

A Study on Data and Information Integration for Conveyancing, Cadastre and Land Registry Automation

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Abstract--Land is immovable, thus, the transfer of landed property from a seller to a buyer and registration thereof involves conveying pertinent data and information between private and public sector agencies, firms, and institutions. Conveyancing processes, cadastres and land registers are intended to provide clarity with respect to legal rights and privileges associated with landed properties. Incorrect conveyancing data or incomplete information in the cadastre and registry can undermine legal rights as well as compromise security relating to landed property. Modern era information and communications technology systems feature capabilities like capturing, recording, storage, retrieval and transmission of data. These capabilities can facilitate data and information integration and interconnectivity necessary to align conveyancing processes to both the cadastre and registry. It is in this context that this paper qualitatively discusses business issues for the application of information and communications technologies towards the automation of property transactions and land administration systems.

I. INTRODUCTION AND BACKGROUND

The transfer of landed property from a seller to a buyer involves numerous activities of many disparate firms and organizations in the private sector, as well as business processes of regulatory agencies, public sector departments and institutions. The structure, business processes and activities of a real estate firm are conventionally different from those of a firm of attorneys. The organization structure of a bank or financial institution is obviously different from that of a real estate or attorney firm. Furthermore, regulatory agencies and municipalities are neither organized in the same way as real estate and attorney firms, nor as banks and financial institutions.

Each agent, organization or institution involved in the transfer of a landed property naturally generates data and information relevant to its business mandate. The amount, content, format and structure of data and information can be very different between each business entity involved in conveyancing processes. Similarly, the protocols used to protect and secure data and information may be vastly different for each entity involved in the value chain that links conveyancing processes to the cadastre and registry. A buyer or seller may be required to provide the same biographical data and information in a format preferred by an estate agent. The same biographical data and information may be provided to an attorney firm and a bank in their respectively preferred formats. In fact, the same biographical data and information may be provided to all private and public sector entities that

will be involved in the legal transfer of a landed property between the seller and the buyer. In addition to bio-data, each entity may collect the same data, for example, location, size, and type of landed property, plus related and documentation in order to perform the tasks associated with its respective role in the conveyancing processes.

Some of the major challenges associated with landed property transfers within and between many jurisdictions include, for instance,

- i. cumbersome and tedious conveyancing processes
- ii. indeterminate delays during conveyancing, cadastre and registry searches,
- iii. lack of transparency from conveyancing through to the cadastre and registry,
- iv. Fraudulent activities that may occur even after the registration of landed property
- v. porous security of confidential data during the conveyancing process, and the
- vi. consequent undermining of clarity with respect to legal rights and privileges associated with and landed properties.

With the ubiquitous and pervading nature of information and communication technologies, it is conceivable that generating and conveying data and information pertaining to landed property transfers could be automated by integration and interconnection among, and across all the business entities involved. A wall-to-wall set of secure, integrated, and interconnected systems should, in an ideal scenario, especially mitigate the risk of fraudulent financial transactions whilst concurrently assuring clarity in terms of the legal rights, duties and responsibilities associated with ownership and title of landed properties.

Land is immovable, thus, the transfer of landed property from a seller to a buyer and the registration thereof involves pertinent data and information, and money between the conveying business entities in a manner that replicates a typical supply chain arrangement. For a single landed property transfer to take effect, the end-to-end conveyancing requires that a buyer will link to some or all of the business entities; the same may apply to the seller; and, the respective business entities may link to each other, either directly or indirectly. The picture in Figure 1 depicts the primary requirements for automation, such as

- i. capturing, recording, and transferring data and information during conveyancing,

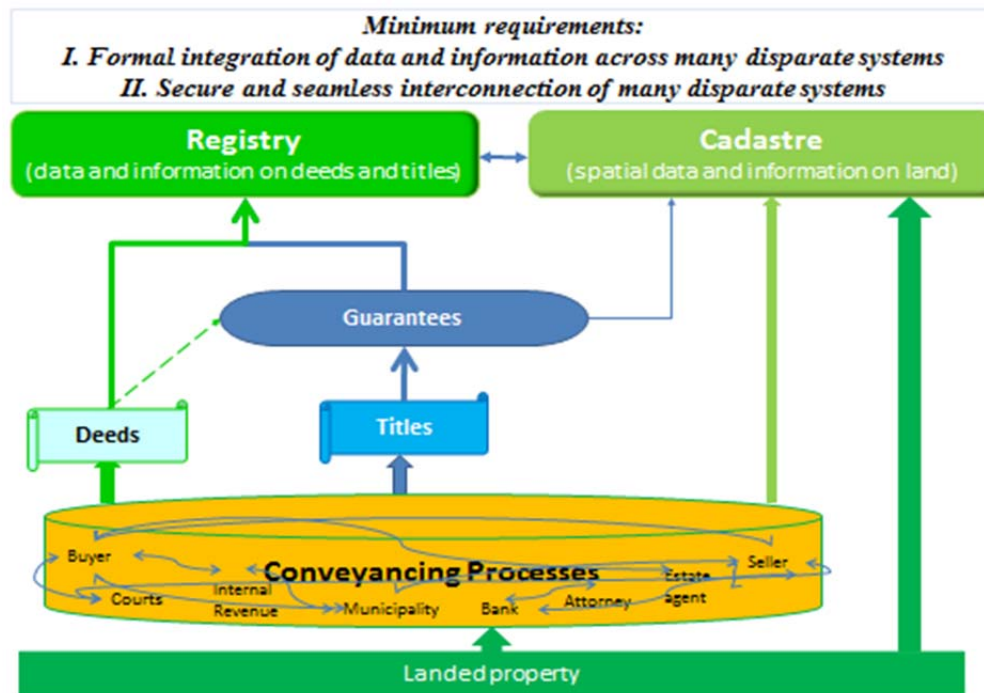


Figure 1. An illustration of linkages between conveyancing processes, cadastre and landed property registration systems

- ii. storing and retrieval of data and information in both cadastre and registry,
- iii. integrating and securing data and information across the systems deployed by disparate business entities, and
- iv. seamlessly interconnecting the disparate systems cadastre.

This narrative paper briefly describes an ongoing research that is exploring the range of business processes and technologies that can be deployed to automate conveyancing transfers, cadastre records, and landed property registry systems. The paper is focused on the qualitative aspects of the ongoing research and the case study environment is South Africa, which *inter alia*, recognizes the need to exploit enabling technologies to facilitate e-conveyancing. Section II discusses some of the pertinent business and operations management issues that need to be considered towards the automation of transactions for landed property transfer. A positive argument for deploying technologies to automate conveyancing, cadastre and land registry is presented in sections III and IV, and concluding remarks on the automation of property transactions and land administration systems are provided in section V.

II. AUTOMATION OF CONVEYANCING - BUSINESS AND OPERATIONS MANAGEMENT ISSUES

A. Supply Chain Considerations

Traditionally, the property sale process, the financing and mortgage origination process, and the settlement and transfer process have been considered to be three entirely separate

functions. Typically, these functions tend to operate in silos and often utilise different technology platforms to collect, store, retrieve, and transmit data and information among the different role players in the conveyancing value chain linking the buyer and seller (refer to Figure 1). The result is that the business processes inherent in the conveyancing value chain are not operationally connected on a seamless technology platform [1], thus leaving gaps in the end-to-end property transfer transaction. Hence, each role player in the conveyancing value chain needs to re-enter information into separate computer programmes which results in duplications, delays and increased errors. Conveyancing can be likened to a supply chain, and it is feasible to deploy technologies to seamlessly link the activities of all the role players involved in landed property transfer transactions, namely the seller, buyer, estate agent, mortgage originator, financial institution, conveyancer, surveyor, deeds registry, municipality and revenue services as depicted in Figure 1.

The primary purpose of a supply chain is to satisfy customer demand [2]. In the conveyancing supply chain these role players include mortgage originators, estate agents, banks, buyers, sellers and conveyancers. Buyers and sellers may live in different provinces or states, or even different continents. Information technologies (IT) facilitate better communication, coordination, collaboration and data exchange within and across corporate and geographical borders [3], thus strengthening and securing supply chain activities [4]. IT infrastructure facilitates supply chain integration by accentuating timely, accurate, useful, complete and reliable exchange of information with increased transparency, lower cost and reduced uncertainty [5; 6].

Information-sharing through inter-organisational systems enable the firms involved to identify and communicate buyer/seller requirements across the conveyancing value chain [7] thus making the conveyancing process more responsive in mitigating risk and uncertainty [8] in property transfer transactions. For example, information that is common to a property transfer transaction can be promptly shared among the different role players with each role player updated on the progress of the transaction.

The alignment of technology platforms enhances value chain capability [9] and transparency which is crucial in minimising delays and errors from converting data among various conveyancing role players [10]. If meta data can be imported into a conveyancing entity's existing system, the communication between the entities would be direct, electronic and more efficient. Despite the benefits of inter-organisational information systems, recent literature shows that the uptake has been very low [11]. A high degree of automation supported by information technology may increase internal process efficiency and reliability through less manual labour and errors, ultimately resulting in lower cost, better delivery service and higher flexibility [12] but these automation efforts occur mostly at the individual entity level and does not benefit the entire supply chain. These systems may include workflow automation systems, electronic data interchange systems and transaction processing systems in order to monitor and control day-to-day activities within an organisation as well as across certain organisations in the supply chain [13].

When e-business technologies are implemented, the business processes should be re-designed to support the new technology [14]. Reference [15] defines reengineering as the 'fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service and speed'. The solution lies in redesigning processes by removing unnecessary activities and replacing outdated processes with cross-functional activities that support parallel processing, speed, service, quality and innovation [16]. Organisations require large investments to redesign internal processes, change traditional distribution channels for their products, update procedures and train their staff so that the integration of the supply chain can be achieved. These costs can ultimately be shared among supply chain partners for the supply chain to achieve increased connectivity, coordination and cooperation between supply chain partners. Without leveraging business systems, companies are likely to develop islands of automation, limiting the scope and scale of their information capabilities and organisational achievements [17]. IT capabilities for data collection and mining allow mortgage lenders to sell complex and customised financial products to consumers in order to provide a better service [18].

B. Risk Management Issues

A definition of risk is the probability of damage or loss, or occurrence of any negative events [19]. Reference [20] defines risk as the combination of the probability of occurrence of harm and the severity of that harm, as well as the potential influence of product and process factors and the uncertainty of that influence [21]. Risk management entails managing an entity's total risk, because it is the firm's total exposure that determines whether the business can avoid financial distress [22]. Risk management in supply chains can reduce the vulnerability of the supply chain as a whole. Supply chain risk management entails identifying the potential sources of risk and implementing appropriate actions to avoid or contain vulnerability [23]. It is important that automatic linking of electronic documents and records throughout the conveyancing value chain also mitigates associated enterprise risks.

One source of risk in conveyancing is unauthorised, illicit or illegal access to confidential data and records. Technologies enabling public key identification [24] and digital certificates are well established for controlling access to secure data and information. In this manner it becomes easy to track the credentials of conveyancers who signed documents in an electronic land transaction, regardless of how old the transaction is [25]. Another source of risk is the service provider's inability to adapt to new technologies, or the entity's inability to stay up to date with the latest technological advances [26]. Both sole proprietors and bigger firms linked in a conveyancing supply chain may find it difficult and onerous to continuously update or switch to new technology platforms that are adopted by their partners in a landed property transaction. For smaller firms, the financial implications may persuade them to outsource certain conveyancing activities to other firms. The effect may be that conveyancing activities which currently are efficiently performed by the smaller firms may be 'lost' to the bigger firms in future.

Contract agreements between firms in a conveyancing value chain also provide a source of risks since they involve legal obligations for each firm [27]. Emails and click wrap agreements used during data exchanges on the web are implicitly binding and the contracting parties become liable [28]. A contract is formed when parties reach consensus and when the offer that was proposed is accepted unconditionally, either tacitly or explicitly, and such acceptance is communicated to the offeror either orally or in writing. The transmission of data and information during landed property transactions implies that a virtual or real contract exists between entities linked in a conveyancing supply chain. The challenge for conveyancing is whether legislation has developed sufficiently to incorporate electronic agreements, particularly in landed property transactions that involve entities domiciled in different jurisdictions and where different legal rules apply.

Regulatory compliance also poses yet another source of risk to conveyancing [29]. The need to adopt safe practices

and processes also raises regulatory obligations, therefore the level of integration between entities influences the regulatory compliance risks and uncertainties [30]. In assessing supply chain vulnerabilities, firms involved in conveyancing need to identify not only the risks to their own operations but also, the risks to all other linked entities [31]. Although increasing visibility and co-operation in the supply chain would improve the identification, risks are often interconnected [32]. A regulatory issue that disrupts one entity in the conveyancing chain, or for that matter the overall land administration (including cadastre and registry), may adversely affect other entities participating in the property transfer transactions.

Managing some of the above risks associated with conveyancing improves validity of data and information in both the cadastre and registry, and enhances the credibility of landed property investments [33]. Confidence and certainty in the conveyancing processes coupled with valid data and information are essential for landed property transactions, as a legal person may not invest in landed properties that may have been, or are subject to questionable data and records in the cadastre and deeds registry. Governments may also suffer loss of income if taxing authorities are unable to clearly identify ownership interests or know who to tax [34].

Payment systems are yet another source of risk in conveyancing because they create security vulnerabilities in relation to accounts that contain false identity and counterfeit information, or alteration of payment instruments [35]. Most payment systems have switched from net settlement to real-time settlement, transforming credit risk into liquidity risk as gross settlement eliminates the former at the cost of the latter [36]. As computer “hackers” become more sophisticated and inflict more disruptive actions, computer software programmes must also respond by preventing intentional actions that would compromise personal information [37]. A lapse in the payment security in the property transaction would jeopardise the conveyancing chain between the buyer and the seller. The point here is that all data and information arising from the conveyancing processes must be secure in order to minimise risks of fraudulent, illegitimate, and illegal landed property transactions. It is therefore imperative that security employed in the envisaged EDRS system would need to be impenetrable in order to protect property rights and not compromise the integrity of the country’s property register.

III. AUTOMATION OF CONVEYANCING, CADASTRE AND REGISTRY – ENABLING TECHNOLOGIES

Conveyancing processes generate data and information explicitly as documents. In some jurisdictions, data fields in forms are originally completed by hand and thus the resulting documents exist in a tangible hardcopy. Often, some of the data fields may be entered electronically online such that all documentation necessary to complete the property transaction may exist in a mixed form, that is, in both electronic format and tangible hardcopy. Although technologies for converting hardcopy documents into electronic format are readily

available, the important aspect remains the management of the documents and their content (i.e., data and information regarding landed property transfers) which must remain secure irrespective of the native origin of the documentation. The following subsections describe the pertinent technology platforms and systems that may be deployed to facilitate end-to-end automation of property transactions and land administration including conveyancing processes, the cadastre, and the registry.

A. Cloud Computing

The ‘cloud’ is usually defined as an architecture that allows an individual or organisation to use tools, platforms and infrastructures over a computer network remotely and to incorporate them into their own business processes [38]. Cloud Computing is a technology that uses the internet and central remote servers to maintain data and applications which allows consumers and businesses to use applications without installation and access to their personal files from any computer that has internet access [39]. It can best be described as a highly automated computing platform with unlimited processing, storage and unambiguous connectivity that is able to carry out a task of any size [40]. It offers an innovative business model for organisations by providing data storage and software services which customers can use on demand at minimal cost [41] without any upfront investment because the infrastructure is owned by a third party [42]. The cloud allows businesses to keep their costs down by accessing software and services on a subscription basis over the internet rather than purchasing multiple licenses directly [43]. Cloud technology can be an attractive solution for small organisations that do not have their own scalable solution.

The same resources can be shared between different customers [44]. The savings adopted from the elimination of some of the functions that were essential in traditional IT can be significant [45] and can be used to offset some of the supply chain integration costs over time. As a result of the competitive pressure in the financial sector, organisations are eager to reduce their IT spending [46]. Adopting cloud technology will enable users to reduce their capital and operational expenditure. Thus, instead of purchasing machines, storage devices, software, and employing staff to maintain these resources, an organisation only pay for resources that were actually used. As a result financial organisations can gain a higher level of data protection, disaster recovery and fault tolerance, as well as shorter development cycles for new products which in turn will support a faster and more efficient response to the needs of banking clients [40] at a lower cost.

Centralised hosting of software applications allows for continuity of software among users, instantaneous backup of data, and the ability to edit and collaborate in real-time. A disaster recovery plan for the e-conveyancing service should be developed to ensure that the level of service negotiated with the users can be sustained [47]. Security concerns when

using cloud-based software services include privacy, security, data integrity and intellectual property management [48] as well as confidentiality, auditability, availability of service and data lock-in [41; 49]. Solutions to various security issues vary through cryptography, in particular public key infrastructure (PKI), use of multiple cloud providers, standardisation of API's, improving virtual machine support and legal support [42]. Private clouds mitigate security concerns as the customer owns the equipment powering the cloud environment and has complete control over the IT resources and securing of the data [40]. Private clouds also allow for greater customisation and control [43].

A hybrid model allows an organisation to take advantage of unlimited scalability by solving some of the trust issues of the public cloud while providing benefits of the public cloud. In this model the cloud computing environment is hosted and managed by a third party but some dedicated resources can be privately used by an organisation. Cloud computing creates a single hub and thus enables organisations to overcome silos. It drives efficiency between supply chain partners and has the capability to bridge functional silos [50]. In the conveyancing environment, a centralised hybrid cloud can be put into place where information from different entities are uploaded. This will enable all stakeholders to exchange common information and documents, as well as track the progress of current transactions thus increasing transparency in the end-to-end process.

B. Electronic Payment Systems

Payment is the process of transferring money from payer to payee that involves physical payment instruments [51]. "Payments" refer to the method by which consumers pay businesses and business receive payments from consumers, thus connecting senders and receivers of money [52]. Interbank payment systems provide the backbone for all financial transactions [36]. In South Africa for example, the National Payment System Act 78 of 1998 provides for the management, administration, operation, regulation and supervision of the payment, clearing and settlement systems [53]. Payment systems should be designed to foster consumer confidence, reduce uncertainties and perceived risks, and to increase the likelihood of wider consumer acceptance [54].

There are interdependencies between banks because they borrow from each other. The failure of one bank to repay can result in the eventual collapse of the entire financial system. Banks and other large financial institutions settle reciprocal obligations in cash through large-value payment systems. Central banks oversee these large-value payment systems closely in order to avoid liquidity risk and gridlocks [55]. Electronic payments provide a transaction trail that can be audited and monitored. The use of electronic payments helps the government ensure that businesses are paying their taxes and help make money laundering and other black market activities more difficult [52]. Profits made on property exchanges are also subject to tax payments and these can easily be traced and managed in the current property transfer

process. This process is fairly lengthy and contributes to delays experienced in the process.

In an online fund transfer system, the buyer provides account details along with the amount of payment which are sent to the bank for a verification of the buyer's credentials [56]. The approved amount is transferred from the payee's account to the seller's account, but the physical money remains in the bank both before and after the payment is initiated on a computer system. The problem with this payment system is two-fold: firstly, the bank is required to supply an online verification at the time of purchase and cannot do so if a connection with their server cannot be established; and secondly, banks keep track of all payment details, such as the amount of payment, buyer and seller details, and this information is open to being compromised. Technology of payment instruments has an impact on how payments work in practice. Digital platforms offer application programme interfaces with third parties [57]. The law needs to be changed to cater for recent technological advancements [58] which include electronic signatures. The appropriate balance between efficiency and the safety of payments systems is key to an effective regulatory framework [59].

There are three payment systems that may be used: paper-based payment systems, direct debit electronic transfer systems, and systems which may use electronic cash [35]. A loan to finance the purchase of a real estate usually requires specified payment periods and interest rates. In most countries, a mortgage is the primary means that prospective home owners use to buy a landed property. Features of mortgage loans can vary considerably and these include the size of the loan, maturity of the loan, method of paying off the loan and the interest rate [60]. An e-conveyancing service should also be capable of electronically processing a range of payments which should include conveyancers' and estate agents' fees and other disbursements [47]. Most financial assets today exist as mere digital records with a tiered structure of clearing institutions culminating in the central bank [61].

The blockchain technology was introduced in the 1970's and is an absolute record of title that describes ownership of any type of asset [62] and it governs the rules and regulations for information and value exchange over a network [63]. Blockchain technology is fast, cheap, easily accessible, open source, transparent and public, and uses a distributed network. Peer-to-peer technologies known as the distributed ledger or crypto-ledger has emerged to facilitate the movement of value and capital between parties without using an intermediary. Crypto-currencies are virtual payment currencies that do not rely on a central authority to generate currency supply; or to verify, track and record transactions, but rely on a distributed ledger to determine, verify and track ownership of monetary units without the need for a central clearing entity. These virtual currencies exist independently from the blockchain technologies and distributed ledger technologies and can therefore be introduced and used separately.

Bitcoin was created in 2009 to serve as a virtual currency system in an open network outside of governmental or central bank control and is therefore a decentralised autonomous organisation whose protocol is difficult to change. Anyone can view transactions in the network, both current and past transactions. Just as the internet changed the way that information was distributed, bitcoin could change the way that information is authenticated as no authentication is necessary with bitcoin [64]. Several companies already receive payments for goods and services in Bitcoin as it offers low processing costs and can easily be used in cross-border transactions [62; 63]. The New York State Department of Financial Services is issuing BitLicences which stipulate certain governance and cybersecurity requirements for financial institutions. As a result, most major banks have launched digital currency and blockchain technology to replace inefficient, costly legacy database and storage systems.

Many believe that Bitcoin as a currency, and blockchain and distributed ledger as technologies will be the financial operating system of the future as it offers a different way of engaging in commerce and could reinvent the way that value and risk are shared between parties. It is a technology uniquely capable of performing key components of a transaction namely recordkeeping, monitoring, asset custody, auditing as well as facilitating trade between parties [65]. The technology used in payment systems would need to be able to cater for such types of payments and virtual currency exchanges going forward as well.

C. Electronic Records Management

Deeds are formal and legally valid documents with specified information and declarations of transactions between two parties that are duly registered with a local land records office to certify the legal validity of transactions [66; 67]. Title deeds do not only furnish information or evidence but they also create rights and obligations that remain even after the death of the author of the documents [68]. Property recording systems play a pivotal role in property transactions as they identify the owner of a title, who has the authority to use and enjoy the property, who is excluded and who can exchange the property [69]. Businesses keep records to fulfil legal requirements for their operations and to protect the rights of their stakeholders [70]. All governmental departments are obliged by legislation to provide for the proper care of documents and to ensure that documents are preserved as official government records [71]. The Deeds Registry is a government department that is responsible for the registration of title of immovable property and as such need to take care that all documents are recorded and stored in a correct and safe manner.

Documents are drafted, changed or destroyed during business processes [72]. Business records serve as the corporate memory of an organisation which allows for organisations to be held accountable for their actions and transactions [73]. Records must be complete, accurate and

reliable evidence of the transactions conducted [74]. The Oxford English Dictionary defines a document as “something written, inscribed, etc., which furnishes evidence or information upon any subject, as a manuscript, title-deed, tomb-stone, coin, picture, etc.” Documents can be signed, countersigned, filled in, stamped, copied, amended, revised, transferred, inspected, delivered, vetoed, archived, falsified, displayed, registered, drafted, destroyed, tabled, validated, witnessed and transferred [68].

Records management focuses on creating, storing, retrieving and using business records without the loss of any information and it facilitates the free flow of records through an enterprise to ensure that information is available where and when it is needed [75]. The failure to manage records through a records management system may lead to a lack of evidence that an entity performed a certain activity which may result in transactions becoming void or voidable. It facilitates quicker decision-making [71]. Records management has evolved from a paper-based function responsible for the storage of miscellaneous documents within an enterprise to one concerned with the management of all the records created or received by an enterprise in a multitude of media which begins from their first creation and follows a path through their active use as sources of information until their eventual destruction [76; 75]). Developments in IT have created both challenges and opportunities for records management, as enterprises are increasingly replacing their paper files with electronic records to save space. The challenge is to maintain authentic, reliable, usable and trustworthy records as envisaged in the ISO15489 guidelines [70]. IT can assist to achieve the aforementioned as well as keep an audit trail for future reference.

An alteration to a paper instrument may leave a physical mark, whereas no physical evidence may be left with an electronic alteration. However, the physical mark would still need to be detected by the examining officer, thus the effectiveness of this safeguard depends on the vigilance of the examining officer [29]. The admissibility of evidence by electronic recording deals with aspects related to the authentication and integrity of the recording [77]. A digital contract may appear on a computer screen to consist of words in a written form but in reality this is merely a representation of the information stored by the computer in electronic form. The electronic form does not consist of words but strings of numbers and symbols and therefore doubt arises as to whether it is in written form [78]. Records management programmes operate within a framework of policies, rules and procedures that provide guidelines to practice [74]. It is therefore important to ensure that legislation and policies are amended to incorporate electronic aspects and thus allow for IT to assist with records management in organisations.

Electronic records need to constantly be migrated to new hardware and software platforms to enable them to remain readable and accessible over time, which thus affects the existing paper environment processes and procedures when compared to electronic records [71]. The existing procedure

implies that a high degree of accuracy of registration data can be guaranteed. Errors do occur, despite the high degree of trustworthiness of deeds registration that is ensured in SA through a process of thorough investigation of deeds documents, and verification of acts of registration through lengthy investigations by deeds office examiners [79; 80].

The legal side of managing electronic records may include providing evidence of the integrity of an electronic document through the use of metadata and managing records for compliance with statutory regulations [70]. Compliance is mainly concerned with information integrity, privacy and records retention [81]. The production of electronic records therefore poses a unique challenge for enterprises to develop and adopt institution-wide integrated records management programmes [71]. The ultimate aim of securing a document is to protect it against tampering and illegal access from the time that a document is created to the time that it is archived [82].

Public institutions like Deeds Registries have always had to manage a large amount of documents and records [72]. Problems typically associated with paper filing systems include records being removed from files and not being replaced, misfiling records, misplacing files, time wasted in searching for a particular file; and only one person being able to work with a file at a given time [75]. As a result thousands of original records in paper format are being scanned and converted into computer files for storage [83]. The intention is not to remove records from the records management system, but to convert paper-based records to a media that occupies less space, is less costly and can be more easily accessed [84]. Microfilm serves as a well-established bridging technology in digitisation efforts which facilitate electronic access without subjecting originals to potentially damaging handling [85]. The Department of Land Affairs (Deeds Office) in South Africa has been using 16mm microfilm with a life expectancy of up to 500 years [85]. They have now purchased more archive writers that are deployed in each of the regional capitals within the country [86] to assist with the digitisation of paper documents.

D. Land Administration Systems

Land administration is defined as the processes of determining, recording and disseminating information with regard to the value and use of land [87]. It involves three functions, namely juridical (for land tenure, i.e. the way in which rights in land are held), regulatory (for land use), and fiscal (for land value) and land information systems are integral to all of the three functions [88]. Entities rely on the accuracy and correctness of information in land administration systems to secure and enforce their ownership rights. The land registration system of SA was not developed from scratch, but developed from existing European practices [89]. At present a mortgage bond in South Africa is executed by the conveyancer before a Registrar of Deeds [90]. Although electronic systems are used to prepare and manage processes and documents involved in conveyancing, the

current land recording system is designed and equipped to accept paper documents [91]. The Deeds Registry manually checks instruments that have been lodged for registration before the register is updated in a paper based system. A manual system is not the most effective system given the volumes of land parcels, registrations, encumbrances and the like.

Most countries have a land recording system consisting of cadastre and land registration components [92]. These systems exist independently of each other and information regarding the same property may differ in these two independent systems. The cadastral component is usually managed by the Surveyor-General while a Deeds Registry records and manages the land registration and ownership components. The separation between maps and registers was also necessary because different skills are required and the available technology, which was paper and pencil, did not allow for integration. The traditional land recording procedures are increasingly computerised and this has proven to be more efficient. Traditional cadastral systems have enjoyed a reputation for reliability, well defined processes and a well-recognised guarantee of security of land ownership. Improved technology enable a country to adopt a totally computerised land register that contains all relevant legal information about land for land recoding purposes [93]. If a link between the cadastre and land registration systems can be automated, it will assist in circumventing differences between the two systems [93]. This has become the focus of many countries that have embarked on efforts to integrate these two systems and SA is no exception.

IV. CASE STUDY OF E-CONVEYANCING IN SOUTH AFRICA

A. Challenges

This section of the paper advances the argument for automation of property transfer and land administration through a case study [95] on e-conveyancing in South Africa. Conveyancing is the term generally used to describe the preparation of sales deed, mortgage and other related documents for creating, transferring and dealing with an interest in land [47]. E-conveyancing aims to shorten bureaucratic delays and save manpower and time, improve the currency of registered information, enhance search possibilities, enable auto indexing, produce better tools for the supervision of the recording and registration process [96]. There is no universal conveyancing process, although many jurisdictions do have similar steps in their conveyancing process although these steps may not occur in the same order [97]. Similar steps in the process may sometimes be carried out by different parties or in a particular sequence but the main tasks in the process are the same. And they include making an offer to purchase, obtaining loan approval from a financial institution, valuation to inspect the property, searching property registers, completion of mortgage documentation, registration and transfer of property to buyers

and disbursements of funds to relevant role-players. The electronic system may bring new risks to the land system mainly regarding the identification of parties to the transaction and the authentication of documents [98].

In South Africa the Chief Registrar approved the Policy Document on the Electronic Deeds Registration System (e-DRS) on 12 June 2009 and the Electronic Deeds Registration Bill is yet to be tabled at Parliament. The proposed legislation will allow for the electronic lodgement of property transactions to be registered [99]. The law must be enhanced and harmonised regarding the making and maintenance of electronic recordings [77]. An external organisation has also mapped an architecture for electronic lodgement frontend at the SA Deeds Office, but after so many years, this system is still not in place.

The hardcopy documents that are currently manually lodged with the Deeds Office are scrutinised by deeds office personnel and registration only takes place when all the documents are correct and comply with the requirements set out in the Deeds Act, when the data in the deeds document coincides with the cadastral data and all deeds registers are complete and correct. However the registration personnel do not guarantee the correctness of the registered data [79]. In addition to a manual check, this process also takes very long. The question arising is whether these intense scrutinies are necessary to ensure the accuracy of the registers and documents, or whether some are not merely applied from force of habit and could possibly be discharged without detrimental consequences. The South African Deeds Office's concern should be limited to the validity of the charge, not the validity of the underlying agreement [90]. A single national deeds office and not provincial designations are preferred as future technology developments could better be enabled without having to go to Parliament for approval for further developments [90]. Instead more customer service centres could be established to assist the general public with general enquires and not registration of transfers of immovable property, encumbrances and ante nuptial contracts. However, this will require proper change management process.

B. Proposals

The e-conveyancing service should be capable of handling high volumes and periods of peak activity. The heart of all the processes and product activity is a centralised data centre, the repository for all metadata, imagery and products. Image processing is a record management solution that is made possible through digitising paper and analogue records by converting material records into digital images. Storage solutions are made easier as less space is required for storage. The establishment and management of a centralised data centre is a very expensive exercise. Software licencing and maintenance, uninterrupted power supply and alternate power source generators, air conditioners to keep all electric equipment in the datacentre cool are required, as well as a team of IT specialists must be contracted to maintain the

system [100]. The ongoing management costs of digital preservation are complex and difficult to quantify, although digital storage is much cheaper than physical storage of originals [101]. An electronic lodgement system has successfully been implemented in New Zealand. Although Australia has subsequently introduced an electronic lodgement system, not much has been published in terms of the security measures that were adopted.

According to [102], the database should be protected by a suite of security measures including firewalls and intrusion detection systems. A digital certificate should be obtained for each person who needs to gain access to the system and the process of issuing digital certificates must be tightly controlled and must include measures to identify the identity of the applicant. Digital certificates must be required for all levels of access but only qualified conveyancers should have the ability to certify and sign electronic transactions. The use of encryption and digital certificates allows the content of the transaction and the identity of the conveyancer who certified it to be conclusively established. In capturing electronic records, metadata information is added to the records, which could be embedded or attached to the records. The metadata must capture all the necessary information regarding the creator, date of creation, system created and other relevant information according to company policy [70]. The integration of the different government processes can be achieved from the core of metadata describing electronic resources, records and document management, information discovery and their preservation prior to their use [103]. A full audit trail must be recorded and disaster recovery capabilities must be maintained.

V. CONCLUDING REMARKS

This paper has essentially explored issues, technology platforms, and systems that are applicable towards automation of conveyancing processes, cadastre and land registry. The paper discusses in reasonable detail the business management issues, enabling technology platforms and systems that may constitute the backbone for automated property transfer transactions and land administration. Although the content of the paper is qualitative, however, the ongoing research follows a mixed quantitative and qualitative approach. In this regard, this paper complements some of the quantitative aspects of the ongoing research which have already been published (see [104]).

With respect to property transfer transactions and land administration, ownership defines the maximum rights, duties and capacities of a legal person with respect to landed property. It is therefore crucial that data and information regarding property transfer transactions and land administration are accurate, valid and current so as not to jeopardise landed property ownership rights, duties and capacities. There are many entities involved in transferring a property from a seller to a buyer, and in some instances, the associated business organisations may be domiciled in

different jurisdictions. In the widest sense, this means that the conveyancing processes may be distributed across a global network that links small, medium and large firms in a value chain respectively comprising estate agents, legal firms, and financial institutions. This paper surmises that these entities work together as a supply chain in order to satisfy the requirements for efficient and secure property transfer transactions.

Well established information and communication technologies (ICTs) can be applied to facilitate the conveyancing processes performed by the various role players involved in the property transfer transactions. It is argued that applying ICTs towards networked linking of conveyancing entities will not only increase the quality of landed property data and information but also, it will improve the efficiency, transparency, and reliability of the processes and have a positive effect on the turnaround time for property transfer. In addition to networked linking of conveyancing processes, it is further argued that end-to-end automation to link conveyancing, the cadastre, and the registry is a necessity for property transactions and land administration in the current era of globalised supply chains where ubiquitous information and communications technologies pervade all aspects of human endeavour.

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