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Accelerated Land Administration Updates

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Introduction

Land administration is about determining, recording, and disseminating land information (UNECE 1996). Land information is a fundamental ingredient in state-backed land tenure systems, valuation systems, land use planning, and land development (Enemark 2004). In most developing countries, land information is created as part of large countrywide land registration projects financially supported by international donors. However, creation must be followed by maintenance: lasting effects on tenure and land market facilitation require that systems keep running long after donors leave (Magis and Zevenbergen 2014). To remain useful, a land administration system must reflect the reality on the ground and this is only possible when all changes in land information are reported (Zevenbergen 2002). Indeed, Williamson et al. (2010) assert that if the changes are not captured in state-backed land registers, the system loses societal relevance and is eventually replaced by an informal system.

In the early 2000s, Rwanda began the process for establishing a land administration system: all rightful claimants would be provided legally valid land documents through a systematic land registration process. The land information was collected in a participatory manner: parcels were surveyed by grassroots surveyors using aerial images and a general boundary approach. The resultant land information was gathered into a digital land register: the Land Administration Information System (LAIS). The LAIS was intended to support the maintenance phase. While the initial land registration was

systematic, the updating process was sporadic: transacting parties would come on an individual basis to district land offices and report changes. Requirements were defined and workflows designed for the various forms of land transaction.

Biraro (2014) analyzed Rwanda's updating procedures and identified obstacles that could discourage the reporting of changes. These included (1) long updating processes due to the analogue nature of the system, the lack of technology used in service delivery, the surveying approach that combined fixed and general boundaries, and the many processes that had to be followed for a single transaction (e.g., to donate a part of land parcel, the right holder follows two processes) and (2) the high registration fees of rights transfer compared to the value of land dealt with in the transaction. It was hypothesized that both obstacles could be better understood and potentially overcome by using the concepts and tools of workflow management, specifically the use of the Unified Modeling Language (UML). Workflow management can be used to analyze and redesign the activities, actors, technologies, and interactions inherent in a complex system. The approach is regularly used in the business sector, particularly in developed countries; however, the application to state-based land administration systems in less developed countries is a more recent phenomenon. In the Rwandan case, the methodology could be used to analyze the activity flows, actors, and technologies in the land information–updating process.

Many authors agree on the importance of updating land information subsequent to initial registration programs; however, in both theory and practice less attention is afforded to ensuring that updating procedures are simple and cost-effective for both state and citizens. In other words, the characteristics of fit-for-purpose land administration, as espoused by Enemark et al. (2014), should be better incorporated into land information maintenance. To this end, this chapter focuses on the updating challenge found in Rwanda. It aims to use workflow management concepts and tools to understand system bottlenecks and redesign options, ones that will improve the abilities of both state and citizens to keep land information updated. A theoretical grounding on land information updating and workflow management is first provided. Subsequently, the methodology, based on a design research philosophy, is described. Results are presented primarily using UML visualizations and accompanying descriptions. Discussions on the outcomes and future research directions follow.

Theoretical Perspective

Regarding definitions, the term land register is used synonymously with the term land administration system, land registration system, or land

recordation system. Land information, sometimes referred to as land records, is broadly considered to include land tenure, value, and use information and is considered a defining component of a land registration system. Updating is considered synonymous with data maintenance and refers to the process of changing textual and spatial elements inherent in land information. The process is considered to include activities, actors, and technologies. Workflow redesign is related to workflow management and is considered synonymous with system upgrading. Upgrading is different from updating (Scheu et al. 2000): upgrading deals with system redesign, whereas updating is about updating the land information in an existing system.

The importance of keeping land registers updated is well recognized. A land register loses value if the information it stores is not updated (Henssen 2010). The failure or success of a registration system is dependent on the completeness and promptness of reporting land information changes (Binns and Peter 1995). Without reporting, the system loses relevance and is replaced by an informal system (Williamson et al. 2010). Although these arguments are theoretically straightforward, keeping systems updated in practice appears more difficult. This is particularly the case in the context of large donor-support initial registration programs: ensuring system maintenance is often a secondary concern (Jing et al. 2013).

The updating challenge is broken down into different elements: reference is made to the distinction between the time that the updating process takes and the cost to register the change (Larsson 1991; FIG 1995; Chimhamhiwa et al. 2009; Enemark et al. 2014). The related issue of accessibility to land offices, land services, and land information provides another lens (Larsson 1991; FIG 1995; Henssen 2010; Deininger et al. 2012; FAO 2012). The quality of land information that leads to security of transactions is also covered by FIG (1995) and Chimhamhiwa et al. (2009). Other aspects including concentration and decentralization of land services may be added to the list: both influence the success of the updating process. These aspects help to better understand updating and can guide the assessment of the existing situation and requirements definition for designing improved workflows.

Workflow is described as a set of tasks organized to perform a business process (Zur Muehlen and Indulska 2010). The concept has been effective in specifying, executing, and monitoring the flow of tasks (Heloisa and Mitchell 1996). Workflow management systems enable automation, via technology, of the processes between people and the tasks of a business (Aversano et al. 2002). However, automation can reduce human contact and even lead to a lack of motivation: people might feel controlled (Aguilar-Savén 2004). Workflow design starts with the identification of system requirements, often on increasing user satisfaction (Todorovski and Lemmen 2007). Norman (1996) suggests that requirements should explain (1) what the system is supposed to do, (2) what the system should have

to do functionally to perform well, and (3) what the users want the system to do for them. In cases where systems interact with citizens, efforts should be made to ensure involvement and cooperation. In the case of land information updating, obstacles impeding the process should be removed to ensure that changes are reported: this workflow has to be customer oriented. Meanwhile, subsequent workflow design and management processes include process modeling, process reengineering, and workflow implementation and automation (Mentzas et al. 2001). Process modeling requires identification of workflow elements useful to capture an abstract process into workflow (Mentzas et al. 2001).

Workflow is one of the nine most frequently used modeling techniques used in a business process (Aguilar-Savén 2004). Various modeling languages are used to represent process activities that need to take place, step by step, to perform an action (Zur Muehlen and Indulska 2010). UML is one of these languages; however, it was specifically developed for information systems (Glassey 2008). It comprises nine diagram types. One type, activity diagrams, describes the flows circulating between activities within a process (Glassey 2008). In land administration practice, the UML activity diagram has been used to model processes. Activity diagrams receive less attention in land administration literature; however, UML class diagrams are heavily used in research dealing with land administration data modeling (Lemmen 2012). At any rate, Chimhamhiwa et al. (2009, 2011) use workflow management to measure land administration business processes whose activities are dispatched into different organizations. Zevenbergen et al. (2007) use UML activity diagrams to model real property transactions across European countries with an aim of providing a comprehensive and comparable description. The use of UML to understand and redesign land information–updating workflows in less developed countries receives minimal attention in the published literature.

Methodology

The research was design in nature: in alignment with workflow management theory, the research activities included requirement gathering, workflow modeling (including "as is" and "to be" situations), and validation processes.

Requirement gathering was primarily undertaken during fieldwork in October 2013 in Musanze, one of the five districts in Northern Province, Rwanda. The district has 476,655 registered land parcels, among which 421,555 (88.4%) had complete information in the land register (summary report on land tenure regularization program of May 31, 2013). In Rwanda, there are 24 recognized land administration workflows. These were developed as part of the Land Tenure Regularization program, a nationwide

program that mapped and registered all landholdings, as recognized in new national land laws, over a 4-year period. For this research, two processes known as "donation" and "parcel subdivision" were the workflows focused on.

The requirements were primarily acquired using observation and semi-structured interviews, including open-ended questions. Secondary data in the form of reports and desktop research also informed the process. For the primary data, 15 actors involved in the updating of land information were identified and interviewed. The number includes seven right holders from the Musanze District Land Bureau (DLB) and eight staff working for one of the institutions participating in the updating of land information. Although the number of participants may appear limited, the data gathered were descriptively rich, would enable modeling of the processes, and at any rate were not intended for quantitative purposes. The specific aspects dealt with in the interviews included the following: the actors involved in the existing process, tasks performed, locations where transactions take place and number of visits involved, required documents and payments for the request to be processed, actors' interactions with technologies including the digital land register and what type of access they have, conditions to have access to the system, and quality checks performed. For parcel subdivision workflow, information was collected on the surveying tools used to take new measurements and the accuracy and required skills to manipulate them. All data gathered were synthesized to develop a general requirements set that could be used for both process modeling and validation phases of the research.

The modeling process was carried out in four steps: (1) primary and secondary data were analyzed and synthesized to develop "as is" or existing workflows for donation and parcel subdivision; (2) the modeled workflows were then analyzed against the general requirements set developed out of the interviews and direct observations: the strengths and any weaknesses of the process were identified and opportunities for redesign established; (3) from the obstacles and opportunities, more specific design requirements were established: the requirements were organized to be used in the validation phase, with each requirement linked to a specific obstacle; and (4) based on the defined design requirements an improved or "to be" workflow for updating land information was designed and presented using UML activity diagrams.

The validation process compared the "as is" model to the "to be" workflow: adherence to the design requirements was checked. Each requirement was assessed and allocated one of four options: (1) validated by the "to be" workflow, (2) partially validated for the "to be" workflow, (3) not validated for the "to be" workflow, and (4) already valid for both the "to be" and "as is" workflows. A limitation of the validation process was that the workflows were not presented and assessed by citizen user groups, although interaction and discussion with experts in the existing Rwandan land administration processes further informed the validation process.

Results and Discussion

First, the two "as is" workflows are presented (donation and parcel subdivision). Second, the specific design requirements established for each workflow are presented. Third, the "to be" workflow combining parcel subdivision and donation is justified and presented. Finally, the results from the validation are presented.

Donation (as is) is a change in land information where rights are transferred as a gift and commences with application. *Application* occurs when the donor goes to the DLB to ask for application requirements. He or she compiles the required documents and pays the required fees (Table 9.1). The application is taken to the LAIS professional at the DLB to check if all documents are complete and valid. "He or she" prepares a transfer agreement to be signed by the donor (with his or her spouse), the receiver, and four witnesses (two from each side). The application is sent to the district land officer (DLO),

TABLE 9.1

"As is" Collected Information on Parcel Donation

Element	Existing Situation
Four offices to enter	Sector office Bank DLB District reception
Four times to come to the district	Ask for information on rights transfer Sign transfer agreement Submit the application Collect land certificate
Eleven required documents	Copy of the donor's and receiver's identity card Donor marital status certificate Donation acceptance letter Filled application form Original land certificate Payment slip for transfer, notification, new land certificate, and cancelling the existing land certificate Notified donation agreement
Five required payments	20,000 RWF for transfer fees 2,000 RWF for notification 1,500 RWF for lease contract cancellation 1,500 RWF for new lease contract 500 RWF for marital status certificate
Three actors access the land information	Access to the land information of their province: PLR (view) LAIS professional at the ORLT (edit) DRLT (edit)

Source: Biraro, M., *Land Information Updating: Assessment and Options for Rwanda*, master of sciences, University of Twente, Enschede, The Netherlands, 2014.

acting as land notary, to notify the transfer agreement. The donor collects the application file with a notified transfer agreement and takes it to the district reception. The receptionist brings back the file to the district LAIS professional, who takes it to the Office of the Registrar of Land Titles (ORLT), at province level, for processing. *Processing* then commences at the ORLT. The application is received and manually recorded by the assistant of deputy registrar of land titles (DRLT). He or she takes the application to the professional in charge of land registration (PLR), who checks the completeness and validity of the documents. He or she also verifies, in the digital land register, if the donor is the real and only (known) right holder. If everything is correct, the application is sent to the LAIS professional (at the ORLT) for processing. If something is wrong, the application is taken to the DRLT, who approves its rejection. For the accepted applications, the LAIS professional scans and uploads the documents into the LAIS. The name of the receiver is added in the database, and the application is electronically sent to the DRLT for approval. This checks if the transfer was done according to the provided documents. If everything is correct, he or she approves it and the change is saved into the database. The LAIS professional prints and seals the new land certificate and takes it to the DRLT assistant. The district LAIS professional collects the printed land certificate and the rejected applications and takes them back to the DLB. *Issuance* commences with the district archivist receiving and manually recording files from the ORLT. After the given time, the receiver comes back, at the DLB, to collect the land certificate as the new right holder. If the certificate is available, he or she gets it. If the application was rejected, he or she gets an explanation of what to do so that the application can be processed. If there is no feedback yet, he or she gets a day that he or she could come back.

The workflow for parcel donation involves six actors, plus the donor and the receiver (Figure 9.1). The DLRT's assistant and the district archivist were omitted to simplify the activity diagram. The grouped columns represent offices where the application passes to be processed. The arrows between the first column and all other columns represent the times the applicant comes to the district. The grouped arrows are interactions done on the same day.

Parcel subdivision (as is) is a change in land information where a parcel is split into two or more parts. Where the split is followed by another change in land information (right transfer or land use change), the right holder follows two separate processes. The workflow is illustrated in four main steps. Application commences when the right holder goes to the DLB to ask for requirements. He or she compiles the required documents and pays the required fees (Table 9.2). The district LAIS professional receives and checks the application file to see its validity and completeness. If everything is correct, the file is given to the district surveyor, who makes an appointment with the right holder for field measurements. The right holder is in charge of transport of the surveyor when he or she comes to take measurements. *Surveying* is undertaken by the district surveyor, with a handheld global

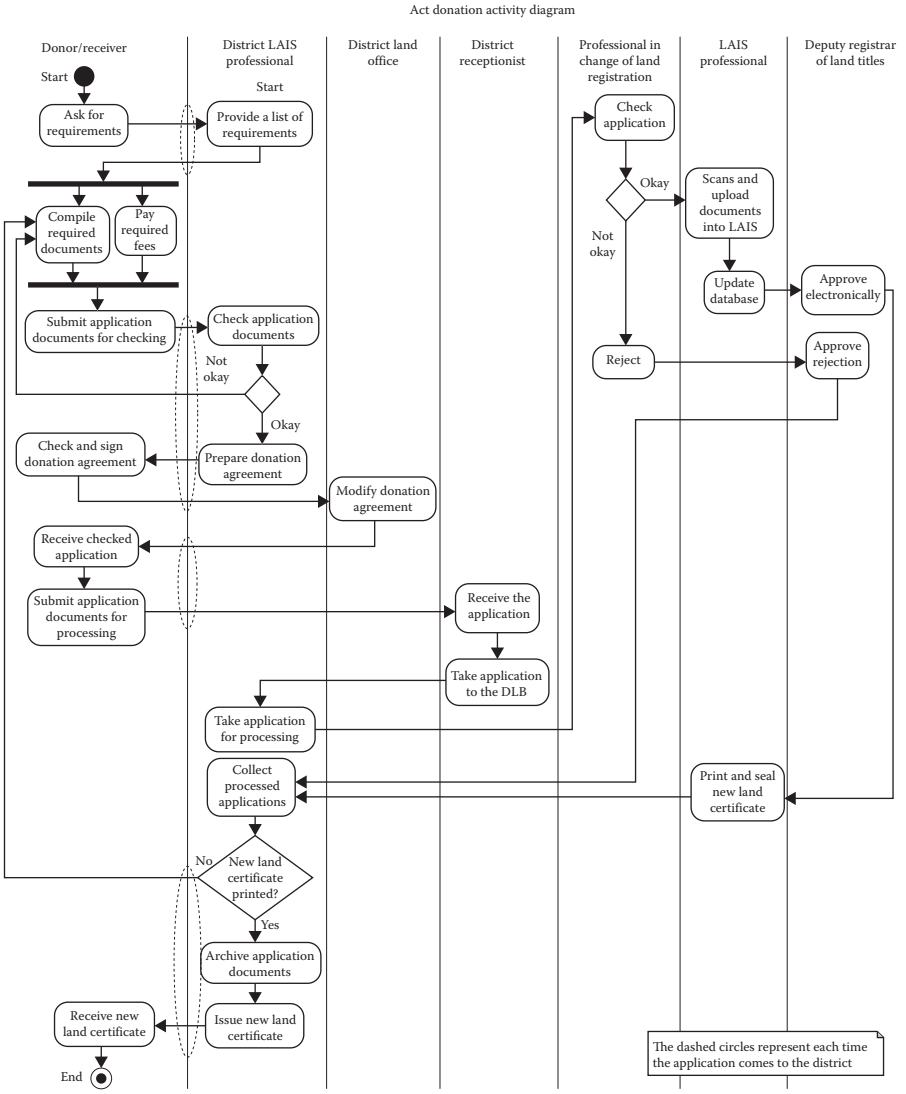

FIGURE 9.1
"As is" workflow for donation. (From Biraro, M., *Land Information Updating: Assessment and Options for Rwanda*, master of sciences, University of Twente, Enschede, The Netherlands, 2014.)

positioning system (GPS), who measures the new boundary that splits the parcel into two or more parts. The accuracy of the GPS is approximately 2 to 3 m, depending on conditions. Once in office, the district surveyor prepares the cadastral plans equal to the number of parcels to be created. He or she then takes the application documents to the DLO, who signs and stamps the cadastral plans. The district surveyor keeps the application file until the

TABLE 9.2

Collected Information on "As is" Parcel Subdivision

Element	Existing Situation
Four offices to enter	Sector office Bank DLB District reception
Five times to come to the district	Ask for information on rights transfer Submit the application for checking Submit the application for processing Collect land certificate
Surveying tools	Handheld GPS Printed aerial image
Skills	Basic surveying skills
Accuracy	3 m (For the GPS)
Nine required documents	Copy of the right holders' identity card Marital status certificate Application letter Filled application form Original land certificate Payment slip for cadastral plan, new land certificates, and cancelling the existing land certificate Cadastral plan for each of the parcels to be created
Four required payments	10,000 RWF for each cadastral plan to be produced 2,500 RWF for lease contract cancellation 2,500 RWF for new lease contract 500 RWF for marital status certificate
Four actors access the land information	Access to the land information of their province: PLR (view) LAIS professional at the ORLT (edit) GIS professional (edit) DRLT (edit)

Source: Biraro, M., *Land Information Updating: Assessment and Options for Rwanda*, master of sciences, University of Twente, Enschede, The Netherlands, 2014.

applicant comes to take it to the district reception. The receptionist brings back the application to the district LAIS professional, who takes it to the ORLT for processing. Processing is commenced by the assistant of the DRLT, who manually records the received application and takes it to the PLR. The PLR checks and verifies, in the digital land register, if the applicant is the real and only right holder. If everything is correct, the application is sent to the geographic information system (GIS) professional for processing. If there is something wrong, the application is taken to the DRLT, who approves its rejection. The GIS professional scans and uploads the documents of accepted applications into the LAIS. Using ArcGIS, he or she overlays the new measurements on the existing data sets. If they match, the parcel is split based on the coordinate points of the new boundary. New unique parcel

identifiers are given to the created parcels. He or she prepares a report and a map explaining the change and uploads them into the LAIS. The application is digitally sent to the DRLT for approval. The LAIS professional prints and seals land certificates that he or she takes to the DRLT assistant. In case there is a mismatch between the new and the existing measurements, a field checking is done by two grassroots surveyors operating at the ORLT at province level. They contact the applicant to fix an appointment for this activity. With a printed map on which there are both new and initial measurements, they perform observations by discussing with the applicant and neighbors (if any). A field report is explained to the applicant and the present neighbors who sign if they agree with it. The report is given to the GIS professional, who processes the request if the problem was resolved. If not, the final decision on the application file is made by the DRLT. The district LAIS professional collects all the processed applications from the DRLT assistant and takes them back to the DLB. Issuance is commenced by the district archivist who manually records all the applications received from the ORLT. After the given time, the applicant comes back to collect the new land certificates, all on his or her names. If the new certificates are available, he or she gets them. If the application was rejected, he or she receives an explanation of what to do. If there is no feedback yet, he or she gets a day to come back.

The workflow for parcel subdivision involves eight actors, plus the right holder (Figure 9.2). The DLRT assistant, district archivist, and grassroots surveyors were omitted to simplify the diagram. The grouped columns represent offices where the application passes to be processed. The arrows between the first and all other columns represent the times that the applicant comes to the district. The grouped arrows are interactions done on the same day.

The aforementioned workflows have many positive points to highlight like the LAIS now operational in all the five ORLTs at province level, right holders who are aware of reporting some of the land information changes linked to rights transfer, and people who understand the importance of having a land certificate as they exchange the land certificate if they do not go to report the change (Biraro 2014). They evidence that the maintenance phase is being strengthened. The remaining obstacles include the long travel distance to the DLB, the need to attend several times at places where the change is being reported due to the limited use of ICT in service delivery, the long updating process due to an analogue approach still in use and to the many actors involved in the process, the many required physical documents for which some are found in different places, and the high registration fees added to other costs spent on compiling the required documents (Biraro 2014).

Design requirements were defined and used in the design (Table 9.3). This would assist in proposing a way to handle the remaining obstacles in land information updating, and validating the subsequent designs. They include what the right holders want the system to do for them and what the system needs to have to perform its functions well (Norman 1996).

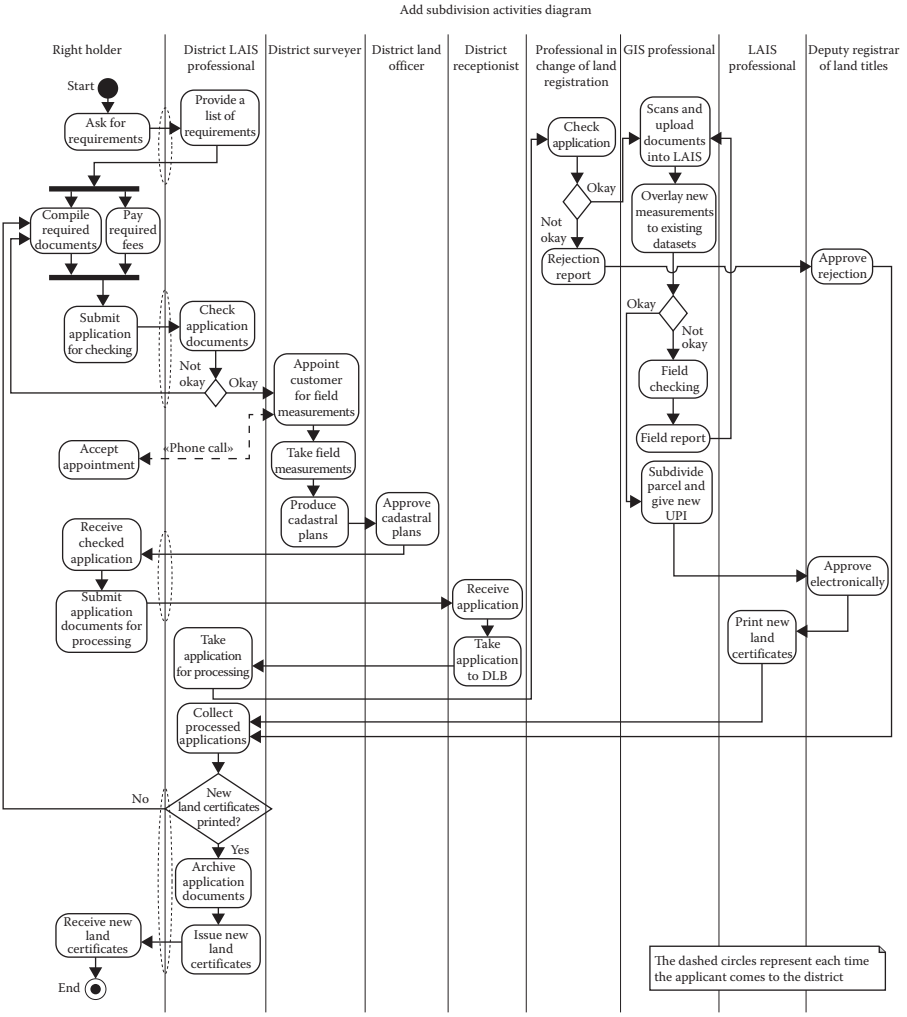

FIGURE 9.2
"As is" workflow for parcel subdivision. (From Biraro, M., *Land Information Updating: Assessment and Options for Rwanda*, master of sciences, University of Twente, Enschede, The Netherlands, 2014.)

The workflow redesigns needed to meet the defined requirements. Analysis of the requirements revealed that they could be best met via one comprehensive workflow consisting of interconnected database systems (Biraro 2014). The workflow connection would reduce the number of submitted documents and save time and money for the right holder. Consequently, Biraro (2014) proposed that the LAIS should be connected to the (1) National Identification Project, which would contain information about the marital status of every citizen with an identity card and a unique identification

TABLE 9.3

Design Requirements

Obstacle	Design Requirement
Coming several times to the DLB.	Easy way of getting information at local offices or online.
Weak use of ICT in service delivery.	Come to the DLB a few times. Contact the customer via e-mail or phone when his or her presence is needed.
Long process for updating land information.	One-stop center for land services. Processes can be combined where possible. Involved actors should be reduced. Reduce the use of physical documents.
Many required documents.	Reduce submitted documents through systems interconnection.
High registration fees.	Determine the required fees based on the capacity of people to pay. Payment should be done after confirming that the enquired service will be provided.
Lack of access to land information.	Actors involved in the updating process should access the land information. Control access to the land information database.
Long surveying process.	One actor should do the surveying and data processing and correct his or her own mistakes.
Accuracy mismatching.	Use the initial data sets as a starting point for new measurements to improve the accuracy and reduce the process time. Simple surveying tools, easy to manipulate. Flexible accuracy depending on the purpose.

Source: Biraro, M., *Land Information Updating: Assessment and Options for Rwanda*, master of sciences, University of Twente, Enschede, The Netherlands, 2014.

number (from 16 years old); (2) court with a database on land-related juridical cases (this would allow checking if there is no pending case on the parcel for which the information is to be changed); (3) Rwanda Revenue Authority, which would inform the new right holder about land taxes, if they are paid or not, or how much he or she will be paying in the future; and (4) banks, with e-payment services, and the DLB would know if the applicant transferred the required fees on the district account.

The subsequent design of the proposed workflow, based on this connectivity, combined the processes of donation and parcel subdivision. According to Biraro (2014), rights transfer or land use change is mostly the reason behind a parcel subdivision. So, why not have a combined workflow instead of having two separate processes? The right holder would apply only once, and two land certificates would be produced with different names. In addition, with the proposed workflow two possibilities are offered, *online* and *physical* applications, taking into account the current technology availability and capacity within the district.

Combined workflow (to be): online includes application, field survey, processing, rights transfer, and issuance. Application commences when the donor is given an account by the IT manager to be able to apply online. The donor logs in, completes the application form, and uploads the scanned land certificate. After submission, he or she gets an application identification number as an approval that the documents are received. The DLO, after logging in, sees all received applications. By using the unique parcel identifier (UPI), he or she retrieves information about the concerned parcel to verify if the donor is the owner and the only owner and if there is no mortgage, dispute, or unpaid taxes. When everything is cleared, the application is sent to the district surveyor for field measurements. If there is a problem, the DLO writes a rejection report and sends it to the donor. *Field survey* commences with the district surveyor locating the parcel of the received application using the initial data set and the UPI. He or she prepares a field map where the initial parcel boundaries are overlaid on an aerial/satellite image. An appointment is fixed with the donor through e-mail. In the field, guided by the donor and the receiver, the district surveyor confirms the shape of the parcel using the printed field map. He or she surveys the new boundaries using a GPS or any other surveying approach depending on the purpose. A field report with the used map, showing where the measurements were taken, is written and explained to the donor and the receiver who have to approve it. Processing commences in the office. The district surveyor scans and uploads the field report into the LAIS and starts to process the application. The new measurements are overlaid on the existing data sets. If there is something wrong, he or she goes back to the field to correct the mistakes. But if there is no mistake, he or she splits the parcel, gives new UPIs, and produces cadastral plan for each of the created parcels. He or she digitally sends the cadastral plans to the DLO to do the transfer. *Right transfer* occurs when the DLO prepares the transfer agreement to be sent to the donor together with the cadastral plans via e-mail and specifies when to come for signature. Both the donor and the receiver check the documents. If they agree, they respond to the invitation. If not, comments are sent to the DLO. On the agreed day, the receiver pays the required fees, using e-payment. The two parties (with their spouses, if any) sign the transfer agreement, and the original land certificate is submitted to be canceled. The DLO notifies the signed transfer agreement, scans it, and uploads it into the LAIS. The application is digitally sent to the LAIS professional to add the change in the database. The DRLT checks the change made and approves the transfer if everything is correct. The database is updated, and new land certificates are ready for issuance. Issuance happens when the DLO checks the land certificates ready for issuance and notifies their owners. The land certificates are printed when their owners come to collect them.

Combined workflow (to be): physical application is used for those who do not have Internet access. It should be noted that processing and issuance occur in the same fashion as the online application and are therefore not included in this description. Application commences when the donor goes

to the leader of the village (the smallest administrative unit) to get a list of requirements and an application form. As the right holder, he or she fills the form and attaches the original land certificate. The application documents are taken to the PLR as a front desk officer at the DLB. This one checks, in the digital land register, the owner, if the parcel is not mortgaged, and if no juridical case is pending or there are no unpaid land taxes. If everything is cleared, the PLR scans and uploads the application documents into the LAIS and gives an application identification number that is automatically generated by the system. He or she archives the physical documents and sends the digital copy to the DLO. If there is a problem in the application, the donor receives an explanation of what is wrong. The DLO also checks the application before sending it to the district surveyor for measurements. If there is a problem, the DLO writes a rejection report and sends it to the PLR, who informs the donor through a phone call. Field survey is undertaken by the district surveyor: the UPI helps to locate the parcel of the received application. He or she prepares a field map where the initial parcel boundaries are overlaid on an aerial/satellite image and fixes an appointment with the donor through a phone call. The field measurements are similar to what is done during the online application. Right transfer happens when the PLR contacts the donor and the receiver to sign the transfer agreement. On the agreed day, the DLO prepares the transfer agreement with the cadastral plan and shows them to both parties. They check the documents, and if they agree with the content the receiver pays the required fees to the DLO. The two parties (and their spouses, if any) sign the transfer agreement.

Validation revealed that requirements were validated, partially validated, or not validated in the "to be" workflows. Additionally, some were found to be already validated in the existing or "as is" workflow.

A total of 10 requirements were identified as being validated: (1) only one process is to be followed in case the transfer is for a part of the parcel; (2) information on updating will be available both online and at village level (closer to the people) instead of only being acquired at district level; (3) an applicant needs to come to the DLB only two times (with the support of an online application) or three times (physical application) instead of eight times (dashed circles in Figures 9.1 and 9.2); (4) the number of involved actors can be reduced from 14 actors (8 during parcel subdivision and 6 during donation) to 5 or 6 actors in online or physical application, respectively; (5) only the professional in land registration (physical application) and the DLO (online application) will use the physical documents while almost all the actors are using them in the existing workflow (6 out of 8 in parcel subdivision and 5 out of 6 in donation); (6) due to system interconnection, the submitted physical documents can be reduced from 20 documents (11 for donation, Table 9.1, and 9 for parcel subdivision, Table 9.2) to 2 documents; (7) the payment can be done after the application is accepted while, in the existing situation, it was done before the application is submitted; (8) actors at the DLB involved in the updating process can now access the land information; (9) surveying and

processing activities can be done by 1 actor while, in the existing situation, it was involving 4 actors (district surveyor, GIS professional, and two grassroots surveyors); (10) instead of starting from scratch during the surveying, the initial data sets can be used as a starting point for new measurements.

Meanwhile, two requirements can be identified as being partially validated: (1) only applicants with e-mail/phone can be contacted; those without e-mail/phone will still be coming to check the status of the application. (2) The land services need to be offered at two separate offices, district and province levels. Meanwhile, one requirement is not validated: as cost analysis was not covered under this research, determination of required fees based on the capacity of people to pay was not met. Finally, three requirements were found to be already valid: (1) access to land information database will be controlled; (2) the accuracy of surveying depends on the purpose; and (3) simple surveying tools, easy to manipulate, will be used.

The validation suggests that the proposed (to be) workflow better meets the requirements than the two separated existing (as is) workflows. Most of the obstacles can be handled; thus, the right holders are expected to be more motivated to report changes. However, the design requirements that could be only partially validated or not validated require further research.

Conclusion

Updated land information is critical for a well-functioning land administration system. Even though the first registration is systematic, the updating is sporadic. Right holders initiate the process by reporting the change. All obstacles standing in the way of the updating process should be minimized or removed to get the full collaboration of the right holders. If this is not organized, they may opt for informality and the system will finally lose its value. The updating workflows should be simple and customer oriented to facilitate their users. The workflow design should respect requirements allowing identifying and handling those obstacles in the updating process to ensure that changes on the ground are getting in the land register.

This chapter discussed the use of workflow management to improve the updating process in land administration. Many authors agree on the necessity of updating the land information, and how efficient the process should be. However, less was said on how these processes should be designed to speed up the reporting of changes in land information. By using Rwanda as a case study, a workflow management system designed with UML was used to analyze the existing updating system and also to design improved processes.

The methodology proved to be useful as it allowed identification of obstacles in the workflow and the definition of requirements. Improvements in

the proposed workflow were validated such as combinations of processes instead of following two separate workflows when two changes are on a same parcel, fewer actors, and less use of papers in the process. All of these have an impact on the speed of the updating process. The workflow based on UML diagrams was beneficial in describing, step by step, the updating process. Specific to Rwanda, future work should determine whether the proposed designs are suitable among right holders. From a theoretical perspective, work could focus on developing measures for ensuring that land information–updating processes receive equal attention, or are even entirely integrated into the design of initial registration programs.

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