Toward Ghana Smart Land Management

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Land acquisition in Ghana is fraught with challenges of multiple sales, numerous unofficial charges, unnecessary bureaucracies, intrusion of unqualified middlemen, and lack of transparency among others. Studies have suggested digitization as a way forward to improve Ghana's land management system and to address these acquisition challenges. However, none of these studies have specifically provided a clear conceptual digital framework for land acquisition. This article applies an integrative review, mixed with strengths, weaknesses, opportunities, and threats (SWOT) analysis, and deductive lessons from a digital land registry concept to develop a blockchain-based smart land acquisition framework solution in view of Ghana's land acquisition challenges

smart land management land acquisition process public lands customary lands blockchain Ghana

1. Introduction

Land acquisition in Ghana is organized along two main lines: Customary and statutory or public. This is because, in a broader view, land in Ghana falls under customary and public management [1][2][3]. Customary lands are managed on the basis of customary laws and traditions of specific traditional/customary areas in the country. Public lands on the other hand are managed on the basis of State laws and Acts. Customary lands make up 80% of lands in Ghana, while public lands make up 20% (18% being lands compulsorily acquired by the State from customary authorities, and the remaining 2% being lands whose legal management has been vested in the state to act as trustees on behalf of the customary owners) [1][3][4][5]. Customary lands therefore provide the largest market base for land acquisition in Ghana, both for private individuals and corporate bodies. This is similar in some other African countries like Uganda, Kenya, and Zambia [6][7][8][9][10][11]. Quaye [4] noted that between 70% and 90% of land market participants across Africa rely on processes involving customary institutions when making land transaction decisions. In certain instances, the government falls on customary authorities to acquire land for governmental projects in the interest of the people [10][12][13]. In Ghana, government's land acquisition is usually done through the power of eminent domain/escheat, otherwise known as compulsory acquisition as provided under Article 20(5) of the 1992 constitution of Ghana, and under the State Lands Act 1962 (Act 125) [14][15]. Although public lands offer an alternative market for land acquisition to private individuals, and corporate bodies, land acquisition from the public lands is to an extent, on a limited basis. This is because public land acquisitions have certain restrictions that make it difficult for open accessibility by all individuals. Article 20 clauses (1) and (6) of the 1992 constitution makes this clear. Article 20(1a) permits the State to compulsorily acquire any land in Ghana for such purposes as is *"in the interest of defence, public safety, public order, public morality, public health, town and country planning or the*

development or utilization of property in such a manner as to promote the public benefit." Clause (6) further states that "*Where the property is not used in the public interest or for the purpose for which it was acquired, the owner of the property immediately before the compulsory acquisition, shall be given the first option for acquiring the property*" [14] (pp. 24–25). This clause creates a limitation on the availability of public lands to all people and this pushes most people to fall on the customary sector for land acquisition.

For public land acquisition, a prospective purchaser makes an application to the Lands commission (L.C) [5]. There are formal steps laid down such as: Receipt of the application by the lands commission, approval of the application, invitation of the applicant for inspection, and thereafter, beginning the processing of the purchase through the opening of a file on the land, preparing the site plan and cadastral plan, among other formalities. The payment of all administrative costs including costs of registration are made before the final registration in the name of the purchaser [5][16]. Customary land acquisition on the other hand involves visiting the customary land owners to declare one's intentions for a piece of land to purchase. Depending on the customs of the particular customary area, and availability of land, the prospective purchaser is taken to see the land [5][17]. The necessary customs are performed and the price for the piece of land is paid [17]. Regardless of the source of land, whether it is from the public or the customary sector, land acquisition in Ghana has been criticized to be fraught with several challenges. Among these challenges are: Double sales of land, difficulty in getting reliable land information by prospective purchasers, numerous unofficial charges in the acquisition processes, issuance of unreliable land documents to innocent and unsuspecting land purchasers, fraudulent land transactions, delayed delivery of land documents, and long processing times for concluding land acquisition, among others [4][5][18][19]. These challenges have been responsible for many other problems in the land sector: Land disputes and litigations that lead to deaths in some cases, the use of armed thugs (commonly referred to as land guards) who are kept on the land to scare off or beat counter claimants just to protect land, and also a huge backlog of land dispute cases at the law courts of Ghana that ultimately affect the pace of delivering justice in the court system [18]. In attempts to resolve these issues, both the public and customary land management institutions have put in measures to provide for well-structured land acquisition mechanisms through the customary land secretariats system (CLSs), the deed registration, and the title registrations systems [19]. Although these are in the right directions, the majority of the challenges still persist. This has been attributed mainly to the manual or paper-based approach to land transaction processes in the Ghanaian land sector [19]. This manual system hinders accessibility to credible land information, it does not the permit real-time update of land transaction records, and again, it hinders transparency amongst stakeholders to land transactions [20] especially where some parties have selfish motives. To overcome the challenges of the current acquisition processes and to enhance land acquisition, digitizing land management processes have been recommended by many studies as a way forward in Ghana's land system [17][21][22].

2. Smart Land Management and Blockchain Technology

Technological application to land management is not new, as many advanced countries including the Netherlands, Germany, and the United Kingdom among others have had digitized land management systems for many years now. In some developing countries across the world like Ghana, Nigeria, and Honduras, however, this could

arguably be somewhat new as land management in these areas has predominantly been manual and paper-based [21][23][24]. Employing smart technologies for land management services and processes underline the concept of smart land management. In this context, smartness is defined by [25] (p. 5) as *"the combination of both smart citizens, who are able to use information and communication technologies to advocate and pursue their interests, and on smart information-processing, i.e. facilities which can fuse data from all types of sources and platforms*." Chigbu and others [26] corroborate this definition and noted that although some technologies could be employed passively, the issue of smartness goes far beyond the mere uptake of the technology, to include the alternative manners in which citizens express their voice and claim their rights. Consequently, applying smart technologies to land management, de Vries et al. [25] define smart land management as land interventions that rely on both passive and/or active information sensors (generated by technological means and also based on voluntary and structured information contributions by citizens) before, during, and after the decision-making process with regards to land. In [27] (p. 274), they also define it as *"the kind of processes that uses social technologies, volunteered geographic information, and crowdsourcing in combination with technical drivers of intelligent information systems and big, linked, and open data."* Smart land management strategies can facilitate the efforts toward sustainable development [28]. This is especially true in the sub-Saharan Africa region, where the largest source of employment to the population is dependent on land [29] and yet have high land institutional and management weaknesses. The discussions in contemporary land management literature on smart technologies for land management thus become very relevant in the context of the sub-Saharan Africa region. Smart technologies for land management according to [25] are persuasive and disruptive in functionality. "Technologies are persuasive if they come without coercion, manipulation, or deception and yet change socioeconomic relations, perceptions and expectations." They are disruptive where their innovations displace and replace existing socio-organizational structures and workflows, interpersonal and inter-institutional relations, utilization of technologies, and societal situations [25] (p. 279). Smart technologies for smart land management operate in ways that change the conventional processes of land management systems that do not better address associated land challenges, or that are less robust to deliver the expected land management results for citizens. These changes can occur in part of a land management process or by means of a complete overhaul and replacement of a specific land management process. In essence, smart land management complements the traditional land management processes by establishing omnichannel services (i.e., enterprises that use both online and offline channels for communicating and distributing their products) [30]. In addition to smart technologies application, smart land management relies on citizens that have the capacity to utilize information technology to advance their courses of actions and interests in a more efficient manner. Hence, a smart land management system is one that seeks to address land challenges through Information communication technology (ICT)-based solutions on the basis of multi-stakeholder connection and transparency. A well-known technology with such a functionality is the blockchain.

Blockchain technology has received numerous citations in recent land studies in relation to smart land management [31]. Among other benefits to land management, blockchain is acknowledged for potential changes in land management by creating a more open, democratic, and trusted system [31][32][33][34][35]. The potentials of blockchain, coupled with the recent ongoing discourses and advocacy toward smart land management, form part of the underlying factors accounting for the reasons why several countries, and scholars, are piloting and writing

about the technology respectively [36][31][37][38][39][40][41][42][43][44]. In these different studies, the benefits of blockchain as a smart technology for land management have centered on its ability to enhance transparency, trust, and land data security. It also enhances data quality, accuracy, and integrity through a consensus mechanism amongst stakeholders, and again, it allows for easy information accessibility, traceability of land records, elimination of fraud, corruption, unscrupulous manipulation of land records, and multiple sales of land [20][40][41][42][45][46][47][48][49][50]. The benefits of blockchain are not limited to land management alone, but to other public administration fields like the finance sector, and supply chain management. This has led to increasing global attention on blockchain across diverse disciplines as is evident in the numerous international conferences, workshops, and seminars focusing on blockchain technology. These programs aim at bringing practitioners, scholars, and policy-makers together for knowledge sharing and awareness creation on the potentials and new possibilities of blockchain, and how to maximize these possibilities in both the private and public sectors alike. Examples of such programs in the year 2020 included: Virtual Roundtable Webinar on the Impacts of Blockchain Technologies on Land Registries and Land Governance (7th October, 2020), Blockchain Africa Conference in Johannesburg, South Africa (11–12 March, 2020), European Blockchain Convention in Barcelona, Spain (20–21 January, 2020), Paris Blockchain Week Summit (9–10 Dec, 2020), Supply Chain on Blockchain Conference in Fishburners Event Space, Brisbane, Australia (13th July, 2020), and Blockchain Expo Global in London (17–18 March, 2020).

In the recent years, different countries including the Republic of Georgia, Canada, Japan, Sweden, Brazil, India, Honduras, and Ghana among others have introduced and/or attempted the introduction of blockchain into their land management systems on both private and public basis for different land administration functions; land titling and registration, land recordation, and land information management [43][49][51][52][53]. The outcomes from these applications have been subject of professional and academic discourses. These discourses have among others focused on whether or not the technology is mature enough and ready for employment to land management given the nascent nature of the concept of blockchain in the land sector. Many writers believe that the technology is mature enough to effect greater changes to land management, while others still argue that the technology is new and not mature enough for land management and land administration functions in full course [38][46][47][54][55]. These different positions have raised some quandaries, and questions in the land discipline at the global level. This makes further research timely and opportune, specifically toward evaluating the application situations of blockchain technology in the land sector. Such research works will enhance and enrich the conceptualizations and understandings surrounding blockchain's application to land management. In the sub-Sahara African region, there exist limited literature specifically dedicated to looking at the actual application situations of blockchain technology in support of land acquisition, despite attempts, deliberations, and/or considerations for its general application in land management and land administration in countries like Ghana, Kenya, Rwanda, Zambia, and South Africa [56]. This study therefore fills this gap in the literature using deduced lessons from a blockchain-based digital land registry concept in Ghana.

3. Results

This section and its subsections present the results that emerged from the literature review, website metadata, and informal discussions with field experts. The sections focus on public and customary land tenure management, particularly land acquisition processes and associated challenges under both systems. It also presents our findings on a blockchain land registry concept as identified from our informal discussions and retrieved metadata from the website.

3.1. General overview of Land Transactions, and Associated Challenges in Ghana

3.1.1. Public Land Tenure, Land Acquisition, and the Associated Challenges

As indicated in the introduction, public lands in Ghana fall under government's control. Article 257(1) of Ghana's constitution states that *"All public lands in Ghana shall be vested in the President on behalf of, and in trust for, the people of Ghana"* [14] (p. 97). The state has absolute ownership of public lands. These are lands that, in previous times, belonged to the traditional or customary authorities but have been compulsorily acquired by the Government through the power of eminent domain, for its administrative and development functions [5]. This category makes up 18% of the entire 20% of all lands that fall under government's control and management. The remaining 2% are referred to as Vested lands. Although vested lands had not been compulsorily acquired from the traditional authorities, government has vested the legal management of all such lands in itself [3]. The original traditional authorities that owned these lands, however, continue to hold and enjoy the beneficiary interest and are entitled to certain percentages of proceeds or revenues that the government realizes from such lands [3]. Despite the differences in public lands and vested lands, there is not much difference in transactions pertaining to both land forms. Lands commission (L.C) is the mandated governmental institution that oversees the management of all such lands on behalf of the government, Article 258(1a) [14]. Prospective purchasers go through the lands commission to access both forms of lands. An application for land is first made to the commission and a decision is made on the application. Figure 1 below shows the various procedures involved in acquisition of public lands in Ghana.

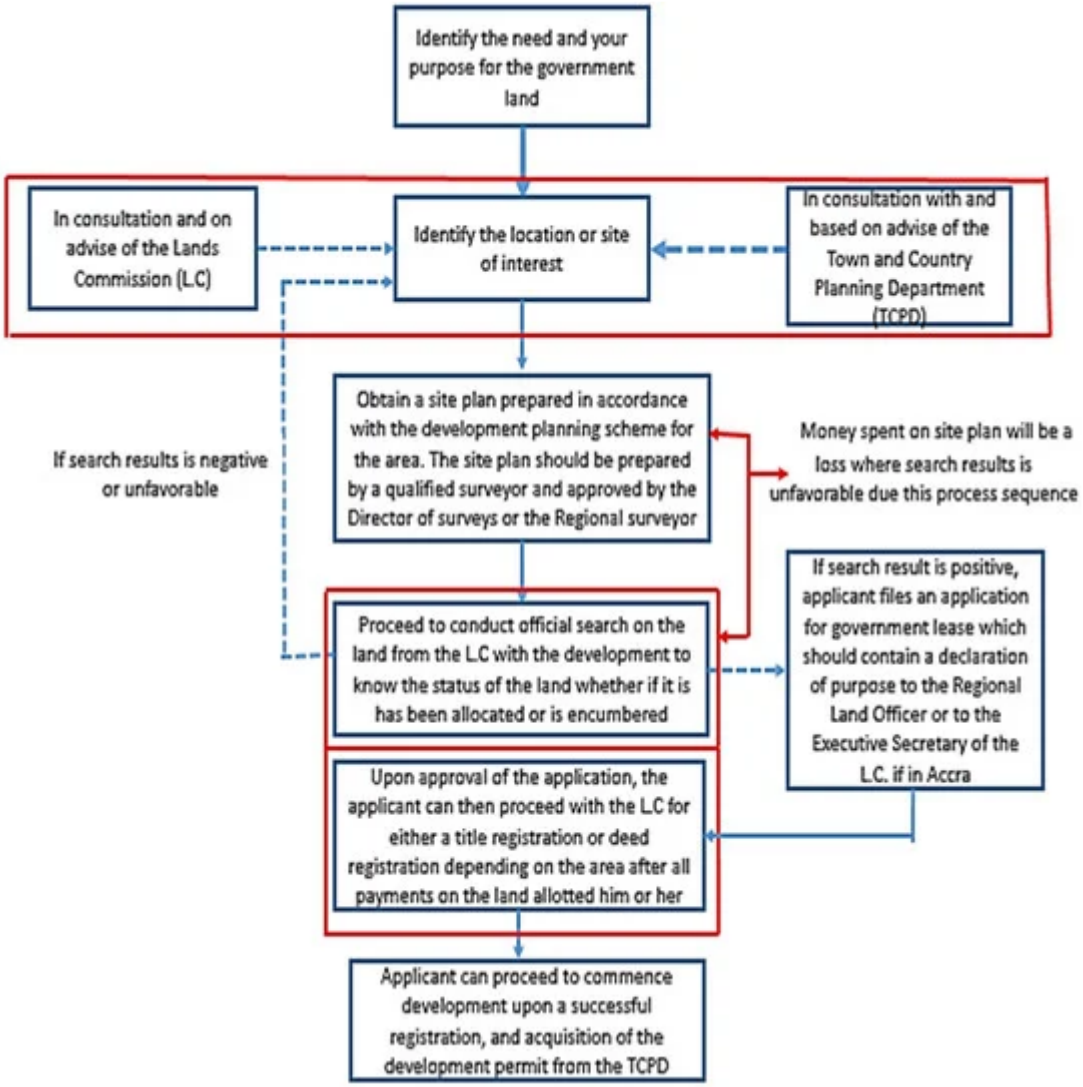

Figure 1. Public land acquisition process in Ghana. Source: Author's construct based on literature.

One will think that the above procedure appears very logical and sequential that—if followed accordingly—could provide for smooth land transactions. However, there are inherent challenges in certain stages of the process that are worth considering. The areas captured in the red boxes above are fraught with certain challenges. The foremost challenge is the high cost involved [47][57][58]. The process has been criticized to be highly costly, which has been attributed to numerous informal charges at the different stages. Besides the actual purchasing value to be paid for the land and other official administrative charges, there are numerous unofficial charges at the different stages of the procedure, which worsen the plight of prospective land purchasers [16]. As the process is mainly manual and activities between clients and officials are hardly known to other officials, some unscrupulous land officials use their offices to perpetuate the bad ethic of taking unofficial monies from prospective purchasers before they go ahead to carry out their mandated official services, although clients have already paid all official charges. This is made possible due to the lack of transparency in the process and among institutional divisions, and among stakeholders [20][21]. This problem is very pronounced at the second stage of the acquisition process where the clients deal with the different divisions of the Lands commission, and also with the officials of the Town and country planning department (T and CPD). Many such unofficial payments happen at the different offices of these different

institutions. In addition, at the stage of conducting a search on the land, most clients usually make unofficial payments to obtain search results. This can be attributed to the fact that within the manual file records-keeping system, it is sometimes very difficult to manually search through many thousands of other files looking for one particular paper file. This could be a daunting task for officials and, in many instances, could take days to weeks to identify such files. This tedious task in many cases is a hurdle and demotivation for officials to start the search process. To get officials to conduct the search as quickly as desired by the clients, most of the clients end up paying unofficial monies to the officials just so they can be motivated to conduct the search and deliver results on time.

A second challenge to land acquisition is the fragmented institutional arrangements, coupled with the overlap of functions due to the lack of consultations and real-time synchronization of actions amongst land institutional divisions, which lead to unnecessary bureaucracies and overlaps [18][57]. This is also found mainly at the second, fourth, and sixth stages of the acquisition process. At the second and fourth stages, as the L.C and the T and CPD work together, it would have been expected that a single search can be conducted at the L.C and results should include the results of the T and CPD. This is, however, not the case, and therefore, clients are faced with dealing individually with these institutions during the search. In addition to this and within the L.C, there are four different divisions, Public and Vested Land Management Division (PVLMD), Land Valuation Division (LVD), Survey and Mapping Division (SMD), and the Land Registration Division (LRD) that clients will have to deal with. Again, at the sixth stage during the registration of the deed or title, which is usually tied to public land acquisition, a prospective land purchaser has to deal with the identified divisions and also the T and CPD. Some of the activities at this stage end up overlapping. For instance, there is an inspection conducted by the PVLMD, as well as the LVD. These are activities that could have possibly been harmonized to simplify the process, which is not the case. Some other less obvious activities, particularly office administrative functions, among the different divisions end up overlapping, which complicates and prolongs the acquisition process with unnecessary bureaucracies and many unofficial expenses.

A third challenge is identified in the sequence of the land acquisition stages. There appears a disarray in the order of the land acquisition process. From the above process in Figure 1, given the order of stages 3 and 4, a prospective purchaser will have to contract a qualified surveyor to prepare a site plan and cadastral plan for them, and pay for it before they proceed to conduct an official search on the status of the land with the plan. This order is criticized on the basis where the search result is negative; the money spent on the plan becomes a loss to the purchaser. However, this order is the case, mainly due to the fact that without such a plan, it becomes extremely difficult for the lands commission to obtain the records on the particular piece of land for the prospective purchaser. Ordinarily, it would be expected that this should not be the case since such lands already fall under the commission's management and must have records of all their lands in that respect. Conversely, the commission largely uses manual records keeping, hence, although most lands that are public and fall under the commission's management, it hardly have the records captured in their system, especially in newly developing areas where land use planning might not have covered or reached yet. By consequence, when a plan is prepared and the exact plot number and location of the land among other details are known to the commission, an effective search can be

done. This is seen as a challenge for prospective purchasers because they could end up wasting so much time and money in the process only to end up with negative search results.

The final challenge identified in the acquisition process is not so much embedded in the stages but associated with a weakness in implementing and enforcing policies that guide the acquisition process [18]. Not only in Ghana is this problem prevalent but very significant across the African continent [2]. This weakness has made way for intrusions of unqualified middlemen into the system [4]. These unqualified middlemen intercept the different stages of the acquisition process, which make it challenging for prospective purchasers. Despite the many divisions and departments involved in the land transaction process, institutional weaknesses in coordinating the works of these divisions, as well as in implementing and enforcing policies, has made way for a lot of unprofessional middlemen to invade the system. Most of these middlemen hang around the lands commission premises, identifying themselves with different offices, and dealing with unsuspecting prospective land buyers. These middlemen in most cases have connections with some of the commission's professional officials that allow them the opportunity to deal with unsuspecting prospective buyers. Apart from complicating the acquisition process stages with unprofessional advices to clients, these middlemen also charge and take huge unofficial fees from the prospective purchasers just to be able to have enough for themselves and for their professional colleagues who help them to be able to carry out such deals. In the worst case situation, a middleman could dupe an unsuspecting purchaser of money and elope with it.

After the above process and identified challenges, when a prospective purchaser's application for the land is finally approved, they then proceed to register the land, and also to get a development permit from the T and CPD before development can commence. These two processes, similar to the acquisition process, are also fraught with many challenges including bribery and corruption, lack of updated land data, lack of transparency, openness and participation for all stakeholders, and difficult accessibility to reliable land information. See Ameyaw and de Vries [20] for details on the procedures involved in the registration and associated challenges.

3.1.2. Customary Land Tenure, Land Transaction, and the Associated Challenges

Customary land tenure holds the remaining 80% of all lands in Ghana, and management is by individual traditional authorities. The traditional authority holds the highest allodial interest [59] in the land, which cannot be alienated. In principle, therefore, it is a usufructuary interest in the form of a lease that is bequeathed to prospective purchasers from the traditional authorities. Different customary areas have different customary laws that govern the management of their lands [2]. Just like the government that holds public lands in trust for the people of Ghana, traditional authorities only hold the land in fiduciary duty for the larger community of the land owning group [2][15][18]. The "*State shall recognise that the managers of public, stool, skin and family lands are fiduciaries charged with the obligation to discharge their functions for the benefit respectively of the people of Ghana, of the stool, skin, or family concerned and are accountable as fiduciaries in this regard*" Article 36(8) [14] (p. 33). On this basis, and especially in the past, acquisition of land from the customary custodians could vary depending on whether a person belonged to the land holding group or not. In recent times however, due to the high demand for scarce land, [5] note that land acquisitions do not necessarily consider whether or not a prospective purchaser belongs to the land

owning group, although some considerations are possible in certain instances for some customary authorities. This and others account for the differences in customary land management amongst the different customary authorities in the country. For instance, in the Kumasi traditional area, Quaye [4] notes that land acquisition is in three stages: (1) Allocation of land by the caretaker or sub-stools, (2) approval by the Asantehene (King of the Ashanti kingdom) as the overlord, and (3) preparation of the lease document within the formal sector. Although formal sector registration under customary land tenure is not compulsorily tied to land acquisition, Quaye [4] notes that it is linked to the acquisition procedure under the Kumasi traditional area. In other traditional areas, one is likely to not see this as a compulsory custom attached to land acquisition and thus highlights another difference among the customary traditional authorities.

It is important to mention that although customary land transactions are not under any compulsion for them to be registered within the formal land registration, certain constitutional provisions and Acts on land render all of such customary land transactions ineffective and invalid from the official and legal point of view until they are formalized within State-established land institutions [57]. This makes land registration necessary even where the land is acquired from the customary sector. Land acquisition under the customary land tenure is consequently linked to the formal land sector, and hence, certain aspects of the acquisition process do involve the government land sectors. Figure 2 below shows the land acquisition process under the customary land tenure system.

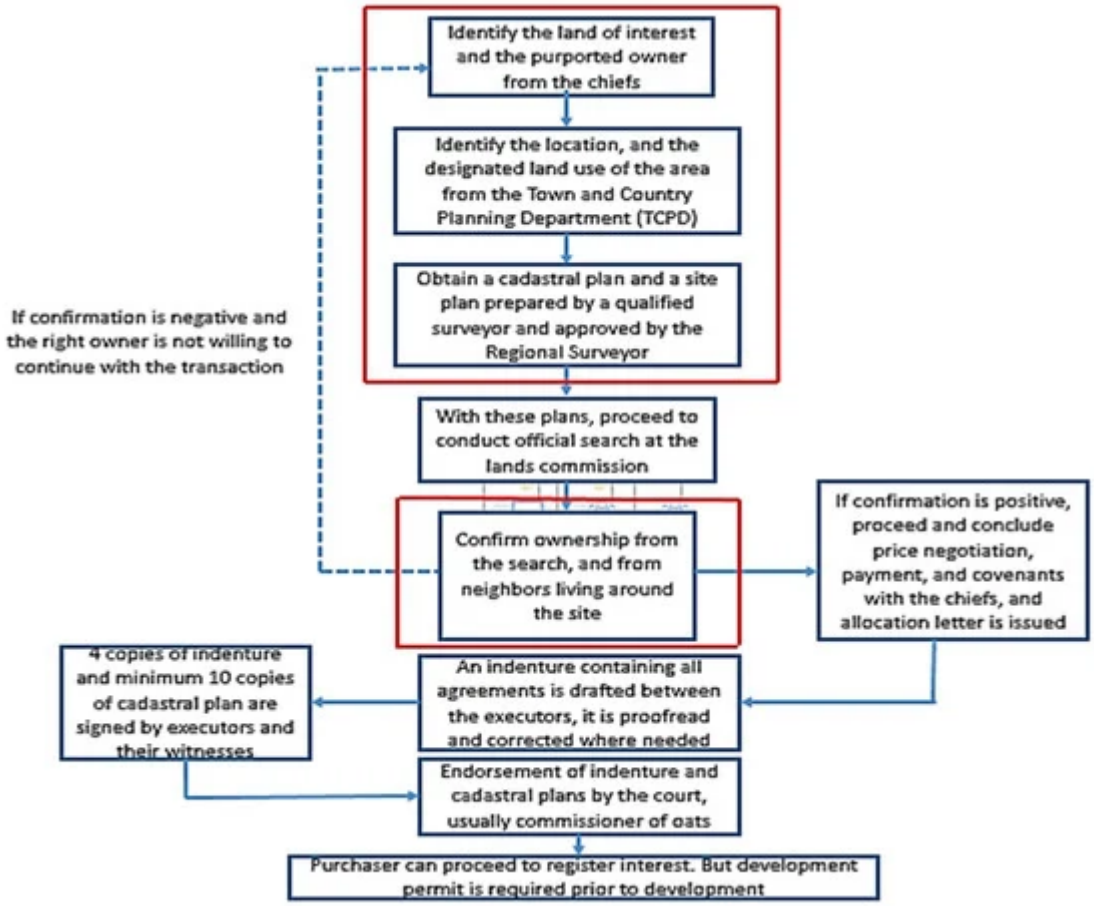

Figure 2. Customary land acquisition process in Ghana. Source: Authors' construct based on literature.

The summarized process above has some inherent activities (customary practices) that need to be highlighted. At the first stage of identifying the land and purported owner, a prospective purchaser visits the customary authority, usually a sub-chief's palace (in the case of the Kumasi traditional area). At the palace, and before the prospective purchaser is welcomed and permitted to disclose his or her mission, they are required first to offer "kola" to the palace elders (typical with the southern part of Ghana). This custom in modern times is represented by an undisclosed amount of money [17]. After this payment, and disclosing one's mission, a visit, in the company of some elders from the palace, is made to the site if there is any vacant land available. For this visit, the prospective purchaser again pays some money to the elders [59]. Crucial to mention is that these monies are not part of the actual land value. The prospective purchaser after the visit can then verify the designated land use of the site shown to them from the T and CPD. Ideally, the applicant should then follow through the remaining stages, i.e., 3,4, and 5, to the negotiation of the land value to be paid. However, in many customary areas, especially where registration of the land is not compulsorily attached to the purchasing of the land, this is usually not done. That is, some prospective purchasers fail to consult with the T and CPD and/or the lands commission, but instead, go straightaway to conclude the land transaction with the price negotiation and payment. A survey in Koforidua, one of the southern regional capitals of Ghana, for instance, revealed 68% of respondents failed to consult any land professional during their land acquisition, and the majority of those that did were victims of unqualified middlemen that have intruded the sector [15]. This finding is however different from that which was found in 2014 in Kumasi where an overwhelming 97% of respondents had had some interactions with the formal land sector [4]. These differences can be attributed to the fact that land acquisition in the Kumasi traditional area is invariably linked with registration within the formal sector [4]. The failure to involve land professionals on the part of some prospective purchasers further compounds the already inherent challenges in the system [15], particularly given that government administrative requisites of valid customary land transactions are usually completely different from the terms that such purchasers enter into with some customary and/or private land sellers [14]. After negotiations and payments are concluded for the land, the purchaser is issued an allocation letter from the sub-chief (in the case of the Kumasi traditional area), with which he could go ahead with other documentation processes [19]. This allocation letter is, however, not valid until the overlord for the traditional area has endorsed or signed it as it is in the Kumasi traditional area [17][19].

In line with the acquisition process presented in Figure 2 above, the first challenge for prospective purchasers is the payment of different monies, Kola money, and site visit fees, which happen at the first and second stages in the process above. These monies go into making the whole land acquisition process expensive and a daunting task for many people, especially the local people in most instances. Payment of the kola money precedes the telling of one's mission, and so, if after the mission is disclosed, it is found that there is no vacant land available, the purchaser loses the money. Both the first and second stages preceding the site plan preparation stage, i.e., third, and the search stage, i.e., fourth, are seen as not in the right order. This is because most prospective purchasers end up wasting much money in instances where the official search results turn out that the land is encumbered and cannot be purchased. This challenge provides room for criticisms of the system as one could argue it out as a deliberate extortion in certain instances.

The subsequent challenges of the acquisition process are rather as a result of the manual system of customary land transactions and management. The first is due to the lack of transparency in the land acquisition process [4][15][22]. In many instances, the information received at the chief's palace becomes the only authoritative information to be relied upon to conclude the acquisition, particularly where no formal sector institutions are contacted. Some dishonest chiefs capitalize on this situation to perpetuate the double sale of the same piece of land to different purchasers, which usually lead to land disputes and conflict.

Finally, another challenge is that just like under the public land acquisition, this acquisition process is bedeviled with many bureaucracies that lead to prolonging and sometimes frustrating the acquisition process unnecessarily. First, the prospective purchaser has to deal with the sub-chiefs, followed with the inspection team, and then with the overlord king of the bigger traditional area who will have to sign the allocation letter after it has been issued by the sub-chief [4]. These processes could take too long particularly while awaiting the endorsement and/or signature of the overlord [2]. The time for the acquisition to be completed, coupled with all the incidental monies to be paid aside the actual value of the land, tends to make the entire acquisition process very cumbersome and challenging for many people [19].

The findings presented on the land acquisition processes under both the public and customary land sectors and the associated challenges call for the need to rethink how these processes can be restructured to eliminate all such procedural challenges. The study uses insights from a digital land registry concept to deduce some lessons helpful for conceptualizing a blockchain-based smart land acquisition framework for Ghana. The next sub-section presents our findings on the digital land registry concept.

3.2. Blockchain-Based Digital Land Registry Concept

Blockchain technology has many different connotations but all draw on the same underlying principle of a decentralized ledger for managing records of transactions in a shared and transparent manner amongst stakeholders. It is defined by [33] as a fully distributed cryptographical system that captures and stores a consistent, immutable, and linear event log of transactions between networked actors. It is a distributed ledger technology that acts as an open trusted record of transactions between and amongst multiple parties that is not stored by a single central authority [60]. This underlying principle of blockchain has caused it to be heralded as the technology to transform the way business transactions are conducted [61]. As iterated by Rijmenam and Ryan in 2019, "it seems that almost any industry that deals with some sort of transactions or tracking mechanisms can and will be disrupted by blockchain" [17]. Blockchain technology has different architectural configurations, mainly public and private, each of which is sub-classified as either a permissioned or permissionless blockchain based on accessibility possibilities. For detailed discussion of these architectural configurations, the blockchain structure, and how the blockchain technology works, see [20].

BenBen is a private blockchain-based digital land registry company based in the capital city of Ghana, Accra. The aim of the company is to create a reliable land information and transactions' system [21] using blockchain technology. The idea behind this land registry concept is to bring together various actors in the land market such as

financial institutions, land sector agencies, and real-estate agencies, and to build end-to-end digital platforms for facilitating trusted, secured, and risk-free land market transactions [62]. This reduces the manual hustle of maneuvering through all the actors during land transaction as identified. Through the digital blockchain database, land data are secured on the blockchain platform, and citizens are permitted to access these for all land transactions [63]. The challenge of double sale and ownership on the same plot of land particularly underlies this blockchain land registry concept [63]. It seeks to bridge the gap between formal and off-market land data and transactions, by offering land market actors a secured digital environment for accessing rated land information and facilitating land transactions. This is achieved by authenticating the land records of different land market sources with the records in the government's land registry system [63]. The authenticated records and all other relevant documents are then harmonized and stored in the digital land registry to support land transactions. Figure 3 below shows the digital land registry concept.

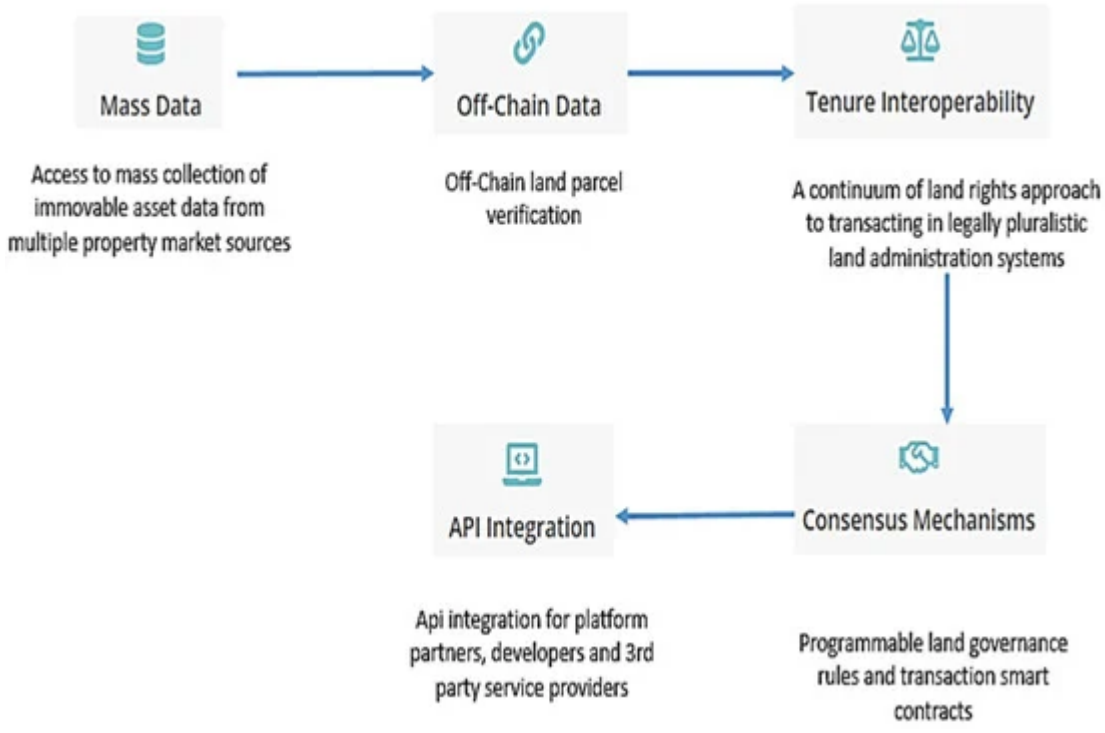

Figure 3. Digital land registry concept. Source: [61].

4. Conclusion

This study has drawn on the new concept of smart land management, specifically, blockchain's application to land management. Through a SWOT analysis and deductive insights from a digital land registry concept, the study sought to identify how blockchain as a smart technology could be employed to enhance land acquisition in a pluralistic land management system fraught with countless challenges. It supports the epistemology that the machinery with regard to land transactions that is clear, understandable, fair, and reasonable in its operation and implementation, and supported by a computerized system to provide quicker accessibility to updated land data, is a

necessity for effective land management and land administration processes [64]. The study demonstrates that bridging the extreme ends of customary and public land acquisitions through a blockchain-enabled system is possible.

The main contribution of this study to knowledge in the topic area is that it has conceptualized a new smart blockchain-based land acquisition framework, Figure 3. This framework and its underlying concept are relevant for addressing land acquisition challenges not only in Ghana but in the many other developing countries especially in the sub-Saharan Africa that have similar dual land-tenure systems and land acquisition challenges. The framework will permit accessibility to land information devoid of intermediaries and eliminate unnecessary bureaucracies and unqualified middlemen to shorten and simplify land acquisition processes. It again eliminates unofficial charges from the process. This makes the framework useful in the context of other African regions like Rwanda, Kenya, Nigeria, and Uganda [12][65][66][67].

It is essential to mention that threats of system sabotage from some corrupt land officials, and customary authorities who might not wish for transparency in their deals, exist. In addition, the private blockchain-based land companies could equally undermine the system for fear that it will eventually kick them out of the land market. Additionally, the eliminated middlemen will try to find alternative approaches to intercept the system. To forestall these threats, we recommend: Initial consensus with customary authorities to get them to understand, accept, and pledge their support for the framework. Provide legal basis for PPP to assure private blockchain experts of a continuous stay in the land market. Again, government should collaborate with customary authorities to absorb most of the graduates in the land discipline that have turned into middlemen due to lack of employment. Finally, legal sanctions should be strictly enforced against any illegal land activities identified and which threatens the system. Other policy implications including expansion of land records digitization in a participatory approach, and public education on the use and how the blockchain system works among others, as identified in [20], are relevant in this study's context.

This study was limited by the scarce literature on both smart land management and blockchain's application to land management, particularly relating to contexts of a pluralistic land tenure system such as that found in Ghana. This limitation is also partly due to the fact that this study is the first to specifically look at the possibility of blockchain's application for both customary and public land acquisition in a simultaneous manner in the Ghanaian context. More research works in this topic area are therefore encouraged. Specifically, considering that the concept of blockchain application to land management is still elementary and continues to evolve, the study recommends that future research works should look into establishing a framework that can be used as a guide to assess the readiness of land management and land administration systems in sub-Sahara Africa for blockchain consideration especially in Ghana.

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