information Science and Earth Observation of the University of Twente in partial fulfilment of the requirements for the degree of Master of Science in Geo-information Science and Earth Observation. Specialization: Land Administration

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ABSTRACT

Implementing a digital land information system for the land administration process is optimal for ensuring access to adequate and transparent land service delivery. Accordingly, scholars and experience from developed countries have demonstrated that LIS facilitate timely access to the updated record on land ownership, land values and land-use restrictions. However, developing and implementing such a system in developing countries remains challenging.

In Ghana, attempts have been made to implement digital LIS to facilitate land administration services; however, it has not been widely adopted for Land administration activities. Currently, there is less discussion on the effectiveness of the LIS in enhancing its adoption.

In line with this, the study identifies Ghana's LIS's effectiveness in supporting the land administration process in two case study areas, Accra and Kumasi. The study developed an assessment framework with eight dimensions and twenty-three indicators through reviewing the literature on existing frameworks for LIS assessment. The eight dimensions were (1) institutional framework, (2) policy and legal frameworks, (3) data quality, (4) technology, (5) working environment, (6) capacity and training, (7) ICT strategy, and (8) communication strategy. These dimensions are categorised under three themes: governance and people, the operational environment, and sustainability measures. Using the identified indicators as a guide for interview and questionnaire development, the primary data for this study was obtained from the staff and clients from the two case study areas. The data gathered was analysed through the thematic analysis approach.

All the twenty-three indicators were measurable in Accra due to LIS availability. The result indicates that Accra is in high alignment with clear institutional roles and mandates, adequate laws and policies and a strategy to protect data, software, and operating system. Still, it needs to improve in the other indicators to provide effective land administration services. In Kumasi, however, only nine of the twenty-three indicators were measurable because fieldwork revealed that digital LIS had never been implemented; however, attempts were made to replicate the digital LIS in Accra. According to the findings, Kumasi is in a high level of alignment with the availability of adequate laws and policies to support analogue to digital conversion. Additionally, there is a positive attitude towards adopting a digital system.

The study concludes that Accra has made a significant effort toward developing and implementing LIS; however, it is still in the initial stages of the development curve and requires more room for improvement. Furthermore, for Accra's LIS to function effectively in Kumasi, additional development would be necessary to accommodate Kumasi's needs and requirements. As a result, the study suggests the following recommendations to aid in the improvement of the digital system: (1) provision of financial support, (2) redefining the scope, requirements, boundaries and deliverables, (3) establishing a national IT organisation, (4) access to professional development programs and orientation, (5)adequate communication protocols, (6) system reorganisation with customer orientation, (7) improvement in implementation protocols and (8) develop a mandatory privacy policy.

Keywords: *Land Information System, Digital System, Analogue System, Land Administration, Ghana, Lands Commission*

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LIST OF ACRONYMS

LIS	
ALC	Accra Lands Commission
PVLMD	Public and Vested Land Management
CLS	Customary Land Secretariet
CSAU	Client Service Access Unit
ELIS	Enterprise Land Information System
ELISS	Enterprice Land Information System Software
GELIS	Ghana Enterprise Land Information System
ICT	Information, Conmmunication and Technology
IT	Information Technology
KLC	Kumasi Lands Commission
LA	Land Administration
LAP 1	Land Administration Project 1
LAP 2	Land Administration Project 2
LAS	Land Administration System
LC	Lands Commission
LRD	Land Registration Division
LUSPA	Land Use and Spatial Planning Authority
LVD	Land Valuation Division
SMD	Survey and Mapping Division

1. INTRODUCTION

This chapter consists of eight (8) sections; an overview of the study background and justification, research problem, main research objectives, sub-objectives, research questions, conceptual framework, the research structure and a chapter summary.

1.1. Background and Justification of the Study

Global concerns such as urbanisation, tenure insecurity, land conflict and unequal land access have put a high demand on reliable and up-to-date land information. To meet such requests and guarantee ownership rights, scholars have advocated for the development of an information system that can provide records on "who owns what piece of land", what type of right and value exists", and "what use is permissible" on time. The performance of these functions lies within the domain of land administration. "Land administration (LA) is a process of determining, recording, and disseminating information about land ownership, value, use, and associated resources (UNECE 2005). According to Enemark (2005), the success of land administration depends on an efficient land information infrastructure; this implies the management of rights, restrictions, responsibilities and natural resources must be facilitated by cadastral and topographic datasets, which allow easy access to land records. Agreeably, Alemie et al. (2015), Biraro et al. (2021a), Krigsholm et al. (2018), and Sattler & Nagel (2010)have asserted that access to adequate and reliable land information is essential for a well-functioning land administration. Such information is very relevant for stakeholders in making land-related decisions (Aydinoglu & Bovkir, 2017; Indrajit et al., 2021; Todorovski et al., 2018).

In recent times, the traditional land administration services have extended from cadastral activities in land tenure and land information management to sharing information among other land-related agencies (Agunbiade & Kolawole, 2016; Enemark, 2009; I. B. Karikari, 2006). This has made land information systems (LIS) imperative for efficient and effective land administration. A land information system (LIS) is a set of software and hardware-based databases that enable the entry, processing, storage, and retrieval of land records (Rakhmonov & Abdurakhimova, 2021). LIS enhances land record management and efficient access to information and reduces the bureaucracies in land administration processes (Meijer, 2009). Countries that have successfully implemented LIS for land administration continue to realise the benefits. For instance, experience from developed countries like the Netherlands has demonstrated the usefulness of LIS in making geographic data accessible to all, promoting transparency, and facilitating individual choices about real estate (Kadaster International, n.d.).

Unlike in developed countries, implementing LIS in developing countries is challenging (Berisso & de Vries, 2010; Correia et al., 2021). In countries where such information systems are in place, they remain latent; hence, essential decisions are made based on limited information (Karikari et al., 2003). For example, after efficiently implementing LIS in Rwanda, the bureaucratic nature of the registration system discouraged landowners from registering their properties, thereby making their LIS lack up-to-date records for decision making (Biraro, 2014). Similarly, Kenya's LIS lacks up-to-date records because of informal registration, which is not documented (Siriba & Dalyot, 2017). Other challenges may result from inadequate land data, poor data quality, and the government's unwillingness to invest in LIS (Yaw Adiaba, 2014). In the scope of innovation in information technology such as LIS, Davis (1989) argued that the system's adoption and usage are crucial factors in achieving the overall success of implementation. One must utilise LIS to achieve the expected outcome; however, this is often not the case in many developing countries. Liberia, for instance, has failed to integrate their LIS into their land administration function (Zeng & Cleon, 2018).

Similarly, most land administration institutions in Ghana operate in the analogue land administration system despite the implementation and benefits of LIS. There is a need to understand why the adoption and usage of LIS remains a challenge in the land administration sector. Such understanding is crucial for determining solutions for enhancing LIS adoption and use.

1.2. Research Problem

Like many developing countries, Ghana's land information system is in its early stage. The decision to implement a digital LIS in Ghana dates to 2003, when the Government of Ghana initiated 'The first land administration project' (LAP 1), which was financially supported by The World Bank (Ministry of Lands and Natural Resources, 2011; The World Bank, 2012). One of the components of the project was to develop a reliable land information system to facilitate land administration functions in the country by ensuring proper management of land records, access to up-to-date records, and reduced face-to-face interactions with clients as well as the general indiscipline in Ghana's land market (The World Bank, 2013). In recognition of this, the government of Ghana implemented LIS for all the Lands Commissions (LC), an institution responsible for public land administration to carry out their daily business process (Deane et al., 2017). This system allowed the commissions to perform their daily business activities in a digital environment and assisted them in electronically processing their data, unique and non-redundant in a standard acceptable to the LIS. However, according to (Deane et al., 2017), most LC did not use the LIS in practice. They carried out their daily land administration functions in the analogue system.

The Kumasi Lands Commission (KLC) is among the many land institutions operating in the analogue system. As a result, accessing and retrieving information about particular parcels is limited to manual searches within the institution (Quaye, 2020). It is often daunting to manually search through thousands of other files looking for one specific paper document. According to Ameyaw & de Vries (2021), identifying such documents could take days or weeks; and often demotivates land officers from initiating search processes. Hence, clients may pay unofficial money to officers to motivate them to search quickly and deliver results.

Ameyaw & de Vries (2020), in their paper, asserted that the analogue land administration system limits access to reliable and credible land information. It makes it difficult for land officials to update and store real-time land transactions. Following this, citizens are challenged with court contestation over ownership mainly because the information they receive from the land office is not updated or has multiple registrations (Imani Africa, 2020). For real estate agencies, this situation might delay the activities of optimising land value and render land inefficient for business. Additionally, the analogue land administration affects access to information and the quality of how citizens and stakeholders can access such information since it is often costly and time-consuming. According to Edwin et al. (2020) and Toulmin (2009), such delays can discourage citizens from formally registering their land. Moreover, in the case of disasters such as the fire outbreaks at the Greater Accra lands commission of Ghana (Ghana Web, 2012), the analogue system has proven ineffective in physically protecting land records since it does not provide backup of existing files and documents (Boateng, 2021).

Although most commissions are manually executing their functions, the Greater Accra LC in Ghana has managed to convert its paper records into digital format. Additionally, the commission has employed the Enterprise Land Information System (ELIS) functionalities to make these records available through its clients' service portal. Since the information system developed under LAP 1 focused on the activities of independent divisions, a Ghana Enterprise Land Information System (GELIS) was developed under the Second Land Administration Project (LAP 2) to integrate all the various land sector agencies (Deane et al., 2017). However, due to the withdrawal of donor support, the GELIS could not be sustained. Hence, the development of ELIS for the sole operations and activities of the LC. Although ELIS is adopted and used

solely by the Accra LC, other land commissions could use the nationwide implemented LIS developed under LAP1 to carry out the daily land administration functions. Still, the question is, why is such a system not adopted and used for land administration?

Various studies have explored the subject of LIS, including its adoption, best practices, and the potential role in land administration (Boateng, 2021; Dhakal, 2016; Hale, 2011; Ho & Rajabifard, 2016; Karikari et al., 2003; Karikari et al., 2002; Meijer, 2009; Romano et al., 2015; van Loenen et al., 2020). Although the above studies suggest the benefits of LIS, Yaw Adiaba (2014) and Zeng and Cleon (2018) have argued that LIS is only a means to an end and does not automatically translate to good land administration practices. The extent of users' willingness to adopt and use it determines whether the LIS will be productive (Badurek, 2009; Kalantari et al., 2015).

Ghana's digital land administration drive has been nearly two decades. However, there are issues such as issuance of unreliable land records, difficulties in accessing reliable land records, long land transactions and processing time, long hours to search and retrieve land records and poor management of records, among others (Gyamera et al., 2018; Imani Africa, 2020; Mireku et al., 2016; Quaye, 2014). The reason why the analogue system remains unchanged after the implementation of digital systems is the premise underlying the objective of this study. The Greater Accra LC has made some progress in its digital land administration drive; it will be reasonable for other LCs to derive lessons from their challenges and prospects. This is not to imply that Accra has a holistic system ready to be imitated elsewhere. However, such lessons could be valuable to the LCs, whose land administration functions are performed manually. Therefore, this study seeks to assess the effectiveness of the land information systems for land administration by drawing on empirical evidence from Ghana's public land administration sector.

1.3. Main Research Objective

The primary objective of this research is to assess the land information system for land administration in Ghana, with a specific focus on Kumasi and Accra. Sub objectives and relevant research questions support this primary objective and are outlined in sub-sections 1.4 and 1.5, respectively.

1.4. Sub-objectives

The following sub-objectives support the realisation of the primary research objective

1. To assess the effectiveness of the land information system for land administration in Ghana.
2. To identify the functions of the land information system in land administration in Kumasi.
3. To identify the functions of the land information system in land administration in Accra.
4. To determine the factors that require further improvement in Accra and Kumasi.

1.5. Sub-objectives and Research Questions

The following research questions are derived given the sub-objectives,

To assess the effectiveness of the land information system for land administration in Ghana

a. What frameworks are available in literature for assessing land information systems?
b. What indicators could be identified to assess the functionality of the LIS in Kumasi and Accra?
c. How does the LIS in Kumasi and Accra respond to the identified indicators?

To identify the functions of the land information system in land administration in Kumasi

a. What is the Land administration process status in Kumasi from LIS perspective?
b. Which part of the Land administration process is affected by the implementation of the land information system in Kumasi?

c. What are the benefits of implementing the LIS in land administration processes?

To identify the functions of the land information system in land administration in Accra

a. What is the Land administration process status in Accra from LIS perspective?
b. Which part of the Land administration process is affected by the implementation of the land information system in Accra?
c. What are the benefits of implementing the LIS in land administration processes?

To determine the factors that require further improvement in Accra and Kumasi

a. What are the current and potential limitations of the LIS in Accra?
b. What are the current and potential limitations of the LIS in Kumasi?
c. What are the lessons learnt for further improvement in Accra and Kumasi?

1.6. Conceptual Framework

This section gives an overview of the conceptual framework for this research. It further explains the concepts; of land administration, land information system, LIS adoption and LIS usage and how they relate. Figure 1 below provides an overview of the framework.

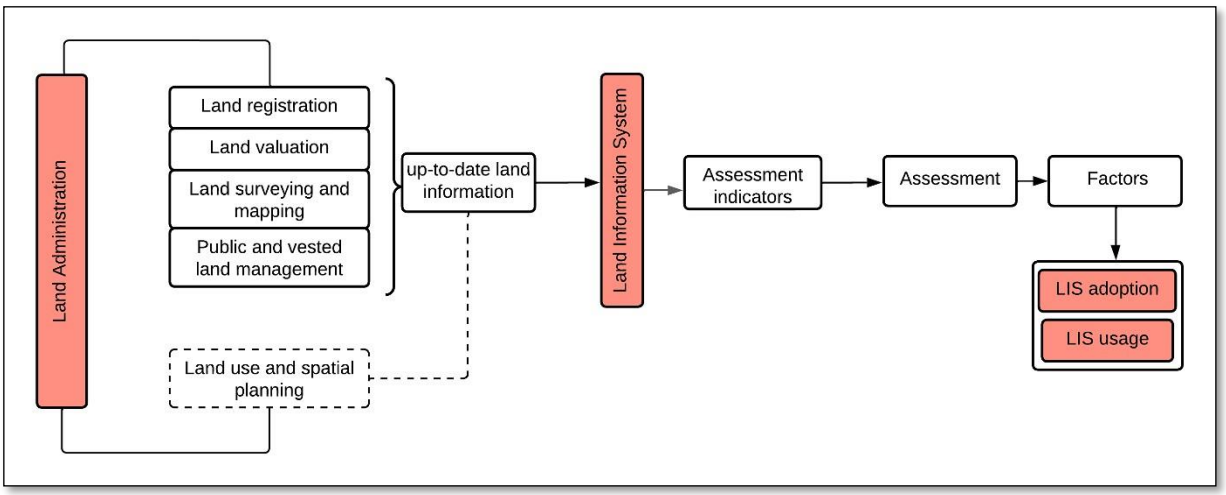

Figure 1: A conceptual framework
Source: Authors Construct, 2022

Figure 1. above shows the various concepts that emerged from this study and their relationship. The main concepts identified in the study are Land administration, land information system (LIS), LIS adoption and LIS usage. In Ghana, public land administration consists of land registration, land valuation, land surveying and mapping, public and vested land management, and land use and spatial planning, formerly known as town and country planning (Kuusaana & Gerber, 2015). While the LC carries out the first four functions, the Land Use and Spatial Planning Authority (LUSPA) carry out the latter (Forkuor et al., 2013). Additionally, the institutions of the customary land are also mandated to carry out deed registration even though they are not part of the lands commission. It is imperative to mention that land use and spatial planning function is outside the scope of this study; however, it is relevant to include them in the framework since they also constitute the land administration in Ghana. Perhaps there will be some interesting findings on land use and spatial planning with the fieldwork.

Land registration ensures secured land access by recording land and property transfers, determining property boundaries, and managing and adjudicating doubts and disputes regarding land rights and parcel boundaries. Land valuation is all the processes associated with assessing land and property values; land

surveying and mapping are related to regulating and demarcating land for land registration and use. The last function, Land management, refers to processes in facilitating government land acquisition and the management of stateacquired land (Lands Commission, n.d.).

Several studies have revealed that the success of these functions depends on reliable and up-to-date data (Aydinoglu and Bovkir, 2017; Indrajit et al., 2021; and Todorovski et al., 2018). Additionally, to ensure efficiency and effectiveness in these functions, it is likewise essential to quickly obtain this information and connect different datasets within the land institutions (Deane et al., 2017). In recognition of this, scholars have advocated using the Land information system (Dhakal, 2016; Hale, 2011; Romano et al., 2015), a computerised system that enhances easy management of land records and easy access to land information. This implies that LIS promote efficiency in land administration (Enemark, 2005; Zeng and Cleon, 2018). Despite the seamless benefits of LIS, its adoption and usage remain a challenge in some parts of Ghana. Adoption refers to integrating innovation into the relevant scope (Straub, 2009). The innovation of focus in this research is LIS. In contrast, usage refers to employing the information system's functionalities in the land administration processes. The assessment of the land information system, which is the study's aim, will help to identify the factors that have hindered the adoption and usage of the information system in Kumasi and that which have enhanced the adoption and usage in Accra.

1.7. Thesis Structure

This section provides insight into the structure of the thesis, which is presented in six chapters.

Chapter one: Introduction

The introduction chapter of the thesis presents the background of land administration and information systems. It further highlights the need for such a system in the land administration domain and the general challenges in implementing such systems. Furthermore, the research problem, research objectives, research questions and the emerging concepts underlying this study are presented in this chapter.

Chapter two: Theoretical framework of the study

This chapter provides insights into theories and practices in literature underpinning land information systems in land administration. It also offers references to Ghana's digital land administration drive. Additionally, this chapter also outlines the framework used in assessing the information system's effectiveness.

Chapter three: The study area and methodology

This chapter introduces the case study areas of the study and the justifiable reasons for selecting such areas. Furthermore, the chapter describes the methods employed for this study, the dataset used, the tools for data collection, and the mechanism for data analysis.

Chapter four: Land information system and land administration in Ghana

This chapter presents empirical findings of the assessment of the land information system in Ghana in alignment with the framework outlined in chapter two. These findings were obtained through semistructured interviews, snowballing, and questionnaires from the Lands Commission and Clients in Accra and Kumasi. Additionally, legal and policy documents from Ghana, knowledge from literature, and the ITC data archive also influence the findings in this chapter.

Chapter five: Assessment of land information system in Ghana

In this chapter, the findings obtained in chapter four are discussed against the theories, concepts and practice reviewed in chapter two of the study.

Chapter: Conclusion and recommendation

This chapter summarises the findings following the sub-objectives outlined in chapter one and further discusses how and if the objectives have been achieved. Moreover, relevant recommendations are proposed based on the results to address the significant concerns during the discussion in chapter five. Finally, this chapter ends with the limitation of the study and areas proposed for further research.

1.8. Summary of Chapter One

This chapter highlights how the research problem emerged from a broader global challenge to a countryspecific case. It introduces the research objectives and justifies the need to assess the effectiveness of LIS in Ghana. Furthermore, the emerging concepts from the study are explained. Lastly, the chapter presents the outline of expectations in the subsequent chapters.

2. THEORETICAL FRAMEWORK OF THE STUDY

This chapter provides a detailed overview of the concepts and perspectives of land information systems. It also provides insight into the adoption of information systems from a theoretical perspective. Additionally, the land administration and land information system in Ghana are discussed in section 2.4. Existing assessment frameworks for an information system are reviewed, and the proposed assessment framework for the study is presented in the last part.

2.1. The Concept and Perspective of Land Information System

Many scholars have defined the term LIS differently across various academic disciplines. Following Dale & McLaughlin (1999) and Larsson (1991), a land information system consists of land data, human and technical capital, and processes and techniques for data collection, updating, processing and dissemination. Agreeably, The United Nations Economic Commission for Europe (UNECE) Report in 1996 states that LIS comprises the land information database and the procedures to collect, update, and distribute land records.

There are cases where such an information system was referred to as the general land administration system; thus, if the information system could facilitate the implementation of land policies and promote effective land administration. In their paper, Bishop et al. (2000) defined LIS as "a GIS that utilises land parcels as the link to the non-graphic database attributes." Hull & Whittal (2013) described the system as an established information system for land management purposes.

The typical lesson derived from these definitions is that LIS involves data to produce information, technology to ensure efficient operation, people to carry out its functions, and procedures to ensure adequate land administration.

Since what is "badly defined is likely to be badly measured", as stated by Organisation for Economic Cooperation and Development (2008), this study defines LIS as an advanced computerised database system and procedures that allow easy access, retrieval, update, dissemination of land records and land service delivery. That notwithstanding, we concord with UNECE (1996) that a land information system may also be in an analogue form, although it is ineffective for land service delivery (Ameyaw & de Vries, 2020; Ameyaw & de Vries, 2021).

Computerisation has been a significant driver of change in the land administration domain. According to (Dhakal, 2016; Hale, 2011; Hull and Whittal, 2013; Kaufmann and Steudler, 1998; Romano et al., 2015; UNECE, 1996), applying modern technologies in land information management is optimal for ensuring good land service delivery and cost-effective land administration systems. Agreeably, a study by Ahuja & Singh (2006) indicated that introducing a computerised system with internal checks and controls over the deeds registration in India helped minimise the potential for error and drastically reduced land conflicts to the barest minimum. In their fourth statement in cadaster 2014, Kaufmann and Steudler (1998) proposed that all countries would have gone digital "no more pencil and paper" by 2018. Although this sounds ambitious and optimistic, it appears more of a phantom than an achievable reality, considering that most developing countries struggle to automate their LAS. Introducing modern computers into the land administration system requires attention beyond human and technical resources, policy, legal and institutional frameworks, data quality, and organisational procedures. These issues are likely to counteract this declaration if not adequately addressed.

2.2. The Adoption and Usage of Land Information Systems (Technology) from a Theoretical Perspective

Considering the remarkable significance of modern technology in the land administration domain in the past decades and the slower pace of adoption, especially in the developing world (Zeng & Cleon, 2018), an

array of literature has foregrounded the theories and practices that underpin the adoption of such contemporary technology. Undoubtedly, such insight is required to understand why there is a narrow pace of adoption and, if possible, come up with a recommendable solution. The insights gained from the reviewed theories and framework in the subsequent sections would support the development of the assessment framework for the land information system considered in this study.

Using Zeng & Cleon (2018) as a framework, LIS is likely to be adopted if individuals are very optimistic about its effectiveness, functionalities and ease of use. Additionally, individuals' self-efficacy will positively or negatively affect their willingness to adopt such modern technologies. Thus technology will be adopted if people can execute a given task. On this observation, the sentiment of Weiner (2009) in the provision of knowledge, skills, and expertise needed to operate and sustain the technology becomes very apparent. Agreeably, it is common sense to omit such technology than to provide it to a group of individuals with no adequate skills to operationalise it. Another striking observation made by Zeng and Cleon is that LIS technologies are likely to be adopted and used if such a system is made mandatory. If this statement should hold, the ratification of a mandatory LIS usage law increases individuals' pressure to use LIS during and after its implementation. Although these observations provide some relevant insight into the theory behind LIS adoption and usage, they are limited to individual perspectives; technology adoption is a far more daunting activity that requires a plethora of considerations (Badurek, 2009; I. B. Karikari, 2006; Masser et al., 1996).

According to Bennett et al. (2019), the adoption of technologies in the lands sector is occurring much slower than expected, mainly due to the historic moderation and the complexities in the existing institutional fabric. Thus, these technologies require a more flexible organisational approach and the willingness to unlearn and learn new things. Clohessy et al. (2020) and Wang et al. (2010) further posit that regardless of the LIS implementation, such innovation is likely unsuccessful if an organisation has no commitment to adopt the technology. The commitments may be exemplified by establishing financial strategy and technological infrastructure (Weiner, 2009), prioritising training and development (Bennett et al., 2019), awareness campaigns, legal reforms, data consideration and encouraging private sector involvement (Henssen, 2010). Although these studies provide compelling reasons for LIS adoption, (de Vries, 2015) is of the view that such adoption goes beyond their observations. According to de Vries, transitioning into a computerised environment may cause people to be replaced at work; such situations influence the behaviour of individuals and may make them adamant about responding to technological changes.

2.3. Land Administration and Land Information System in Ghana

The dual tenure system characterises land tenure in Ghana, which the state and traditional authorities exercise. The Customary institutions own about 80% of Ghana's land, while the remaining 20% reside in the state and private individuals (Arko-Adjei, 2011). The governance of customary lands resides in the allodial head, which could be heads of stool and skin and family heads. In contrast, under the statutory regime, land governance is administered through a mechanism by the state (Arko-Adjei, 2011).

As stipulated by article 258 of the 1992 constitution of Ghana, the Lands Commission is required to carry out five distinct functions; land registration, land valuation, surveying and mapping, and public and vested land management. Subsequently, other institutions, such as the land use and spatial planning authority, also support land administration by regulating land use controls and granting planning comments (Kuusaana & Gerber, 2015).

To strengthen land administration and enhance coordination between the customary institutions and public land sector agencies, thus customary and statutory tenancies, a Customary Land Secretariat(CLS) was established by the Ministry of Lands and Natural Resources during LAP1. Among other things, the CLS is

mandated by the Lands Commission Act 2008 to keep updated land records of transactions and link landowners to the public land sector. Subsequently, this mandate is more formalised by Act 1036 of 2020. The CLS can now record transactions and prepare lease documents which could be used as proof of transaction. However, under section 14 subsection 4 of Act 1036 (Land Act, 2020), the recorded transactions must be submitted to the LC at the end of every three months. This means that the overall management of land information resides within the Lands Commission. It is relevant to mention that the mandate to issue out lease documents is only valid in areas where deed registration is in effect. In title-declared areas, the LC is the sole authority to record and issue certificates. Thus in Ghana, deed and title registration are the recognised registration types.

The land administration system in Ghana is predominantly analogue (Boateng, 2021). Apart from the Greater Accra Region, which has digitised part of its land administration system, one can only manually interact with land administration processes in the remaining parts of the country. In Ghana's first and second land administration projects, plans were made to transition Ghana's land administration sector into a digital system by establishing a land information system for title registration under LAP 1 and the Ghana Enterprise land information system in LAP 2 (Deane et al., 2017). However, these plans have not come to fruition. Subsequently, Ghana's drive towards digitisation has become very apparent. For instance, Act 1036 (Land Act, 2020) mandates the LC to establish a land information system equipped with the necessary technological artefact to enhance land interests' transfer, creation, and registration. The Act further requires that capacity be made available for utilising the information system. Although this is a brilliant initiative, it will require more than a legal framework for a successful implementation.

2.4. 2.5 Land Information System Assessment Models

The first step in assessing any system is defining it; however, there is no universally accepted model or indicators to objectively evaluate the effectiveness of a land information system, no matter how it is defined. According to Steudler (2004), the absence of a comprehensive and universally standardised assessment framework could result from the cultural, political and social variations in the land administration systems worldwide. Additionally, the purpose of assessment also influences which indicators to look for, making it impossible to adhere to a specific framework (Showaiter, 2018). Due to these variations, The UNGGIM (2020), in their Framework for Effective Land Administration (FELA), proposed that the framework serves as a living document subject to constant review to meet evolving needs. Although most assessment frameworks mainly focus on policy and organisational aspects of the entire land administration system, as identified in Ali et al. (2010); Burns (2007); Chekole et al. (2020); Enemark & van der Molen (2008) and Showaiter (2018); international bodies, national agencies and scholars alike have attempted to provide indicators to assess the effectiveness of LIS qualitatively. These indicators are identified and explained in the subsequent subsections.

2.4.1. Justification for the Selected Reviewed Assessment Frameworks

The frameworks reviewed in this study were selected based on thematic conformity, the scale of application and conceptual conformity. While most frameworks focus on other aspects of LAS, these frameworks thematically capture the subject of land information systems. Additionally, they provide a broader application scale that allows the assessment of LIS at the national and sub-national levels. The broader scale of the framework's application is useful because the scope of this study is at the sub-national level. Lastly, these frameworks capture the relevant concepts in the definition of LIS, which are data, people, process and technology. The reviewed assessment frameworks, together with the theories on LIS adoption and usage discussed in section 2.2, will inform the assessment framework for this study.

2.4.2. Assessment model developed by The United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM)

The United Nations designed the Framework for Effective Land Administration (FELA) for low and medium-income countries. FELA strategically conforms with the Integrated Geospatial Information Framework (IGIF) to serve as a reference guide for member states to develop new geospatial information systems or improve existing ones (UNGGIM, 2020). The assessment of the effectiveness of geospatial information management is supported at both national and regional levels by optimising seven (7) essential principles, eight (8) goals, and nine (9) strategic pathways. See figure 2 for an overview of the Framework.

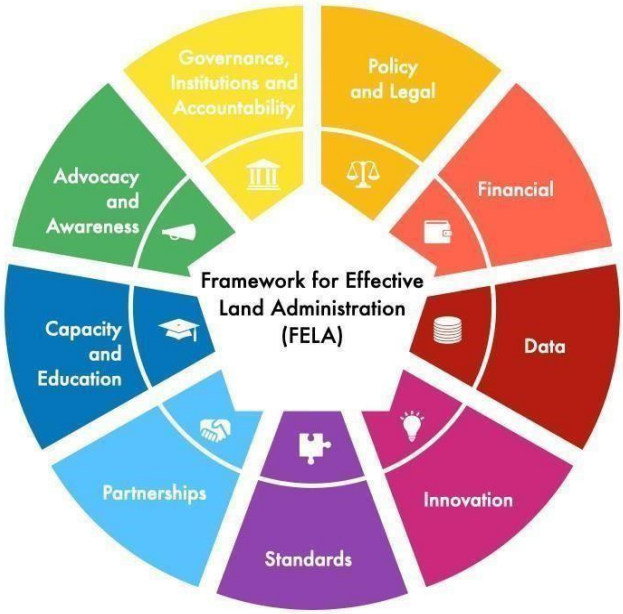

Figure 2: Framework for Effective Land Administration
Source: Adopted from UN-GGIM (2020)

The framework's strategic pathways are influenced by governance, technology, and people. The nine pathways for guiding, monitoring, and assisting the implementation of an information system are summarised and explained below.

Governance and Institutions: This pathway measures the governance model, institutional arrangement, structures, and commitment that has been put in place to achieve a successful geospatial information management system.

Legal and policy: This pathway looks at the legal and policy environment and how they influence land information management regarding official responsibility for data production, exchange, processing, and storage.

Financial: This is to provide an insight into the cost of implementation and the financial commitment allocated to provide a sustainable information system that can be maintained in the long run.

Data: This pathway looks at the means of acquiring, organising, integrating, and archiving land information. It further considers the overall management of data sharing and reuses as well as specific obligations to institutions and users.

Innovation: This pathway finds the choice of technology (hardware and software) and how it strategically aligns with the institutional processes. The main idea is to optimise cost-effective technologies that meet the evolving needs of geospatial information management.

Standard; This measures how different information systems communicate and exchange data in a manner that is not subjected to more than one interpretation.

Partnership: This pathway measures the value of land information through trusted partnerships that acknowledge community needs, organisational needs, and national interests.

Capacity and Education: This pathway measures the skills, instincts, techniques, and resources needed by an organisation and communities to optimise land information systems for decision making.

Communication and Engagement: This pathway measures stakeholders' engagement and input in implementing an information system. Stakeholders' concerns are critical factors to consider for a successful land information system.

2.4.3. Assessment Model by The World Bank

The World Bank in 2012 developed the land governance assessment framework (LGAF) to help countries deal with issues of land governance (Deininger et al., 2012). The framework serves as a tool to guide good land governance practices and provides the basis for governments to prioritise various land reforms and monitor the progress of such reforms over time. Like FELA, LGAF can be holistically implemented at the national or regional level. LGAF is anchored by detailed indicators under five broader themes: *legal and institutional framework, land use planning, management and taxation, management of public land, public provision of information, and dispute resolution and conflict management* (Deininger et al., 2012). Although all these themes play a vital role in monitoring the performance of good land governance over time, Reviewing all five themes is beyond the scope of this study. Our primary focus is to review the public provision of information and identify how the available indicators can be employed to assess the effectiveness of the LIS in Ghana. Table 1 below provides an overview of the theme, indicators, and dimensions.

Table 1:: The Land Governance Assessment Framework-Public Provision of Information

THEME: PUBLIC PROVISION OF INFORMATION		
Land Governance Indicators		**Dimensions**
LG 16	Completeness of the land registry	Mapping of registry records
		Relevant private encumbrances
		Relevant public restrictions
		Searchability of the registry
		Accessibility of registry records
		Timely response to requests
LG 17	Reliability of Registry Records	Registry focus on client satisfaction
		Cadastral/registry info up-to-date
LG 18	Cost-Effectiveness and Sustainability	Cost to register transfer
		Financial sustainability of registry
		Capital investment
LG 9	Transparency	Fee schedule public
		Informal payments discouraged

Source: Adapted from The World Bank 2012

2.4.4. Assessment Indicators by Land Equity International (LEI)

In collaboration with Millennium Challenge Cooperation (MCC), LEI has also identified some critical components to consider in assessing LIS. Land Equity International (2020) presents five major indicators

to guide the assessment of the effectiveness of LIS; the indicators, which are policy and legal framework, institutional framework, technology, finance, and sustainability, employ various dimensions to dissect the appropriateness of land IT systems holistically. The details of the indicators are summarised and explained below;

Policy and Legal Framework: This indicator seeks to assess if the laws and policies of the country are available and adequate to support the effective implementation of LIS. the general argument is that the implementation of the system requires the adoption of new processes or tools and as such, there must be laws and policies on work processes, data management, standards, data pricing, privacy, and metadata **Institutional Framework:** This indicator identifies the institutional infrastructure's viability in providing an enabling environment for LIS implementation. It focuses on three main dimensions institutional processes, institutional capacity, and behaviour of an organisation.

Technology: This indicator assesses the technological environment of LIS. It emphasises the hard and soft infrastructure, internet sources, electricity, and how they conveniently facilitate the implementation of LIS. **Finance:** This indicator assesses whether there are adequate financial resources for implementing the LIS. **Sustainability**: This indicator seeks to evaluate whether strategic measures have been put in place to sustain the implementation of LIS in the long run. It focuses on the IT strategy of the organisation, maintenance culture and risk measures.

2.4.5. Assessment Framework by dr Steudler

Some individual initiatives to assess LAS have been published in literature. Among them are the evaluation framework for assessing the urban cadastral system's reliability in Ethiopia (Chekole et al., 2020) and a framework for land administration organisation (Showaiter, 2018). Although these frameworks fit their adopted purpose, they do not capture the concepts of LIS. Chekole et al. (2020) focus on cadastral systems policy, while Showalter focuses on LA organisation. Unlike the above, Steudler (2004) presents a holistic framework that captures some important indicators for measuring the quality of the entire LAS by considering five significant evaluation areas: policy, management, operational, external factors, and review process. The areas are further categorised and reviewed from different evaluation aspects. See table 2 for an overview of the framework.

Table 2: The Assessment Framework by dr.Steudler

Evaluation areas	Evaluation Aspects
Policy level	Land policy aspects and objectives
	Historical, political and social aspects
	Land tenure and legal aspects
	Financial and economic aspects
	Environmental sustainability aspects
Management level	Strategic aspects
	Institutional and organisational aspects
	Human resources and personnel aspects
	Cadastral and land administration principles
Operational level	Definition of users, products and services
	Aspects affecting the users
	Aspects affecting products and services

External factors	Capacity building, education
	Research and development
	Technological supply
	Professional aspects
Review process	Review Process
	User satisfaction
	visions and reform

Source: Partially Adapted from dr. Steudler (2004)

2.4.6. Overview of the Reviewed Frameworks

Although not in unison, the assessment frameworks by UN-GGIM, World Bank, LEI, and Steudler (2004) present some similarities in indicators to assess the effectiveness of a land information system. It can be deduced from the reviewed frameworks that the effectiveness of an information system depends on the people responsible for land administration functions and clear governance strategies, adequate technology and services, and sustainability measures. These indicators are categorised under four thematic areas and presented in table 3 below.

Table 3:An Overview of the Reviewed Frameworks Under Four Thematic Areas

THEME	FELA	LGAF	LEI	STAUDLER
Governance and people	Governance and Institutions Legal and Policy		Policy and Legal Framework Institutional (processes and structures)	Land policy aspects and objectives, historical, political, and social aspects Land tenure and legal aspects Strategic aspect The institutional and organisational aspects Cadastral and land administration principles
Sustainability	Financial capacity and education	Cost of registration Financial cost	Finance Sustainability Institutional capacity	Capacity building Education Review process Human resources and personnel aspects
Operational environment	Innovation Data Standard	Completeness of the land registry Reliability of Registry Records Transparency	Technology	Definition of users, products and services Aspects affecting the users' Aspects affecting products and services
				User satisfaction Technological supply

Others	Partnership Communication and engagement			Professional association aspects Environmental sustainability aspect Visions and reform

Source: Author's construct, 2022

2.4.7. The Elements Considered for Assessing the Effectiveness of Land Information System

The reviewed models present a realistic perspective to determine the effectiveness of an information system; however, it is equally essential to select dimensions and indicators that align with the purpose of assessment and local situation and context (Showaiter, 2018). Land administration systems are evolving with unique local conditions. Thus different indicators and dimensions are required to examine various issues in all aspects of LAS (Zhang & Tang, 2017); in our case, LIS in Ghana. In recognition of this, the study will consider three key elements commonly identified in all the reviewed models; (a) governance and people, (b) operational environment, and (c) sustainability measures to assess the LIS in Ghana. These elements are further elaborated on in the subsequent subsections.

2.4.7.1. Governance and People

This dimension focuses on policies, legislature, and institutional infrastructure to enhance the adoption of LIS. The absence of policy measures such as guiding documents, procedures on data management, data standards, and the sharing of data presents challenges in LIS implementation (Land Equity International, 2020). A country's legislative framework could threaten its digital land administration drive, especially in cases where laws do not support digital signatories or give precedence to paper records over digital receipts. Therefore it is relevant to assess the comprehensiveness of the law in ensuring an effective adoption of land information systems. Additionally, institutional processes, responsiveness to change, and technological competence are relevant considerations for implementing a successful land IT system (Land Equity International, 2020; (World Bank, 2019). Clearly defined processes that are less complex and cost compelling can enhance the effective adoption of LIS (Showaiter, 2018).

2.4.7.2. Operational Environment

The operating environment is one of the key elements influencing LIS adoption (Land Equity International, 2020). This study defines the operating environment to encompass data quality, the working environment, and the system's technology.

Technological tools are not fit for all purposes. There are instances where technology is established on its abilities instead of purpose. For example, after efficiently implementing a land use and management information system for land use planning in Ghana, planning officers were reluctant to use the technology because it lacked basic drawing features like curves needed in layout and scheme preparations. Although the technology could be used to perform spatial analysis and functions, its inability to draw curved lines rendered it aborted. Every technology varies in goals and operational requirements (Lengoiboni et al., 2019); therefore, if technology is not fit for the purpose, the effectiveness of the land information system may be compromised.

Additionally, land data is the primary foundation on which LIS is built. Without data, there will be no meaning to LIS. For this reason, there is the need to assess the availability of land data and how it conforms to data quality standards in satisfying the information system's needs. For LIS to be effective, it is equally important to have a conducive working environment with access to a reliable power supply, good internet connectivity, and basic office logistics and infrastructure (Land Equity International, 2020).

2.4.7.3. Sustainability Measures

In addition to an enabling operational environment and fit-for-purpose technological artefacts, clear sustainability strategies are required to sustain the operationalisation of the LIS in the long run (Biraro et al., 2021b; Burns, 2007a; Deininger et al., 2012; FAO, 2012). Burns (2007) categorised such measures into financial, technical and participatory sustainability; while financial and technical sustainability focuses on maintenance cost, financial commitment, IT capacity, and skills, participatory sustainability focuses on keeping the public informed about the importance of maintaining up-to-date land information. Biraro (2014) provides evidence of an outdated information system; such systems are incapable of ensuring trust and are ineffective for making decisions. In recognition of this, the sustainability element will focus on education and capacity, communication strategy, and most importantly, the availability of ICT strategy, which, according to Todorovski (2006), effectively supports long-term business operations.

2.5. The Assessment Framework for LIS in Ghana

This assessment framework hybridises the insights gained from the theories on LIS adoption and usage and the dimensions commonly identified by FELA, LGAF, LEI (2020), and Steudler (2004). It covers three thematic areas; governance and people, the operational environment, and sustainability measures. Similar to FELA, this framework explores the effectiveness of LIS through qualitative indicators and eight dimensions: policy and legal frameworks, institutional capacity, data Quality, technology, working environment, ICT strategy, training and capacity, and communication strategy. See table 4 below for an overview of the framework.

Table 4: The Assessment Framework for LIS in Ghana

Thematic Areas	Dimension	Indicators
Governance and People	Institutional Framework	Institutional mandates, roles, and responsibilities are clear without overlapping functionalities
		The land administration process is clearly defined and integrated into the functionalities of the information system
		Positive Attitude Toward Information, Communication and Technology (ICT) Adoption
		Availability of system implementation plan
	Policy and Legal Frameworks	Availability of laws and policies to support analogue to digital conversion
		The system is ready to process all the different types of land rights, right holders, and restrictions
		Data standards, data privacy, data security, and data sharing options are properly regulated
Operational environment	Technology	Availability of strategy to implement the system's specifications (thus strategies to ensure that the computer hardware, software, backups, and storage space needed for effective LIS are available)
		The availability of user-friendly manuals
		The availability of a user-friendly system

	Data	Data is available to be fed into the system
		Data has all the relevant attributes needed for a specific context and are free from contradictions
		Availability of plan to get a complete cadastral coverage
	Working Environment	Availability of suitable ergonomic environment
		Reliable power supply and internet connection
Sustainability measures	ICT strategy	Availability of help desk to provide technical support and assistance
		Availability of strategy to retain key IT staff (thus, if IT staff is well motivated)
		Availability of strategy to protect data, software and operating system
	Training and Capacity	Availability of IT experts for database, land administration processes, and data and network security
		The staff has adequate training in using the information system
		Availability of a plan to get the capacity available
	Communication Strategy	There is a public awareness campaign with content focusing on all the stakeholders of the information system
		Availability of option for a feedback mechanism

Source: Author's construct, 2022

2.6. Summary of Chapter Two

The chapter identified and reviewed the concepts of the study concerning the research problem and objectives from a literature perspective. The reviewed concepts were: land information systems, theories on adoption and usage of information systems, and land administration and information systems in Ghana. The chapter also peeked into available frameworks in literature for assessing the effectiveness of LIS, which served as the basis for developing a suitable framework for LIS assessment in Ghana. This framework will guide the development of questionnaires for data collection. The next chapter outlines the study area and the approach for undertaking this study.

3. THE STUDY AREA AND METHODOLOGY

This chapter gives an overview of the study area, justification for selecting the study area, the required dataset that was used for this research, the research design, and the steps that were executed to achieve the study's overall objective, which is to assess the information system for land administration in Ghana.

3.1. Overview of the Study Area

The study draws insight from two case study areas on a sub-national scale thus, Kumasi and Accra. Kumasi is a metropolitan area within the Ashanti Region of Ghana. It is the second-largest city in Ghana (Forkuor et al., 2013) and serves as the capital state for the Asante Kingdom and the Ashanti Region (Amoako, 2014). The city's geographic location enables it to provide good connectivity to other parts of the country and beyond. Furthermore, the city is economically considered the commercial hub of West Africa, with the largest open-air market serving both inhabitants and beyond. This identity of Kumasi makes it very attractive to investors and migrants; hence the need for information on land ownership, land use, and restrictions becomes crucial.

By default, all the land in Kumasi belongs to the stool or Asantehene (paramount chief); however, the state has acquired lands through the Administration of Land Act 1962 (Act 123). The Asantehene holds the allodial rights in trust of his subject, and any person who seeks to acquire such land must initiate such transaction at the CLS. This makes land governance in Kumasi very centralised to the stool. The land Act 2020 (Act 1036) mandates the CLS to record and update land transactions. This role is very apparent in Kumasi, considering that deed and title registration are at play. Subsequently, there are laws to ensure the submission of recorded transactions at the CLS to the KLC for the overall management.

On the other hand, despite its smaller geographic size, Accra is the capital city of Ghana and the most populated city *(see figure 3.)*. The land governance structure in Accra is decentralised among stools, families, states, and individuals; therefore, a person who wants to acquire land must obtain consent from these institutions. Unlike Kumasi, which practices the dual registration system, the whole of Accra is a title registration area. Currently, the LC is the only body mandated by law to issue land title certificates; this legally centralises the overall land information management in Accra to the LC.

3.1.1. Justification of the Study Area

Kumasi and Accra are selected as the study area because the former provides an intriguing case study to identify why the analogue land administration system remains persistent within the lands commission. The latter has a working LIS which will help provide lessons for future implementation. Unlike the Greater Accra Region, which has digitalised its land administration processes, Kumasi Lands Commission operates in the analogue system. Furthermore, Kumasi and Accra are the two biggest cities in Ghana; therefore, several land transactions take place in these areas. This makes the need for reliable information imperative.

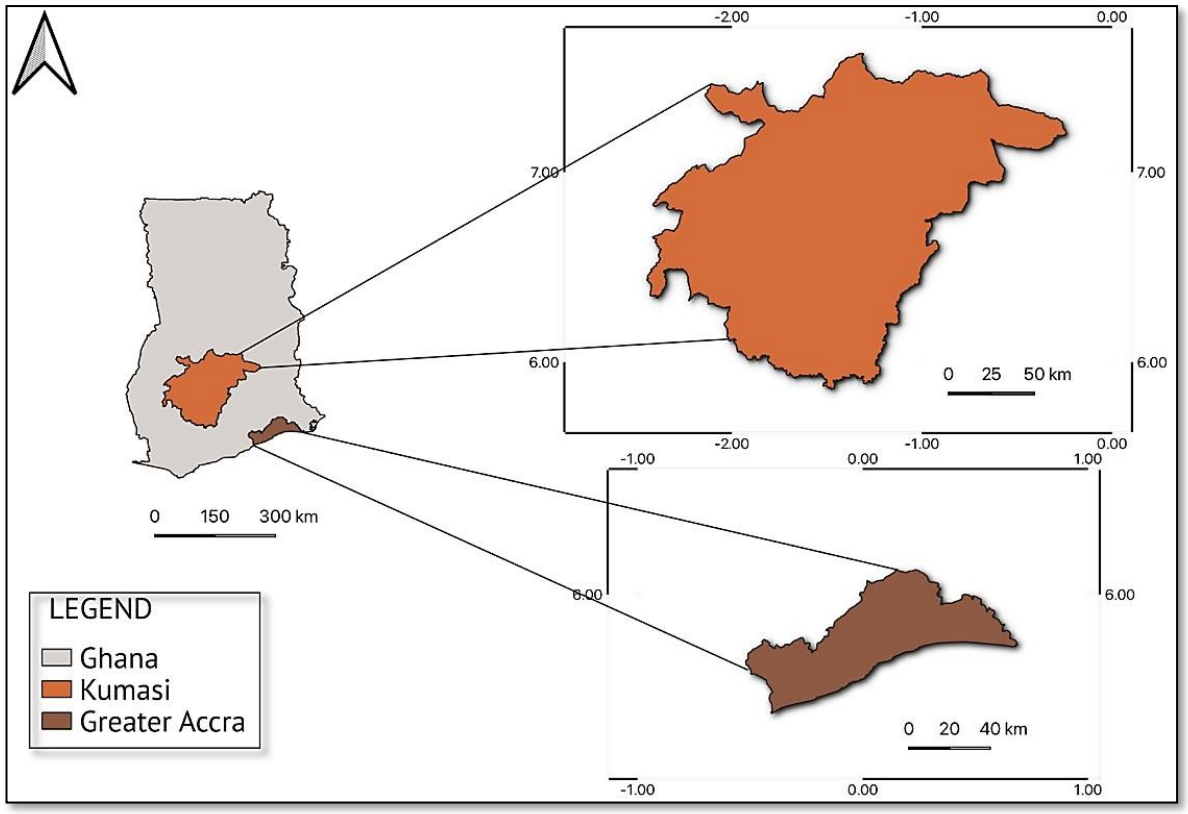

Figure 3: Map of Case Study Areas
Source: Authors Construct, 2022

3.2. Dataset

This research relied on a dataset obtained from literature, ITC data archives, interviews with key informants from Kumasi and Accra Lands Commission and questionnaires from clients in both study areas. The clients were landowners who had used the services of the LC. On the other hand, the key informants were the staff which constituted officers from Land Registration Division (LRD), Land Valuation Division (LVD), Survey and Mapping Division (SMD), Client Service Access Unit (CSAU), IT department, and Management.

3.3. Sampling Design

The research adopted purposive sampling to identify the key respondents who provided relevant information about the LIS in Kumasi and Accra LC. These respondents were selected based on (i) their knowledge about the topic, (ii) their level of involvement in activities within the LC (iii) their willingness and availability. Furthermore, to understand how the information system has improved land service delivery, a convenient sampling technique was used to obtain information from clients, i.e. landowners. Data from clients were obtained from twenty-five (25) respondents and twenty-three (23) respondents from Kumasi and Accra, respectively. Eight (8) and eleven (11) key informants were purposefully selected to provide relevant information about the Kumasi and Accra Lands Commission LIS. In general, sixty-seven (67) respondents were used in this study. Table 5 gives an overview of the respondent used in primary data collection.

Table 5: Overview of Respondents for Primary Dataset

Respondents	Case Study Area	Number of respondents
Lands Commission Management	Accra	3
	Kumasi	1
IT Department	Accra	1
	Kumasi	1
Client service Access Unit	Accra	1
	Kumasi	1
Land registration Division	Accra	1
	Kumasi	1
Land Valuation Division	Accra	1
	Kumasi	1
Survey and Mapping Division	Accra	2
	Kumasi	1
Public and Vested Land Management	Accra	2
	Kumasi	2
Clients	Accra	23
	Kumasi	25
	TOTAL	**67**

Source: Authors Construct, 2022

3.4. Research Design

The study adopted the qualitative research approach. According to Creswell et al. (2011), qualitative research allows the researcher to elicit information about beliefs, feelings, and values that intrigue behaviours by answering what, why, and how questions. Additionally, it enables the researcher to better understand a situation (Bazen et al., 2021). In recognition of this, a qualitative approach was selected because this study aims to assess information systems for land administration to gain a deeper insight into why it has been adopted and used for land administration purposes in Accra and not in Kumasi. This study also used the case study strategy of the qualitative method, which according to (Yin, 2018), is appropriate for making an empirical inquiry into existing phenomena. The selected units of investigation, Kumasi and Accra lands commission, will provide more understanding of LIS effectiveness.

3.4.1. Research Design in Stages

This research was carried out in three stages: pre-fieldwork, fieldwork, and post-fieldwork, as illustrated in figure 4. Details of the specific activities undertaken under each stage are further elaborated in the subsequent subsections.

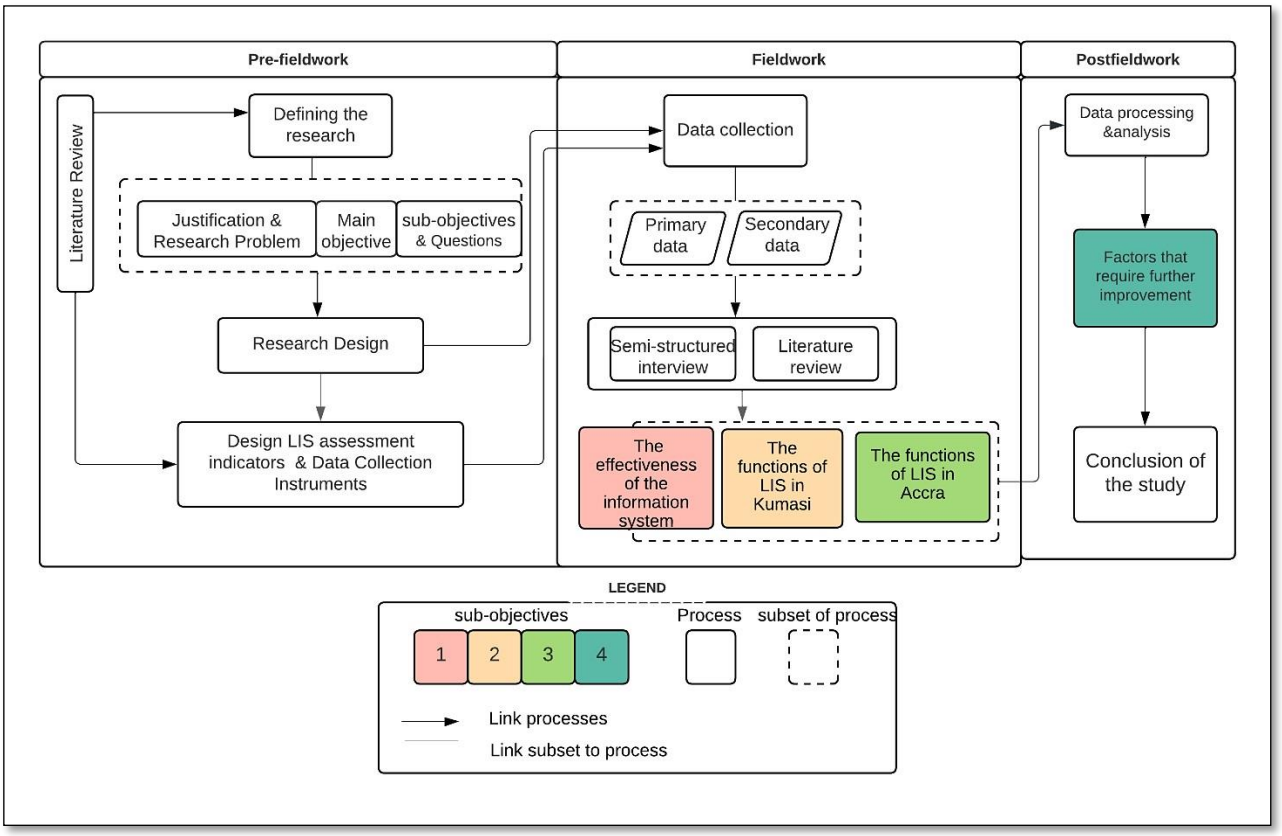

Figure 4: Methodology Flow Chart
Source: Authors Construct, 2022

3.4.1.1. Pre-fieldwork

Defining the Research

The research idea was conceived at this stage. The study's background and justification were first identified through a literature review on theories, concepts, and practices about LIS and land administration. The research problem was then identified and explained with evidence obtained from the literature. The next step was to formulate the overall research objectives, sub-objectives, and the research questions required to achieve the study's overall goal.

Research Design

After defining the research objectives, sub-objectives, and research questions., the research design was developed. It includes a research matrix in appendix 3.1 indicating; the required data, method of data collection, respondent, the expected output for each research question, and the associated sub-objectives. This process was relevant for providing an overview of the entire study framework.

Design LIS Assessment Indicators and Data Collection Instruments

Designing suitable indicators served as input for the interview guide and questionnaire development for data collection in Accra and Kumasi. Thus, the indicators provided an overview of what to expect in the field regarding the functionality of the information system in Ghana. Therefore the indicators were developed by reviewing the frameworks for assessing LIS in literature. This stage was finalised by designing semistructured interview guides and questionnaires for data collection following the identified indicators (see section 2.5).

3.4.1.2. Fieldwork

Data Collection

Data collection aims to obtain quality evidence for data analysis and develop credible and convincing answers to research questions (Kabir, 2016). This research used both primary and secondary data to answer the research questions. The primary data were directly collected from the Kumasi and Accra Lands Commission staff using semi-structured interviews. Open-ended questionnaires were used to obtain information from clients with the help of the Kobocollect tool. The semi-structured interview enables the researcher to ask open-ended questions and provides the flexibility of follow-up questions, probes, and comments to understand the topic in-depth (DeJonckheere & Vaughn, 2019). This method of primary data collection contributed to achieving the goals of sub-objectives 1, 2, and 3. In conducting the interview, the conversations were recorded to capture the answers from the respondents. In situations where the interviewee did not wish to be recorded, a field assistant was available to take notes of the answers.

The secondary data was obtained through the review of relevant literature. Keyword searches from journals, reports, legal documents, thesis, books, internet sources, and ITC data archives were used to gain insight into the LIS, land administration, and strategies to improve the information system for land administration processes.

3.4.1.3. Post fieldwork

Data Processing and Analysis

The primary data obtained through audio recording was transcribed into text using Atlas.ti; similarly, the notes taken on the field were scanned to generate the text. The generated text from the scanned notes and the questionnaires from the clients were uploaded into Atlas.ti where the data was arranged and coded. The codes generated from the data were then grouped into themes for answering the research questions. The secondary data extracted from existing literature were grouped in an excel table constituting the author's name, the document title, publication year, and the major findings. The qualitative thematic analysis was used to establish the link between themes and patterns from both primary and secondary data and was succinctly provided with meaningful interpretations to achieve sub-objectives 1, 2, 3 and 4

Identification of Factors that Require Further Improvement

The results obtained from analysing primary and secondary data related to sub-objectives 1, 2, and 3 provided the basis for identifying the factors for improving LIS in Ghana's Lands Commission. This process used relevant literature on LIS's best practices, theories, and concepts to support the recommended proposal.

Conclusion of the Study

This is the final process of the study. It includes the overall reflection on the findings and the proposed recommendation for LIS improvement. The future research direction is also represented at this stage.

3.5. Summary of Chapter Three

This chapter presented the case study areas, why they were selected, the dataset, and the scientific approach used to achieve the study's goals. The methods adopted for the study were sufficient in attaining the study's findings, which are presented in the next chapter.

4. LAND INFORMATION SYSTEM AND LAND ADMINISTRATION PROCESS IN GHANA

This chapter presents empirical findings on the effectiveness of the land information system (LIS) in Kumasi and Accra based on the assessment framework developed in chapter two. This chapter is categorised into

two sections; insights from the case of Kumasi and insight from the case of Accra. The primary data for assessing the LIS and the integrated functionalities were obtained from the staff of the Commission and clients of the two case study areas *(see table 5)*. Other secondary data was also obtained from land laws and policy documents of the Commission and the ITC data archive.

4.1. Land Information System in Kumasi

The land administration in Kumasi is limited to manual processes. Dean and Quaye (2017) indicated that an information system was implemented for all the land sector agencies under LAP 1 but was not adopted nor used for land administration processes; findings from fieldwork indicate that no such system has ever been implemented in Kumasi. In recognition of this, the goal of assessing the information system in Kumasi is constrained; thus, the developed indicators could not be fully measured due to the non-existence of LIS in Kumasi. The following were the identifiable and measurable dimensions: institutional framework, (2)policy and legal frameworks, (3)data quality, and (4)working environment. The primary data was obtained from twenty-five (25) clients and eight (8) staff of the Kumasi Lands Commission *(see table 5)*. Secondary data from Ghana's land laws, policy, and ITC data archive also contributed to the findings in this section. The subsequent sub-sections provide insight into the results following the identifiable indicators.

4.1.1. Institutional Framework

This dimension provides insights based on four indicators: institutional roles and mandates, LIS and the integrated functionalities, attitude towards ICT adoption, and availability of implementation plan.

Institutional mandates, roles, and responsibilities

Act 767 of Ghana (Lands Commission Act, 2008) outlines the specific duties discharged by the land administration institution. In Kumasi, an interview with the PVLMD revealed some overlapping functionalities and roles in executing the said duties. An instance was identified in the deed registration process. According to one respondent from PVLMD, this process is carried out by both the PVLMD and the CLS. According to the management, this duplication is a way of generating income for the CLS and the LC. During deed registration, the client must complete the CLS process and initiate it again at the KLC with PVLMD (Boateng, 2021). Subsequently, 20 of the 25 clients believe that it is costly and time-consuming to undertake the same transaction twice.

The land administration process is clearly defined and integrated into the functionalities of the information system

Based on an interview with management, the land administration processes in Kumasi involve granting concurrence and consent, plan approval and cadastral plan preparation, tax value assessment, verification and certification. *(See table 6 for the processes overview)*. According to fieldwork findings, these activities are undertaken manually due to the absence of the LIS.

Table 6:Description of Land Administration Activities in Kumasi

Activity	Description
Concurrence	This is when the LC bears witness to a transaction between a stool and a party,
Consent	It refers to approving ownership transfer of land purchase from a stool or government
Plan approval, cadastral and parcel plan preparation	It is the approval of site plans submitted by clients and the preparation plans for deed and title registration
tax value assessment	It consists of determining the taxable amount on a property

Verification	It involves checking the genuineness of the documents submitted by clients
Processing	It is the documentation of requests submitted by clients
Certification	It involves issuing title and deed documents to the client

Source: Authors Construct, 2022

Positive attitude toward Information, Communication and Technology (ICT) adoption

The attitude toward ICT adoption is presented from two perspectives: internal and external attitude. Whiles the internal focuses on the staff of the Commission; the latter provides insights from the clients who interact with the services of the Commission

Internal attitude towards ICT adoption

Even without an information system, the staff of the LC exhibited a positive attitude towards ICT adoption during a video elicitation on the potential of LIS. Follow the link below for an overview of the video https://www.youtube.com/watch?v=MvsHIEJsNvY.

After the video elicitation, all the divisions identified in an interview that the functionalities of LIS in the land administration process would result in a well-organised and less bureaucratic service delivery. To add to the optimism in ICT adoption, the LRD has adopted the functionalities of Microsoft Excel to keep location lodgement and administrative numbers. This assists them in file and certificate identification in their records room. Similarly, the PVLMD also uses a tracking system to identify the location of files from the records room. Here is a picture of the record room captured during fieldwork in Kumasi.

Figure 5: Records Room of the PVLMD, Kumasi
Source: Fieldwork Kumasi Lands Commission, 2022

External attitude towards ICT adoption

When the video identified in the link above was shown to the clients, all 25 of them acknowledged LIS as effective, convenient, reliable, transparent and fast. When the clients were further asked if they would use

such a system if implemented, 19 out of 25 respondents indicated they would use it. 2 out of 25 respondents would prefer a combination of analogue and digital. The remaining 4 respondents would like to interact with the services of the Commission manually *(see figure 4.1)*. According to the respondents, opting for a manual system or combination of systems is due to the fear of the unknown in a digital environment and low literacy.

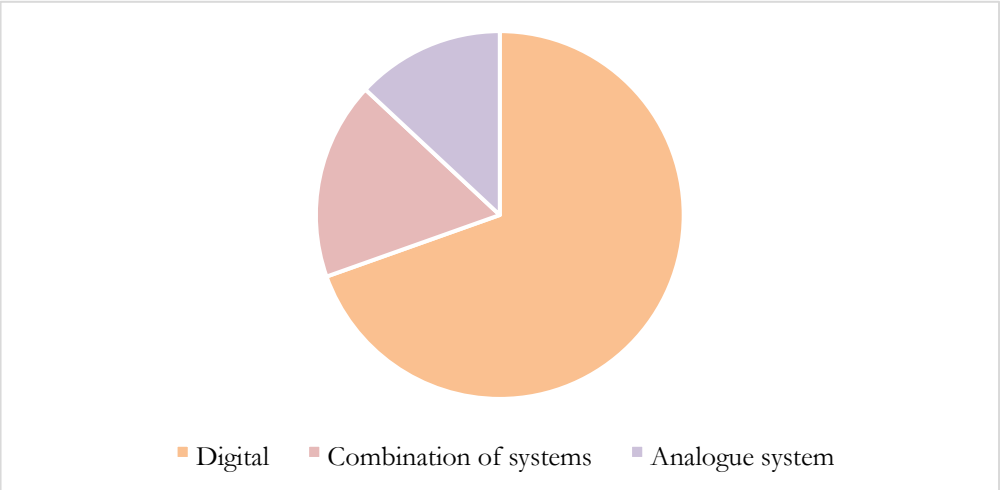

Figure 6: Clients' Preference for Land Administration Service in Kumasi
Source: Authors Construct Based on Fieldwork Findings, 2022

Availability of system implementation plan

Considering the non-existence of an information system in Kumasi, it is a reasonable excuse not to have a system implementation plan that details the specific requirements and scope. However, according to management, Kumasi is in the process of replicating the system in Accra. This is apparent in scanning PVLMD records and establishing an IT department, CSAU and the provision of some technological artefacts. The technological tools include monitors, barcode readers, printers, mouse, and keyboards; however, according to the respondent from LRD, they are more of a decorative piece than a tool for enhancing daily business activities due to their inability to operationalise them.

4.1.2. Policy and Legal Frameworks

This dimension identifies and measures the availability of laws and policies supporting LIS. It further provides insight into the legally accepted land right that LIS could support.

Policies and laws

To ensure good land administration in Ghana, Ghana's National land policy (Ministry of Lands and Forestry, 1999) advocates for developing LIS to support land administration services. Act 1036 of Ghana additionally lays the legal foundation of LIS. Per subsection one of section 73 of Act 1036 (Land Act, 2020), "*a transfer of land or an interest in land is required to be made by a conveyance, that transfer is lawfully made if that transfer is by an electronic conveyancing.*" The electronic conveyancing specified in the act is applicable to the deed and the title registration system, which is the current registration system in Kumasi. Furthermore, the recognition of digital signatories in the conveyancing process is catered for by Act 772 (Electronic Transaction Act, 2008).

Land rights and information system

Land rights are interests held by a person, stool, family/clan or state, providing the ultimate power to exert ownership. Per Act 1036 (Land Act, 2020), Ghana's legally recognised land rights constitute allodial interest,

freehold, usufruct, leasehold, and customary tenancy. Table 7 below describes the right following the provisions of Act 1036.

Table 7: A Description of Land Rights under Act 1036

Land Rights	Description
Allodial Interest	Allodial rights are the highest interest in land and are given to the first settlers of unoccupied land. It usually resides in stool or family
Freehold	Freehold Land rights are held in a stool or family landholder or an individual in perpetuity
Usufruct	It is an inherent and alienable right by a subject or a member of a stool, family or clan that holds the allodial title.
Leasehold	It is an interest in land for a duration capable of being ascertained and obtained when a person who holds allodial interest, freehold, or usufructuary right conveys it to another person for a specified time. It is also possible for someone with a leasehold interest to assign part of or the whole interest to another.
Customary Tenancy	This is an interest created through a contract and is acquired when a stool or family which holds the allodia title or a person who holds freehold or usufruct grants another person an interest in land upon agreed terms

Source: Authors Construct, 2022

Subsequently, any person who wants to register a transaction or an interest under usufruct must be altered into leasehold before documentation. As identified in Boateng (2021), the traditional setup in Kumasi recognises other customary transactions such as customary gifts and "Awowa", which could be translated as "pledges"; however, no law has made provision to accommodate these interests.

4.1.3. Data

This dimension measures data availability, the scope of data and the availability of a plan to get complete cadastral coverage of Kumasi.

Data is available to be fed into the system

In an interview with the SMD and PVLMD, it was identified that documents such as files and copies of transaction certificates are available for digital conversion. However, a substantial part of these documents remain missen due to relocation to their current building or being torn apart. According to the respondent from the PVLMD, for the lands whose records remain missen, they have to rely on clients for validation and are usually not successful. Similarly, the LRD also mentioned that data is available; however, the current state of organising such documents will present a probable cause of omission during digital conversion. For instance, encumbrances and conflict-related land documents were seen pasted on the walls within the LRD and not in the records room of the division.

Data has all the relevant attributes needed for a specific context

All the divisions indicated that existing data has all the required features specified in Act 1036 (Land Act, 2020) and the LI 1444 (Ghana Law Finder, 1988). However, there are issues in determining the land use and zoning restrictions due to differences in coordinate systems. The spatial planning authority prepares layout and zoning plans in the WGS84 coordinate system, and the LC operates using the national datum; thus, Ghana War Office. According to the PVLMD and SMD respondents, these differences present a challenge in identifying the actual use of the land when the cadastral plans are supper imposed on the layout plans.

Availability of a plan to get complete cadastral coverage

In an interview, the LRD indicated that the current strategy to get comprehensive cadastral coverage is public sensitisation on the importance of land registration. This mass education is rooted in various televisions and radio platforms in the region. However, further insight from the respondent indicated that this strategy had not yielded many outcomes because land registration in Ghana is sporadic; thus, it will require a more capital-intensive approach and plan to get complete cadastral coverage.

4.1.4. Working Environment

This dimension identifies two indicators; the availability of an ergonomic environment and reliable power and internet connection.

Availability of suitable ergonomic environment

This indicator provides insights into the convenience of the office space and furniture supporting business activities in the Kumasi LC. According to LRD, there is not enough furniture for staff during business hours; as a result, officers are on the move to find a space to lodge. Apparently, this often presents difficulties in locating some of these officers to undertake a specific task or an activity. In response, management in Kumasi indicated that funds are unavailable to meet such demands; every budget request is submitted to the head office in Accra, and they determine what should be done and how much should be allocated. On the other hand, space and furniture have been provided to clients at the newly established CSAU. Concerning the suitability of the available furniture, the divisions mentioned that they were comfortable if they had a place to sit.

Reliable power supply and internet connection

The general power situation in Ghana is not reliable; as a result, an option has been made for a standby power plant for the day-to-day administration of the LC. However, according to management, the power plant is often not utilised in the case of power outages due to insufficient funds for fuel. In the situation where fuel is made available, all the divisions are encouraged to turn off their air conditions to ensure that there is enough energy to carry them through the day. According to all the divisions, this situation often makes them very uncomfortable at work.

Moreover, an interview with the staff indicates that internet is constantly supplied. However, the connection is usually lost in the event of power outages and the absence of a standby plant.

4.2. Land Information System in Accra

In assessing the LIS in Accra, this study covered three thematic areas: governance and people, the operational environment, and sustainability measures. These areas are further categorised into eight dimensions; (1)institutional framework, (2)policy and legal frameworks, (3)data quality, (4)technology, (5)working environment, (6) capacity and training, (7) ICT strategy, and (8)communication strategy. Furthermore, the benefits of integrating the system's functionalities into the land administration processes and the issues of concern are presented in this section. The primary data used to provide the insights from Accra was obtained from 23 clients and 11 staff of the Accra Lands Commission *(see table 5)*. The secondary data from Ghana's land laws and policy also influenced the findings in this section.

4.2.1. Institutional Framework

This dimension focus on three indicators: institutional mandates and responsibilities, land administration processes and how they are integrated into the LIS functionalities, attitude towards ICT adoption and system implementation plan availability.

Institutional mandates, roles and responsibilities

An interview with the management of Accra LC indicates that the mandate, roles and responsibilities bestowed on the LC by Act 767 (Lands Commission Act, 2008) are clearly defined and coordinated.

Undoubtedly, interviews with the staff from the land registration division (LRD), survey and mapping division (SMD), land valuation division (LVD) and public and vested land management (PVLD) connote clear and distinct functionalities with no overlapping roles. The Commission's primary mission is "*to provide high quality, reliable and efficient services in geographic information, guaranteed tenure, property valuation, surveying and mapping through teamwork and modern technology to stakeholders*"(About Lands Commission, n.d.). However, the LC's service quality and reliability require more than a written statement. Most clients interviewed; thus, 19 out of 23 respondents regard such services as bureaucratic.

The land administration process is clearly defined and integrated into the functionalities of the information system

Based on an interview with management, Accra's land administration processes can be categorised into seven primary activities: granting concurrence, granting consent, plan approval and barcoding, tax value assessment, verification, processing, and certification. See table 8 for the process overview.

Table 8: Description of Land Administration Activities in Accra

Activity	Description
Concurrence	This is when the LC bears witness to a transaction between a stool and a party,
Consent	It refers to approving ownership transfer of land purchase from a stool or government
Plan approval and barcoding	It is the approval of plans submitted by clients and the encoding of information about the exact location of a parcel and the corresponding boundaries
tax value assessment	It consists of determining the taxable amount on a property
Verification	It involves checking the genuineness of the documents submitted by clients
Processing	It is the documentation of requests submitted by clients
Certification	It involves issuing title documents to the client

Source: Authors Construct, 2022

Findings from LRD, PVLMD, and LVD indicate that the system does not have the functionality to accommodate all the activities involved in the LA processes. Currently, the system fully supports barcoding and some aspects of verification, tax value assessment and processing.

There is a positive attitude toward ICT adoption

This indicator is measured from two perspectives: internal and external adoption, with a specific focus on the staff and clients of the Commission**.**

Internal attitude towards ICT

Even without incentives to adopt and use the system, it is explored daily for land administration processes due to the management's strict enforcement rules. Currently, one cannot escape the whims of the system; thus, all processes must go through the system. Although the interview with LRD, SMD, LVD, PVLMD and CSAU indicate a positive attitude towards adoption, thus 5 out of 5 respondents meant that digital land administration is well organised and less bureaucratic; it could not be deciphered if the managements enforcement rules influence this attitude

External attitude towards ICT

Whiles all officers exhibit a positive attitude towards ICT adoption, a similar cannot be said of the clients who daily interact with the LC. Although all 23 interviewed clients indicated that digital land administration is effective, reliable, transparent and convenient, 16 respondents are willing to adopt such a system. 4 respondents would prefer to use a combination of analogue and digital because the analogue system would serve as an alternative if there is a malfunction with the digital system. The remaining 3 respondents are

unwilling to use such a system due to the lack of skills in working in a digital environment or the loss of trust in the digital system. *(See figure 7 for an overview of responses from the client*).

"I don't trust the digital system due to previous experience with digital payment. You are never certain if your transaction is through or not because the system breaks down, and there is no one to confirm such payment. I prefer to transact manually. That is when I can be sure that all relevant documents are fully submitted." One client responded.

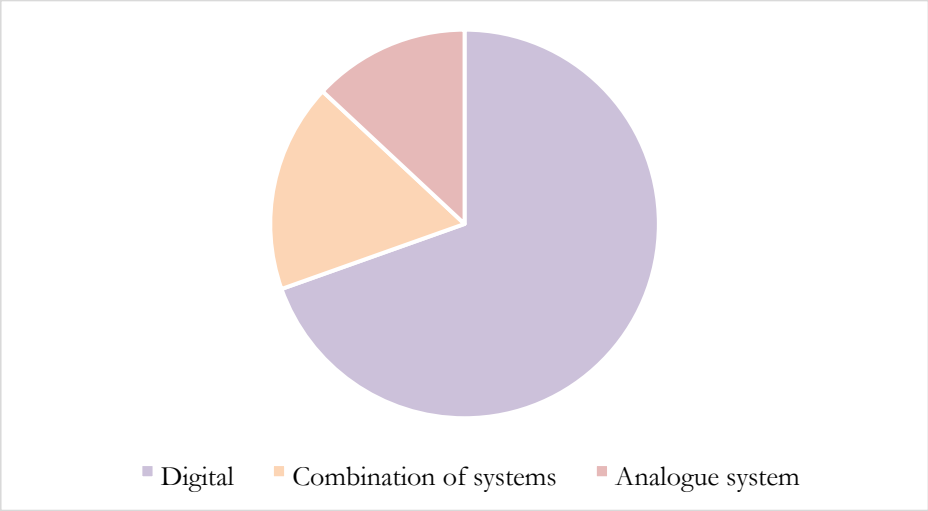

Figure 7: Clients' Preference for Land Administration Service in Accra
Source: Authors Construct Based on Fieldwork Findings, 2022

Availability of system implementation plan

Questions like what is the scope of the system? what are the system's boundaries? How much budget is required? And what specific action should be taken cannot be answered as far as the information system is concerned. A strategic implementation plan to detail these requirements is non-existing in Accra. In an interview, the IT department indicated that the fuzzy nature of the scope and boundaries of the system has slowed down the automation of the land administration system. According to management, the LC is adopting the agile system development method. However, no specific source of funds is allocated for the system's development, implementation, and sustenance; subsequently, only 33% of the income generated is assigned to the Commission annually for the day-to-day administration. The remaining 67% goes to a consolidated government account. As a result, the systems development and deliverables are implemented when needed and could be financially supported.

4.2.2. Policy and Legal Frameworks

This dimension provides findings on the existing laws and policies to support the functionalities of the information system in Accra. Additionally, findings on the registrable rights in the LIS according to the laws of Ghana are also presented.

Policies and Laws

The existence and fabric of the information system in Accra are established under a clear guiding policy and legal instruments. The development of the land information system was first identified in the National Land Policy (Ministry of Lands and Forestry, 1999) as an action to enhance adequate institutional capacity and capability in the land administration system. Concerning the instruments, Act 1036 (Land Act, 2020) mandates establishing the information system and further posit that *"a conveyance is lawfully made only through electronic means"* and demands the Commission to develop an information system with adequate technological infrastructure to facilitate such conveyancing. In addition, Act 722 of Ghana (Electronic Transaction Act, 2008)) supports digital signatories that may be required to replace manual stamps and signatures in the

conveyancing processes. It is relevant to mention that the whole of Accra is declared as a title registration area and hence has the full support of the law in developing LIS.

Land Rights and Information System

Subsequently, there are five recognised land interests in Accra. These include allodial interest, usufruct, freehold, customary tenancy, and leasehold. According to LRD, the information system cannot accommodate all the different types of recognised land rights. Thus the system only supports leasehold, customary tenancy and usufruct processing and documentation with a loss in meaning in the latter. Subsequently, section 5 subsection 1a of Act 1036 (Land Act, 2020) describes "usufruct" as an inherent right that could be inherited or alienated subjected to no time limit. However, registering such interest will reverse the inherent right to a 99 years leasehold, thus altering the usufructuary meaning.

The absence of inclusion of freehold interest despite its legal recognition could be explained by the act that acknowledges its existence. According to the Land Act (2020), "*A person shall not create an interest in or rights over any stool, skin, clan, or family land which vest in that person or body of persons a freehold interest in that land."* Although the law is silent about creating freehold interest in individual lands, which could be gifts, sales or inheritance from one's parents, the system functionality does not make accommodation for documenting such interest.

Data standards, privacy, protection and regulations

Data standardisation varies across the various divisions due to differences in functionalities. For instance, in preparing a cadastral plan, the SMD requires the plan data of the coordinates of the parcel, size of the parcel in its imperial units, the bearing, plan number, registration district and locality, scale, surveyors' signature and other relevant numbers. These are different from the specification required by PVLMD in granting concurrence. According to an interview with SMD, PVLMD, LVD, and LRD, all other standards governing data are specified and regulated by legal instruments such as L1 1444. Additionally, efforts are made to check the compliance of submitted documents to these standards.

Concerning data privacy and protection, access and restriction to data are clearly outlined in Act 989 (Right to Information Act, 2019). Everyone in Ghana has the right to information; however, access to such information should not result in undue loss or gain to a person, a group, a financial institution or any other body(Right to Information Act, 2019). Given this, the LC duly assesses every request for information/data to determine whether the application safeguards the life or liberty of the party/s involved. While this regulation applies to information within the realm of the LC, user identification (Emails) in using the system may be compromised.

Before any client can use the system, they must sign up with their email address and password. According to the CSAU respondent, the system frequently breakdown and presents a difficult situation for new signups. This has made it possible for new clients to initiate transactions using previous successful logins of other clients.

The potential to disseminate data resources across the various divisions is not a problem as far as the region's land administration system is concerned. In an interview with SMD, PVLMD, LRD and CSAU, it was identified that data resources, precisely parcel details, have been consolidated into one database, which officers could query through their secret credentials. It is important to consider that this consolidated data resource is restrictive to only internal data. The LC must fall on the Land Use and Spatial Planning Authority (LUSPA) for external data such as land use plans and zoning regulations. Section 117 of Act 1036 (Land Act, 2020) mandates LUSPA to share data on layout and zoning plans with the Commission; however, according to an interview with management, this option is constrained. Such data is often not released on time, so clients are sometimes asked to obtain this data from LUSPA.

4.2.3. Technology

This dimension provides an overview of the existence of a strategy to implement the LIS specification and the usability of the LIS and its manuals.

Availability of strategy to implement the system's specifications

According to management, the LC in Accra has put in measures to provide all relevant hardware and software to fulfil the requirement of the information system. This is evident in the availability of monitors, system units, printers, scanners, barcodes, keyboards, and mouse. Whiles this hardware remains common in IT, CSAU, LRD, PVLMD and SMD, the same cannot be said of LVD. Some officers in this division have to use their personal computers during work hours.

Moreover, other responses from management indicated that the LC uses the Enterprise Land Information System Software (ELISS), which is internally developed based on their business needs. Thus ELISS interface varies across the various division. The LC also uses PostgreSQL for database management, QGIS and Topcon tools for geographic data processing. It is relevant to mention that PostgreSQL and QGIS are open-source and not subject to license renewal. Subsequently, the IT respondent noted the availability of a network management system (*see figure 8 for an overview*) to monitor network connectivity and a server containing all the digital archives and records of the LC. Provision has also been made for server backup; however, the type of backup could not be disclosed due to security reasons.

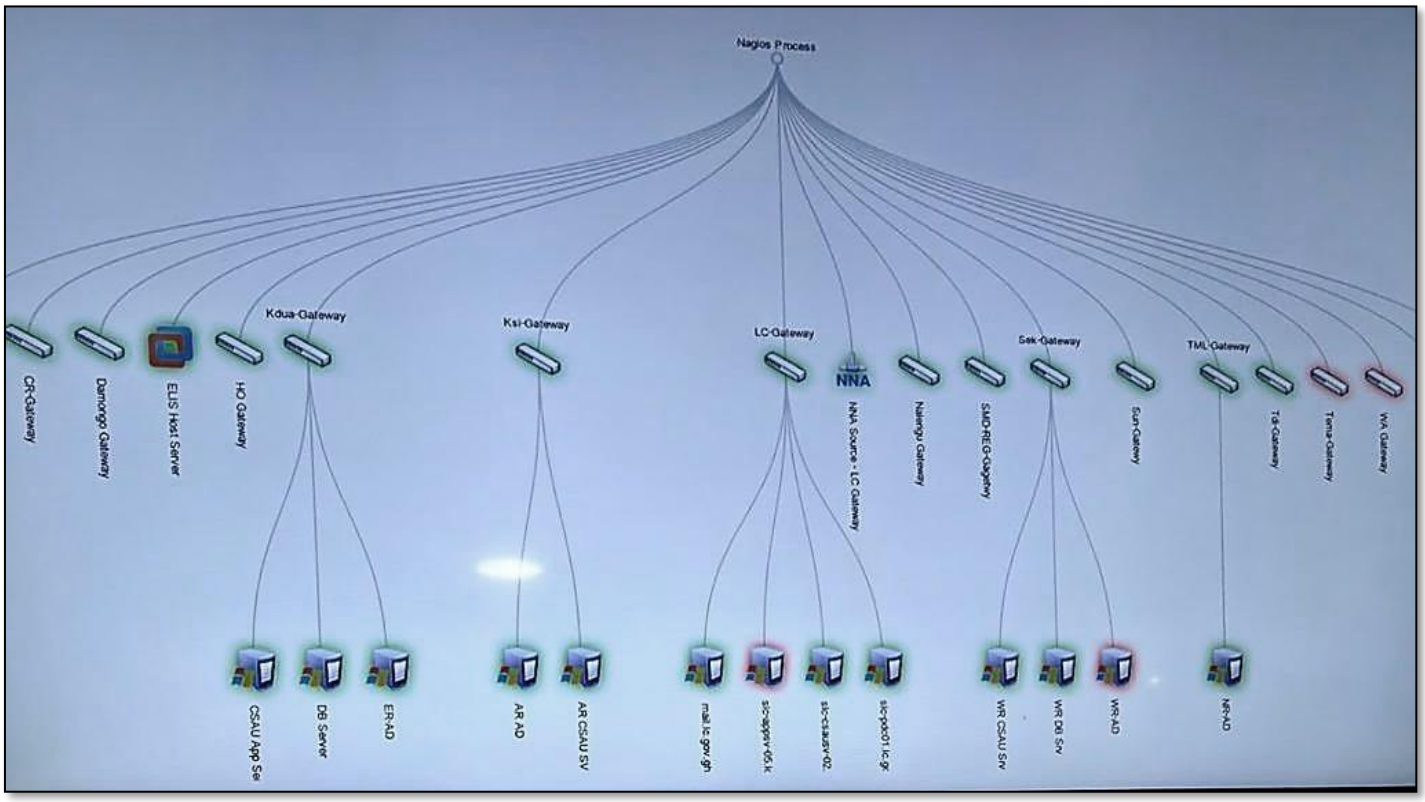

Figure 8: Network management system at Accra Lands Commission
Source: Accra Lands Commission, 2022

The availability of user-friendly manuals and systems

This indicator measures the system's usability from internal and external points of view. The internal focuses on the staff of the Commission, and the latter focus on the clients who interact with the services of the Commission.

Internal users

Findings from CSAU, PVLMD, SMD, LVD, and LRD reveal no operational manual available to staff to guide the use of the system conveniently; however, provision was made for a brochure that outlined the purpose and goals of the information system. They also indicated that IT staff is available to provide the needed guidance in the event of any operational difficulties.

Aside from the absence of an operational manual, the divisions/departments are not in unanimous agreement concerning the system's usability with reference to its interface and access to common features for their daily business activities. In an interview, the SMD, LVD, LRD and CSAU indicated that the systems interface keeps changing automatically without their prior knowledge. As a result, they sometimes have to spend an entire day trying to understand and work with the updated interface. If such understanding has not been derived, the entire land administration process must be kept on hold.

Furthermore, the LVD also stated that the system does not provide all the relevant features needed for their scope of work. In assessing the taxable value, LVD must emboss a stamp on the document; however, this feature is currently non-existent because the system is being developed incrementally. Whiles all departments have indicated that the system is sometimes unreliable due to operational malfunctions, they all attest that the system has suitable navigational components and is focused on the needs of the Commission. Table 9 presents the findings on the system's usability.

Table 9: Findings on the System's Usability in Accra

Department	Area	Assessment		Area	Assessment		Area	Assessment		Area	Assessment		Area	Assessment	
		Good	Not so good		Good	Not so good		Good	Not so good		Good	Not so good		Good	Not so good
PVLMD	Organizational needs	√		Navigational Components	√		Systems interface	√		Access to common features	√		Reliable (no operational malfunctions)		×
SMD		√			√				×		√				×
LVD		√			√				×			×			×
LRD		√			√				×			×			×
CSAU		√			√			√			√				×

Source: Authors Construct Based on Fieldwork Findings, 2022

External users

Majority of the clients who have interacted with the system share similar sentiment with land officers concerning the system's reliability. 20 out of the 23 respondents indicated that the system often breaks down and renders them incapable of executing their transaction at the appropriate time. Moreover, they are not as privileged as the Commission's staff to receive any support or help from their homes where such transactions are initiated. This means that in case of any operational difficulties in using the system, the client must quit the online process and physically resort to the Commission for assistance and support

4.2.4. Data

This dimension identifies data availability, attributes availability and a strategy to get complete cadastral coverage in Accra.

Data is available to be fed into the system

According to PVLMD, LVD, and LRD, the quality of the existing paper documents is in good condition and available for digital transformation. This is evident by the consolidation of all paper records in the system. on the other hand, the SMD reported in an interview that the existing map documents are not in good condition for digital transformation, especially with maps dating back to the 80s. While some parts remain missen, several of them are worn out, so the boundaries are not visible enough for digitisation.

Data has all the relevant attributes needed for a specific context

According to Section 104 of Act 1036 (Land Act, 2020), the land registrar enters the following in the land register: name and other information of the proprietor, name and other information of the person granting their interest, and the information on the parcel, however, restrictions on land use and zoning is limited to state lands, stool lands and individual lands; family is exempted from such restrictions. According to LRD, the reason for exemption is that a family or an individual can decide to register their land for a purpose other than selling. Even though the law did not specify under which condition should such restrictions be applied. It appears that the LC has different means of interpreting this law.

Availability of a plan to get complete cadastral coverage

Whiles data remains the most integral part of every land information system, Accra does not have complete cadastral coverage with details of all parcels. This is due to the sporadic nature of the registration system or perhaps people's undesirability to register their interests. According to the management, there is an idea to get complete cadastral coverage of the entire country; however, this idea is yet to be devised into a plan.

4.2.5. Working Environment

Under this dimension, findings on the suitability of the ergonomic environment and the availability of reliable power and internet connectivity are presented.

Availability of suitable ergonomic environment

The ergonomic aspect of the working environment focused on the suitability of office furniture, space, monitors, and keyboards. Apparently, the condition of these elements varies across the divisions and departments. It appears that the PVLMD, Office of the Enterprise Land Information System (OELIS) and CSAU have adequate working space. In contrast, the SMD, LVD and IT departments do not have sufficient space to accommodate their needs. From observation, these offices were overcrowded with little room for mobility. In response to this issue, management is constructing a new building. However, the construction has been delayed due to the limited inflow of funds.

Concerning the suitability of office furniture, PVLMD, OELIS, LRD, and CSAU have adjustable office furniture with lumbar support. This is contrary to the observation made at the LVD. In one instance, an officer from SMD had to use a salute tape to support his chair from falling apart. In another instance, a lady complained bitterly about back pain due to the inability to adjust the office chair to her height standard. The size of the monitors in all divisions and departments ranges from 15 to 20 inches. They also use the standard keyboard size, which is about 17 inches. According to the staff, these are enough since they are in the early stages of automating the land administration system.

Reliable power supply and internet connection

Geographically the divisions and departments within the LC in Accra are spatially dispersed. The PVLMD and OELIS occupy what they call the "new building." They are constantly supplied with good internet connection and backup electricity during power outages. Nonetheless, SMD, which happens to be 1km

apart, cannot boast of these privileges. Provision has not been made for generators. According to management, they plan on completing a new building for the SMD where backup of power and internet would be catered for; until then, all activities will be put on hold in the case of power outages. In the case of LRD, LVD, and CSAU, provisions for backup generators have been made; however, they are sometimes unable to use them due to their inability to buy fuel. The LVD and CSAU share the same geographic area with the IT department; however, in the case of a power crisis, only the IT department is offered backup support.

4.2.6. Capacity and Training

This dimension identifies the adequacy of skill in using the LIS, the availability of a plan to get capacity available, and the availability of IT experts to support the LIS implementation.

The staff has adequate training in using the information system

The majority of the staff (3 out of 5) emphasised that they have sufficient skills to explore the system's functionalities. According to management, training was provided to the staff prior to implementing the system; however, 1 out of the two respondents who believed they do not have enough skills indicated that the training was broad and did not focus on specifics of their daily activities. According to this respondent,

"We came to work one Friday and were told to go for a two-day weekend training in Koforidua on ELIS because we were to start working with it the following Monday. We returned from the training and could not do anything for that whole week because most of us did not fully understand it. I recently discovered that requests initiated by clients' could be processed from the public tab on the system. Until my discussion with one colleague, I kept believing that clients had not submitted any requests. It appears I never checked at the right place".

The other respondent raised a similar concern about a lack of skills in retrieving information from the database. Accordingly, this has resulted in an overreliance on the few with these skills and sometimes causes delays in executing the land administration functions.

Availability of a plan to get the capacity available

According to the management, there is an idea to get capacity available because the information system is not yet fully developed. This idea includes internal human resources development, involvement of the private sector and decentralisation of LC services on a virtual scale and at the local level; according to management, services of the LC are mostly rendered at the regional scale. Through decentralisation, the organisational capacity can be extended. As brilliant as these ideas may seem, there is no comprehensive plan to realise them.

Availability of IT experts for database, land administration processes, data and network security

According to an interview with an IT respondent, the LC has enough personnel for data management, software, and network management. There is, however, no centralised body in charge of establishing IT standards and procedures for operational administration and management. Currently, the experts in this department provide IT support to all divisions in Accra and other regional LCs. According to the IT respondent, these experts have key IT officers and other personnel who assist them in carrying out their functions and providing IT assistance. The organogram of Accra's IT department is shown in Figure 9.

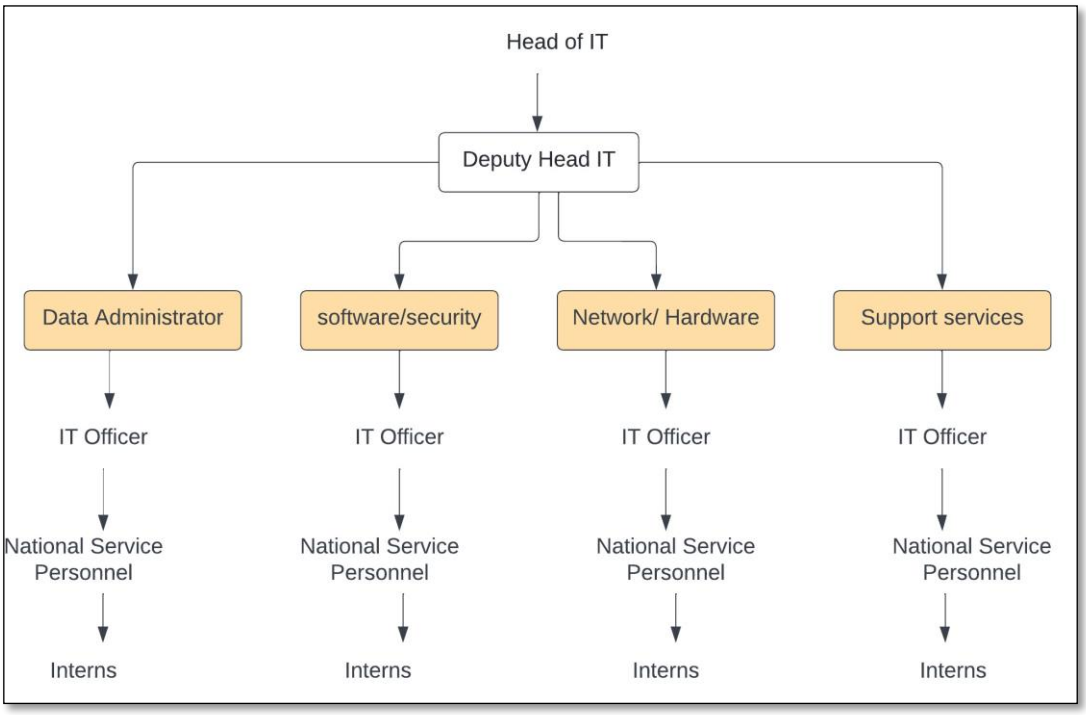

Figure 9: Specialist Model Organogram of the IT Unit Source: Accra Lands Commission (2022)

4.2.7. ICT Strategy

The strategies put in place to enhance the sustainability of the system are identified under this dimension. It presents findings on the availability of help desks, a strategy to retain key IT staff, and a strategy to protect data, software, and operating system. *Availability of help desk*

According to the staff, support is provided by the IT department in case of difficulties in using the system. This support ranges from fixing broken parts of computers, staff logins and access, and navigating through system updates to other operational malfunctions. In a bid to provide this support, a WhatsApp group connects all divisions and departments to IT and serves as a platform where all complaints are made. Thus there is no physical desk present for users to log complaints. While this may seem very convenient considering the dispersed location of the divisions, it puts the clients who cannot share this common platform with the IT in a dilemma. This claim is reinforced by an observation made at the CSAU. A client who had aborted the online process due to a system breakdown had no idea where and when to get redress; the officer from the CSAU to who she complained kept telling her to wait for the IT. However, how the IT was ever going to know about the complaints is an answer that could not be received.

Availability of strategy to retain key IT staff

An interview with the management indicates no strategy to keep key IT staff for the system's sustainability sake. According to management, the IT staff is just like any other staff of the Commission and does not require any exceptional condition of service. To reiterate the words of one respondent from the management level,

"They are public servants, and they understand the terms of services and responsibilities that come with accepting the job offer. In Ghana, we all follow the single-span salary structure where public workers are placed under one salary structure irrespective of their specialisation. Even if we want to do something about their condition of service, our hands are tied because the government decides how much we spend as Commission".

When one of the respondents was further probed about what would be done if they came back to work the next day and realised the key IT staff had quit the job because of dissatisfaction, the response was that people are desperate for a job they will find a replacement.

Availability of strategy to protect data, software and operating system

According to the IT department, control has been established to protect data, software, and operating system from unauthorised modification. Aside from using antivirus protection, staff require a VPN and encryption password to access the server containing the digital archives; this way, they can monitor access. Furthermore, there is occasional cyber security training and routine checks to monitor data security compliance. In addition to this is an established network firewall used to observe both outgoing and incoming network routes. subsequently, all the cost involved in issuing these security protocols is well taken care of by the management

Moreover, attempts have been made to physically protect the data within the various divisions and departments. According to an interview with the respondents from LRD, PVLMD, SMD, CSAU, and IT, access to records within the records of each division and department are strictly out of bound to non-staff. For the CSAU, PVLMD, and IT department, staff require a pin to access the working areas; however, these pins only grant access and do not keep track of who accessed it. On the hand, the LVD and SMD rely on key locks to access such areas. Additional security personnel are available to patrol the LC premises during and after working hours.

4.2.8. Communication Strategy

This dimension assesses the mechanism to ensure user awareness of the LIS. It also identifies the options in place to receive feedback on the user experience of the LIS.

Public awareness campaigns with content focusing on all stakeholders of the system

Public awareness is relevant for establishing people's understanding of the relevance of a particular activity. According to management, such awareness has been created on two scales as far as the information system is concerned; thus, internal (staff) and external (clients) awareness.

In an interview, management indicated that the development of the system is in consultation with users; however, it appears that by saying users, reference was being made to the staff of the LC and not the clients who interact with the LC. Even though management mentioned in an interview that they had explored various platforms to educate and inform the client about the digital land administration drive, only a few people are aware of the system's existence. This is buttressed by the 14 out of 23 respondents who indicated they had no prior knowledge of the information system before interacting with the LC. These respondents only learned about the system after some officers informed them to use the online portal to submit their requests. 7 out of the 9 respondents who had prior knowledge about the system indicated that they saw it on a poster during a visit to the LC. The remaining two respondents learned about it from the newspaper.

Availability of option for a feedback mechanism

A feedback option serves as a platform for users to share their experiences based on an output of a system. These experiences could serve as input for further improvement of a system. However, findings from the fieldwork indicate that such a mechanism has not yet been put in place as far as the information system is concerned. According to the clients, i.e. 23 respondents, the first point of contact in case of any difficulties is the CSAU. However, these complaints are often not documented for future reference, according to the CSAU. In response, management mentioned that they duly acknowledge the relevance of feedback in the system development process and have accommodated this option; however, it is yet to be implemented.

4.3. Land Administration Processes in Accra

Land administration processes in Accra combine digital and manual systems. As indicated in chapter two, these processes are carried out by four independent divisions: surveying and mapping, land valuation, public

and vested land management, and land registration. However, other land agencies such as the land use and spatial planning authority and the customary land Secretariat assist in the processes. It is relevant to mention that departments such as the Client Service Access Unit (CSAU), IT and Universal Merchant Bank (UMB) play a vital role as long as land administration in the region is concerned. While the UMB assists with any payment proceedings between clients and the LC, the IT provides technical support. The CSAU is a new department established in 2016 to assist with the LC's transactions. It serves as a one-stop-shop that directly connects a client to the divisions; thus, all division application requests are submitted through the CSAU. The processes undertaken by the divisions are: granting concurrence, granting consent, plan approval and barcoding, tax value assessment, verification, processing, and certification. The parts of the processes integrated into the system's functionalities are outlined in the following sub-sections.

4.3.1. Processes of Public and Vested Land Management

The activities of PVLMD involve granting consent and concurrence on stool lands. The concurrence on stool land is an indication that the LC bears witness to the transaction that has taken place between a party and a stool. On the other hand, consent indicates transaction approval for a party who acquired either public or stool land and sought to transfer ownership to another party. In this sub-section, activities involved in granting consent and concurrence are presented.

4.3.1.1. Granting Consent

The party who first acquired the land from either the government or stool submits an allocation letter, indenture, and the lease for that particular land at the CSAU. The PVLMD representative at the CSAU scans the documents into the system. The scanned and the hard copy documents are forwarded to the back office of the PVLMD for assessment. At the back office, the documents are checked against the digital records in the system to verify the actual ownership. The applicant is invited for a site inspection if everything conforms to the records. This process is to verify if the current land use conforms to planning regulations. If the land use does, consent to transfer ownership is granted, and the respective administrative charges are assessed by the officer in charge and paid by the applicant. After payment, the applicant is invited via SMS to pick up the consent certificate. It is relevant to mention that from the beginning of the process to this point only involves the granting of consent. Suppose an applicant wishes to record the consent with the LC. In that case, they must submit the consent certificate with copies of their indenture and note of allocation for plotting and pay the associated charges.

4.3.1.2. Granting Concurrence

A client manually submits a consent letter and an indenture from the stool to the CSAU and requests for application for concurrence. The client is requested to make the necessary payment using the online system or the bank option at the CSAU. After payment, a representative from PVLMD at CSAU scans the documents into the system. The scanned and the hard copy documents are forwarded to the back office of the PVLMD for assessment. At the back office, the documents are checked against the digital records in the system to verify if the applicant is buying from the appropriate stool. The appropriate officer requests the hard copy documents and issues the concurrence certificate for plotting if all details are correct. Copies of the certificate are made available at the CSAU for the applicant to pick up. It is important to note that the process reverses to the manual system after verification. When one officer was confronted about the issue, the response was,

"what if the scanned document were fake? for certification and plotting, we need the original copies to be sure."

4.3.2. Processes of Survey and Mapping Divison

The SMD activities involve plan approvals that encompass barcoding and cadastral plan preparation. This sub-section outlines the plan approval process and its integration into the information system.

4.3.2.1. Plan Approval Process

Applicant submits copies of plans; this plan must include a computational file of how coordinates were picked from the site and approval by a private license surveyor. The SMD officer checks the quality of the plan using top corn tools. The plan is scanned into the system if all the quality indicators are met. A barcode containing the parcel's exact location is generated using the system.

4.3.3. Processes of Land Valuation Division

According to an interview with the LVD respondents, this division's main activity is assessing a property's tax value before land registration begins. To assess the tax payable on the value of a property (land) client must first create an account with the LC on their portal and submit a request for stamping, also known as the tax value. After making this request, the client scans and uploads copies of the indenture (an agreement between the buyer and the seller) and makes the processing payment. A Valuation representative receives the request at the CSAU for assessment. If all details conform to the requirement, the client is invited by mail to submit the original documents to the CSAU for further vetting and acknowledgement. Even though resubmitting the physical documents for further assessment appears to be a task duplication, this process is necessary because the original document is legally required to have a physical stamp or seal, which cannot be embossed on the scanned copy. The CSAU batches the document into the system and manually hands it over to the stamping officer to assess and determine the tax amount. Documents are batched into the system and manually submitted to the CSAU for the client to make the stamp duty payment and collection. It is relevant to mention that each activity undertaken under each of the processes could be tracked down by the client in the system. Figure 10 outlines the workflow activities in the stamping process.

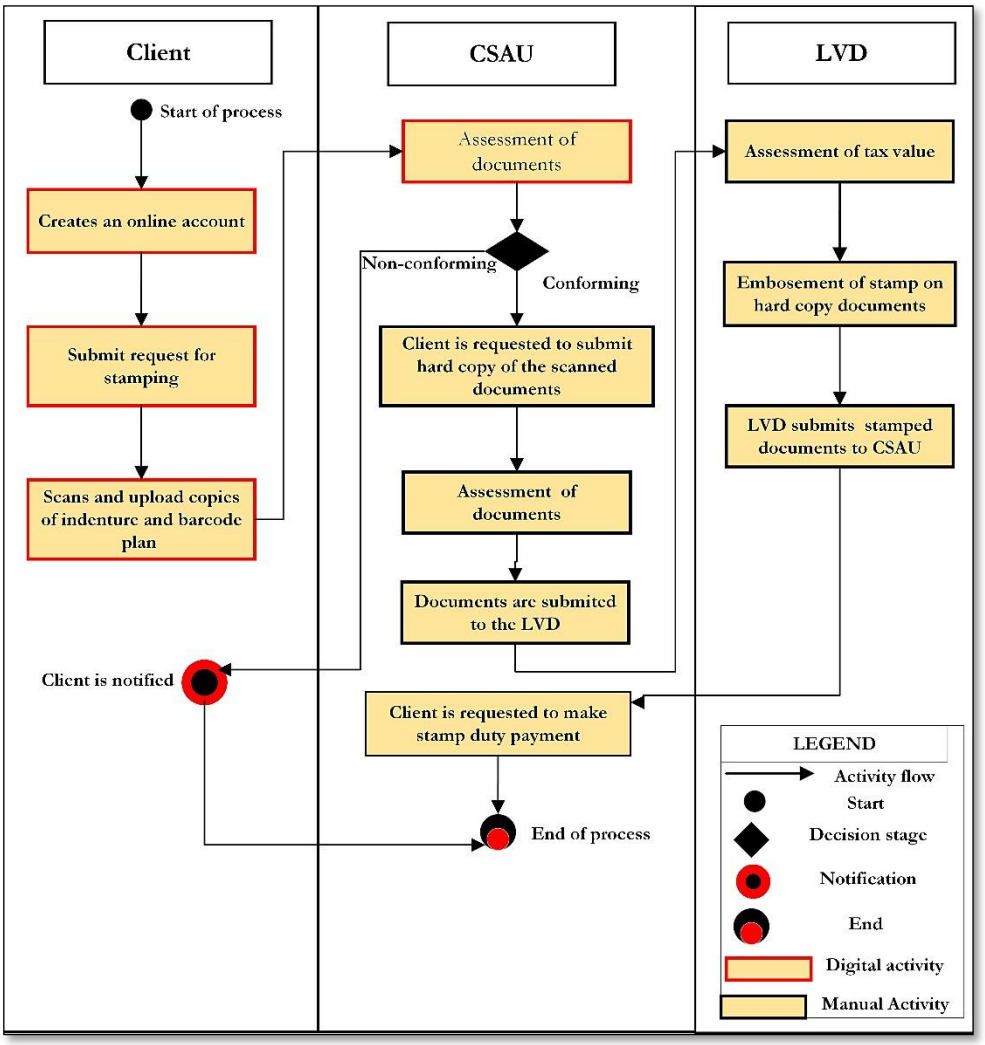

Figure 10: Stamp Duty Process Workflow in Accra
Source: Authors Construct based on fieldwork, 2022

4.3.4. Processes of Land Registration Division

The main activities carried out by this division are verification of documents for registration, processing of registration documents, and issuing land title certificates (certification) after registration. According to the respondent from LRD, the culmination of these activities is the land registration process. This process is outlined in the subsection below.

4.3.4.1. The Land Registration Process

The land registration process in Accra involves title registration of stool lands, family and individual lands, and public and vested lands. This process depends on successfully executing all the processes and activities of the survey and mapping, PVLMD and the land valuation division. The functions performed by these divisions serve as an input for land title registration, i.e., the pre-registration process. To initiate registration, the client must submit an indenture and proof of stamp duty payment that the valuation has issued. Depending on the type of land, thus, if it is state or stool land, a copy of the concurrence letter issued by the PVLMD is added and manually submitted to the LRD representative at the CSAU. The documents are scanned into the system by the CSAU. A bill is generated for the client to pay. This payment is made either through UMB or online.

The scanned documents are forwarded to the PVLD and SMD for verification search when payment is confirmed. The verification search is to verify whether the land has not been registered in any name apart from the name on the document. The documents are sent digitally to the coordinator for vetting and approval when the verification search is complete; the SMD is then notified to prepare a cadastral plan if all information is correct. It is relevant to mention that the registration process from the time the documents are scanned into the system to this point takes place in the digital environment. However, everything reverses to the manual process after cadastral plan preparation. Copies of the cadastral plans are submitted to the LRD. The LRD prints out all documents (approval letter from the coordinator and the cadastral plan). These documents are placed on the client's file submitted at the beginning of the process and submitted for publication. The documents are forwarded for final approval if no objection is raised after 21 days of publication. The title certificate is prepared and delivered to lawyers for approval. The certificate goes back to LRD for updating, and the client is notified to pick up the title certificate at the CSAU at the end of the process.

Ideally, there is a database that contains all PVLD and SMD records; however, fieldwork results indicate that officers from LRD do not have adequate skills to retrieve information from the database. Hence, their dependence on PVLMD and SMD. Obtaining such feedback on the verification search usually takes days to weeks and delays the entire registration process due to this dependency. Figure 11 below outlines the workflow activities in the registration process.

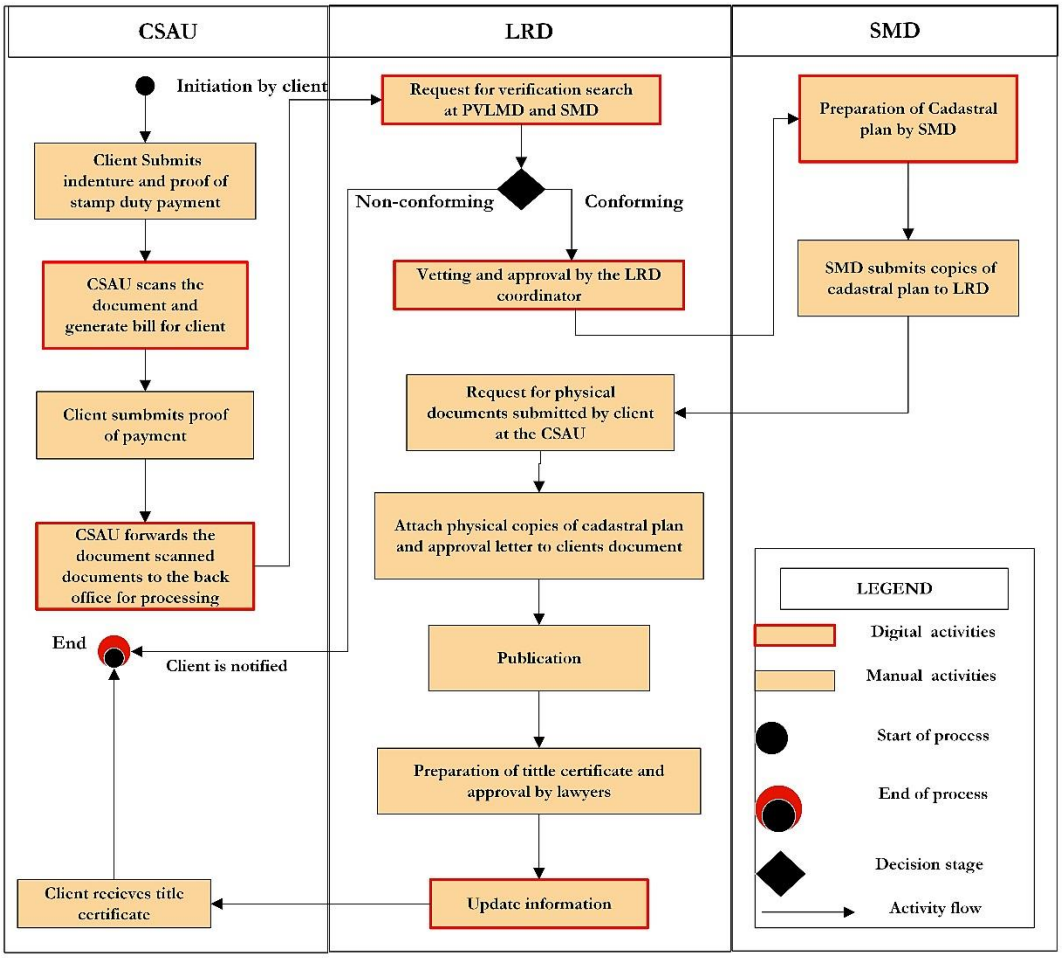

Figure 11: The land Registration Process in Accra
Source: Authors Construct based on fieldwork findings, 2022

4.4. The Effects of Implementing the LIS in Land Administration Processes in Accra

This section presents the findings on the effects of implementing the land information system in the land administration processes in Accra. It focuses on data integration, internal operations, and service delivery.

Data integration

Data integration combines data from different sources and presents a unified means of identification. According to management, unlike the manual system, where the same parcel of land was given different identities and approval, the advent of LIS has allowed a consolidated data system linking all the data from the various divisions. The consolidated data has a unique identification; thus, by entering the unique identity, one can retrieve all information related to the parcel. According to the LRD, PVLMD and SMD in Accra, data integration has promoted interoperability, which was impossible under the manual system. This is because they can access and work on the same piece of document concurrently.

Business operations

The business activities of the LC have seen some improvement as far as the information system is concerned. According to management, the ability of a client to initiate their transaction online has helped reduce physical interaction. Furthermore, the simplified online payment of fees available to clients has curbed the rent-seeking behaviour from some staff. If Clients do not wish to use the online payment system, a bank option is available at the LC.

According to management, the SMD did not have enough capacity to check the quality controls of plans submitted for documentation due to their manual state. However, with the introduction of the digital system, they can check the quality of all digital plans by using a software called "Topcon tools" and further generate a barcode with all the exact location of a parcel and the corresponding boundaries. The barcode is supposed to eliminate the repetition of site visits in the ownership transfer of the same piece of land.

Another observation is the ability to track the status of a client's application in the system. According to management, both the client and management can monitor the status of every application in the system. A job number is generated for every application, and at each stage of the process, the officer working on the document logs in their credentials. This way, if an activity takes longer than expected, management can query the responsible party.

Service delivery

One key factor for implementing the digital system is to improve service delivery(Ministry of Lands and Forestry, 1999). According to clients who had used the system's functionalities to perform searches, it took 1-2 weeks to obtain the search result; according to management, this is an improvement from the previous system, which took nearly 2-3 months. All 6 respondents who had used the system for stamping indicated that it took 1-2 months to obtain their documents. By comparing this to findings from LVD, which indicate 1-3 months, it can be argued that the system has reduced valuation processes by one month, although this may not be very significant.

Despite the inability of the client to initiate the processes of registration digitally, findings from management indicate a significate improvement in 3 months turnaround time of registration compared to the previous system, which took several years. This is contrary to findings from the 16 respondents who had registered their lands with the LC from the system implementation. 13 out of the 16 respondents who initiated their transaction between 2016-2019 and 2020-2022 indicated that their request is still in progress. The remaining 3 respondents also noted that it took between 1 and 2 years to receive their title document between 2016 and 2019.

From the administered questionnaire with the clients, 20 out of the 23 indicated that the services of agents and officers were employed to initiate the transaction on their behalf. Figure 12 below is a graphical presentation of how the clients initiated transactions in Accra.

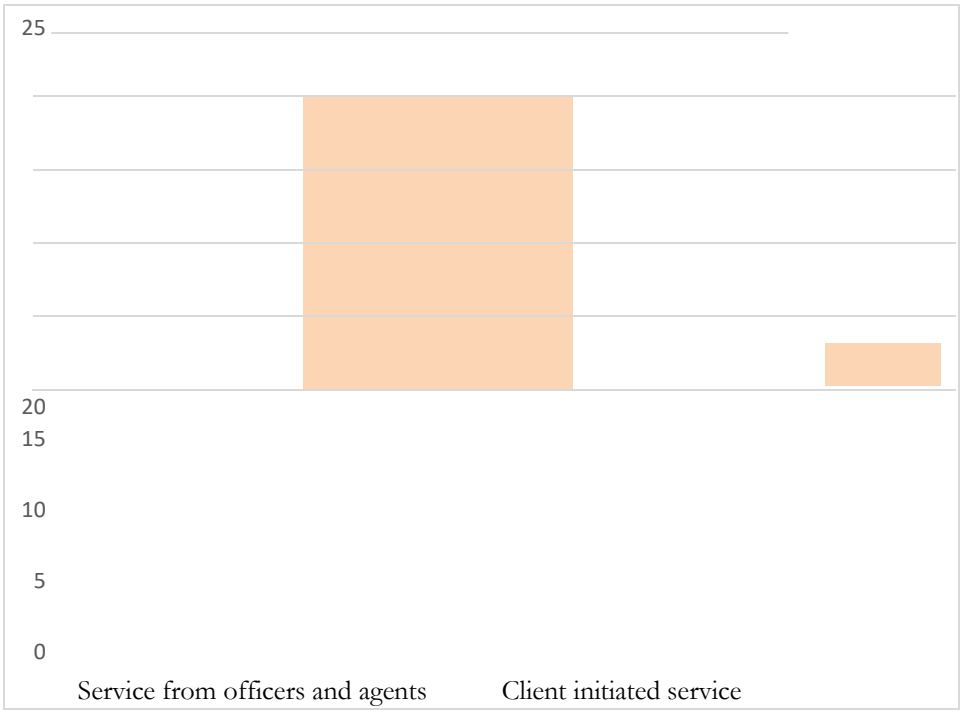

Figure 12: Means of Initiating Transaction in Accra

Source: Author's Construct Based on Fieldwork Findings, 2022

According to the 20 respondents, the processes could be very frustrating because if an application gets stuck at a point, you must always commute to the LC to find out why. To them, it is time-consuming. Additionally, they often do not receive any notification as to whether their document is ready. By reiterating the words of one respondent,

"*You have to find an agent who often happens to be a land officer and pay them to assist with the processes. It doesn't make sense because the government pays them to carry out these tasks; however, you need the documents, so you must succumb to their demands."*

In response, the CSAU indicated that the IT department is responsible for sending out these notifications; however, they are sometimes unable to pay the mobile network providers. Hence, these notifications become backlogs in the system and end up being deleted.

4.5. Summary of Chapter Four

This chapter used the assessment framework developed in chapter two to assess and provide insight from the information system in Kumasi and Accra. Additionally, the integrated functionalities of the LIS and the effects of integrating such functionalities were adequately covered in this chapter. These findings served as a basis for discussion in chapter five of the study.

5. ASSESSMENT OF THE LAND INFORMATION SYSTEM IN GHANA

This chapter presents an analysis and discussion of the results identified in Chapter four in relation to the literature insight. This is done per the research sub-objectives and questions outlined in the study's first chapter. This chapter contains the sections listed below: LIS assessment in Accra and Kumasi, a summary of LIS assessment in Accra and Kumasi, Accra's land administration processes, the effects of LIS implementation in Accra, and the factors that require further improvement for the development of LIS in Accra and Kumasi, respectively.

5.1. Assessment of LIS in Accra and Kumasi

This section analyses and discusses the LIS in Kumasi and Accra based on the following dimensions: (1)institutional framework, (2)policy and legal frameworks, (3)data quality, (4)working environment, (5)technology, (6)ICT strategy, (7)training and capacity, and (8)communication strategy. While these dimensions are covered in Accra, the analysis in Kumasi is restricted to the first five dimensions.

5.1.1. Institutional Framework

Institutional mandates, roles and responsibilities

According to Enemark et al. 2016 and FIG (1995), decentralisation allows for efficient LIS and makes LA services more accessible to the general public. Nonetheless, if these services overlap, they allow opportunities for bureaucracies and high service costs (Getie et al., 2022). In the case of Kumasi, the study identified that the decentralisation of LA activities between the CLS and PVLMD has resulted in multiple responsibilities for the two institutions and an extra burden for the clients *(see sub-section 4.1.1)*. In her study, Biraro (2014) identified that such bureaucracies often demotivate landowners from reporting changes. On the other hand, findings from Accra indicate that the LC aligns with the roles, responsibilities and mandates elucidated by The Lands Commission Act 2008 and the Land Act 2020 (Lands Commission Act, 2008; Land Act, 2020).

The land administration process is clearly defined and integrated into the functionalities of the information system

Regarding the integrated functionalities of the LIS in the LA processes in Kumasi, the study's findings revealed that the LA process in Kumasi is limited to manual procedures, which contradicts Deane et al. (2017), who stated that LIS was implemented nationwide for LA activities. On the other end, Accra has successfully implemented the LIS; however, not all the LA activities are integrated into the system's functionalities because the system is fully developed. Subsequently, the system's functionalities are delivered incrementally. While this contributes to the system's inability to accommodate all LA activities, an interesting observation was made in sub-section 4.3.1.1. Land officers could not fully trust the document's authenticity in a digital form and needed to validate the hard copy document at the end of each activity. According to his publication Hijris (2018), Bahrain's LA organisation resisted the digital LA process due to the need to maintain paper documents for reference and validation. Agreeably, Alshehri and Drew (2012) observed that a fundamental impediment to digitising LA process is a lack of confidence in a digital system. As a result, it is possible that a lack of trust in technology would stymie the complete automation of LA processes in Accra.

There is a positive attitude toward ICT adoption

The land officers of Kumasi and Accra have a positive attitude toward adopting ICT. Amidst the absence of LIS in Kumasi, the staff has adopted some technological application software to assist in their business processes. This implies that they believe in the efficacy of technology in the LA processes and might be willing to adopt a digital LA process. This belief was established when all the staff respondents from both cities acknowledged that LIS enables a well-organised and less bureaucratic service delivery. Subsequently,

this confirms the observation made by Zeng and Cleon (2018), as they indicated that LIS is likely to be adopted if its capabilities are believed. While this may be true, we can further argue that the management's strict enforcement rules in the case of Accra might have contributed to the widespread adoption of the LIS technologies; thus, the ratification of a mandatory LIS usage law may increase individuals' pressure to use LIS during and after its implementation.

On the other hand, a common trend could be identified from the client's perspective on LIS adoption in both cities. Although the clients duly acknowledge LIS's functionalities and capabilities (see sub-sections *4.1.1 and 4.2.1*), it is not enough for them to adopt and use such a system. This implies that LIS technology adoption requires many factors to succeed (Badurek, 2009; I. B. Karikari, 2006; Masser et al., 1996). As identified in both study areas, clients will likely stick to the manual land administration services without the knowledge, skills, and confidence to optimise a digital system.

Availability of system implementation plan

According to Clohessy et al. (2020) and Wang et al. (2010), establishing a clear implementation strategy is vital for the overall success of LIS. The strategy includes scope and boundary definition, budget and financial plan and timelines for system deliverables. Kumasi does not have a system implementation plan due to the non-existence of LIS. In contrast, Accra has a working LIS; however, there is no plan to facilitate the system's implementation. Such strategies become very apparent given the LIS availability in Accra. It could be argued that the system is developed extemporaneously. To validate this statement, there is no dedicated source of funds for the system's development, implementation, and sustenance; subsequently, only 33% of the annual income is assigned to the LC for its day-to-day administration. It is relevant to state that this 33% income is not fixed. For instance, 33% of the "X" amount generated today is different from the 33% of the "X" amount generated tomorrow since it is dependent on the total income generated.

5.1.2. Policy and Legal Frameworks

Policies and Laws

The Ghana Land Policy (Ministry of Lands and Forestry, 1999) and Act 1036 (Land Act, 2020) provide for the establishment of LIS and are further supported by the Electronic Transaction Act. These instruments offer coverage for the deed and the title registration systems in Ghana. Findings indicate that Accra's system is being replicated in Kumasi, which operates under the dual registration system *(see subsection 4.1.1*). Although the legal protocols allow for the implementation of a digital system, there might be some implementation challenges considering that the fundamentals of the LIS in Accra are designed to support the title registration.

Land rights and information system

Despite the differences in the land governance structure identified in section 3.1, Kumasi and Accra appear to have common land rights *(see subsections 4.1.2 and 4.2.2)*. Subsequently, not all these rights can be adequately catered for in the information system due to legal constraints. The act that establishes these rights as recognised interests poses a considerable threat to their entire existence. In line with Land Equity International (2020), laws could negatively impact the successful implementation of LIS.

Act 1036 (Land Act, 2020) acknowledges the existence and registration of usufructuary interest; however, it also forbids the creation of any perpetual interest in land. Therefore, the usufructuary interest is truncated into a 99 years leasehold during registration in both study areas. The usufructuary interest in Ghana is perpetual and yonder above the mere use and gathering of fruit (Woodman, 1966). In Kumasi, land governance revolves around the stool, which is reverenced as the overlord of the lands, and any force attempting to take such lands from his subjects is a direct attack on the stool. Therefore, even without documentation, perceived tenure security prevails (Boateng, 2021), so the question is, why would one register a land only to accept a loss in meaning? On the other hand, Accra has fragmented land ownership

(Williams Miller, 2018) and is highly cosmopolitan (Cities Alliance, 2016); therefore, people might be willing to accept such loss and document their interest to validate their tenure security.

5.1.3. Data

Data is available to be fed into the system

Often, LIS implementation fails due to data inadequacies (Adlington, 2021). Subsequently, both study areas will likely encounter challenges in the digital LA drive if measures are not implemented to resolve the issues with data inadequacies. Findings from both areas show that portions of existing paper maps remain undigitised due to the invisibility of boundaries. This is coupled with the absence of a plan to get cadastral coverage, especially in Accra. According to Burns (2007), communicating the relevance of registration encourages people to report changes in land ownership. In line with his thought, Kumasi has sensitised the public about the benefits of registration, but such a solution was not enough to encourage registration *(see section 4.1.3).* Experience from Rwanda in their Land Tenure Regularisation Program indicates that getting complete cadastral coverage is capital intensive. As identified in section 4.1.3, land registration in Ghana is sporadic and would require a more capital-intensive approach to complete its cadastral coverage.

Data has all the relevant attributes needed for a specific context

Concerning the availability of data attributes, Accra's information on land-use restrictions on family lands is unavailable due to the absence of legal regulations on the disposition of family lands (Appau, 2018). One can argue that such information could be obtained from the archives of LUSPA. However, there is no infrastructure to link the LC and LUSPA; therefore, data gap is an issue as far as the LIS in Accra is concerned. Most importantly, such data is required to support decision-making.

On data standardisation, measures are put in place to ensure conformity, although data requirements vary across the four divisions in both study areas. Nonetheless, the conformity does not extend beyond the LC. In Kumasi, it was identified that the difference in standard between the LC and LUSPA has resulted in a struggle to determine if registered property conforms with the layout and zoning plans. According to Cockburn et al. (2019), different standardisation negatively affects data interoperability and renders data less efficient for the public good. Apparently, this observation does not deviate from the situation in Kumasi. Although the layout plans are available, they are ineffective for the intended purpose and, hence, cannot be utilised by the LC.

Data Protection

Act 989 of Ghana (Right to Information Act, 2019) outlines the measures to safeguard the privacy and liberty of parties who interact with the LC; however, user identification is compromised in the case of Accra. Though this is a security breach, it could be regarded as a challenge arising from technology; thus, no matter how the laws are formulated, such occurrences are unavoidable if technology is involved. ICT in LA processes is undoubtedly efficient and effective (Boateng, 2021; Dhakal, 2016; Hale, 2011; Ho and Rajabifard, 2016; Karikari et al., 2003, 2002; Meijer, 2009; Romano et al., 2015; Van Loenen et al., 2020); however, it could pose a potential threat to data privacy and would require more than legal instruments to remedy such a menace. This is not to imply that technology involvement always leads to risk exposure but that some technological solutions carry more risk exposure than others, so when issues like this occur, the focus should be on whether the technology is a bad fit or if other factors are at work.

Regarding physical data protection, Accra has made efforts to provide digital security passes, CCTV screens, and security personnel to patrol the LC premises during and after working hours. However, the recent flooding event at the LC in Accra, reported by Ghana News Agency (2022), has raised the question of how physically secure data and computer hardware could be.

Data Sharing and Regulation

According to Gal and Rubinfeld (2019), data integration enhances a preferable option for data exchange. Additionally, it combines different data sources and enables several entities to utilise it effectively (OECD, 2015). This is observed in the case of Accra, as the consolidation of internal data into one database has made it possible for the land officers to retrieve information. However, the option for external data sharing with LUSPA is constrained despite the legal enforcement in place, and in effect, clients have to intervene. If measures are not enforced, this could delay the entire LA process.

5.1.4. Working Environment

Availability of suitable ergonomic environment and reliable power supply and internet connection

This dimension aimed to assess the ergonomic environment's suitability and availability of internet and power connections for LA activities. In Kumasi, it was identified that LRD officers lurk around during office hours due to insufficient furniture. Similarly, LRD officers and the IT department in Accra have limited space for carrying out their business activities.

Another critical insight from Accra is the uneven distribution of power and internet connectivity among the divisions. It appears that the needs of some divisions have been prioritised over others. However, as long as the LIS is concerned, all the divisions require equal power and internet availability. For instance, if CSAU activities are halted due to a power or internet outage, the other divisions that have access to power and internet would not be able to carry out their task because there is a system factor involved. All activities are connected. That is how a system works; it is a set of connected activities (The Association of Business Executives, 2015), and the neglect of one sub-system could render the others less effective and inefficient.

Regarding the suitability of monitors and keyboards, findings from Accra indicated a positive and subjective opinion about their usage. At the early stages of LIS implementation, organisations could be sceptical about the provision of these infrastructure (Bishop et al., 2000); this notwithstanding, staff should not feel any discomfort in executing their business activities as identified in the LVD in Accra. Measures must be put in place to resolve any situations that may cause discomfort during work hours.

Though different scenarios have been presented in this sub-section, there is a strong correlation; thus, all scenarios require financial capital to resolve the situation. Subsequently, there is no financial autonomy of the LC in both study areas (see sub-sections 4.1.4 and 4.2.1), which has affected their ability to meet certain needs.

5.1.5. Technology

Availability of strategy to implement the system's specifications

Although technological tools are available to meet the system's specifications, they are inadequate, considering that some officers in Accra need to rely on their personal computers (see sub-section 4.2.3). One may argue that the use of personal computers for LA activities should not be of much concern as long as it gets the job done; however, personal items are not bounded by the security provided within the walls of the LC and are very liable to burglary. In effect, this might pose a great threat to data safety. Moreover, open-source software is convenient, cheap and requires no need for license compliance, as identified in (Randhawa, 2008); this study is of the notion that such software offers no accountability; thus, no one could be held responsible in the case of any challenges. Additionally, they offer no warranty and vendor support, which could put the LA activities on hold in case there are issues with the software.

The availability of user-friendly manuals and systems

Following sub-section 4.2.3, the LIS in Accra strategically aligns with the organisation's needs and offers suitable navigational components; however, there is no operational manual, and the system is unreliable due to developers' inability to constantly communicate changes and new updates to users. This results in

opportunities for mistakes and low optimisation of the allocated time for service delivery. According to Burns (2007), communication between users and developers should not terminate after a system's implementation. Agreeably, such communication should be two-sided, thus from users to developers and from developers to users and, most importantly, extend beyond the internal users of the system. Further finding from Accra has shown that the system often breaks down and sometimes denies client from creating new user identification. Subsequently, the solution to this issue is using identification details of successful clients, which compromises user identification safety.

5.1.6. Capacity and Training

The staff has adequate training in using the information system, availability of a plan to get capacity available and availability of IT experts for database, land administration processes, data and network security

In ensuring effective LIS, Weiner (2009) and Zeng & Cleon (2018) found that providing training and individual efficacy is an important factor for consideration. The current study indicated in subsection 4.2.6 that some form of training was provided to the staff in Accra before the system implementation; however, according to findings, this training was not enough for some staff to optimise the system's functionalities fully. Additionally, a comprehensive plan to get capacity available or improve upon the existing ones is currently non-available.

Regarding the availability of IT experts, the study identified that experts for database, land administration processes, data, and network security are adequately catered for as long as the LIS in Accra is concerned *(see subsection 4.2.6). T*hese experts provide support and assistance to the divisions in Accra and beyond. Additionally, they have autonomy in the deployment of IT standards and procedures for operational management. This insight raises two critical questions (a)who provides support and assistance to the IT? (b) who ensures the compliance of such procedures and standards? Unfortunately, these questions cannot be answered due to the lack of a central IT governance structure to manage such activities. Based on this insight, this study concludes that there is a fundamental organizational gap as long as IT is concerned.

5.1.7. ICT strategy

Availability of help desk

Contrary to expectations, this study did not identify the availability of a help desk to provide technical support to the client in optimising the system in Accra. Although technical solutions were identified, they were only limited to the staff through a shared WhatsApp platform. Thus external users have no means of communicating unexpected difficulties. According to Alshehri and Drew (2012), the absence of technical support often results in electronic governance failure. Although the system in Accra is not a failure considering some of the positive benefits identified in section 4.4, the issue of a client not having a place for physical redress is a complete downside of the LIS. This could potentially render the system ineffective for service delivery.

Availability of strategy to retain key IT staff

Following the availability of a strategy to retain key ICT staff, the findings are somewhat discouraging. There is no strategy to retain such staff. According to management, a replacement was the identified solution to compensate for the loss of competent IT staff if they abandon their job due to dissatisfaction with the service condition. In their paper, Biitir et al. (2021) identified that the resignation of key staff on the implementation team was an important reason for Ghana's unsuccessful land administration reform. In support of this, Land Equity International (2020) added that most digital LA fails because of losing critical staff during and after implementation. Based on the findings identified in subsection 4.2.7, it could be deduced that in the case of Accra, this result is influenced by two aspects: first, the placement of public servants under one salary structure and second, government control over fund allocation.

5.1.8. Communication Strategy

Public awareness campaigns with content focusing on all stakeholders of the system and the availability of options for a feedback mechanism

A previous study by Burns (2007) has noted the relevance of communication before and after the implementation of LIS. One would assume that the development of a system requires consultation and communication with all users; thus, external and internal, as identified in Todorovski (2006). However, in Accra, such consultation was limited to the internal users of the system. Additionally, there is no consideration for feedback input from system users. With reference to subsection 4.2.1, the provision *of "efficient services in geographic information"* was vibrant in the mission statement of the LC; therefore, any efforts towards achieving this goal will be futile if the needs of all users are not adequately catered for in new development such as LIS.

According to Bennett et al. (2019), an awareness campaign is one of the commitments to ensuring the sustainability of LIS. Indeed, the management in Accra has made a commitment to inform the public about the LIS through various platforms; however, 14 out of the 23 clients suggested they did not know the LIS prior to their interaction with the LC. Subsequently, the impact of this awareness campaign was beyond the scope of this study and considering the small sample size; caution must be applied as these findings might not necessarily imply that the awareness campaign strategy was ineffective.

5.2. Summary of LIS Assessment in Accra and Kumasi

Based on the results in chapter four and the discussion of the results presented in section 5.1, the assessment of LIS in Accra and Kumasi can be given on four rating scales: high alignment, medium alignment, low alignment and not applicable. "High alignment" ratings are indicators that are present and implemented to enhance LIS usage. "Medium alignment" ratings are indicators which are present and implemented. however, they do not adequately enhance LIS effectiveness. "Low alignment" are indicators that are ineffectively implemented or not present at all to support LIS. Not applicable are the indicators that could not be measured due to the non-existence of LIS in Kumasi. Table 10 and 11 presents the assessment result.

Table 10: Assessment Result of LIS in Accra

High alignment	Medium alignment	Low alignment
Institutional mandates, roles, and responsibilities are clear without overlapping functionalities	The land administration process is clearly defined and integrated into the functionalities of the information system	Availability of system implementation plan
Availability of laws and policies to support analogue to digital conversion	Positive Attitude Toward Information, Communication and Technology (ICT) Adoption	The availability of user-friendly manuals
Availability of strategy to protect data, software and operating system	The system is ready to process all the different types of land rights, right holders, and restrictions	The availability of a userfriendly system
	Data standards, data privacy, data security, and data sharing options are properly regulated	Availability of plan to get a complete cadastral coverage
	Availability of strategy to implement the system's specifications	Availability of strategy to retain key IT staff (thus, if IT staff is well motivated)

	Data is available to be fed into the system	Availability of a plan to get the capacity available
	Data has all the relevant attributes needed for a specific context and are free from contradictions	Availability of option for a feedback mechanism
	Availability of suitable ergonomic environment	
	Reliable power supply and internet connection	
	Availability of help desk to provide technical support and assistance	
	Availability of IT experts for database, land administration processes, and data and network security	
	The staff has adequate training in using the information system	
	There is a public awareness campaign with content focusing on all the stakeholders of the information system	

Source: Authors Construct, 2022

According to the assessment summary in table 10, Accra is in high alignment with three indicators, medium aligned with thirteen indicators and in low alignment with seven indicators. Based on the literature and the discussion presented in the previous sections, the indicators identified as medium and low alignments highly influence the effectiveness of LIS. These indicators would require additional improvement.

Table 11: Assessment Result of LIS in Kumasi

High Alignment	Medium Alignment	Low Alignment	Not Applicable
Availability of laws and policies to support analogue to digital conversion	Institutional mandates, roles, and responsibilities are clear without overlapping functionalities	Availability of system implementation plan	The system is ready to process all the different types of land rights, right holders, and restrictions
	Positive Attitude Toward Information, Communication and Technology (ICT) Adoption	Availability of plan to get a complete cadastral coverage	Availability of strategy to implement the system's specifications
	Data is available to be fed into the system		The availability of userfriendly manuals

			The land administration process is clearly defined and integrated into the functionalities of the information system
	Data has all the relevant attributes needed for a specific context and are free from contradictions		The availability of a userfriendly system
	Availability of suitable ergonomic environment		Data standards, data privacy, data security, and data sharing options are properly regulated
	Reliable power supply and internet connection		Availability of help desk to provide technical support and assistance
			Availability of strategy to retain key IT staff (thus, if IT staff is well motivated)
			Availability of strategy to protect data, software and operating system
			Availability of IT experts for database, land administration processes, and data and network security
			The staff has adequate training in using the information system
			Availability of a plan to get the capacity available
			There is a public awareness campaign with content focusing on all the stakeholders of the information system
			Availability of option for a feedback mechanism

Source: Authors Construct, 2022

In Kumasi: four out of the eight dimensions were measured: (1)institutional framework, (2)policy and legal frameworks, (3)data quality, and (4)working environment (see section 4.1), which together constitute nine indicators. Based on the assessment result, Kumasi is highly aligned with the availability of laws and policies to support analogue to digital conversion. This may serve as a positive start for implementing digital LA

services. Subsequently, Six and three indicators were in medium and low alignments, respectively (see table 11 and appendix 2). Fourteen indicators were not applicable. Thus, they could not be measured due to the non-existence of LIS.

5.3. Land Administration Processes in Accra

According to FAO (2012), people might be hesitant to report changes in land ownership if the processes involved are too bureaucratic. Biraro (2014) provided empirical evidence of how the bureaucratic LA process in Rwanda rendered their LIS outdated. Accra could observe these bureaucratic procedures in all land administration processes, thus, from consent applications to title registration requests. For instance, in the consent application process, the client must pick up the issued consent certificate and re-initiate another process at a fee to get it recorded with the LC. Additionally, after paying for the issuance of a barcode containing the exact information about the parcel, the SMD is again requested at the registration stage to produce a cadastral plan. This implies extra cost and time for the client because they must take the surveyor to the site and pay for the services of capturing the same information available in the barcode plan. The bureaucracies have encouraged clients to pay agents and land officers unofficially to facilitate their transactions. According to findings, at least 20 out of the 23 clients used their services. On this note, the idea of Larsson (1991) and Henssen (2010) becomes prominent; thus, any obstacle that hinders people from registering their interest must be eradicated. This will ensure that those who report changes in land ownership are not demotivated. Reporting such changes is relevant in updating land records.

5.4. The Effects of Implementing the LIS in Land Administration Processes in Accra

According to Meijer (2009) and Rakhmonov & Abdurakhimova (2021), the implementation of LIS enhances business operations and allows for data integration and easy access to information on land ownership. This current study shows that Accra has witnessed some of these improvements after implementing LIS. According to the results identified in section 4.4, the LC has consolidated the data across the various divisions and can easily retrieve information by executing queries. Furthermore, the business operations of the LC have improved, considering that the SMD can digitally check the quality of plans submitted for documentation and employ the functionalities of the LIS to generate a barcode plan with the exact location and the corresponding boundaries.

In Meije (2009), it was identified that LIS enhances accountability. Agreeably, the implementation of LIS has improved accountability in delivering LA services. According to results in section 4.4., both management and the client could track the application status in the system and identify the divisional officer responsible for carrying out an activity. Through this system functionality, management can query the responsible party if an activity takes longer in the system.

The last factor for consideration is that the system's implementation has enhanced service delivery. Clients who had used the system to conduct searches indicated that they were able to obtain search results within 1-2 weeks which, according to management, took nearly 2-3 months under the manual system. This confirms the earlier observation made in paragraph one of this section, data integration in LIS facilitates access to information. Although this is a significant improvement, it could not be identified in this study if it was facilitated by using unofficial services in transacting with the LC. According to results presented in section 4.4, 20 out of 23 clients unofficially employed the services of agents and officers to initiate transactions on their behalf. Perhaps this might have contributed to the improvement in service delivery.

5.5. Analysis of the Factors that Require Further Improvement of the LIS in Accra

This section gives insight into the current and potential limitations of the system in Accra and the lessons that could be derived for further improvement in the system's functionalities. These insights are based on

the assessment of the information system and the integrated processes. The following subsections present the current and potential limitations of the system in Accra

Absence of a clear implementation guide

There is no justification to strategically ensure the success of an information system without an implementation plan. Its absence presents a challenge in determining the systems requirements, actionable goals, deliverable and budget requirements. Therefore, a well-crafted implementation guide is an essential factor to consider.

Limited access to funding

Establishing an information system requires a financial investment due to its capital intensity. With the excessive control by the government over how much funds are allocated to the LC for its internal project and day-to-day administration, there is a probable cause for delays in the system's implementation.

Legal limitation of registerable interest

The laws governing the recognised land interest, to some extent, compromise the registration of such interest. Except one accepts a loss in meaning, freehold and usufructuary interest cannot be accommodated in the system's functionalities. The researcher agrees with Abubakari et al. (2020), pointing out that these legal limitations reduce people's desirability to register their interests. Establishing the information system aims to provide up-to-date land information; if people are unwilling to register their interest due to these restrictions, obtaining information that is required for an up-to-date land information system will be more challenging.

Moreover, the law is not specific regarding the disposition of family lands. This has resulted in the exemption of such lands from the planning and zoning restrictions.

Defective ICT strategy

The defectiveness in ICT strategy draws on four key factors: the absence of a plan to retain key IT staff, the lack of central IT governance structures, restrictive technical support, and compromised user identification. The IT staff play a critical role as far as the development and implementation of the system is concerned. However, there is no strategy in place to retain these staff. This does not imply that the other staff plays a less vital role; however, the ripple effect of losing an IT staff at a crucial point in both the development and implementation stage outweighs the others. Additionally, there is no central IT body to set and regulate the IT standards used by the LC. Such regulations are required for the development and implementation of digital systems

Furthermore, the findings provide strong evidence of restricted technical support to clients who access the system's functionalities from convenient places. This is due to the absence of a help desk and an emergency call centre to address clients' specific needs. Whiles this is seen as a current limitation, it may affect people's willingness to adopt any future information system since it contributes to the negative encounters with technology.

Although no significant concerns were raised by clients concerning the security of their identification, it is a complete breach of privacy to use a client's identification details without their knowledge. These actions may result in false transactions, misunderstanding and possible lawsuits or legal actions against the LC, considering that the LC is a body corporate with a common seal and may sue and be sued in its corporate name.

The system does not encourage divisional integration

In theory, the LC is seen as one body with integrated functions; surprisingly, there are no divisional windows to allow for such integration in practice. It appears that the system has been designed on the premise of separation. Thus the divisions perform different activities independently with limited or no integration. This

is evident from the land administration process identified in section 4.4. Apparently, with valuation, clients submit their documents for stamping and go away. With survey and mapping, clients get their plans approved and go away. PVLMD, clients apply for concurrence, obtain consent and go away. You apply for a land title certificate with the land title registry and go away. Even though the issuance of a title certificate depends on the completion of activities from the other three divisions, it appears that for successful completion of the registration process, the client has to serve as the connecting link among the division.
Subsequently, the client also serves as the link between LUSPA and the LC due to the constrained relationship between the two institutions. If a client does not obtain zoning and planning comments from LUSPA, the LC is in no capacity to identify the land-use restrictions on the land.

Duplication of efforts

Duplicates can be observed in all the activities in the integrated process. After obtaining a consent certificate, such a record is not immediately recorded in the system. The clients must initiate and pay for another process to record such records. The time cost involved is what most clients exert resentment. It is not surprising that 20 out of the 23 respondents indicated that the services of agents and land officers were unofficially employed to initiate a transaction.

Another factor for consideration is that clients must physically submit hard copy documents that they have already scanned into the system for tax value assessment. This not only duplicates the client's work but also a time cost for the officers undertaking such a review. They have to assess the same documents twice; thus, the scanned and physical documents for embossments of physical stamps or to check if both documents are a match. Currently, this study could not identify if the duplication is caused by the absence of the system's functionalities to support digital signatories or the absence of trust in the digital system. However, considering the observation by (Zeng & Cleon, 2018), inadequate trust in the system might have also contributed to such duplication.

The last factor to consider is that LRD requires the SMD to prepare a cadaster plan for the clients after generating the barcode plans. Since this barcode information contains the exact position and has the approval of the director of the survey, it is an extra cost for clients and a duplication of a task for the surveyors to visit the site of the parcel to capture the same piece of information which could be obtained from the barcode plan.

Inadequate data quality

The quality of data negatively affects the system's ability to generate up-to-date information. The SMD indicated that some maps are scrambled, lost and worn out with unrecognisable boundaries on scanned sheets. Such data is not fit for digitisation and has resulted in less representation of land information in the system.

Weak communication strategy

Although the system provides the client with the functionality to track and identify the application status, there are some weaknesses in its ability to notify clients when their process is ready. This might delay the clients from picking up their documents and result in a pile of documents from the front office. If these documents are not picked up on time, they might again be liable to the harsh manual condition the system intends to resolve.
Additionally, the inability of users to provide feedback on the system is a huge setback. The potential effect limits how users' needs could be addressed for a more optimal and functional system.

5.6. Analysis of the Factors to Consider for LIS Development and Implementation in Kumasi

Having gone through the fieldwork process in Kumasi and identifying that LIS is non-existence, this study reintroduces a new objective to identify the factors for LIS development in Kumasi based on the best practices in Accra. Per the findings specified in subsection 4.1.1, Kumasi is in the process of implementing the LIS in Accra. However, in this study, it is of the view that the fundamentals of the system in Accra cannot be supper imposed on Kumasi. In fact, it cannot be assumed that the system in Accra will work perfectly in Kumasi, considering its current and potential limitations. Additionally, these cities have different land governance structures, different registration systems and processes and different land ownership regimes.

It was identified in section 3.1 that the land governance structure in Kumasi is centralised around the stool. This means that land ownership resides in the stool; hence the issue of identifying who owns what would not be a problem as opposed to Accra with fragmented land ownership. This could be an advantage for LIS implementation; however, the deed registration system and the decentralisation of LA activities between the CLS and the LC might challenge the implementation of Accra's system in Kumasi. This is because the system in Accra does not provide the gateway to plugin the activities of the CLS. According to Larsson (1991) and Henssen (2010), reporting changes in land ownership must take place within one office (e.g., CLS). However, such information must be distributed between the related institutions (e.g. CLS and PVLMD) and not the clients as identified in Kumasi *(see subsection 4.2.1)*. Hence in future LIS development, this gateway is required to ensure the institutional window for such integration.

5.7. Summary of Chapter Five

This chapter discussed the results presented in chapter four and provided an overview of the assessment result based on four rating scale. It further highlighted the potential and current limitations of the LIS in Accra, as well as the factors for improvement. Additionally, the factors to consider for future LIS development and implementation in Kumasi are presented. The next chapter presents the study's conclusion, recommendations, and future research directions.

6. CONCLUSIONS AND RECOMMENDATIONS

This chapter presents the conclusion of the study's findings based on the objectives outlined in chapter one. Furthermore, a set of recommendations based on the analysis and discussion in chapter five is presented in this chapter. The study's limitations and areas for future research are also presented. This chapter is finalised with a summary.

6.1. Conclusion

The study aims to assess the land information system for land administration in Ghana by drawing on evidence from Kumasi and Accra. To achieve this objective, the study used semi-structured interviews and questionnaires administration based on the qualitative research approach to gather the relevant data. Following the thematic analysis, the findings and discussion are presented in chapters four and five, respectively. The subsequent subsections present the conclusion of the study outcome under the four subobjectives of the study.

6.1.1. To Assess the Effectiveness of the Land Information System for Land Administration in Ghana

The first sub-objective focused on assessing the effectiveness of the land information system for land administration in Ghana. This was achieved by reviewing frameworks for LIS assessment in literature. The reviewed frameworks were selected based on their ability to be applied on a broader scale and thematically capture the concepts and the components of LIS definitions. Based on this review, an assessment framework consisting of three themes, eight dimensions and twenty-three indicators was developed to assess the effectiveness of the LIS in the two study areas. The twenty-three indicators were input for developing questionnaires and interview guides for data collection.

The result from the study indicates that Accra is in a high level of alignment with three indicators: (1) clear institutional mandates, roles, and responsibilities, (2) availability of laws and policies to support analogue to digital conversion and (3) availability of strategy to protect data, software and operating system. Furthermore, from the assessment result, Accra is in medium and low alignment with thirteen and seven indicators, respectively (see subsection 5.2).

On the other hand, only nine out of the twenty-three indicators could be measured in Kumasi. This is because the study identified that LIS had not been implemented. Kumasi highly aligns with the availability of laws and policies to support analogue to digital conversion. Six and two indicators were in medium and low alignments (see table 11).

6.1.2. To Identify the Functions of the Land Information System in Land Administration in Kumasi

This sub-objective identifies the functions of the land information system in land administration in Kumasi. This objective is achieved by analysing data collected from the staff and clients from Kumasi LC. The results show that the LA process in Kumasi consists of granting concurrence and consent, plan approval and cadastral plan preparation, tax value assessment, verification and certification. However, due to the absence of an implemented LIS, none of these processes is carried out in a digital environment. The result shows that staff are in tuned with the analogue processes and have a positive attitude towards adopting a digital system.

To Identify the Functions of the Land Information System in Land Administration in Accra

This sub-objective identified the functions of the land information system in land administration in Accra through data collected from staff and clients from Accra LC. From the LIS perspective, the LA status in Accra combines analogue and digital systems and work processes. Based on the result from Accra, the LA processes were categorised into eight activities: granting concurrence, granting consent, plan approval and

barcoding, tax value assessment, verification, processing, and certification. According to the results, the digital system fully supports barcoding and verification. The assessment of tax value (stamping), processing and certification are carried out in the analogue and digital systems and work processes (see section 4.3). According to the results, there are duplicated activities in the work processes.
The results further show that integrating the LA services into the system's functionalities has enhanced data integration and interoperability, business operations, accountability and service delivery. However, this study could not decipher if external factors like using unofficial services from land officers and agents facilitated such improvements. Subsequently, the study identified that these actors played a role in the transaction between the LC and clients.

6.1.3. To Determine the Factors that Require Further Improvement in Accra and Kumasi

This sub-objective focused on determining the factors that require further improvement in the LIS in both study areas. However, this sub-objective was constrained due to the absence of LIS in Kumasi. This notwithstanding, the objective was partially achieved by identifying the current and potential limitations of the LIS in Accra based on the result of the discussion. The results indicated that the LIS in Accra requires improvement in eight major areas: implementation plan, funding, law implementation, ICT strategy, divisional integration, work processes, data quality and communication strategy. On the other hand, Kumasi had no LIS; however, findings from fieldwork indicated that attempts were being made to replicate the system in Accra. Based on this insight, a new objective was developed to identify the factors for LIS development and implementation in Kumasi based on the practices in Accra. The identified results are as follows:

- Accra's LIS is developed for the title registration process and does not reflect the dual registration system in Kumasi.
- Accra's land governance and administration structures differ from Kumasi's. - The land Registration procedures in Accra are different from Kumasi

The conclusion drawn from this result is that unless Accra's LIS is further improved and redesigned to accommodate the Kumasi requirement, the LIS's fundamentals could not be imposed on Kumasi.

6.2. Recommendation

The LIS in Accra has to some extent, positively affected LA activities. However, the results from the assessment indicate there is still a long way to go. Kumasi, on the other hand, is trying to replicate the LIS implemented in Accra; however, as good as this may be, this study suggests that the system in Accra needs to be further improved and redesigned to accommodate the need of Kumasi. Therefore, this section presents a set of recommendations to support LIS's effectiveness in Ghana.

Provision of financial support

Incorporating ICT solutions in land administration require a substantial financial investment. In Accra, the system's functionalities are delivered when they can be afforded from the annual 33 per cent allocated funds for their day-to-day administration. Due to limited access to funds, the LC cannot meet some of its basic needs, such as adequate power supply, space, internet connection, office logistics, and computer hardware. Subsequently, the LC employs open-source software to meet some of the system specifications. This software offers no vendor support in the case of any malfunctions. Therefore to remedy these shortcomings, this study recommends adequate financial investment from the government and donor agencies. After such investment, a reliable source of income must be identified for the maintenance and sustenance of the system. Additionally, the LC must set a budget and ensure that the budget can support the system's implementation.

Redefine the system requirements, scope, boundaries and deliverables

The current study identified that the system's requirement, scope and boundaries in Accra remain fuzzy. In line with this, the study recommends a redefinition of these elements by involving all the system's relevant stakeholders. Additionally, private sector outsourcing could potentially get the needed capacity and expertise to outline and set out these requirements.

Establish a national IT organisation to set and regulate IT standards

Accra's IT department has the autonomy to deploy the IT standards for the LC and beyond. First, there are no national IT standards to guide IT. Second, no central IT agency regulates and monitors compliance with IT standards because such an agency is non-existing. Therefore, the study recommends establishing a national IT organization to set IT protocols and standards, ensure compliance, and monitor IT activities.

Provision of professional development programs and orientations to redevelop the capacity of the staff on an occasional basis.

As identified in Accra, some staff cannot optimize the LIS functionalities due to insufficient skills. In recognition of this, the study proposes training and retraining programs for the staff to keep them on course with the activities involved with the LIS. Neither the LIS nor the staff is static; therefore, such programs are required to keep the staff abreast with the development of the LIS.

Establish a clear communication channel among divisions, IT and Clients.

The major setback of Accra's LIS is the inability of users to send feedback on the use of the system and the failure of the IT to communicate changes and system updates to the divisions. In line with this, the study recommends constant communication on the system updates through release notes and other channels like staff emails address. Additionally, an option should be provided for users of the system to rate their experience. This should not be limited to the external users (clients); however, it should also focus on the internal users (staff).

LIS reorganisation with customer orientation

The system in Accra does not encourage divisional integration. Currently, the divisions continue to operate as separate entities. As a result, there is no seamless flow in the work processes, and the client has to serve as the connecting link among the divisions and the work processes. Therefore the study proposes a system redesign to streamline the division's activities. This way, if the transaction's purpose is registration, the clients would not have to hop from one division to another. The client would only receive a notification once the entire process is over.

Implementation protocols should be improved to reflect the status of the law

The study identified an implementation gap regarding the categories of registered interest and the actual practices at the LC. Although the law recognises usufructuary interest as inherent and alienable, recording these rights at the LC would automatically truncate it to a leasehold of 99 years. Furthermore, the law is specific on the data required for registration. However, due to the absence of regulation for family land disposition, they are exempted from complying with some of the requirements of the law. Hence the study recommends implementation procedures that reflect the law's definitions, requirements and status.

A mandatory privacy policy should be developed

According to findings from Accra, the system sometimes breakdown and presents a difficult situation for new clients to signup. This has allowed new clients to initiate transactions using previous successful login details of other clients, which is a breach of privacy. Therefore there is a need to develop a privacy policy, and the instructions should be followed mandatorily.

6.3. Summary of Conclusion and Areas for Future Research

In conclusion, this study has assessed the LIS for land administration in Ghana by drawing on evidence from Accra and Kumasi. The study adopted the qualitative research approach and developed an assessment framework with indicators to measure the effectiveness of the information system. In general, the LIS in Accra is in the early stages of development; thus, Accra is at the beginning of a comprehensive learning and development curve. Although some progress has been made, there is still a long way to go; strategies are therefore required. Furthermore, to replicate Accra's system in Kumasi, extra functionalities are needed to support the local situation in Kumasi

Future Research Areas

It was identified that some parts of data remain unavailable for digitisation due to boundary invisibility. There is literature on reusing documents from old archives and maps; therefore, further research on implementing this is recommended.

Furthermore, future research may be applied to identify the feasibility of implementing Accra's System in Kumasi and other parts of Ghana.

Further research in both study areas may also focus on how individual perception and experience with ICT influence their willingness to use future technology.

Although the study successful assessed the effectiveness of LIS in Accra, the focus was on the system functionalities, capabilities and the elements provided to support its existence. However, the implementation process of a system plays a role in its adoption. Therefore, future research could focus on the actual implementation of the system and how it facilitates LIS adoption.

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LIST OF APPENDICES

Appendix 1: Overview of the Research Design Matrix

Research Question	Required Dataset	Data Gathering Method	Respondent	Data Processing and analysis	Expected Output
Objective 1. To assess the effectiveness of the land information system in Ghana					
What frameworks are available in literature for assessing land information systems?	Data on available LIS assessment frameworks	Literature review		Literature review	Description of the available assessment framework
What indicators could be identified to assess the functionality of the LIS in Kumasi and Accra?	Data on suitable indicators for assessing LIS	Literature review		Literature review	Indicators for assessing the LIS
How does the LIS in Kumasi and Accra respond to the identified indicators?	Data about the status of the information system	Semi-structured interview	Staff and clients from Kumasi and Accra LC	Qualitative thematic analysis	Description of the status of the LIS per the identified indicators
Objective 2: To identify the functions of the land information system in land administration in Kumasi					
What is the Land administration process status in Kumasi from LIS perspective?	Data about LA status in Kumasi	Semi-structured Literature review	The KLC staff	Qualitative thematic analysis	Description of the LA status

Which part of the Land administration process is affected by the implementation of the land information system in Kumasi?	Data about the integrated functionalities of the LIS in LA processes	Semi-structured interview	The KLC Staff	Qualitative thematic analysis	Description of the processes integrated into the functionalities of the LIS

What are the benefits of implementing the LIS in land administration processes?	Data about the benefits of the land information system in LA processes	Semi-structured interview/ Questionnaire	The KLC staff and clients,	Qualitative thematic analysis	Description of the benefits of the land information system on LA processes
Objective 3. To identify the functions of the land information system in land administration in Accra					
What is the Land administration process status in Accra from LIS perspective?	Data about LA status in Accra	Semi-structured, Literature review	The ALC staff	Qualitative thematic analysis	Description of the LA status
Which part of the Land administration process is affected by the implementation of the land information system in Accra?	Data about the integrated functionalities of the LIS in LA processes in Accra	Semi-structured interview	The ALC Staff	Qualitative thematic analysis	Description of the processes integrated into the functionalities of the LIS
What are the benefits of implementing the LIS in land administration processes?	Data about the benefits of the land information system in LA processes	Semi-structured interview/ Questionnaire	The ALC staff and clients,	Qualitative thematic analysis	Description of the benefits of the land information system on LA processes
Objective 4. To determine the factors that require further improvement in Accra and Kumasi					

What are the current and potential limitations of the LIS in Accra?	Data on the limitations of the LIS in Accra	Review of findings from the study		Qualitative thematic analysis	Description of the limitation of the LIS in Accra
What are the current and potential limitations of the LIS in Kumasi?	Data on the limitations of the LIS in Kumasi	Review of findings from the study		Qualitative thematic analysis	Description of the limitation of the LIS in Kumasi
What are the lessons learnt for further improvement in Accra and Kumasi?	Data about the lessons for further improvement	Review of findings and discussions from the study			Description of recommendations for LIS improvement in Accra and Kumasi

Appendix 2: Overview of Assessment Results

Thematic Areas	Dimension	Indicators	Case Study Area	Ratings		
				High Alignment	Medium Alignment	Low Alignment
	Institutional Framework	Institutional mandates, roles, and responsibilities are clear without overlapping functionalities	Accra	√		
			Kumasi		√	
		The land administration process is clearly defined and integrated into the functionalities of the information system	Accra		√	
			Kumasi	Not Applicable		
		Positive Attitude Toward Information, Communication and Technology (ICT) Adoption	Accra		√	
			Kumasi		√	
		Availability of system implementation plan	Accra			√
			Kumasi			√
	Policy and Legal Frameworks	Availability of laws and policies to support analogue to digital conversion	Accra	√		
			Kumasi	√		
		The system is ready to process all the different types of land rights, right holders, and restrictions	Accra		√	
			Kumasi	Not Applicable		
		Data standards, data privacy, data security, and data sharing options are properly regulated	Accra		√	
			Kumasi	Not Applicable		
Operational environment	Technology	Availability of strategy to implement the system's specifications (thus strategies to ensure that the computer hardware, software, backups, and storage space needed for effective LIS are available)	Accra		√	
			Kumasi	Not Applicable		
		The availability of user-friendly manuals	Accra			√
			Kumasi	Not Applicable		
		The availability of a user-friendly system	Accra			√
			Kumasi	Not Applicable		
		Data is available to be fed into the system	Accra		√	

	Data		Kumasi		√	
		Data has all the relevant attributes needed for a specific context and are free from contradictions	Accra		√	
					√	
			Kumasi			
		Availability of plan to get a complete cadastral coverage	Accra			√
			Kumasi		√	
	Working Environment	Availability of suitable ergonomic environment	Accra		√	
			Kumasi		√	
		Reliable power supply and internet connection	Accra		√	
			Kumasi		√	
Sustainability measures	ICT strategy	Availability of help desk to provide technical support and assistance	Accra		√	
			Kumasi	Not Applicable		
		Availability of strategy to retain key IT staff (thus, if IT staff is well motivated)	Accra			√
			Kumasi	Not applicable		
		Availability of strategy to protect data, software and operating system	Accra	√		
			Kumasi	Not Applicable		
	Training and Capacity	Availability of IT experts for database, land administration processes, and data and network security	Accra		√	
			Kumasi	Not Applicable		
		The staff has adequate training in using the information system	Accra		√	
			Kumasi	Not Applicable		
		Availability of a plan to get the capacity available	Accra			√

			Kumasi	Not Applicable		
	Communication Strategy	There is a public awareness campaign with content focusing on all the stakeholders of the information system	Accra		√	
			Kumasi	Not Applicable		
		Availability of option for a feedback mechanism	Accra			√
			Kumasi	Not Applicable		

Appendix 3: Ethical Consideration

This research will consider three ethical principles: informed consent, anonymity, and confidentiality. The respondents were informed about the purpose of the study, the information required, the use of such information, and the outcome of providing the information. The data collected was willingly provided by the respondent through, and they have the right to access this data anytime they wish to do so. During the data collection process, permission was obtained from the respondents to record the conversation.

Since this topic is susceptible, respondents' identities were treated with strict confidentiality and anonymity. Subsequent responses that opted for anonymity consent were not quoted anywhere in the study.

Appendix 4: Data Management Plan

Origin of Data:	
1. What kind of data will be used during this project	Data from interviews, questionnaires and literature
2. What is the source of the data?	Primary and secondary data
3. Are various data sources integrated in the datasets you are going to use?	Yes
4. If yes could you identify the individual datasets that are combined	I can identify the individual datasets combined
Data owner(s)	Libraries, online journals, United Nations Committee of Experts on Global Geospatial Information Management, LEI, The Kumasi Lands Commission (KLC), The Accra Lands Commission and Clients from Accra and Kumasi
1. Which organization owns the data you are going to use?	The Ghana Lands Commission in Accra and Kumasi
2. Can you easily find out what you are allowed to do with the data you are going to use?	Yes

ORGANIZING AND DOCUMENTING YOUR DATA

Data organization:	
1. How will you organize your data during the project? E.g. folder structure and names	1.MSc Thesis Data a. KLC interview data b. ALC interview data c. KLC clients d. ALC clients e. Literature data
2 What can you tell about the quality of the data?	a. Primary and secondary data reflect the actual scope of the research and can be proved by a known source b. Primary and secondary data adequate to answer all the research questions

	c. Data stored on a computer hard drive and google drive do not conflict with each other d. Primary and secondary data is available for analysis and review whenever and wherever it is required
Metadata	No available metadata
1 What metadata comes with the data?	
2. Is there any metadata missing?	

PROCESSING YOUR DATA

Versioning:	
1 What would be your strategy concerning versioning your data files during the project	A new subfolder titled processed data will be made for processing data and upgraded when there are any changes.
2 How can different versions of a datafile be distinguished	It depends on the number of upgrades made

PROTECTING YOUR DATA

Ethical review:	
Do you think your project requires ethical approval by ITC Ethics Committee?	Yes
Why?	The research involves collecting data from respondents that may be sensitive. ethical considerations are adhered to, and identities are treated with strict confidentiality