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ARTICLE

User and Systems Requirement Framework for Electronic Land Registration Systems Decentralisation in Ghana

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ABSTRACT

Although land registration systems are constantly changing based on entrenched institutional frameworks, they cannot fulfill their technical objectives. Technical designs based on loopholes in the existing land registration system are the common steps in advanced countries. However, the missing link between the implementation of technical designs and their uses and users, affect the prospects of land registration decentralisation in developing countries. User and System requirements are used to integrate and enhance land registration services delivery across land information systems. This study assesses and develops framework for decentralised electronic land registration systems in Ghana. Semi-structured interviews were used to collect user and system requirement data from clients and technical staff of the Lands Commission in Accra. The framework pointed out five main policy outline strategies. These include land registration process modeling (process reduction and turnaround time monitoring), technical function (file tracking), the effect of changes in the registration loupe and absorption of land registration report, land registration workflow improvement, and the use of aerial images. The study recommends a systemic monitoring and evaluation of staff job roles.

1. Introduction

Land administration represents government concern to provide security of tenure and information about land tenure for property markets and public activities. Land administration systems offer structures for implementation of land management policies and strategies. These include processes and frameworks, adherence to standards, legal frameworks, land information systems, and users required to contribute, support and control the use of these structures [11]. A significant increase in land transaction and land development projects are the driving force of these structures [15].

Based on that governments across the globe have taken advantage of electronic platforms to facilitate land registration for economic transformation. However, most land information systems have limitedly achieved their intended aims due to lack of adherence to user

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and systems requirements. Governments are interested in harmonising policies and reforms as system design strategies than recognising the need for consultation and feedback from users and stakeholders in the design process [5]. These lead to staff resistance across most developing land administration systems. The concept of user and system requirements is usually applicable in the manufacturing and computer industries. This is because, it is fairly recognized that about 80% of production in the manufacturing industry is determined by the collaborative decision of stakeholders in the early stages of the design cycle, therefore the ability of stakeholders to understand what they need and expect from the production plays an important role in the industry's development [2]. User and system requirements are major components for enterprises to improve their product design. So a precise thought of customer requirement information is vital to provide dependable design decisions. In today's competitive global marketplace, competitive advantage lies with those companies that understand and respond quickly to dynamic user and systems requirements that guarantee quality, reliability, and performance [32]. However, most land registration practices can be said to be monopolistic. That is, land registration systems are managed and controlled by centralised state institutions [20,4,18,27]. However, one of the key visions of every land administration institution is to satisfy user needs through the application of soft land registration systems and practices thereby ensuring tenure security. This can be achieved by an increase in public responsiveness regarding benefits of the formalisation of property rights, receive feedback on public acceptance, and evaluation of the land registration services provided [23]. Feedback from the land registration system requires a spatial definition of registered administrative sectors in varied land registers, coordinated exclusively to capture the spatial extent of tenure, land institutional efficiency, and improved data integration [10]. Others argue that efficient management of geographic data and data interoperability among different institutions and stakeholders helps to improve the land cadastre [1,4,11]. In Ghana, the land registration system is partly electronic and complex. The procedures are long due to interwoven classes of land ownership and registration requirements [5]. Often, there are institutional challenges such as overlapping claims of ownership by users, unclear land registration processes, presence of unknown staff (ex-national service workers), poor conditions of service, lack of collaboration among the land registration institutions and their stakeholders [3,8]. Few studies on land registration have been carried out in Ghana to identify user needs with the view to satisfying them[3,5,8,33]. Until now these studies have focused on analysing land administrative practices, and they proposed numerous theoretical approaches for proper land registration system at the centralised level in Ghana. However, these studies have ignored the technical gap (system requirements) and user requirements needed for the implementation of a comprehensive land registration system at the decentralised level in Ghana. Therefore, this study assesses the prospects of a decentralised electronic land registration system from the perspective of user and system requirements. Users of land registration systems have a gatekeeping role in ensuring an efficient and transparent land registration system through collaboration with land registration institutions. In Ghana, users who are unable to register their lands are often disadvantaged. This contradicts the view in customary land law in Ghana that land rights are birthrights. This study contributes towards the facilitation and improvement of the electronic land registration system in Ghana. Aside from that, there are benefits in this study for the drive to scale up the integrated land information system to other regions in Ghana. Theoretically, the study contributes to the land administration discourse by fusing user and system requirements approaches from computing and manufacturing domain to land registration. Practically, identifying systems and user needs will avoid staff resistance, improve land registration turn-around time, and improve productivity across the value chain. The paper is structured in six sections. Section two reviews literature on Ghana's land registration systems, and user and systems requirements. Section three presents the methodology of the study. The results are presented in section four and discussed in section five. The conclusion is presented in section six

2. Ghana's Drive towards Electronic System of Land Registration

The drive to transform land registration systems from manual to electronic systems started in 1999. The 1999 national land policy heralded the commencement of land registration reforms [5]. The policy provided a guideline that saw the implementation of the Land Administration Project (LAP) I and II. LAP I aimed to 'fashion a well-functioning and sustainable land administration system that ensures efficient, decentralised, fair, and cost-effective decentralised land administration (World Bank, 2013, p. 4). The First Phase of the project aimed to (i) improve valuation and information, and land titling registration (ii) harmonising land regulatory and policy framework for sustainable land administration and (iii) institutional development and reform. In 2012, LAP II introduced

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new departments within the Lands Commission to serve as an entry point for electronic transactions [5]. These include the Clients Services Access Unit (CSAU) and the Ghana Enterprise Land Information System (GELIS). Clients Services Access Unit (CSAU) aimed to improve service delivery through the provision of customer-focused and quality services to the general public. The CSAU serves as case management and a single point of contact that safeguards between the client information and the complex processes of land registration. In 2016, the government aimed to re-engineer the business processes of land registration with the introduction of the Ghana Enterprise Land Information Systems (GELIS). The GELIS facilitates full automation of the land registration processes and provides a holistic Land Information System that permits all users including public land institutions and other government institutions to digitally carry out their business activities effectively and efficiently using common databases.

2.1 User Requirements in Land Administration

Sustainable land registration systems are required to meet the needs and benefits of the people concerning their relationship to the land [9]. However, these require that well-functioning land registration processes are built around the organization's mandate driven by stakeholders and user needs [14]. A study in Turkey showed that land registration projects in the 1990s failed because stakeholders did not meet data infrastructure standards due to the failure to integrate user needs [1]. Recently, a study on the institutional design of the land administration system in Ghana confirms this claim [5]. Studies on user requirements in land administration and management are limited. User requirements serve as means of data gathering in the form of service quality, time, dissemination, and storage for a well-functioning land registration system [7]. A study showed that user requirements answer the following questions: What do the users or clients need and want from a new system? Who needs the information and what information is necessary? For what purpose will the information be used by the client? When, and in what time interval does the client need the information? In what quality, standard, and quantity of information is needed as a minimum or maximum? In what way is information transferred to related persons or institutions? [25]. Another study revealed that user requirements are enabled by interviewing users and officials through collecting data in the form of rules, regulations, reports, complaints, and recommendations of land registration [28]. A study in Macedonia shows the use of questionnaires as a means to gather user requirements from both external sources (NGO's), citizens and internal sources (Government officials) to improve the business services of its Cadastral Organisation [29]. The integration of user requirements in the system design of organisations leads to the performance of its business services and the opportunity for further improvement in the existing system [30]. User requirements also enable one to know the gap in the existing architecture and then help to translate this requirement into the system design. Technically, model building in support of the land administration domain depends on user requirements that support land administration system implementation [16].

2.2 System Design and Implementation

Land administration systems in some parts of the world are confronted with a lack of spatial and descriptive land information, parcel mapping and outdated maps, metadata, common standards for descriptive data, duplication, and storage of the same information into individual systems [25]. Others are noncontinuous data update, technology systems in some agencies that might complicate the interoperability amongst systems, tracking of information changed and accessed, insufficient control of internal user access, and security of the information accessed [25]. System requirements form the foundation for the original assessment and ideas for developing and validating any product [12]. Aside from that system requirements are established to adhere to the wishes of the client and communicate with the client, thereby improving the ability of the designer to react to changes in the client's wishes, and to explain design choices to the client [21]. Technically, systems requirements control the logical process of an electronic system which cannot be distracted by implementation details [12]. This strategy enhances communication accuracy between the designer and the client while being easier to comprehend [12]. Systems requirements are mostly characterised by the ability of the system to access data. Data accessibility includes the ability to visualise, query, generate tables [31]. An electronic system review in China showed the need to impute the latest data of clients, correcting the existing data, and deleting outdated data, to ensure data integrity and recognition [17]. A similar study proved that database systems are the supporting tool for manipulating data [31]. The database should be able to support a diversity of data types and formats, including but not limited to: spatial data imagery, raster, vector, tabular data, documents, photographs, static and time-series, and URL links [31]. System requirements in land administration in some jurisdictions are based on the ability of the system to improve transparency and system integrity through the

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ability of the system to generate land reports, digitize all interest in land, identification, and elimination of problems of double plotting and double referencing for titles, carry out instant land searches, and creation of digital base maps [13].

3. Materials and Methods

The case study approach was used to study the land registration system in Accra. The study assessed the challenges of user and systems requirements of the electronic land registration system in Accra. Accra was selected because the electronic land registration system is being piloted in Accra. Primary data was collected from the technical staff of the different divisions of the Lands Commission. The divisions include the Public and Vested Land Management Division (PVLMD), Client Service and Access Unit (CSAU), Land Title Registry (LTR), Land Valuation Division (LVD), and the Survey and Mapping Division (SMD).

3.1 User and Systems Requirement Definition

system users are defined as clients who register their lands at the Lands Commission and the staff working with the land registration system. Users (clients) were selected using the simple random sampling technique. A list of 100 selected clients was obtained from the Land Title Registration Division of the Lands Commission. These form 5% of clients who received their land title documents in 2021. Key technical users (staff) were purposively selected from all the divisions. Semi-structured interviews and key informant interviews were used for clients and technical staff respectively. User requirements focused on land information verification, data processing, and services quality. System requirements on the other hand are electronic land registration system capabilities required for efficient system operation and services delivery. System requirements focused on parcel search systems ability, document tracking, systems monitoring and evaluation, and database availability

3.2 Data Analysis

The data were grouped into themes and analysed with Atlas Ti software. Quotations and descriptive statistics were used to present a summary of user and systems requirements.

4. Results

4.1 Brief Description of the Land Registration Processes in Ghana

The study found three distinct levels of land registration processes in Ghana depending on the land ownership type. These processes include the private (family lands) land registration processes, stool lands registration processes, Public and Vested Lands registration processes. However, the processes are not straightforward but follow an up-down approach of data flow within every division of the Lands Commission. The main institutions responsible for the registration of these land ownership types include the Survey and Mapping, Client Service Unit and Access Unit, Lands Valuation Division, Public and Vested Lands Management Division, and the Land Title Registration Division. Within these divisions, some units perform specific tasks to ensure the movement of land documents. Aside from these institutions, other stakeholders include the customary land secretariat and the Land Use and Spatial Planning Authority.

The Customary Lands Secretariat is the institution that is responsible for recording rights in the land on behalf of customary landowning groups such as the family and stool in Accra. The Land Use and Spatial Planning Authority is responsible for providing and allocating land use plans to clients. The key land registration documents required include an indenture, Site plan, Allocation note, and consent letter. Among these documents required, the survey showed that 46% and 43% of respondents used site plan and the indenture as an entry point in the registration system. The purpose of these two documents according to respondents is to give them the legal backing of parcel ownership even before the registration process, but it cannot confer title to the land. The other 11% of respondents admitted the use of a consent letter as an entry point. The reasons for consent letters are respondents who have ever registered state or vested lands. For consistency in land registration requirements, an officer at the CSAU confirmed that:

> [...] the said two documents must conform to legal, survey, and mapping standards of the Lands Commission. This includes the signature of a licensed surveyor and a solicitor from the high or supreme court of Ghana.

The Survey and Mapping Division investigates and prepares cadastral plans on which plotting of parcel coordinates is done to assist the Land Title Registry to issue land title certificates. The Survey and Mapping Division interacts with the Land Title Registry and Public and Vested Lands Division in delivering survey search and mapping request. The complex nature of land ownership and registration processes requires detailed background checks before the purchase and registration of lands to avoid double sales and land disputes in Accra. The

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study discovered that lands are registered for sale, lease, mortgage, and use (see Figure 1).

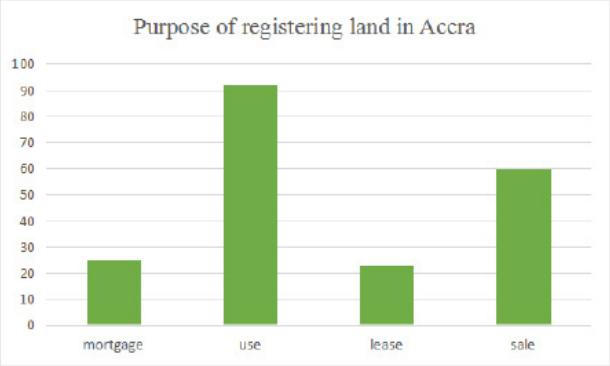

Figure 1. Purpose of registering land in Accra

4.2 Cross-Cutting Issues of Electronic Land Registration Processes

The issues are related to the verification and document processing in the land registration system.

4.2.1 Verification of documents

The emerging issues regarding verification are division-specific. These include; parcel search, capabilities of assessment report templates, and inconsistency in manual, digital verification of site plan, and electronic deficiencies. The Customer service and Access Unit is the first point of information flow in the land registration system. Concerning parcel search, an officer at the CSAU explained that:

> [...] Verification of documents interface does not permit the Customer Services and Access Unit attendant to absorb and write a report on the status of a client's application. The Customer Service and Access Unit verification process does not track the progress of a client's application"

According to the CSAU, the system supports the search of documents. However, due to the high volumes of applications received in a day, it makes it difficult for the system to provide quick search reports. In other instances, because of a lack of sensitization regarding the processes of registration, some clients are requested to return when their documents do not meet their requirements during the verification process. According to a senior officer at the CSAU:

> [...] Customer Service and Access Unit receives on average 200 applications per day regarding first registration, which takes about a day to review all these applications when an applicant's documents meet all requirements.

Also, the design of the document's assessment template creates some difficulties for the assessors as they are not able to check the details of the documents, as such the registration interface remains secondary. According to one officer at the Lands Title Registry:

> [...] The template was designed not to include all relevant information that concerns statutory ones. According to the officer, this should appear on the same page to enable the assessment of documents without any difficulties. This delays the workflow because most registration processes get stuck somewhere in the flow where statutory or vested lands are registered.

Moreover, verification of stool lands at the Land Use and Spatial Planning Authority slows the process. Clients who wish to register stool lands can verify whether their lands conform with the master plan of Accra. When the request is made, the officers within the LUSPA also undertake another search on the field. These processes alone take a month to get a report. One side effect of this process is that the client is made to make double payment for site inspection.

There are conflicting interests in the visit and preparation of site plans from the Survey and Mapping Division and the Land Use and Spatial Planning Department. By law, the Land Use and Spatial Planning Authority visit the site when a client wants to put up a landed property. However, the registration of stool lands only gives them the mandate to verify an applicant's site in office but not on the field. This process needs to be wiped off as suggested by the Lands Commission.

Finally, verification of documents at all divisions was affected with internet problems.

> [...] According to an officer at the GELIS unit, the internet system goes off during the verification process. This affects the payment of fees and slows the whole process.

4.2.2 Data Processing

Processing in the study involves capturing, plotting, and back coding of search parcels at the Commission. The study found that there was non-capturing of relevant information including statutory information during the verification process. This affects the processing of search documents at the SMD. According to an officer at the SMD:

> [...] Some data which are required on the checklist are not provided especially the statutory items such as consideration/rent, solicitor, etc. by the front officers of the CSAU. Such documents must be returned at the point of submission to the Public and Vested Land Management Division for a check. This results in the back-and-forth movement of documents within these two divisions.

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Also, the back coded site plan processes introduced by the Lands Commission in the registration process was to ensure that site plans conform to survey standard and are assigned a secret number. However, this process delays because a certified surveyor must re-visit the site to determine the veracity of the site plan submitted by the client. According to an officer:

> [...] The yellow card we use before makes the registration process easy because you don't have to visit the field for any inspection because it takes two days for survey plans to be ready"

However, there are issues regarding the plotting of site plans for both stool lands and family lands between the two divisions. According to officers:

> [...] clients can plot their parcel at both survey division and Pubic and Vested Land Management Division. Therefore, there is the likelihood of double plotting hence stacking the process at the Pubic and Vested Land Management Division during the registration process. This results in disputes and the return of applications. It is also possible for a client to plot family lands at the Land Title Registry and the Survey and Mapping Division.

Sometimes parcel area or dimensions are not captured properly; hectare is sometimes used for acreage creating problems with assessment, hence delay in the release of a file to the next stage of the registration process. Also, inadequate survey and cartographic instruments slow the business processes of the Survey and Mapping Division. Most survey processes are laborious because the equipment (plotters) used are outmoded and not enough to quickly complete the survey and cartographic work of the Survey and Mapping Division. An officer at SMD indicated that:

> [...] Out of 211 survey plans received from the Land Title Registry, the Survey Division can process only 10 percent a day and forward to the cartographic department for plotting.

These make survey and plotting of site plans take one month to complete. There is a lack of a database in place for the Survey and Mapping Division; Pubic and Vested Land Management Division to ensure they keep up-to-date files. The Land Title Registry indicated that they do not have a database, and so when a file gets missing they go back to the cartographic department for missing pottered files.

4.3 User Requirements

The clients that use the land registration system include individuals, banks, estate companies, banks, estate companies, and firms. The informal sector workers in the registration process include traders. Collection of client requirements helps to get different views from clients on the land registration process and how their responses would change their present situation. User requirements are a relevant component of information technology because it allows for improvement of the existing design [32]. This implies that land registration should be built to meet the needs and benefits of the people concerning their relationship to the land.

According to most clients of the Lands Commission, their documents are not scanned at the entry point of the registration i.e., the Customer Service and Access Unit, as such they have to carry the documents from one office to the other which sometimes results in some documents or files getting missing. From the viewpoint of the Customer Service and Access Unit, all documents are scanned at the last stage of the process to get records of applicants. As a result, files get missing before they get to the last stage, especially when the number of applicants is many. The Customer Service and Access Unit suggests that it would be easy when applicants' documents are scanned at the entry point to allow digital movement of files. On the contrary, few clients support the fact that the scanning would be helpful because they have the feeling that their documents can be edited and their rights transferred to another party. Thus the general idea is that clients prefer the land registration process is digitized to avoid missing and spoiled documents, but are also concerned that they may lose the land rights altogether.

Moreover, Clients indicated that traveling a long distance to the Lands Commission is still something that needs to be addressed. Generally, the Client survey suggests that the processes should be reduced firstly and decentralised to improve the land registration process. This is because the Lands Commission in Accra serves the large population of Accra. Some officials indicated that the Metropolitan, Municipal, and District Assemblies (MMDAs) be given the right to register lands just as the Land Use and Spatial Planning Department. Clients indicated that there is a need to decentralise the processes to the Metropolitan, Municipality, and District levels so that the regional Lands Commission would have a seamless database to share data and information among them. This implies the need to interoperate data within local government offices (see Figure 2).

In addition, clients are of the view that sending text messages to them delays information sharing. According to clients, sharing information is affected by a poor mobile network. Furthermore, clients noted that the text messages which are sent out to applicants are not the best in terms of content and timing. Clients complain of receiving several

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text messages in respect of documents they know nothing about. These text messages are sent to them many times in a day. Some individuals complained of receiving more than 20 messages in a day. Thus, the clients suggested the use of mobile phone calls, emails, or letter posts. This is necessary because it would reduce the stress clients go through since some of the divisions are not located near each other. Therefore, application forms should make provision for other mobile contacts so that clients can be reached on time.

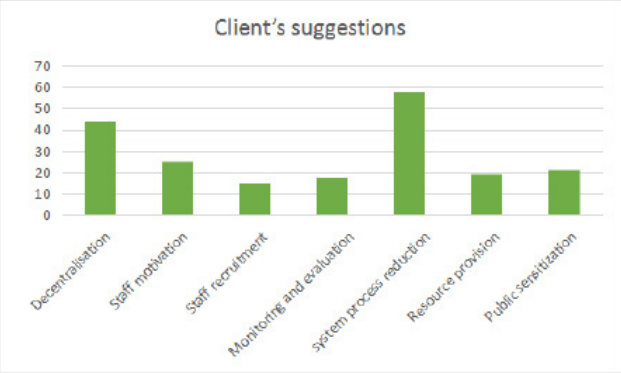

Figure 2. Client's suggestions

Survey site plans are necessary and should be checked by the Commission, but clients suggested that, going to the field for site inspection be discontinued. Rather, there should be a desktop system for verifying and inspecting land documents. This way, land valuation and ground rent assessment can be facilitated easily at the office.

Finally, Clients indicated that the plotting and signing stage of certification takes more time. According to clients, it takes sometimes, more than a month for the documents to get there. It was also found that there is no interface available to all the divisions to keep track of each other, and the movement of documents. The information shows that certifications are done every three months, as such, clients indicated that there should be a system in the workflow where an officer can be tasked to monitor and check the processes of registration to reduce the delays. As a result of these flaws in the system, the user perception score on registration time was average (table 1).

User perception of the land registration system

Table 1. Client perception index on the registration system

User perception	Level of perception	Percentage % of respondent	User description
Service quality • Delivery of information • Conformance with registration requirements • Reliability of service officials	Average	48	Messages are not delivered on time. Clients receive several text messages. Lack of awareness of land registration requirements delays the registration process because the client must come to the registration centre to inquire about the necessary documents. It is also not reliable to contact any of the officials without identification for registration. Some officials sometimes receive monies from clients that are not accounted for. This leads to double payments, most especially when a promised client's registration fail.
Data quality • Quality and content of the registration documents	Satisfactory	59	There is a lack of uniformity in the site plan template. Clients who contract 'quack' surveyors present site plans that lack all the requirements of a plan. Sometimes grid lines are missing. This makes it difficult for some plans to be approved at the Commission. The clients are of the view that when the Commission provides a uniform template to surveyors it will ease that.
Registration timeline	Average	32	Lands Commission is envisaged to reduce the land registration period to three months. But, the processes currently take about five months depending on the type of registration. where clients have queries of their files, the registration period sometimes exceeds six months. Even to years.
Registration cost	Average	20	Every stage of the registration process requires the payment of money. It is not known how much a client may legally pay for land registration services because the client pays unapproved fees to officials that are not accounted for. Therefore, the client is not able to provide the exact amount that is required to register their documents. Clients are part of this development because they influence these staff themselves to enable them to get quick registration. The poor client's document would be in the registration chain for years because they cannot pay

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4.4 System Requirements

These are system needs that enable the system to perform adequately. These requirements ensure efficiency, flexibility, interoperability, integrity, and testing of the new system [24]. To gather system requirement data, interviews were conducted at all the divisions of the Accra Lands Commission. Survey and Mapping Division indicates that there is a need to reduce the double search of a parcel on site. There should be an interface where all private surveyors would directly upload coordinates picked from the site to the Survey and Mapping Division to enable surveyors to directly prepare site plans on a uniform template. This will avoid the issues of indeterminate boundary, asymmetric and scaling problems of site plans, thereby improving parcel searches.

The use and access to the internal and external database should be the starting point within each division of the Lands Commission to enable them to track documents of applicants. Interviews from all the divisions show that officers need a database to store both spatial and non-spatial survey plans and historic files. This should support a multi-user database within and outside the Lands Commission..

Other system requirements include system monitoring and evaluation. According to the staff, there is no laid down system workflow indicating monitoring and evaluation of actors within each division. The study found that there is the need for well assembled and networked computers, well customized and functional intranet and internet systems that can ensure faster execution of data on the interface of the system within the divisions Lands Commission to ensure monitoring.

Provision should be made for copies (extra copies) presented by the client to be easily identified. The interface indicating the forms of every division should be created for the number of copies. This would reduce the complaints of submitting four documents, yet officers of a division are giving one or two depending on the type of registration. For example, the interface template should include all relevant information including statutory information.

The verification of documents interface does not permit the CSAU attendant to absorb and write a report on the status of a client's application. The CSAU verification process does not track the progress of a client's application. However, it supports the search of documents. Results show that the CSAU receives on average 200 applications per day regarding first registration and other registration inquiries which takes about a day to review all these applications when an applicant's documents meet the requirements of all requirements. This slows the preparation of reports on all inquiries made by applicants.

Technically, the study found that the workflow model should be able to support the survey maps and other attribute data, communication within other connected programs, and provide the level of access permission of officers within each division of the Lands Commission such as an ID or a password.

Finally, ensuring quick access to registration information was a challenge. To ensure quick access to registration information, it was suggested that there should be an online system where clients can upload and find information regarding the registration processes. These according to some staff, would reduce the mistakes clients make regarding what should be submitted. Table 2 shows system requirements from the client's perspective.

Table 2. Land registration system requirements from Lands commission staff perspective

System requirements	Institution concerned
System ability to reduce double parcel search	Survey and Mapping Division
Data interoperability	All divisions
System ability to monitor workflow performance	Administration
Transaction reporting and absorption of report	All divisions of the Lands Commission
Online registration of parcels	All divisions of the Lands Commission

5. Discussions

The purpose of user and systems requirements in this study is to link client and systems needs to draw a policy framework for an improved land registration system in Ghana. User requirements serve as means of data gathering in the form of service quality, time, dissemination, and storage for a well-functioning land registration [7]. The results have shown that user and system requirements can be analysed into process modeling and technical function. i.e., what clients need and how the clients want the entire land registration system to operate. In this study, it was found that the requirements that the user and system need can be analysed into three main themes; digitalisation and decentralisation of the system, reduction of the length of registration, and security of document (non-compliance with scanning). These would help to improve the business performance of the Lands Commission and open opportunities for further improvement in the existing system [29].

Concerning decentralization, clients indicated a need to decentralise the system in the MMDA's to enable

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easy registration. Although this finding has economic importance, it is not possible because Accra lacks a complete cadastral system where all parcels are mapped despite the declaration of every part of Accra as Title Registration District. This is likely to face challenges similar to a study in Kenya where data standardisation and data interoperability was an issue facing the implementation of its Land Information System (LIS) [19]. The ripple effect is that there could be chaos regarding determining parcel size and parcel boundary when the land registration system is decentralised. The best alternative to tackle the decentralisation of the system would be to reduce the length of registration process. Based on this we can infer that reducing the duration of the registration process can be the first stage. The second will be to decentralise it later after there is a complete cadastre in Accra. This can be achieved by a drive change in aggregating the processes through complete digitalisation and prototyping but not to reform local land institutions as suggested in some studies [21-23]. Even though, the digitalisation drive has its consequences regarding security. The study discovered that users require the digitalisation of land documents. That notwithstanding, it is necessary to consider the security of clients' documents during the registration process. Figure 3 presents a theoretical approach that can facilitate the technical perspective of digitalisation and decentralisation drive to complete land information systems design and implementation in Ghana.

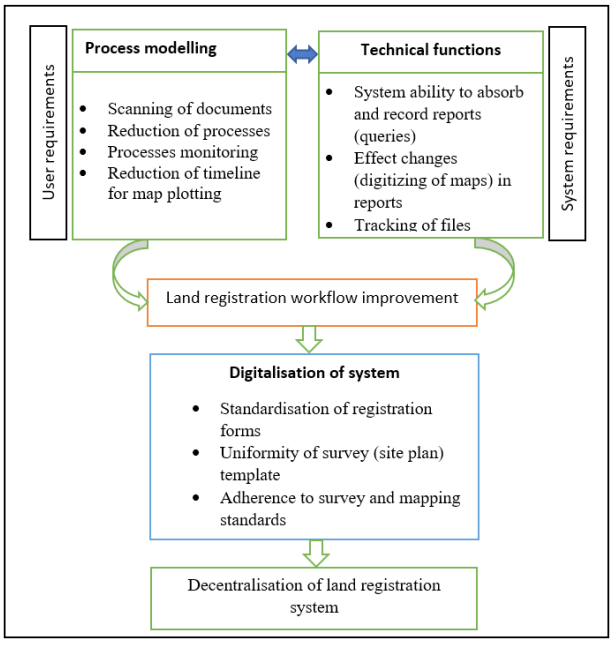

Figure 3. Electronic decentralised land registration systems framework

6. Conclusions

The theoretical background of this study identified the gaps concerning the application of user and system requirements in the land registration domain. The study revealed the emerging issues that necessitate the integration of user and system requirements in land registration systems. Based on semi-structured interviews, the paper developed a theoretical framework that defines overall user requirements and system design towards an efficient land registration system in Ghana. System requirements are the land registration systems capabilities required for an efficient land services delivery. The study found that the land registration process is confronted with poor coordination of functions, bureaucracy, inadequate logistics, inadequate staff, and monitoring equipment. Users require a streamline of the land registration processes, a decentralized system, scanning of documents at the entry point, desktop inspection of survey plans, and assessment of stamp duty. The study suggests that decentralisation of the system as an ultimate objective may be achieved through the use of aerial images as a starting point to facilitate desktop parcel inspection, survey, titling, and valuation. However, the drivers of data interoperability malfunctioning need to be checked. Technically, system design requires, absorbing processed reports, quick access to information, display of survey maps, and the ability to connect with other software programs. These have a significant implication on the transition of the manual system to a fully digitalised land information system. Finally, land registration system designers must be able to respond, predict and address clients' needs effectively during the registration process.

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