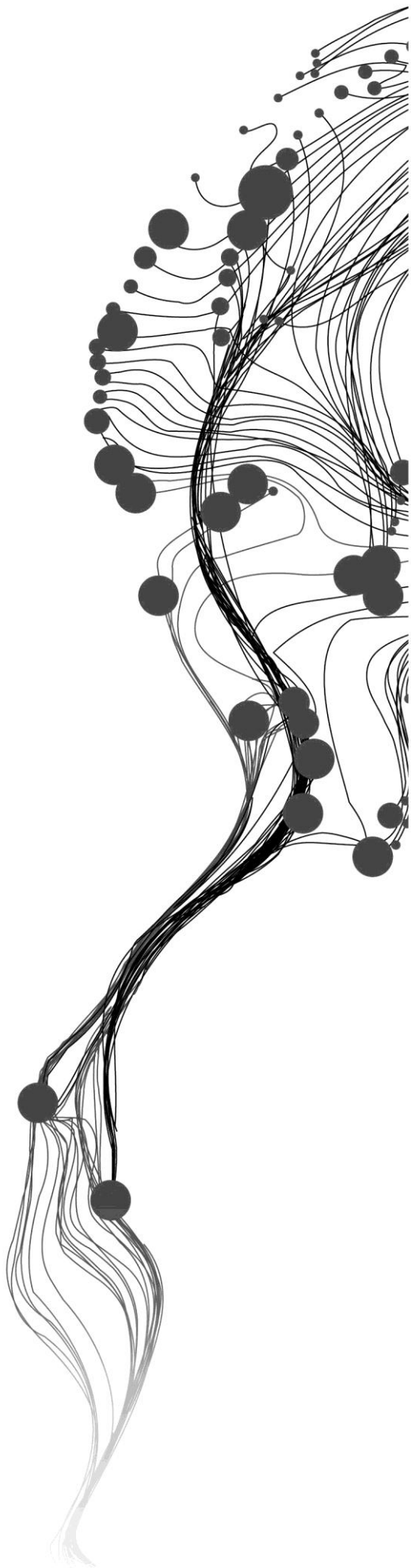


LAND INFORMATION UPDATING: ASSESSMENT AND OPTIONS FOR RWANDA

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February, 2014

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DISCLAIMER

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ABSTRACT

Land information, as a result of an initial systematic or sporadic land registration program, answers the land related questions of “who and how” as well as “where and how much”. Over time, the answers to these questions change. Therefore, to be truly useful, the land information must also be changed. The concept of reporting and recording changes in land information is known as updating. For a registration system, updating is fundamentally important: its success depends on the promptness of reporting changes in land information.

Rwanda completed registering all its lands through a systematic land registration program using the general boundary approach. The work was completed in a period of 5 years. However, to be sustainable, the program still requires considerable effort and well designed procedures for updating land information. Though the collection of land information was systematic, their updating is sporadic.

This research examines how Rwanda is undertaking the updating of land information. The aim is to determine obstacles and propose alternative solutions to overcome them. Even if the findings are specific to Rwanda, the results may be used in other countries where large-scale registration programs have been completed in short period of time using the general boundary approach. The research focuses on the three workflows of parcel donation; parcel subdivision and mortgage registration. These workflows respectively correspond to the identified obstacles of high registration fees; accuracy mismatching between new and existing measurements; and complexities in changes registered by separate institutions. The field work undertaken demonstrated further obstacles faced by the right holder when reporting changes. These included for example the long travel distance to the District Land Bureau for application process; long updating workflows; a multitude of required documents; long surveying process; and so on. The obstacles were used to define requirements and subsequently used to design two new workflows for Rwanda: one integrating subdivision and donation; and another for mortgage registration. The proposed workflows are underpinned by an inter-connection between the National Identification Project (with information on every citizen from 16 years old); the Electronic Mortgage Registration System (with information on registered mortgages); the Courts (with information on received cases about land disputes); the Rwanda Revenue Authority (with information on land taxes); and the Banks (with its e-banking service). The designed workflows are highly recommended to Rwanda as the validation shows that identified obstacles are tackled. Most of the requirements are validated when comparing the existing workflows and the new designed workflows. At the same time, a focus group discussion, made of Rwandans students, was done to analyse if the designed workflows will improve the updating process in Rwanda.

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List of abbreviations

AoMA	: Abstract of Mortgage Agreement
DLB	: District Land Bureau
DLM	: Department of Lands and Mapping
DLO	: District Land Officer
DRLT	: Deputy Registrar of Land Titles
eMRS	: Electronic Mortgage Registration System
FAO	: Food and Agriculture Organisation
FIG	: Fédération Internationale des Géomètres (International Federation of Surveyors)
GIS	: Geographical Information System
GPS	: Global Positioning System
ICT	: Information Communication Technology
KCB	: Kenya Commercial Bank
LAIS	: Land Administration Information System
LGAF	: Land Governance Assessment Framework
LIS	: Land Information System
MINIJUST	: Ministry of Justice
ORG	: Office of the Registrar General
ORLT	: Office of the Registrar of Land Titles
PLR	: Professional in charge of Land Registration
RDB	: Rwanda Development Board
R-LAEP	: Rwanda Land Administration Enhancement Project
RNRA	: Rwanda Natural Resources Authority
SMS	: Short Message Service
UML	: Unified Modelling Language
UPI	: Unique Parcel Identifier
UNECE	: United Nations Economic Commission for Europe
US	: United States

Glossary

Land Administration Information System is a web based land registration tool developed in Rwanda in order to ensure a proper land management and land administration; and specifically the maintenance of land certificates issued to landholders during land registration. It comprises a data store and a processing capacity held centrally. A user is able to interface with the data using a web browser on internet (RNRA, 2012).

Land Administration System is an infrastructure to implement land policies and land management strategies in support of sustainable development. The infrastructure includes institutional arrangements, a legal framework, processes, standards, land information, management and dissemination systems, and technologies required to support allocation, land markets, valuation, control of use, and development of interests in land (Williamson *et al.*, 2010).

Land Information refers to *spatial* information (parcel geometry, unique parcel identifier, size, land use and location) and *non-spatial* information (unique parcel identifier, land right, right holder and evidence of how land rights are brought to right holder)(RNRA, 2012).

Land Information System is a system made of human and technical resources which, together with appropriate organizing procedures, are applied to collect, maintain, analyze, disseminate and use of land-related information(Dale & McLaughlin, 1999).

Land Register is a public land record used to record the existence of deeds or title documents, thereby protecting rights in land and facilitating the transfer of those rights (Williamson *et al.*, 2010). In Rwanda, a land register is both a list of owned plots and their owners; and a representation of the territorial layout (MINITERE, 2004).

Land Registration is a process of recording rights in land either in the form of registration of deeds or through the registration of titles to land, so that any person acquiring a property in good faith can trust in the information published in the land register (Williamson *et al.*, 2010).

General boundary is a boundary where the precise line on the ground has not been determined, although usually, it is represented by a physical feature, either natural or man-made, such as a fence, hedge, ridge, wall (in condominium parcel), ditch, road, or railway line, and shown graphically on a map normally, a large-scale topographic map (Williamson *et al.*, 2010).

Fixed boundary is a boundary which has been accurately surveyed so that any lost corner monument can be replaced precisely from the measurements (UNECE, 1996).

Updating refers to record the land information change in the real world into the land register within a specified time period. **Maintenance** refers at the same time to the update of changes and the upgrade of the accuracy (Jing *et al.*, 2013).

In this research, the terms *updating* and *maintenance* refer to the same thing: report and record a change in land information.

Workflow, in this research, refers to a designed activities process describing a type of change in land information, requirements to register the change, actors involved, their tasks and/or roles, techniques to be used and the place where the change registration is processed.

1. INTRODUCTION

1.1. Background

Rwanda started to put in place a functioning Land Information System through a program called Land Tenure Regularisation. The program was undertaken in 2005 with trials and, in 2009, with a nationwide systematic land registration. The aim was to provide legally valid land documents to all rightful landholders (RNRA, 2012). The program was completed in 2013. The Land Tenure Regularisation program used the general boundary approach: grass roots surveyors were used to demarcate land parcels on high resolution ortho - photo or enlarged satellite images. The surveying was done by the grass roots surveyors and claims were assessed in the field in a highly participatory manner. During the systematic land registration, spatial and non-spatial land information were recorded using two different computer systems: respectively the Geographic Information System and the Land Tenure Regularisation Support System (RNRA, 2012). The two systems were connected by a Unique Parcel Identifier linking the parcel information to its owner. So far, the non-spatial land information stored in the Land Tenure Regularisation Support System was migrated into a web based land registration tool known as Land Administration Information System (LAIS) designed to support the maintenance phase. The spatial component has also to be added into this system to form a complete digital National Land Register (RNRA, 2012).

The process of updating land information in Rwanda starts from the District Land Bureau, located in each District, and is completed at the national level where the entire land information database is electronically managed. The process is lead by a manual which gives guidelines on how to register changes in land information. The document was published in 2012 by the Department of Lands and Mapping. Comparatively speaking, Rwanda made a positive progress in land administration in registering all its land. Now, it is on the list of countries in the world with a complete and digital land register. However considerable efforts are still needed to update the land information in order to get benefit from this improved Land Information System.

This research is conducted in order to examine how Rwanda is doing the updating of land information; find out probable obstacles and design alternative solutions for overcoming them. Three workflows are focused upon in this research: transfer of rights through *parcel donation* relating to the registration fees; *parcel subdivision* corresponding to the survey approach; and *mortgage registration* as a change registered by separate institutions. A number of requirements are defined based on identified obstacles in the three workflows. The same requirements are used to design two new workflows proposed to Rwanda to improve its updating system. The first workflow integrates parcel donation and parcel subdivision; and the second is for mortgage registration. All the workflows presented in this research are mapped using the Unified Modelling Language (UML).

The research is important not only to Rwanda but also to other countries that have used or want to use the same approach for land registration. The assessment of the updating process is done in terms of workflow organisation after the completion of the systematic land registration phase. It is believed that the right holder will be better able to use and follow a simple workflow: changes in land information will be reported and the land register will be updated more promptly. Meanwhile, a difficult workflow is not easy to understand; and there is a great possibility that few changes will be reported and the land register will become out of date. So the updating workflow will be simple to be understood and followed by the right holder. This idea lies at the heart of the research problem, objective, methodology, and design approach.

The research is subdivided into six chapters. This first chapter is an introductory part that gives a background and justification of the research. Chapter two is about literature review on requirements related to the updating of land information; workflow modelling technique and the land information system in Rwanda. Chapter three describes the methodology and the techniques used in data collection and workflow design. Chapter four is about modelling the existing workflows in updating land information in Rwanda; their analysis; and the definition of design requirements. The fifth chapter is about designing and validating new workflows. The last chapter summarises the conclusions delivered from the research and gives recommendations to Rwanda and for further researches.

1.2. Research problem

The systematic land registration was carried out by using participatory approach with a high involvement of the State. The State planned when, how and by who the registration was to be done. The role of the right holder was to show the boundaries of her/his parcel and pays, in average, 10 US dollars of registration fees (Byamugisha, 2013). The land registration and the issuance of land certificates were handled by the State at the Cell office (a Cell was the unit of registration). This was quite simple for the right holder.

To update the land information; a sporadic approach is being used: the right holder initiates the process by reporting a change. During the updating process, s/he follows designed workflows; looks for required documents, at different places, and pays required fees so that the change can be recorded in the land register. If the workflows for updating land information are not simple, not all the right holders will report changes in land information.

After analysing the manual describing the updating process; and based on discussions and observations done during the field work; the existing workflows for updating land information in Rwanda have obstacles that may discourage right holders to report changes in land information. The identified obstacles that constitute the object of this research are following:

- The application to register a change is physically done at the District Land Bureau at the district level and sent to the Office of the Registrar of Land Titles at the province level to be processed. A province may have at least five districts and a district can have an average area of 84,377 hectare which there may be 349,362 parcels (Summary report of 31th May 2013). For some right holders, it is a quite long distance to get to the District Land Bureau; and this more than once and on different days. The distance to get to the land office and how often the right holder has to go there are the weak points.
- The required fees to register changes resulting from transfer of rights through sale, donation, succession, or parcel exchange include: flat rate for transfer fees; fees to notify the transfer agreement; fees to cancel the existing land certificate; fees for the new land certificate and fees for other required documents like the certificate of marital status. If the transfer concerns just a part of the parcel, the right holder pays also the fees for each of the cadastral plan to be produced. The total amount of these fees is high especially for the right holder whose transfer is not involving money (like succession, donation, or parcel exchange) or sales that involve little money.
- All changes in land information are registered and managed by the Department of Land and Mapping except mortgage registration. This type of restriction of rights is registered by the Office of the Registrar General under Rwanda Development Board. The registration of mortgage is tricky as the updating of land information is scatted in separate institutions. If the information sharing is poorly

done, some changes may not be recorded in the land register. In this case, the transfer can be done on a parcel that has a mortgage without the new owner be aware of it.

- Surveying approach has other obstacles in change registration. Fixed boundaries are used to update general boundaries in order to improve the accuracy of initial measurements. As the District Surveyor does not have access to the land information, s/he starts from scratch when taking new measurements. By overlaying their measurements with the existing dataset, the two data provide different results. In this case, the grass roots surveyors at the Office of the Registrar of Land Titles at province level go back to the field not with a GPS but with a printed map with both measurements for a field checking. The process can take long to be done as it depends on the available requests at the province level.

As a consequence of the above obstacles in the updating process; *all changes in land information may not be reported in order to be recorded in the land register which may result in system devaluation*. So, there is a need to have simplified workflows for updating land information in Rwanda.

1.3. Research objectives

The land register has to reflect the reality on the ground in order to be useful (Zevenbergen, 2002). This is possible when all changes that affect the right holder – the right – the parcel are reported and recorded. This is the main driver behind the research.

1.3.1. Main objective

The main objective of the research is to *design workflows for updating land information in Rwanda that will handle identified obstacles which may stop the right holder to report changes in order to be included in the land register*.

1.3.2. Specific objectives

The main objective is broken down into five specific objectives which are:

1. *Understand the existing workflows for updating land information in Rwanda,*
2. *Identify obstacles in the existing workflows for updating land information in Rwanda,*
3. *Define requirements to design workflows for updating land information in Rwanda,*
4. *Design new workflows for updating land information in Rwanda,*
5. *Validate the new workflows for updating land information in Rwanda.*

1.4. Research questions

To achieve the above objectives, the following research questions have to be answered:

1. How are the existing workflows for updating land information in Rwanda due to parcel donation, parcel subdivision and parcel mortgaging?
2. What obstacles are in the existing workflows for updating land information in Rwanda due to parcel donation, parcel subdivision and parcel mortgaging?
3. What could be the requirements to design workflows for updating land information in Rwanda due to parcel donation, parcel subdivision and parcel mortgaging?
4. How new workflows for updating land information in Rwanda due to parcel donation, parcel subdivision and parcel mortgaging can be designed based on the requirements?
5. How valid are the new designed workflows for Rwanda in relation to the design requirements?

1.5. Conceptual framework

To design new workflows to update land information in Rwanda, the design requirements are crucial. The Figure 1.1 below shows a relation that exists between the workflow for updating land information and the land administration through its four functions identified by Enemark (2004) in his global land administration perspective. Those functions are *land tenure* (securing land rights, rights transfer); *land value* (assessing the value of the land, collecting land taxes); *land use* (spatial planning, control of the use of land); and *land development* (building new infrastructures, planning and regulating construction) (Enemark, 2004). In the figure, the workflow is made of actors and their tasks on each step; requirements and techniques to accomplish a task and the location or office where the task is carried out.

In the “*to be*” situation, the workflow will be simple which means: it will consider the design requirements. This will remove obstacles for the right holders when reporting changes in land information. The land register will be updated more promptly as the changes will be reported. It will then become useful for the land administration.

In the “*as is*” situation, considered as the actual situation in Rwanda, the workflow for updating land information has obstacles. Therefore it becomes difficult for the right holder when reporting changes. If these obstacles remain, there is a great possibility that few changes may be reported as people are discouraged. The land register will become out of date thus not useful for the land administration. In Rwanda, the obligation to register change is regulated by the law (Government of Rwanda, 2013). But if the administrative procedures put in place are not easy for those who use them, it will become difficult to respect the law (FAO, 2012).

This research is then coming to help to design workflows for updating land information that moves Rwanda from the left side to the right side. The new workflows to be designed should remove obstacles that discourage the right holder to report changes in land information.

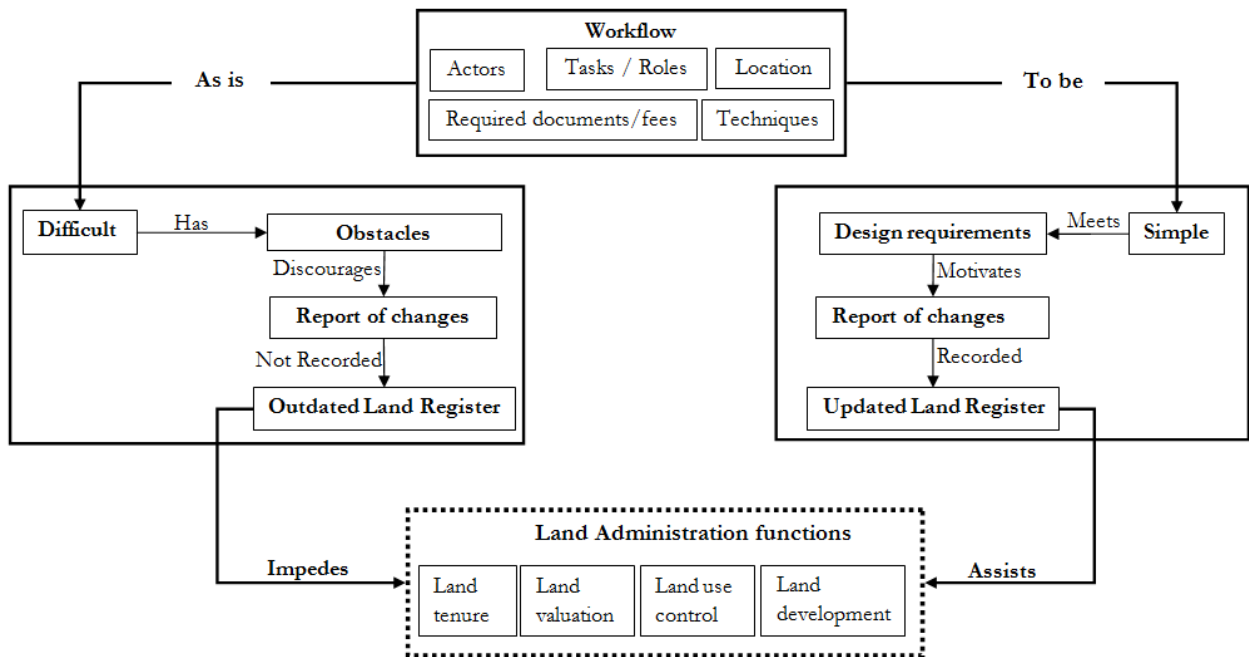


Figure 1.1 Land information updating fitted in the global land administration perspective (Enemark, 2004)

1.6. Research matrix

To achieve the research objectives and answer the research questions, proper research techniques are used. The Table 1.1 gives a generalised overview of the research techniques used per each research objective and research question. The first and second objectives are achieved using the primary and secondary data collected on the field in Rwanda; and the result presented using Unified Modelling Language (UML) activity diagram. The third objective is achieved through an analysis of the collected data done referring to the literature review on updating. For the fourth objective, a process modelling is followed to design the new workflows and the UML activity diagram to model the workflows. A focus group discussion and an assessment to validate the requirement are done to achieve the last objective.

Research objectives		Research questions	Research techniques	
Main	Specific		Primary Data	Secondary Data
<i>Design a workflow for updating land information in Rwanda.</i>	Understand the existing workflows for updating land information in Rwanda.	How are the existing workflows for updating land information in Rwanda due to parcel donation, parcel subdivision and parcel mortgaging?	- Direct observations, - Interviews.	- Documents on updating land information in Rwanda, - Process modelling, - UML activity diagram.
	Identify obstacles in the existing workflows for updating land information in Rwanda.	What obstacles are in the existing workflows for updating land information in Rwanda due to parcel donation, parcel subdivision and parcel mortgaging?		
	Define requirements to design workflows for updating land information in Rwanda.	What could be the requirements to design workflows for updating land information in Rwanda due to parcel donation, parcel subdivision and parcel mortgaging?	- Direct observations, - Interviews.	Literature review.
	Design new workflows for updating land information in Rwanda.	How new workflows for updating land information in Rwanda can be designed?	- Direct observations, - Interviews.	- Process modelling, - UML activity diagram.
	Validate the new workflows for updating land information in Rwanda.	How valid are the new designed workflows for Rwanda in handling the identified obstacles?	- Requirements assessment, - Focus group discussion.	

Table 1.1 Research matrix

1.7. Research design

The research is carried out in three main steps: pre-field, field work and post field work as shown by the Figure 1.2. The first step is the starting point of the research where the research problem, the research objectives and research questions are formulated. The field work is conducted in Rwanda to collect primary and secondary data on the existing situation. The last step is a process modelling of the updating workflows. The details on the research flow are provided under the Chapter 3 on research methodology.

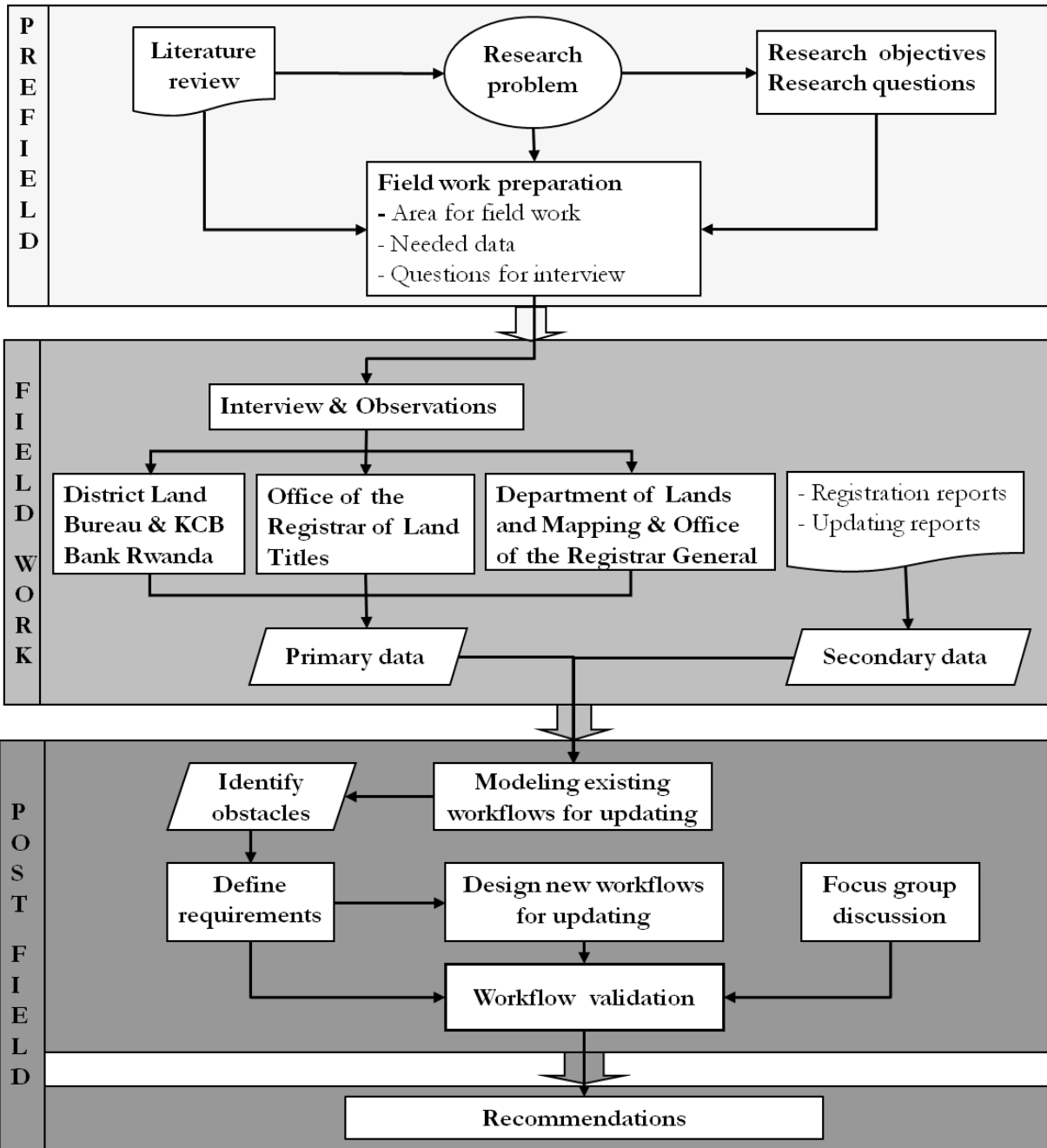


Figure 1.2 Research design

1.8. Thesis structure

Following are the chapters included in the research.

Chapter 1: General introduction

The chapter is an introductory part that gives a background and justification of the research through the research problem. The research objectives and research questions are provided and linked to the research techniques in a research matrix. A flow chart describing the research methodology is also presented.

Chapter 2: Land information updating

The chapter is about literature review on land information system and land information; and requirements relating to their updating; workflow modelling technique and land information system in Rwanda.

Chapter 3: Research methodology

The chapter explains in details the methods and techniques used in data collection; and the process followed to design and model new workflows.

Chapter 4: Existing workflows for updating land information in Rwanda

The chapter is about modelling three of the existing workflows for updating land information in Rwanda which are parcel donation; parcel subdivision and parcel mortgaging. An analysis of those workflows is done by highlighting the achievements so far performed in the updating process but also obstacles that still exist in the three workflows. The requirements to design new workflows proposed to Rwanda are defined.

Chapter 5: Designing and validating new workflows

The chapter contains two workflows designed to be proposed to Rwanda: one integrates the updating of land information due to parcel donation and parcel subdivision; and another is for mortgage registration. The validation of those two workflows is covered under this chapter: an assessment of the design requirements defined in the forth chapter and a focus group discussion.

Chapter 6: Conclusions and recommendations

The chapter summarises conclusions drawn from the research thesis and gives some recommendations to Rwanda and for further researches.

2. LAND INFORMATION UPDATING

The previous chapter provides a generalised overview of the research. Chapter two deepens the basis for the research by providing an analysis of existing literature dealing with land information system, land information and design requirements to keep the information up to date. Additionally, the chapter also delivers an overview on workflow modelling technique and in particular the Unified Modelling Language (UML) as a key tool that underpins the design and presentation of results. The last section focuses on the land information system in Rwanda which produced the National Land Register in digital format.

2.1. Land information

Land information is a result of an initial systematic or sporadic land registration process that covers an entire area. Systematic land registration is normally a government initiative where all eligible right holders are given legal documents to support their claims (Williamson *et al.*, 2010). Sporadic land registration is designed for individuals who individually pay to have their parcels registered (Williamson *et al.*, 2010). Land registration answers the land related questions of “*where and how much*” that gives *spatial land information* and the question on “*who and how*” that gives the *non-spatial land information* (Henssen, 1995). In some cases, the two types of land information are managed by one institution, like in The Netherlands, or in other cases by two separate institutions as it is done in Austria or Poland (Bogaerts & Zevenbergen, 2001). In the case of Rwanda, the spatial and non-spatial land information are managed by one institution known as the *Department of Lands and Mapping* (DLM) under Rwanda Natural Resources Authority (RNRA, 2012). The information is gathered into a single database called *land register*. A land register is both a list of owned plots and their owners; and a representation of the territorial layout (MINITERE, 2004). The spatial land information comprises the geometry of the land parcel and its location; a Unique Parcel Identifier (UPI); parcel size and its land use. The non-spatial land information is about land rights and rights holder; the UPI (that links the spatial to non-spatial land information) and evidences on how the rights are attached to the right holder (RNRA, 2012). The term “*land register*” used in Rwanda is similar to what Williamson *et al.* (2010) describes as *cadastral system* and what Henssen (1995) calls *land records* or *land recording* and they are all, more or less, synonymous.

2.1.1. The updating of land information

The land register, no matter how well it is established, loses its value when the land information it stores is not updated (Henssen, 2010). The information on parcels, rights and right holders keeps changing due to different reasons with or without rights transfer. Binns and Peter (1995) argue that the failure or success of a registration system highly depends on the completeness and promptness in reporting changes in land information. Without reporting changes in order to be added in the land register, the system loses relevance and finally it is replaced by an informal system (Williamson *et al.*, 2010). The way the land information changes are reported and recorded in the land register follows known updating procedures that clarify the role of each actor in the workflow; and techniques and tools to be used on each step. The updating procedures should be flexible rather than standardised as says Enemark (2013). The steps may be the same but the tools and techniques used may depend on the present need thus fit for purpose. It is important that the procedures are kept as simple as possible because the duty of reporting is left entirely to the initiative of the right holder (Binns & Peter, 1995). For Enemark (2013), building land information, especially spatial land information, is not a one stop process. It should take all opportunities whenever and wherever needed and/or possible; which allows to continuously update, upgrade and improve the land information. So, the updating of land information is a regular activity that requires resources (human and

technical resources) and procedures to clarify the role of each actor in the workflow even if techniques and tools to be used may differ (Zevenbergen *et al.*, 2007). A combination of those requirements for updating brings out what Dale and McLaughlin (1999) calls *Land Information System* (LIS) defined as a system that includes human and technical resources, procedures and techniques to collect, maintain, analyze and distribute land information.

The land information and its updating procedures and techniques are part of the LIS. The implementation of the LIS contributes to a good land administration through a broad range of four functions as identified by Enemark (2004) in the global land administration perspective. The information on land provides a basic infrastructure to run the *land tenure* (securing land rights, rights transfer); the *land value* (assessing the value of the land, collecting land taxes); *land use* (spatial planning, control of the use of land); and *land development* (building new infrastructures, planning and regulating construction) (Enemark, 2004). The whole picture is give by Williamson *et al.* (2010) when describing the Land Administration System. They talk of an infrastructure made of institutional organization, laws, procedures, standards, land information, land management and information dissemination, and technologies required to support land allocation, land market, land valuation, land use control and land tenure development. The updating of the land information affects the Land Administration System of a country (Williamson *et al.*, 2010).

2.1.2. Requirements related to the updating of land information

A successful system design starts with an identification of requirements which increases user satisfaction (Todorovski & Lemmen, 2007). According to Norman (1996), requirements are (1) what the system is supposed to do; (2) what the system needs to have in order to perform well its functions and (3) what the users want the system to do for them. This first and second description fits respectively with *functional* and *architectural requirements* that Hackman-Antwi *et al.* (2013) identified when working on the requirements for point cadastre. They actually identified four categories of requirements which are (1) *preparation requirements* referring to context awareness before starting the project; (2) *functional requirements* relating to the purpose of the point cadastre; (3) *quality requirements* referring to how easy, cheap or accurate the point cadastre should be; and (4) *architectural requirements* relating to collection, storage, maintenance and visualisation of the cadastral point information. These four categories are relevant for the establishment of a new land information system (as it was the case for the point cadastre) (Hackman-Antwi *et al.*, 2013) and they can be called *system requirements* as a little was said on customer (right holder) mostly involved in the maintenance phase. As Henssen (2010) said: “*possible efforts should be made in the maintenance phase to get citizen’s cooperation*” unless no one from the land office will know about the changes in land information. Then the requirements to update land information should be more customer-oriented. Obstacles that stands in the reporting process should be removed for them to ensure that changes in land information are reported and recorded (Henssen, 2010). In this way, the maintenance phase may add another category of requirements to the four categories identified by Hackman-Antwi *et al.* (2013) : *customer requirements*. These requirements will refer to what the right holders want the system to do for them (Norman, 1996).

Different authors (Chimhamhiwa *et al.*, 2009; Enemark, 2013; FIG, 1995; Hackman-Antwi *et al.*, 2013; Henssen, 1995, 2010; Larsson, 1991) wrote about criteria or key point (described in the paragraphs below) to consider when assessing the quality and performance of a land information system. Even though these key points are suggested to see whether a system is well performing or not; they can be taken as requirements that the same system should fulfil in order to be enjoyable by its users. They will allow removing obstacles for the customer during the updating process. They can also be used as reference of what information to collect about the existing situation in order to identify the customer requirements in the updating of land information.

Larsson (1991) and Henssen (2010) suggested that to remove obstacles for the right holder in the reporting process, the *reduced travel distance* from the customer to the land registry (or any other offices where to acquire land services); the *affordable registration fees* (like stamp duties, surveying fees); the report of change in land information should be done at *one office* (e.g.: the registration office) which will inform other concerned institutions; the *information sharing* (about the registered changes in land information) should be between institutions that deals with land issues (e.g.: between courts and the land registry in case of adding or removing a caveat); and finally the *registration of a change should be obligatory*. Even if the two authors agree that to register a change in land information should be compulsory and not a matter of choice; they thought in favour of the right holder who has to collaborate in the updating of the land information.

Some of the above aspects were also touched by the FIG (1995). They argued that a successful land information system should be *accessible* to all users through decentralized land offices and have a *low cost* operated in a way that the recovery does not unduly burden the right holder. The FIG also suggested that the system should have *security* provided through the *quality* of the land information so that banks are certain of the ownership when offering mortgage; be *clear and simple* to understand and to use as complicated procedures slow down the system and may discourage its users; be *timeless* by offering updated land information; and be *sustainable* which implies its maintenance over time. As the Land Information System is more about the procedures and techniques to collect, maintain, analyze and distribute land information (Dale & McLaughlin, 1999); the FIG criteria are very much oriented on the quality of the system in the line to satisfy its users among which they are customers (right holders).

Chimhamhiwa *et al.* (2009), in their framework that shows a well performing business process in land administration, come again on *reduced cost* of the process that include activity and process cost. They talked about an *improved quality* of the issued documents offered by the system and this results from the quality of the stored information (FIG, 1995). The designers of the assessment framework also added a *shorter time* that the whole process should take; *technological continuous improvement* in data management; *higher customer satisfaction* as they are the recipients of the process output and *higher reliance with society goals* which are the land administration functions (land valuation, land market, land use control, land development (Enemark, 2004)). The authors cover mostly the technical aspect of the updating process also very important for the customer satisfaction.

The same aspects about cost, time and customer satisfaction were touched by Enemark (2013) but with much emphasis on the updating of the spatial land information especially in the developing world. The focus should first be to provide a complete spatial framework that may be upgraded and updated whenever necessary (Enemark, 2013). For Enemark (2013), the maintenance process would be possible if it is supported by the use of infrastructures that are *simple; faster; cheap; reliable; sustainable* and *free of corruption*. The author talked of the *fit for purpose* of the process that should base on the country context rather than the adoption of more advanced technical standards. For him, the security of tenure does not require boundary accurately surveyed. The important aspect is to know what relation connects a specific right to a land parcel. Accurate surveys may be for a high value to the urban areas while in the rural area general boundary approach by the use of imagery may be sufficient (Enemark, 2013).

The World Bank (2013), in the Doing Business report, sets out key points to measure the way a country is performing the property registration as a way of enhancing its business activities. This report, annually done for all countries in the world, comes again on the aspects of cost and time that the process takes, to assess how easy the property registration in a country is. The countries ranked first are those with *few steps* in the registration process; *less days* that the process takes and *low fees ratio* comparing to the property value. For 2013, Georgia was ranked as the first country in the world having the easiest property registration

with one step, two days to register and 0.1% of the property value as registration fees while Nigeria was the last on the list with 13 steps; 86 days and 20.8% of the property value as registration fees (The World Bank, 2013). In 2013, Rwanda was the 63th among 182 ranked countries, with 5 steps; 25 days and 5.6% of the property value as registration fees (The World Bank, 2013). These criteria from the World Bank reflect how the procedures in property registration assist or impede the land market of a country.

The Land Governance Assessment Framework (LGAF) (Deininger *et al.*, 2012) is a tool promoted by the World Bank to analyse and assess the legal framework, policies, and practices in land governance of a country and to monitor progress over time. The tool uses five thematic areas that are: legal and institution framework; land use planning, management and taxation; management of public land; public provision of land information; and dispute resolution and conflict management. Each thematic area has a number of indicators to be used in the assessment. The specified indicators for the fourth thematic about public provision of land information are *transparency* in a way fees are fixed and collected; *completeness of the register* especially the spatial land information that should have a unique identifier; *reliability* of the land register with updated information on right holder; *cost effectiveness*, *accessibility* and *sustainability* of the land services as users revert to informalities if the registration fees are high (Deininger *et al.*, 2012). The completeness and the quality of the land information stored by the system are the basis for the updating process. So, they have to be ensured or, at least, the level on which they are, known to ensure the success of the updating process.

The improvement of the land governance is again addressed by the Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the context of National food security (FAO, 2012). The guidelines talked about transfer and other changes in tenure rights and duties. They proposed that the changes in land rights should be *regulated by the law*, also said by Larsson (1991) and Henssen (2010). The State should keep *simple* the administration procedures to encourage and allow everyone to participate in the land market. Also the land register should be *accessible* to allow people to confirm the real right holder and thus avoid risks of transactions if there is something wrong.

Some of the above authors share a common understanding on some aspects in the assessment of the quality and the performance of a land information system. The aspect of *time* that the process takes; *accessibility* to both land offices and land information; *cost* of land services; and the *quality* of land information which leads to *security* of both land information and transactions come more than once. Other aspects like *concentration* and *decentralisation of land services* may be added on the list as they could remove obstacles for the right holders in the reporting of changes in land information. These following aspects guided the data collection described in chapter three and the definition of the design requirements under the fourth chapter.

2.2. Workflow modelling technique

2.2.1. Defining a workflow

Zur Muehlen and Indulska (2010) define a workflow as a set of tasks organised in order to perform a business process such as processing order for phone purchase, processing insurance claims, etc. They mentioned that the workflow also describes conditions or requirements under which tasks are performed and controlled. This flow of tasks can be either between one or more computer applications; or one or more people; or a combination of the two (Zur Muehlen & Indulska, 2010). For Aguilar-Savén (2004), a workflow is more than a technique. It is also a method to analyze and improve a process, including its modelling. A workflow allows an inclusion of all works to be performed, no work is left behind; it is easy

to learn; facilitates improvement as it is easy to make changes; and it can be cross organisational as different systems can be combined (Aguilar-Savén, 2004).

In this research, a workflow refers to a designed activities process describing a type of change in land information, requirements to register the change, actors involved, their tasks and/or roles, techniques to be used and the place where the change registration is processed

2.2.2. Workflow modelling

Heloisa and Mitchell (1996) state that workflow technology has been effective in specifying, executing, monitoring, and coordinating the flow of tasks within a distributed environment while reinforcing flexibility. This can be done using a Workflow Management System that enables automation of the process between human and tasks of a business process (Aversano *et al.*, 2002). Some of the benefits of this technology include planning and synchronisation of tasks; monitoring the implementation and completion of tasks; creation of a well documented and monitored environment which facilitates the analysis of the tasks, processes and ways an institution structures its businesses (Heloisa & Mitchell, 1996). However the workflow technology reduces human contact as everything is remotely controlled which even leads to a lack of motivation as people feel controlled (Aguilar-Savén, 2004).

The workflow management includes *process modelling* to describe the flow of activities; *process reengineering* to optimise the process; and *workflow implementation and automation* that requires technology to use information system and human performance to implement, plan, execute and control the tasks as described by the workflow (Mentzas *et al.*, 2001). In this research, the *process modelling* is the technique used to describe the existing situation in the updating of land information in Rwanda.

The process modelling requires identification of workflow elements such as tasks, actors, information systems, human skills, useful to capture an abstract process into a workflow (Mentzas *et al.*, 2001). The approach was used by Chimhamhiwa *et al.* (2009) and (2011) when measuring the land administration business processes whose activities were dispatched into different organisations. A number of requirements got from the investigations, workshops, conference feedback and different literature was selected and used to assess the existing business process. This allowed identifying areas that need improvement and suggestions are proposed by the authors.

2.2.3. Other modelling techniques

A workflow is one of the nine most frequently modelling techniques used in business process (Aguilar-Savén, 2004). Other modelling techniques are: (1) *Flow charts*; (2) *Data flow diagram*; (3) *Role activity diagram*, (4) *Role interaction diagram*, (5) *Gantt Chart*, (6) *Integrated Definition for Function Modelling*, (7) *Coloured Petri-net* and (8) *Object Oriented methods*. All these modelling techniques allow to their users to learn about a process, to make decisions on the process or to develop business process (Aguilar-Savén, 2004). All of these can be done using various modelling languages or notations or graphics that allow a representation of the process by specifying, step-by-step, activities that need to take place in order to perform an action (Zur Muehlen & Indulska, 2010). As there is no particular notation for workflow modelling, the *Unified Modelling Language* (UML) is used in this research to model the workflow for updating land information in Rwanda.

2.2.4. Unified Modelling Language

The Unified Modelling Language (UML) is a graphical representation that can be used in process modelling although it was specifically developed for information system (Glassey, 2008). It is a language that allows to specify, to visualize, to construct and to document business process as well as software systems (Aguilar-Savén, 2004).

The UML comprises nine diagrams: (1) *user case diagram* that presents the system function from user point of view; (2) *class diagram* which shows the static structure of a system; (3) *object diagram* that describes objects and their relations (object is an element of the class); (4) *sequence diagram* that illustrates the interaction between objects on temporal basis; (5) *collaboration diagram* that presents the interaction between objects in a structural way; (6) *state diagram* that shows the dynamic behaviour of an object in terms of states, transitions and events; (7) *activity diagram* that describes the flows circulating between activities within a system; (8) *component diagram* that illustrates the physical implementation of a system in terms of software components; and (9) *deployment diagram* that shows the configuration of executable and related components (Glassey, 2008). This research uses the activity diagram to model the structure of the updating process.

In land administration, the UML activity diagram is often used to model processes. For example it was used by Zevenbergen *et al.* (2007) to design the real property transactions across European countries. One of the aim of the research was to provide a comprehensive and comparable description of real property transactions (Zevenbergen *et al.*, 2007). Even if the legal terms used in transaction differ country by country; the research managed to produce a comparable step by step description of rights transfer for several European countries using UML activity diagram.

2.3. The land information system in Rwanda

Rwanda is a country of 26,338 squares Km; divided into 4 Provinces plus the capital of Kigali City; 30 Districts; 416 Sectors; 2,148 Cells; and 14,837 Villages (the smallest administrative unit). In regards to land information updating, two main phases can be identified in its history in Land Administration. The first phase concerns the establishment of the land information system with a systematic land registration started in 2005. Before this year, land belonged to the State and the citizens only have rights on improvements (The World Bank, 2010). The second phase is the updating of the land information that is the aim of this research.

2.3.1. Establishing the land information system in Rwanda

The land information system in Rwanda was established through a systematic land registration under a program called Land Tenure Regularization, first, with trials in 2005, and in 2009 with a nationwide. The program was an implementation of Land Policy approved in 2004 followed by the Organic Law of 2005 which later on became a Land Law in June 2013 (Government of Rwanda, 2013). The Land Tenure Regularization program was aiming to provide legally valid land documents to all rightful claimants in Rwanda (RNRA, 2012). The information on land were collected in participatory manner : land parcels were demarcated by grass root surveyors on high resolution ortho – photo or on enlarged satellites images while the claims on the land were assessed on the field by the neighbours with an intervention of the local authorities where required (RNRA, 2012). The summary report of 31th May 2013 on this program gives about 10.4 million of registered parcels; 8.8 million of printed land lease certificates within which 5 million were collected by their owners. This is a positive progress done by Rwanda in documenting all land rights under its territory and gathers information in a digital National Land Register (Byamugisha, 2013).

2.3.2. Land information updating in Rwanda

Rwanda has 5 Offices of the Registrar of Land Titles corresponding to 4 Provinces plus the Kigali City and 30 Districts Land Bureaus located in 30 District Offices. The process of updating land information starts from the District Land Bureau where the applications are submitted and sent to the Office of the Registrar of Land Titles for processing. The process ends at the Department of Lands and Mapping where

the national land information database is centrally managed (RNRA, 2012). By considering the usable area of Rwanda which is 20,635 square kilometres excluding lakes and national parks (The World Bank, 2010); a District can have in average 349,362 parcels (the total parcel is 10.4 Million - Summary report on Land Tenure Regularization Program of 31th May 2013) on a usable area of 687.833 square kilometres.

No matter how quick the National Land Register was established, considerable efforts are still needed to organise the updating of the registered land information (Henssen, 2010). To support this, the procedures should be kept simple in order to motivate the rights holders to report changes. Difficult procedures slow down the process and discourage their users (Ali *et al.*, 2013). In this regard, the government of Rwanda has undertaken some actions:

- (i) A **ministerial order determining the modalities of land registration (2008)** pursuing the National Constitution of 2003 and the Organic Law of 2005 determining the use and management of land in Rwanda. This organic law was repealed in 2013 by the Law governing land in Rwanda. The ministerial order includes the establishment of a Register of Land Titles; procedures for registration of titles and other interests in land; and transfers of land and related matters (MINIJUST, 2008).
- (ii) A **procedures manual** describing how to register changes in land information published in 2012 and in use in the updating process (RNRA, 2012). The document explains different types of changes in land information recognised in Rwanda; actors involved in the process and their roles; required documents; and forms to be used when applying for change registration. The Unified Modelling Language is used through activity diagrams to illustrate the process of change registration.
- (iii) A **Land Administration Information System (LAIS)** as a web based land registration tool developed to ensure a proper land management and land administration; and specifically maintenance of the land certificates issued to the right holders during the registration (RNRA, 2012). The system comprises a data store and a processing capacity held centrally. The users at the regional offices are able to interface with the system using a web browser via internet (RNRA, 2012).
The name of this system reflects, at the same time, the "*Land Administration System*" as an infrastructure to implement land policies and management for sustainable development (Williamson *et al.*, 2010); and the "*Land Information System*" as a system to collect, maintain, analyze, disseminate and use of land-related information (Dale & McLaughlin, 1999). This is show the double role that LAIS has to play in the administration of lands in Rwanda.
- (iv) The **Rwanda Land Administration Enhancement Project (R-LAEP)**, operating under the Department of Lands and Mapping, is supporting the updating phase. Its objectives are to reduce the procedures, time and cost of change registration in Rwanda in order to foster a conducive investment climate. Some activities are to be done, like: 1) operationalization of LAIS in all 30 Districts in Rwanda; 2) a fully integration of legal and spatial land information; 3) a response to requests for sharing land information with other stakeholders, and so on (RNRA, 2013).
At the time of the field work (October 2013), this project has started the operationalization of LAIS in almost 20 Districts across the country.

The current main concern in Rwanda is how the land information should be updated in order to be disseminated to the users to provide them useful information. There are still some issues relating to the

registration fees and the capacity building of the district land staffs who have to maintain and sustain the land information and land registration system (Byamugisha, 2013).

2.4. Summary

The land information system is in the core of the land administration. To make it useful, the changes in land information have to be reported as soon as it happens to keep the system up to date. The speed on which the report is done depends on how the updating workflows are designed. The workflow modelling that uses the Unified Modelling Language can help to structure the process and see where obstacles, that may discourage the right holders, are. Rwanda, as a country where the land information system is still under implementation, the design of the updating workflows should respect the requirements. Those ones have to remove the obstacles for the right holder when reporting changes.

3. RESEARCH METHODOLOGY

The above chapter provides details on the updating of land information and the workflow modelling technique used in this research. The Unified Modelling Language (UML) is the notation adopted to illustrate the updating process. As explained in the second chapter, a process modelling describes the flow of activities (Mentzas *et al.*, 2001). This requires the identification of workflow elements including actors, tasks, information system, human skills and so on (Mentzas *et al.*, 2001). For this reason, the data collection was conducted to get all the information on the existing workflows for updating land information in Rwanda.

The Figure 1.1 gives a generalised view of the research methodology covered under this chapter. Two main sections are covered here. The first section explains in more details the techniques used in data collection as presented in the Table 1.1. The second section describes the process followed in the design of the new workflows for updating land information.

3.1. Data collection

The data collection is mainly based on a field work done in Rwanda from 30th September up to 24th October 2013. The purpose of the field work was to capture and understand the “*as is*” situation of the workflows of updating of land information in Rwanda. The selection of the field area; the workflows cases; and the techniques used in the data collection are explained below.

3.1.1. Field area

During the field work, not all the 30 District Land Bureaus that are in Rwanda were visited due to time limitation even if it could have given a real picture of the existing situation of updating of land information. One District Land Bureau (DLB) was visited and the corresponding Office of the Registrar of Land Titles (ORLT) where the bureau is located. The selection criteria were: a District outside the Kigali City; with a mixture of urban and rural land use and a big number of land information changes reported. As the reports on registered changes in land information were not easy to get before the field work; the selection was based on a survey report on household living conditions done by the National Institute of Statistics of Rwanda (2011). In this report, the Northern Province had the highest rate of purchased land in 2011 (17%). So, Musanze as a District of this province having a mixture of urban and rural land use was chosen as place for field work.

Musanze is one of the five Districts of the Northern Province (Figure 3.1) with an area of 530.38 square kilometres. 476,655 was the number of demarcated land parcels among which 421,555 (88.4 %) have complete information in the land register (Summary report on Land Tenure Regularization Program of 31th May 2013). Its District Land Bureau has one District Land Officer (who also is a land notary); four District surveyors; one LAIS Professional and two Archivists, as actors participating in the updating of land information. The updating workflows studied in this land bureau were: transfer of rights through parcel donation and parcel subdivision as two of the three land information changes to be dealt by this research (Figure 3.2).

For the mortgage registration, the Office of the Registrar General in the Rwanda Development Board and the KBC Bank Rwanda were visited as the institutions participating in this workflow.

3.1.2. Land information changes cases study

In Rwanda, there are 24 types of land information changes (Figure 3.2) where each one has a specific workflow for updating. This research does not deal with all of these land information changes. Based on the identified obstacles explained under the Section 1.2 in the research problem; three changes (highlighted in the Figure 3.2) are used as cases study. The transfer of rights through parcel *donation* is a land information change which does not involve money as the parcel is acquired as a gift. This is why this it was chosen to see how the obstacles linked to the high registration fees may be resolved. A second change chosen was the parcel *subdivision* referring to the accuracy mismatching between new and existing measurements. The surveying process can delay the whole updating process due to this issue. So, it is worthy to propose how this can be efficiently done to fasten the updating process. The last land information change was the *mortgage* registration. As explained early, this change is registered by a separate institution. So it is important to see how the information sharing is to be done to have all changes added in the land register but also to avoid transaction that may occur on a mortgaged parcel without being aware of it.

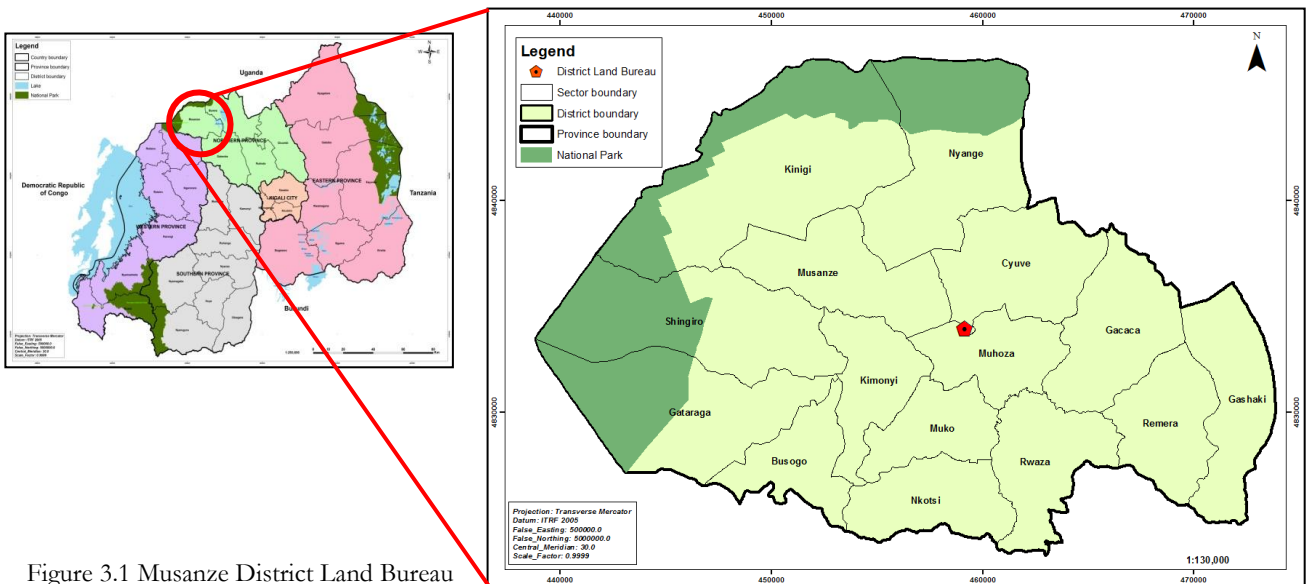
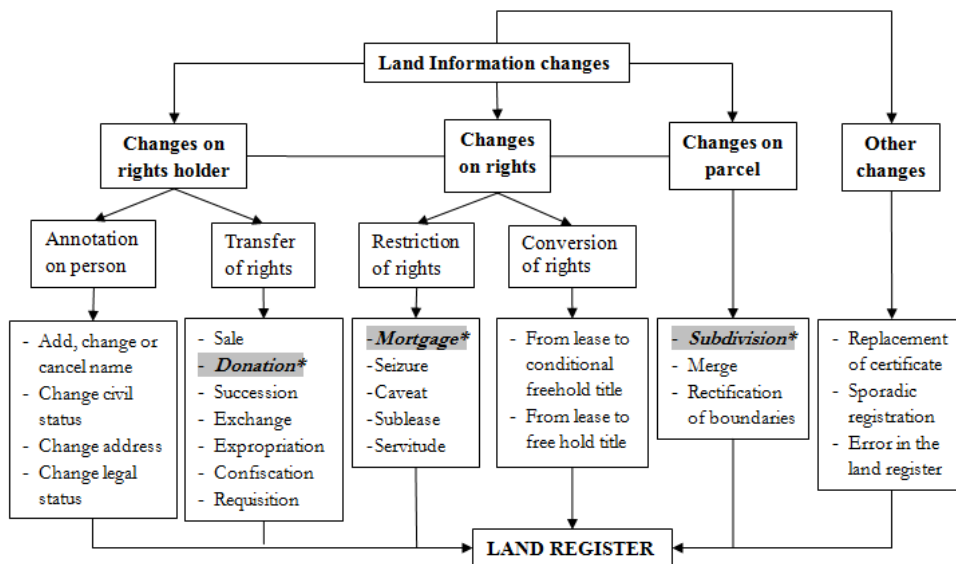


Figure 3.1 Musanze District Land Bureau



Highlighted* Type of changes in land information that the research focuses on.

Figure 3.2 Types of changes in land information in Rwanda (adapted from RNRA (2012))

3.1.3. Data collected

To design a workflow for updating land information, a consideration of a set of requirements allows removing obstacles in the process that may stop right holder to report changes. The first step in requirements definition is to collect information about the existing situation to be able to know the present needs from which the requirements are to be generated (Todorovski & Lemmen, 2007). The needed data (Table 3.1) were collected based on open questions for interview (Annex 2). The elements that generated the questions were from the literature on updating requirements (Section 2.1.3). Those elements were chosen based on the obstacles identified in the procedure manual on updating in Rwanda before the field work. The identified obstacles were: *long travel distance to the land office; high registration fees; mortgage separately registered by another institution and accuracy mismatching between existing and new measurements.*

Data needed	Element	Description
Process	Actors involved	Every internal or external actor who gets in touch with the application was considered.
	Tasks performed	Each activity done on the application is considered from <i>application preparation</i> up to the <i>issuance of a new land certificate</i> .
	Offices	Each place where the applicant has to go when inquiring services related to the registration of land information change was considered.
	Physical presence	Whenever the applicant has to be physically present at the office where the change is reported was considered.
Surveying approach	Surveying tools	Tools used to take new measurements when there is changes in spatial land information especially parcel subdivision.
	Skills	Type and level of education needed to manipulate the surveying tools.
	Accuracy	Accuracy on which new measurements are taken.
Registration requirements	Required documents	Type of documents that the applicant has to include in the application file.
	Required payments	Type and amount of money that the applicant is supposed to pay for the request to be processed.
Information sharing	Access to land information database	Actors involved in the process of updating who have, at least, the right to view the land information.
	Conditions to have access	Conditions that an actor has to fulfil in order to get access to the land information database.
	Level of access	Level on which actors can access and use the information from the database.
	Quality checking	Type of checking done before changes are included in the database.
	Actor who checks	The position or role of the actor who does the quality checking of entered data.

Table 3.1 Needed data and elements for workflow assessment and design

3.1.4. Interviews

Different external and internal actors involved in the updating of land information were identified and interviewed. The questionnaires for interview are in the Annex 2.

External actors (Table 3.2) are right holders (customers) met at the Musanze District Land Bureau coming to report a change in land information or to collect a new land certificate. A respondent was a person who accepted to answer interview questions. Some right holders refused to be interviewed either because they were in hurry to find out the missing documents or they were unhappy of what they got as responses to their applications or they were not sure for what the answers are to be used even if an introduction was given before the interview starts. The number of interviewee was not a matter here as the objective was to understand the existing workflows. So, the seven right holders who accepted to be interviewed provided sufficient information about the process followed when reporting changes in land information. They are the ones who know the obstacles that stand in their way when reporting a change. They are, as well, the ones who initiate the updating process by coming to report a change. The customer questionnaire is in the Annex 2.

Respondent number	Type of land information change	Reason of coming to DLB
1	Parcel registration	Collect land certificate
2	Parcel registration	Collect land certificate
3	Rights transfer through parcel donation	Ask for information
4	Rights transfer through parcel selling	Collect land certificate
5	Parcel registration	Look for a District surveyor
6	Remove a caveat	Submit application for checking
7	Rights transfer through parcel donation	Sign transfer agreement

Table 3.2 External actors interviewed

The internal actors (Table 3.3) are those working for one of the institutions participating in the updating of land information. It is worthy to know what they do and how they do it in order to understand the existing workflows. The service offered to the applicant depends on how the internal workflow is organised. According to Chimhamiwa *et al.* (2011), in a cross organisational workflow, a poor quality of application documents received upstream congest the checking activity downstream as incomplete applications are rejected and returned backwards. That is why internal actors in the workflow of updating land information were also interviewed. The questionnaires used are the Annex 2.

There are other unstructured interviews had with the right holders whose land parcels were going to be surveyed and with the two grass root surveyors operating at the Office of the Registrar of Land Titles. Those grass roots surveyors participated in the systematic land registration and they were kept in order to assist the GIS Professional. When there is an accuracy mismatching between the initial and the new measurements, they are sent back to the field to do a checking by using a printed map on which the two measurements are overlaid on the aerial image. They contact the right holder and meet her/him on the field.

Office	Position	Role in updating	Number
District Land Bureau (DLB)	District Land Officer (DLO)	- Heading the District Land Bureau; - Land notary.	1
	District surveyor	- Field surveying; - Produce cadastral plan.	1
Office of the Registrar of Land Titles (ORLT)	Deputy Registrar of Land Titles (DRLT)	- Heading the Office of the Registrar of Land Titles; - Approves the changes in land information.	1
	Professional in charge of Land Registration (PLR)	- Checks the applications before being processed; - Orient the applications.	1
	LAIS Professional	- Scan and upload, into LAIS, the application documents on non spatial land information; - Process requests on non-spatial land information; - Print and seal the new land certificates.	1
	GIS Professional	- Scan and upload, into LAIS, application documents on spatial land information; - Process requests on spatial land information.	1
Department of Lands and Mapping (DLM)	IT manager	- Manage the national land information database and its accessibility.	1
	Coordinator of GIS Unit	- Coordinate all activities and data involving spatial information.	1
Office of the Registrar General (ORG)	Mortgage Verifier	- Check the electronic applications to register mortgage.	1
Kenya Commercial Bank (KCB) - Rwanda	Legal Officer	- Scan and upload the application documents into Electronic Mortgage Registration System; - Produce an Abstract of Mortgage Agreement.	1

Table 3.3 Internal actors interviewed

3.1.5. Direct observations

Direct observations in the offices were done to see how changes in land information are reported, checked and recorded into the systems. It allowed seeing how applications are received and checked; required documents and payments. The visited offices dealing with the updating of land information due to parcel donation and parcel subdivision were: the District Land Bureau; the Office of the Registrar of Land Titles in Musanze and the Department of Lands and Mapping in Kigali. For mortgage registration, the Kenya Commercial Bank - Rwanda and the Office of the Registrar General were visited too. Five field visits were also done in Musanze District: two parcels surveyed with the District Surveyor and three parcels checked with the grass root surveyors.

3.2. Modelling process

The modelling process as showed by the Figure 1.1 was carried in four steps described below:

Step 1: Data presentation

The primary and secondary data were put together and presented based on the elements used in data collection. It allowed understanding the existing workflows for updating land information in Rwanda as it was explained by the interviewees. The three workflows of transfer of rights through parcel donation; parcel subdivision and mortgage registration, that are the focus of this research, were modelled using UML activity diagrams.

Step 2: Data analysis

An analysis was made on the three modelled workflows that present the existing situation in the updating of land information in Rwanda. Interviews and direct observations from the field backed this analysis. This combination of information allowed identifying achievements so far performed in the updating process and the remaining obstacles that may disturb the right holder when reporting changes.

Step 3: Define the requirements for design

The identification of obstacles revealed where improvements are needed. From each obstacle, a number of design requirements were defined. The requirements were structured based on the aspects to be considered when assessing system performance as suggested by authors under the Section 2.1.3. Each aspect was linked to a specific obstacle in the updating process.

Step 4: Design new workflows

Based on the defined design requirements, two new workflows for updating land information were designed and presented using the UML activity diagram. The design of those workflows was in a way that respects the defined requirements.

Step 5: Validate the new workflows

The validation, as the last part of the process, was done in two ways:

- Assessing the requirements: The existing situation was compared to the new situation proposed by the new workflows. The assessment was to check if the design requirements were respected and the highlighted obstacles were removed or not.
- Focus group discussion: The designed workflows were presented to a group of 5 Rwandan students working for the Department of Lands and Mapping at different levels. The discussion allowed analysing if the new workflows will improve the updating process in Rwanda.

3.3. Summary

Under this chapter, detailed explanations of the data collection techniques and modelling process are provided. The selection of the study area and the three changes in land information covered by the research are also explained. The next chapters four and five provide the results generated by the use of this methodology.

4. EXISTING WORKFLOWS FOR UPDATING LAND INFORMATION IN RWANDA

The previous chapter on research methodology gives a general view of the modelling process used in this research also illustrated by the Figure 1.1. This chapter presents, in the first section, activity diagrams of the existing workflows to update land information in Rwanda. Three workflows are presented: parcel donation, parcel subdivision and mortgage registration. Each workflow is described in three main steps that include application, change processing and issuance of new documents. The surveying part is specific for parcel subdivision. The second section comes with an analysis of those workflows by pointing out the achievements so far performed in the process of updating in Rwanda and the remaining obstacles that may disturb the right holder when reporting changes. The third section is about the requirements to be respected in the design of the new workflows so that obstacles can be removed. They are defined based on the literature (Chapter 2) and updated based on the data collected in the field (Chapter 3).

4.1. Workflows to update land information in Rwanda

The updating of land information in Rwanda is underpinned by a procedures manual describing how the registration of changes in land information is to be done (RNRA, 2012). The manual describes, by the use of activity diagrams, the updating workflows made of actors; steps or tasks; and the requirements for the application to be accepted. However, the described workflows are a bit different from what the field data collection revealed. This is for example the processing of the changes in land information handled at the Province level instead of District level. When interviewed, the Deputy Registrar of Land Titles of the Northern Province explained that the updating system is under implementation and services are being moved slowly by slowly at the District Land Bureau. He also agreed that more efforts are still needed to strengthen those bureaus in term of equipments and human capacity building to allow them to maintain and sustain the land registration system. Thus, the three selected workflows for updating land information are presented “*as is*” at the time of the field work based on the primary and secondary data collected at that time. Each modelled workflow has a table and an activity diagram that clarify the process.

4.1.1. Updating land information due to parcel donation

Donation is a change in non-spatial land information where rights are transferred from a Donor to a receiver through a gift (RNRA, 2012). The transfer can be for the whole parcel or for just a part of it. If it is only a part, the right holder first apply for parcel subdivision and gets two or more certificates on her/his name (depending on the parts to be produced) and then transfers the concerned part. The workflow for registering the change in land information due to parcel donation can be divided into three main steps where different tasks are performed by different actors (Figure 4.1).

- (1) **Application:** To know what the requirements are, most of the right holders interviewed said that they came to the District Land Bureau (DLB) to ask for that. After knowing what to bring, the right holder compiles the required documents as listed in the Table 4.1 provided at different places: certificate of marital status provided by the Sector office (three months of validity); application form obtained at the DLB; and the payment slips obtained from the bank after paying the required fees. The type of required payments and the amount to be paid are given in the Table 4.1. The right holder takes the application file to the LAIS Professional at the DLB. This one checks if the application is complete and all documents valid. He then prepares a transfer agreement that is checked and signed by the Donor (with her/his spouse when applicable) and the Receiver plus two

witnesses for each party (Donor and Receiver thus four witnesses). After both parties have signed, the District LAIS Professional takes the application documents to the District Land Officer (DLO), who is a land notary, to notify the transfer agreement. This can be done on the same day or on a different day depending on the availability of the DLO. The Donor comes back to collect the application file with a notified transfer agreement and take it to the District Reception. The DLO of Musanze explained that: *“All letters that enter the District are addressed to the Mayor of the District. That is why they have to pass by the reception before they get to the concerned unit that has to process the application”*.

As the donation acceptance letter is addressed to the District Mayor, the Donor submits the application at the District Reception and gets a copy of the application letter with a stamp of the date the application is received. The Receptionist brings back the application file to the DLB where the District LAIS Professional takes the documents to the Office of the Registrar of Land Titles (ORLT) for processing. In the Northern Province, the ORLT receives the applications from the DLB on Tuesdays and that is even when the District LAIS Professional collects the processed applications. The DLO of Musanze explained that: *“It is an agreement between the DLBs in the Northern Province and the ORLT to allow those who process the applications to have enough time to process the applications”*.

- (2) **Processing:** At the ORLT, the application is received by the Assistant of the Deputy Registrar of Land Titles (DRLT) who manually records, into a book of entries, the name of the applicant and the reason of application. This Assistant of the DRLT is the one also in charge of taking the application file from one desk to another and every time she records who has the application file to avoid that the documents may be lost. Also, every person at the ORLT who receives an application puts, on the first page, a comment of what s/he did or what s/he wants the next actor to do and signs.

So, the Assistant takes the application to the Professional in charge of Land Registration (PLR) who, again, checks the completeness and the validity of the received documents. As she has access to LAIS (Table 4.1), she verifies, in the land register, if the Donor is the real and only right holder. If everything is correct, the PLR takes the application to the LAIS Professional (at the ORLT) for processing. If there is something wrong in the application, s/he takes it to the DRLT who approves its rejection. The Assistant collects the rejected applications from the DRLT and wait for the District LAIS Professional to come and take them back to the DLB.

For the accepted applications, the LAIS Professional (at the ORLT) scans and uploads the application documents into LAIS and the application gets *“accepted”* status. She then updates the database with the name of the new right holder and the application is electronically sent to *“processed”* where the DRLT finds it for approval. The DRLT checks if the change was done according to the provided documents and approves the transfer. The status of the application becomes then *“approved”* and the change is saved in the database. The LAIS Professional prints and seals new land certificates for all approved transfers. The status of the application then becomes *“printed”*. She then takes the printed land certificates to the Assistant of the DRLT where the District LAIS Professional collects them together with the rejected applications and takes them back to the DLB. The District LAIS Professional signs, in the recording book in front of each application that he takes back, as way of confirming that the application is no longer at the ORLT.

- (3) **Issuance:** The District LAIS Professional takes all the collected files from the ORLT to the District Archivist. The Archivist records the received documents into the book of entries. After the submission of the application documents, the new right holder (Receiver) is given three weeks to come back to the DLB to get a feedback of the application. After the given time, s/he comes at the DLB and shows, to the Archivist, the copy of the application letter on which there is a stamp of the submission date. The archivist checks in the book of entries. If the new certificate is available, the receiver gets it and signs in the book that s/he takes it. The application documents are then archived

at the DLB by the District Archivist. If the application was rejected and the documents are back to the DLB, the Receiver gets an explanation of what to do so that the application can be processed. If no feedback yet, the Receiver is asked to come back the next Wednesday as the District LAIS Professional goes, on Tuesdays, to the ORLT to collect processed applications.

The Table 4.1 below list the offices where the applicant gets the required documents; the times that s/he has to go to the District during the process; and requirements (documents and payments) for the application to be accepted. It also specifies actor who access the land information database and which type of right they have. The application form filled and signed by the right holder is shown in the Annex 3.

Data collected	Element	Existing situation
Process	Actors and tasks involved	See Figure 4.1. Existing workflow for parcel donation.
	Offices to enter	- Sector office, - Bank, - District Land Bureau, - District Reception.
	Times to come to the District	- Ask for information on how to transfer rights, - Sign donation agreement, - Submit the application at the District reception, - Receive new land certificate.
Registration requirements	Required documents	- Copy of the Donor(s) identity card or power of attorney in case of representative, - Copy of the Receiver identity card, - Marital status certificate of the Donor, - Donation acceptance letter, - Filled application form, signed by the Donor(s) (Annex 3), - Original land certificate, - Payment slip for transfer, - Payment slip for notification, - Payment slip for a new land certificate, - Payment slip to cancel the existing land certificate, - Notified donation agreement signed by both parties.
	Required payments	- 20,000 Rwf (22 Euro*) for transfer fees, - 2,000 Rwf (2.2 Euro*) for notification of the transfer agreement, - 1,500 Rwf (1.6 Euro*) for lease contract cancellation, - 1,500 Rwf (1.6 Euro*) for new lease contract, - 500 Rwf (0.55 Euro*) for marital status certificate.
Information sharing	Access and level of access to land information	Access to the land information of the province they are working in: - Professional in charge of Land Registration -> View, - LAIS Professional (at the ORLT)-> Edit, - Deputy Registrar of Land Titles -> Edit.
	Conditions to have access	The permission granted by the management to get a user account and password from the database administrator.
	Quality check	Done before approving the change.
	Actors who checks	Deputy Registrar of Land Titles

*1Euro = 906 Rwandan Francs (XE Currency Converter, 2013)

Table 4.1 Existing situation for updating land information due to parcel donation

The change in land information due to parcel donation involves 6 internal actors, plus the Donor and the receiver as shown by the Figure 4.1. The Assistant of the DLRT and the District archivist are omitted in

the figure to simplify the activity diagram. The diagram illustrates the tasks and actors performing them; and the offices (represented by colours) where the application passes to be processed. The dashed circle represent the times that the applicant comes to the District .The grouped arrows are interactions done on a same day. The District Land Bureau and the Office of the Registrar of Land Titles are located at different places (buildings).

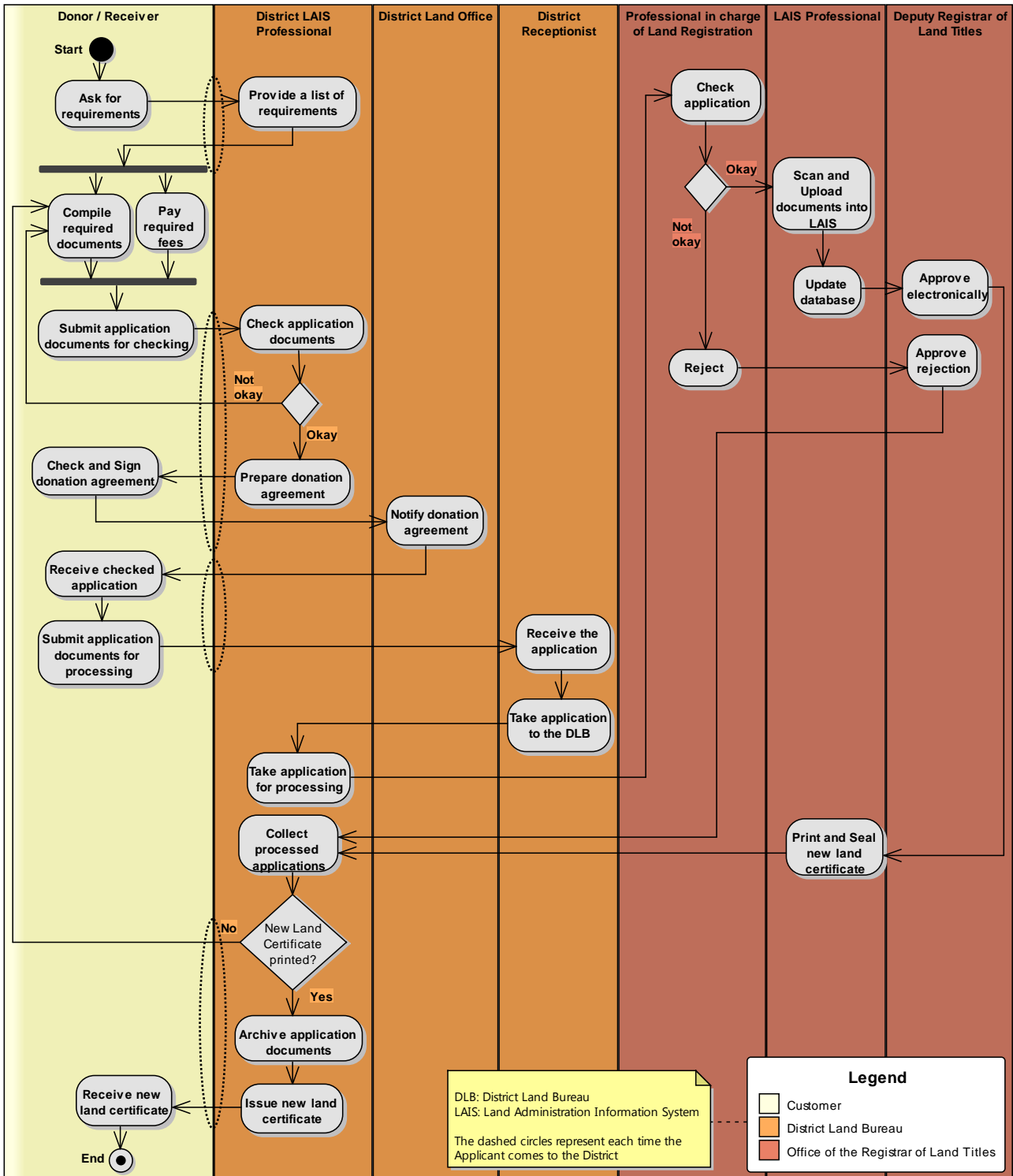


Figure 4.1 Existing workflow for parcel donation

4.1.2. Updating land information due to parcel subdivision

Subdivision is a change in spatial land information where the parcel is split into two or more parts (RNRA, 2012). The split can be followed or preceded by another change in the land information. If this is the case, the right holder follows two separate processes. For example: a parcel for which the land use is agriculture, the area of each part to be created has to become at least 1 hectare. If the area will be less, the right holder has to apply, first, for land use change from agriculture to residential; and then subdivides the parcel (as there is no restriction of area for residential). The workflow for registering the change in land information due to parcel subdivision can be divided into four main steps where different tasks are performed by different actors (Figure 4.2).

- (1) **Application:** The right holder goes to the District Land Bureau (DLB) to ask for requirements. S/he compiles required documents as listed in the Table 4.2. The type of payments and the amount to be paid are given in the Table 4.2. The application file is given to the LAIS Professional at the DLB to check the validity and completeness of the documents. The District LAIS Professional handles the application to the District Surveyor who makes an appointment with the right holder for the field measurements. The appointment can be on the same day or on a different day depending on the availability of the District Surveyor. If it is a different day, the District Surveyor calls the applicant the day before the field measurements as a reminder and also to ask where exactly the parcel is located.

At the time of the field work, the right holder paid the transport for the District Surveyor when he came for surveying. When interviewed, the District Surveyor explained that: *“The District has a car and a motorbike. However, they are used for all activities at the District that requires transport. So, when they are not available or broken down, we ask the right holder to arrange for us transport as there is no other way to get to the parcel. It can either be her/his own car or s/he pays for us a public transport (mostly motorbike).”* It is the right holder, herself/himself, who pays the driver. No money is given to the District Surveyor.

- (2) **Surveying:** The District Surveyor, guided by the right holder, uses a hand held GPS (picture shown in the Annex 5) to take the coordinate points. S/he starts with the entire land parcel, and then takes two or more coordinate points of the new boundary that splits the parcel into two or more parts depends on the shape of the parcel or the new boundary to be surveyed. According to the District Surveyor, the accuracy on which the coordinate points are taken is not above 3 meters even though it is rare to have 2 meters.

The Musanze DLB has other surveying tools like the electronic distance measuring wheel (picture shown in the Annex 5) used when the sky is not clear; and the total station used for big areas for the purpose of spatial planning. But these tools were not used at the time of the field work.

After the measurements, the District Surveyor tells the right holder when the cadastral plan will be ready so that s/he can come to take a complete application to the District Reception. Once in the office, the District Surveyor prepares the cadastral plans that equal to the number of new parcels to be created. He then takes the application documents to the District Land Officer who approves the cadastral plans by his signature and stamp. After approval, the District Surveyor keeps the application file and waits for the applicant to come and take it to the District Reception. When the Reception receives the documents, the applicant gets a copy of the letter on which it is stamped the date of submission. The Receptionist brings back the application at the DLB and the District LAIS Professional takes it to the Office of the Registrar of Land Titles (ORLT) for processing.

- (3) **Processing:** At the ORLT, the Assistant of the Deputy Registrar of Land Titles (DRLT) records the name of the applicant and the purpose of the application into the entries book. The Assistant then takes the file to the Professional in charge of Land Registration who checks and verifies, in the

land register using LAIS, if the applicant is the real and only right holder. If everything is correct, the Assistant takes the application to the GIS Professional for processing. If there is something wrong in the application, the Assistant takes it to the DRLT who approves its rejection. The rejected application is kept by the Assistant until the District LAIS Professional takes it back to the DLB.

The GIS Professional scans and uploads the documents of accepted applications into LAIS. The application gets a status of “*accepted*”. After that, he plots the coordinate points on the cadastral plans into Excel sheet; visualises them in Arc Map; projects and overlays them on the existing measurements. The existing shapefiles are kept on the server where they are copied when they are going to be edited. If the new measurements of the outer boundary match the existing boundary, the GIS Professional splits the parcel based on the coordinate points of the new boundary. He then gives new Unique Parcel Identifiers (UPI) to the created parcels and uploads the edited shapefile into LAIS. A search into the database can be done by using either the old UPI or any of the new UPIs. If the old UPI is used, the whole history appears as filled in the attribute table: the UPI that produced two or more UPIs (also visible in the database), and the type of change that caused this.

The GIS Professional then writes a report with a map explaining what he did and he uploads it into LAIS together with other application documents. The application is sent to “*processed*” for approval. The DRLT approves the change after checking if it was done according to the provided documents. The status of the application becomes “*approved*”. The LAIS Professional prints and seals new land certificates for all applications, in the system, with “approved” status. The status of the application then becomes “*printed*”. She takes the printed land certificates to the Assistant of the DRLT.

In case the coordinates do not match with the boundary of the concerned parcel a field checking is required to see where the mistake is. The Annex 4 shows a map of a mismatching between the new and the existing measurements that requires a field checking. This field checking is done by two grass roots surveyors operating at the ORLT. They call the applicant to fix an appointment and ask her/him to contact the affected neighbours, if any, to be present during the checking. Once on the field, the grass roots surveyors use a printed map on which there are both new and initial measurements (map shown in the Annex 5). They do observations by discussing with the applicant and neighbours (if any). When possible, the grass roots surveyors draw, on the map, the situation as found on the field; and as explained by the applicant and presents neighbours. A field report is orally explained to the applicant and the present neighbours. They then sign on a form where the report will be written and put their contacts. Once in the office, the grass roots surveyors write the report and handle it to the GIS Professional. When the problem is resolved, the GIS Professional proceeds with the request. If not, the file with the field report is taken to the DRLT for the final decision. In case of rejection, the DRLT writes on the first page what should be done on the application to be processed and signs.

The District LAIS Professional collects all the processed files from the DRLT Assistant and takes them back to the DLB.

- (4) **Issuance:** The District Archivist records, into the entries book, all files taken from the ORLT. Three weeks after the submission of the documents, the applicant comes back to collect the new land certificates all on her/his name. S/he shows the copy of the letter on which there is a stamp of submission date and the District Archivist checks into the received files. If the new certificates are available, the applicant gets them and the application documents are archived at the DLB by the District Archivist. If the application was rejected and the documents are back to the DLB, the applicant receives an explanation of what to do so that her/his application can be processed. If no feedback yet, the applicant is asked to wait the next Wednesday as the processed applications are collected on Tuesdays by the District LAIS Professional at the ORLT.

The Table 4.2 list the offices where required documents are enquired; the times that the applicant has to go to the District during the subdivision process; required documents and payments for the applications to be accepted; and surveying tool and required skills to manipulate them. The actors who access the land information database and which type of right they have are described in the table. The application form filled and signed by the right holder is shown in the Annex 3.

Data collected	Element	Existing situation
Process	Actors and tasks involved	See Figure 4.2. Workflow for parcel subdivision.
	Offices to enter	- Sector office, - Bank - District Land Bureau, - District Reception.
	Times to come to the District	- Ask for information on how to do subdivision - Submit application documents for checking - Submit the application at the District reception for processing - Receive the new land certificates
Surveying approach	Surveying tools	- Hand held GPS (Annex 5), - Printed ortho-photo (Annex 5).
	Skills	- Basic surveying skills
	Accuracy	3 meters (for the GPS)
Registration requirements	Required documents	- Copy of the right holder(s) identity card or power of attorney in case of representative, - Marital status certificate of the right holder, - Motivation letter, - Filled application form signed by the right holder(s) (Annex 3), - Original land certificate, - Payment slip for the cadastral plan, - Payment slip for new land certificates, - Payment slip to cancel the existing land certificate - Approved cadastral plan for each of the parcels to be created.
	Required payments	- 10,000 Rwf (11 Euro*) for each cadastral plan to be produced, - 2,500 Rwf (2.7 Euro*) for lease contract cancellation, - 2,500 Rwf (2.7 Euro*) for new lease contract, - 500 Rwf (0.55 Euro*) for marital status certificate.
Information sharing	Access and level of access to land information	Access to the province in which they are working in. - Professional in charge of Land Registration -> View - LAIS Professional (at the ORLT)-> Edit - GIS Professional -> Edit - Deputy Registrar of Land Titles -> Edit
	Condition to have access	The permission granted by the management to get a user account and password from the database administrator.
	Quality check	- Before approving the change, - Before doing a backup on the server.
	Actor who checks	- Deputy Registrar of Land Titles, - GIS Professional

*1Euro = 906 Rwandan Francs (XE Currency Converter, 2013)

Table 4.2 Existing situation for updating land information due to parcel subdivision

The change in land information due to parcel subdivision involves 8 internal actors, plus the right holder as shown by the Figure 4.2. The Assistant of the DLRT; the District archivist and two grass roots surveyors (involved when there is a problem in the new measurements) are omitted in this figure in order to simplify the diagram. The activity diagram details the tasks and actors performing them; and the offices represented by colours, where the application passes to be processed. The dashed circle represent the times that the applicant comes to the District. The grouped arrows are interactions done on a same day. As stated before, the District Land Bureau and the Office of the Registrar of Land Titles are located at different places (buildings).

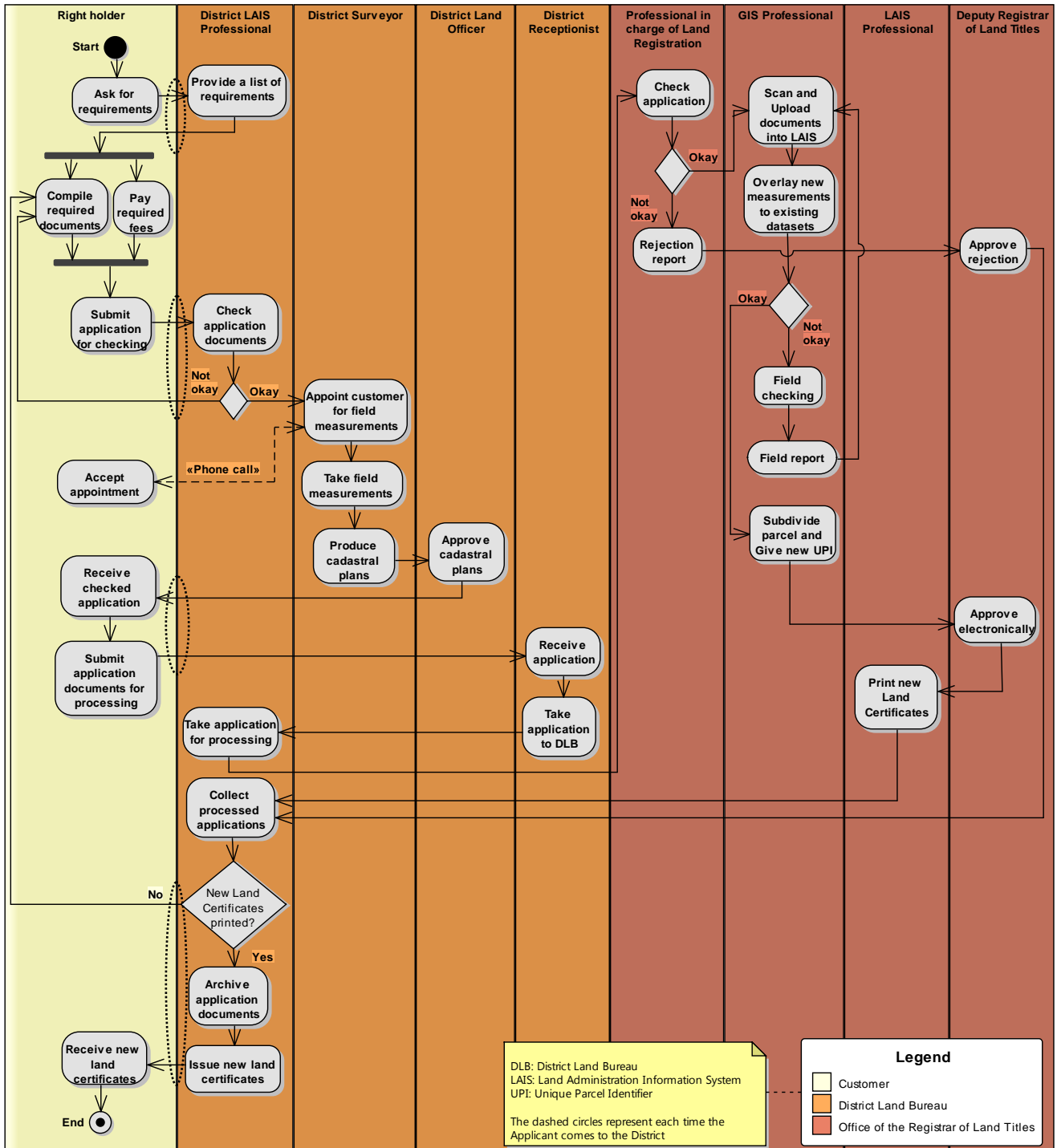


Figure 4.2. Existing workflow for parcel subdivision

4.1.3. Updating land information due to parcel mortgaging

Mortgage is a restriction of rights on parcel which hinder the right holder to dispose her/his property unless the restriction is removed (RNRA, 2012). The parcel is given as collateral to get a loan from the bank that may sell it if the money is not paid back. The actual situation in Rwanda (October, 2013) is that the mortgage is separately registered from other changes in land information. The mortgage registration is done by the Office of the Registrar General (ORG) under Rwanda Development Board (RDB) while other changes in land information are registered by the Department of Lands and Mapping (DLM) under Rwanda Natural Resources Authority (RNRA). The registration of the mortgage is done via an Electronic Mortgage Registration System (eMRS) managed by the RDB. The Land Administration Information System (LAIS) from the DLM is connected to eMRS from RDB in a way that the banks can access the land information through eMRS that they use to register a mortgage. The registration process can be divided into 3 main steps where different tasks are performed by different actors (Figure 4.3). The described process is from the KCB - Rwanda as one of the banks that register mortgages using the eMRS.

- (1) Application:** The right holder goes to the bank to ask for requirements to receive a loan by mortgaging her/his parcel. As part of the requirement compilation; the right holder goes to Sector office to look for a certificate of marital status (three months of validity); s/he pays the registration fees at the Bank of Kigali; and does property valuation to a certified valuer. The required documents and money to pay are described in the Table 4.3.

The right holder takes the application documents to the bank where the Credits Analyst checks the completeness and the validity of the submitted documents and does other process for loan approval. When the application is complete, the Credits Analyst gives it to the Legal Officer. If not, the right holder is asked to complete the application.

- (2) Processing:** The Legal Officer of the Bank prepares then an Abstract of Mortgage Agreement (AoMA) by filling a form in the eMRS. S/he uses the Unique Parcel Identifier to retrieve the land information relating to the parcel to be mortgaged and adds them into the mortgage agreement. The Legal Officer prints the AoMA and invites the right holder to sign it. Both the right holder and the Legal Officer (on behalf of the Bank) sign the AoMA in front of the Notary. This one then notifies the mortgage agreement. Once in the office, the Legal Officer scans and uploads, into the eMRS, the application documents together with the notified AoMA. He then sends them to the Office of the Registrar General (ORG) through the eMRS.

At the ORG, the Mortgage Verifier gets a notification into the eMRS that there are applications sent. She checks the digital files again to see if the received documents are complete and valid. If everything is correct, the Mortgage Verifier sends the application to the Registrar General for approval by using the eMRS. If there is something wrong, the Mortgage Verifier sends back a notification through the eMRS to the Legal Officer with an explanation of what to correct.

For complete applications, the Registrar General checks them and approves the mortgage registration if everything is correct. But if not, the Registrar General sends to the Mortgage verifier a notification justifying the rejection. The Mortgage Verifier also notifies the Legal Officer of the bank.

Once the mortgage registration is approved, it appears in the land information database that a specific parcel was mortgaged.

- (3) Issuance:** After the approval, a certificate of mortgage registration is automatically generated by the eMRS. The Legal Officer prints and issues the certificate to the right holder and keeps a copy for the Bank.

The Table 4.3 lists the offices where the right holder enquires the required documents; the times that the applicant has to go to the Bank where the mortgage is being asked; required payments for the applications to be accepted and the amount of money to be paid. The actors who access the land information database and which type of right they have are described in the table. The application form filled and signed by the right holder is shown in the Annex 3.

Data collected	Element	Existing situation
Process time	Actors and tasks involved	See Figure 4.3. Workflow for parcel mortgaging.
	Offices to enter	<ul style="list-style-type: none"> - Sector office, - Bank of Kigali, - Office of the Valuers, - Bank where the mortgage is being applied, - Office of the Notary.
	Times to come to the Bank	<ul style="list-style-type: none"> - Ask for information on mortgage registration, - Submit the application, - Sign the AoMA, - Receive a certificate for mortgage registration.
Registration requirements	Required documents	<ul style="list-style-type: none"> - Copy of the right holder(s) identity card, - Marital status certificate of the right holder, - Valuation report, - Copy of the land certificate, - Payment slip for mortgage registration, - Payment slip for notification of AoMA, - Filled application form (Annex 3).
	Required payments	<ul style="list-style-type: none"> - 20,000 Rwf (22 Euro*) for mortgage registration, - 4,800 Rwf (5.3 Euro*) for the AoMA, - 12,100 Rwf (13.3 Euro*) for notification, - 30,000 Rwf (33.1 Euro*) per hour for valuation report, - 500 Rwf (0.55 Euro*) for marital status certificate.
Information sharing	Access and level of access to land information	- Legal officer from the Bank giving the mortgage -> View
	Conditions to have access	The permission granted by the management to get a user account and password from the database administrator.
	Quality check	Done before approving the mortgage registration
	Actor who checks	<ul style="list-style-type: none"> - Mortgage verifier, - Registrar General.

*1Euro = 906 Rwandan Francs (XE Currency Converter, 2013)

Table 4.3 Existing situation for updating land information due to parcel mortgaging

The workflow to register mortgage involves 5 internal actors, plus the right holder as shown by the Figure 4.3. The activity diagram details the tasks and actors performing them; and the offices, represented by colours, where the application passes to be processed.

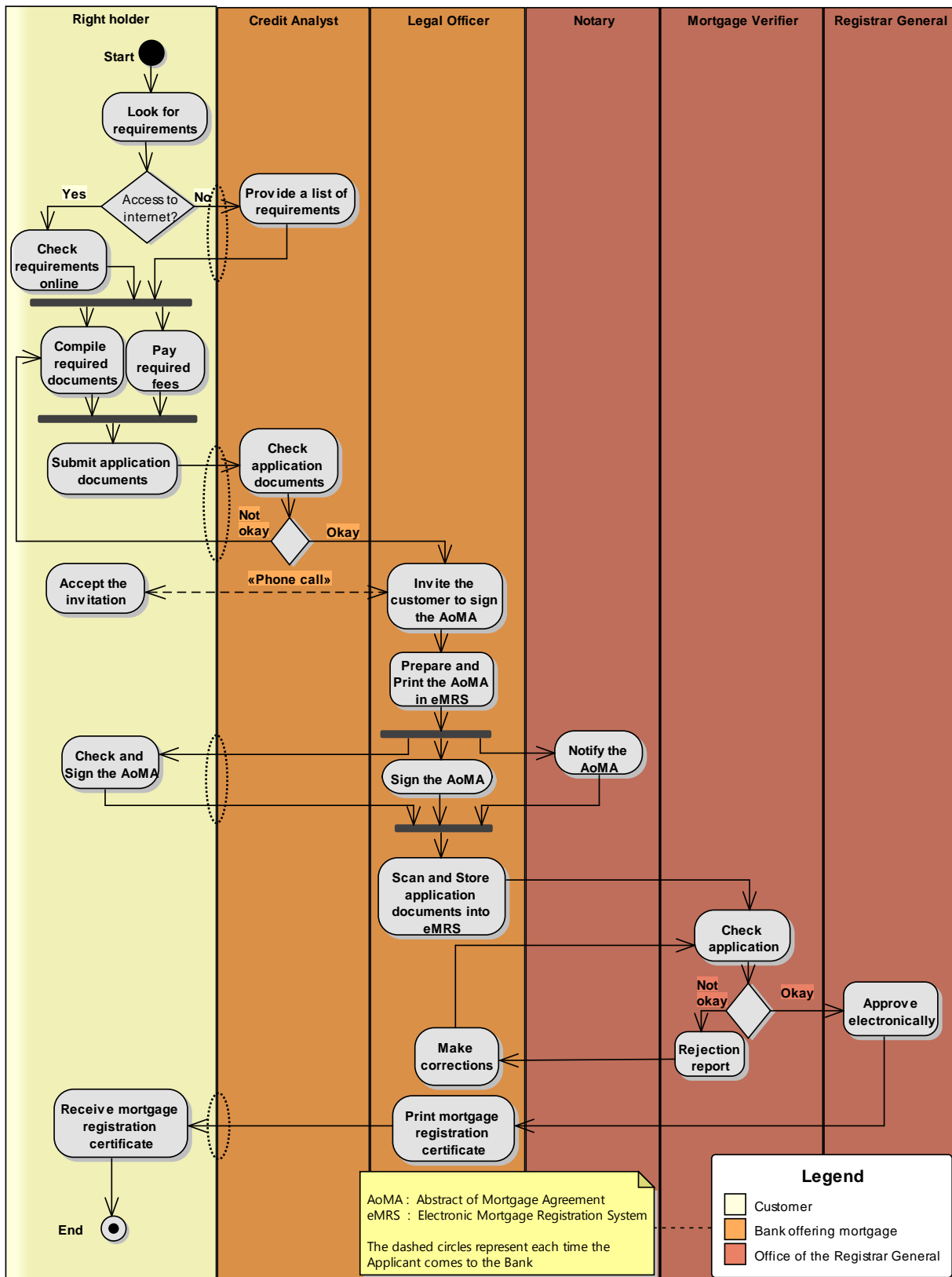


Figure 4.3.Existing workflow for mortgage registration

4.2. Analysis of the existing workflows for updating land information in Rwanda

The workflows for updating land information in Rwanda as described above have many positive points to highlight but also obstacles for the right holder who reports changes. The achievements are signs that something is being done to strengthen the maintenance phase: some of the obstacles identified in the research problem were found resolved at the time of the field work. The remaining obstacles suggest that there is opportunity for improvement and these are proposed in this research. The analysis is based on an assessment of the described diagrams; the primary and secondary data corrected on the field work.

4.2.1. Achievements

- The Electronic Mortgage Registration System (eMRS) is now linked to Land Administration Information System (LAIS) which means that all registered mortgages are visible in land information database after the Registrar General has approved them. This obstacle arose in the research problem was found resolved during the field work. The banks which use the eMRS can access the land information during the process of mortgage registration and, vice versa, those in the Office of the Registrar of Land Titles can see the parcels that were mortgaged. No change can be done on a mortgaged parcel without being aware of it.
- The Department of Lands and Mapping is aware of the obstacles in the updating process and two projects are ongoing to improve the situation. One is on high fees enquired during change registration named “Towards sustainable in Land Administration”(Land Tenure Regularisation Support Program, 2013). This project is being proposed to see how registration fees can be reduced in order to capture changes as they occur and at the same time cover the capturing costs. Another project is called “Rwanda Land Administration Enhancement Project” and its objectives are to reduce the procedures, time and cost of change registration. This is being done through different activities like an operationalization of LAIS in the 30 Districts of Rwanda; a fully integrate legal and spatial information; a responding to requests for sharing land information with other stakeholders among other. At the time of the field work (October 2013), this project has started the operationalization of LAIS in almost 20 Districts across the country.
- LAIS is now operational in all the five Office of the Registrar of Land Titles. This means that some tasks in the updating workflow are being done electronically. The Deputy Registrar of Land Titles does not need to have physical documents to approve the change registration, as they are scanned and stored into LAIS in previous steps.
- The right holders are aware of reporting some changes occurred in land information. This is the case of changes linked to rights transfer. This statement is based on that, among seven customers interviewed at Musanze DLB, five of them had a case related to either transfer through sale or donation.
- People understand the importance of having a land certificate. This is because even if they do not follow the established procedures to report changes in land information; the buyer of a land parcel does not pay the agreed money unless the seller gives her/him the land certificate even if the names of the seller still on the documents. With the land certificate, the buyer fills that s/he has the land as well.

4.2.2. Remaining obstacles

- The application to register a change is physically done at the District Land Bureau (DLB) and processed at the Office of the Registrar of Land Titles at province level. It is even at the DLB that information on the process of updating can be obtained. A Province is made of at least five Districts and a District can have an average area of 84,377 hectare which there may be 349,362 parcels (Summary report of 31th May 2013). For some, it is a quite long distance to get there as they have to take public transport or walk for a long time. This becomes more difficult when, during the process, the customer has to come to the District more than once and on different days. In the described workflows, s/he may come up to four times during transfer of parcel through donation or when applying for parcel subdivision (Table & Figure 4.1 and Table & Figure 4.2).
- The updating process is long for the right holder as an analogue approach is still in use at some steps of the workflow. Once the application documents are submitted, the file moves from one desk to another passing by a number of actors (5 actors for parcel donation – as the Deputy Registrar mostly uses digital copy (Figure 4.1) and 6 actors for parcel subdivision – the LAIS Professional does not need application documents to print the new land certificate (Figure 4.2)).
- The application file to apply for change registration contains a multitude of documents to be compiled and submitted by the right holder (11 documents for parcel donation - Table 4.1, 9 documents for parcel subdivision - Table 4.2 and 7 documents for mortgage registration). Some of those documents provide duplicated information like the motivation letter and the application form. What is in the letter is again filled in the form (application forms are shown in the Annex 3). In addition to this; the payments are separately done which makes that the application file can contain up to four payments slips (Table 4.1, Table 4.2). The space for archiving those documents will not be easy to find as Rwanda even still has to keep many other documents used in the systematic land registration.
- The fees to be paid during change registration is high for some right holder, especially those whose changes did not involve money like parcel donation. The required payments include flat rate for transfer fees; fees for notification, for cancelling the existing land certificate; fees for the new land certificate; and fees for marital status certificate (Table 4.1). If there is a subdivision, the right holder has to pay the fees for each of the cadastral plan to be produced.
In case of a parent who wants to give a piece of land to her/his children as an heritage (as it is mostly the case in rural area), if s/he cannot pay those fees, s/he will not come to report changes but still the parcel is subdivided and given to the children.
- The payments are physically done at the bank but not all the banks. The money is put on the district account which is not in all the banks. Sometimes, there are longue queues as even other institutions like schools for example, have their account in the same bank. It can happen that the right holder returns back home without submitting her/his application as s/he spends a long time in the bank to pay. Even though the mortgage is provided by a bank (KCB - Rwanda for example), the required payments are paid in a different bank where the district account is.
- If two changes in land information are occurring on a same land parcel (for example: subdivision and a transfer of rights or land use change); the right holder has to follow two separate processes. For example, to transfer rights of a part of the land parcel, the right holder first applies for subdivision and then applies to transfer the rights of the concerned part. This is long and costly.

It also means that the right holder has to face twice some of the identified obstacles in the updating process like long workflows; high registration fees; many required documents; etc.

- The actors at the DLB do not have access to land information which means that no checking in the database is done before the application is accepted and required fees paid. This does not give certainty to the right holder that the service applied for and for which the money was paid will be provided.
- The approach used in the updating of spatial land information is still a big issue. Fixed boundaries are used to update general boundaries in order to improve the accuracy of initial measurements. As the District Surveyor does not have access to the initial measurements, s/he starts from scratch when s/he is taking new measurements. By overlaying the two measurements, they provide different accuracies. In this case, the grass roots surveyors at the Province level go back to the field not with a GPS but with a printed map with both measurements and an aerial image for a field checking (Annex 5). This can take a long time to be done as it depends on the available requests at the Office of the Registrar of Land Titles as all the spatial changes from the DLB under this officer are checked by those two grass roots surveyors.
- The use of Information and Communication Technology (ICT) in service delivery is still on lower level which makes that a person has to go to the place where the service is offered to ask for information. Even the websites, that each District in Rwanda possesses, do not offer enough or up to date information on the process of updating land information.
- There are still insufficient infrastructures to support the updating process at the district level. This is the case of transport where the applicant arranges the transport for the District Surveyor when s/he has to survey the parcel. Other infrastructures like computers or internet at Sector and Cell level are still also a problem which makes difficult to decentralise the land services.

All those obstacles may be a burden for the right holder if s/he wants to report a change in land information. There is a possibility that some right holders are discouraged and opt for an informal transaction.

4.3. Design requirements

The above analysis of the existing situation in the updating of land information revealed obstacles that may be a burden for the right holder when reporting changes. To be able to propose a way of removing them, the design requirements are defined and used in the design. The requirements are grouped in two categories based on how Norman (1996) describes the requirements: *customer requirements* and *system requirements*.

4.3.1. Customer requirements

Customer requirements are what the right holders want the system to do for them (Norman, 1996). Those aspects have to be respected when designing a workflow for updating the land information, in order to remove obstacles that may discourage the right holders to report changes (Henssen, 2010). If the right holders do not say anything about the changes, no one from the land officer will know. The article 20 of the Land Law stipulates: “*Registration of land is obligatory*” and the article 21 says: “*Land rights may be transferred between persons through succession, gift, inheritance, ascending sharing, rent, sale, sublease, exchange, servitude, mortgage or any other transaction,..*”(Government of Rwanda, 2013). The article 5 of the ministerial order determining

the modalities of land registration clarifies this in saying: “*Transfers of title of immovable property, whether between living persons or by death, can only occur by registration. ...no encumbrance or charge is binding on immovable property if it is not recorded on the Certificate of Registration*” (MINIJUST, 2008). These articles clarify the obligation to register changes in land information. But if the administrative procedures put in place are not favourable for those who have to report changes, it becomes difficult to respect it (FAO, 2012). This is why regulations is supported by well designed and clear procedures and workflow for changes registration in order to get right holders collaboration highly needed in updating (Henssen, 2010). So if the customer requirements are considered in the workflow design; it will affect positively their commitment to respect the regulations.

In the case of Rwanda, the Table 4.4 describes the customer requirements to be respected in the process of updating land information. The *aspects* are elements brought out by authors under the Section 2.1 saying that they may be assessed when checking whether a land information system is well performing or not. Those aspects are selected based on the *obstacles* identified in the existing updating workflows. As a way of removing them, *requirements* are defined based on the situation in Rwanda obtained from right holders’ interviews.

Aspect	Obstacle	Design requirement
Land office accessibility	<ul style="list-style-type: none"> - Long travel distance to the DLB. - Coming several times to the DLB / bank offering mortgage. - Weak use of ICT in service delivery. 	<ul style="list-style-type: none"> - There should be an easy way of getting information on local officers (closer to the people) or online. - The number of times a customer has to come to the DLB or to the bank offering mortgage should be reduced. - The customer should be contacted through email address or phone when her/his presence is needed.
Process Time	<ul style="list-style-type: none"> - Long process for updating land information. 	<ul style="list-style-type: none"> - The services of updating land information should be located under one roof -> one stop centre. - When possible, two or more processes can be combined. This will save time and money for the customer who has to follow them. - The number of involved actors should be reduced by keeping actors who are really needed. - The use of physical documents should be reduced at minimal level.
Information sharing	<ul style="list-style-type: none"> - Many required documents. 	<ul style="list-style-type: none"> - The number of submitted documents should be reduced through systems interconnection.
Cost	<ul style="list-style-type: none"> - High registration fees. 	<ul style="list-style-type: none"> - The required fees have to be determined based on the capacity of people to pay. - The required payment should be done after confirming that the enquired service will be provided.

Table 4.4 Customer requirements

4.3.2. System requirements

The system requirements are what the system needs to have in order to perform well its functions (Norman, 1996). In the case of updating process, one of its functions is to respond to the customer needs which removes for them obstacles when reporting changes in land information (Henssen, 2010).

The system requirements in the Table 4.5 are defined in the same way as the customer requirements: based on literature and adapted to the situation of Rwanda. The *aspects* are elements brought out by different authors to assess system performance. They are selected based on the identified *obstacles* in the existing situation. As a way of removing them, *requirements* are defined based on the situation in Rwanda obtained from interviewed internal actors (Table 3.2) about what they think can help to improve the updating process.

Aspect	Obstacle	Design requirement
Information sharing	<ul style="list-style-type: none"> - Lack of access to land information. 	<ul style="list-style-type: none"> - The internal actors involved in the updating process should have access to land information database to allow a proper checking before the application is accepted. - There should be different and controlled level of access the land information database to protect the data.
Surveying approach	<ul style="list-style-type: none"> - Long surveying process. - Accuracy mismatching 	<ul style="list-style-type: none"> - Field measurements and data processing should be done by one actor who will go back to the field if any mistake is in her/his work. - The initial datasets should be a starting point to do new measurements so that the accuracy can be improved and the time that the process takes reduced. - The surveying tools should be simple and easy to manipulate. - The accuracy should be flexible depending on the purpose and needs of the rights holders.

Table 4.5 System requirements

4.4. Summary

This chapter discusses about the existing situation in the updating of land information in Rwanda. The assessment of the three modelled workflows comes up with achievements proving that something is being done to strengthen the updating process. The revealed obstacles in the updating process opened up for improvements suggested as design requirements. These obstacles may discourage the right holder to report land information changes. The design requirements are defined in way that the obstacles are removed to motivate the right holders in the reporting process. The design of the new workflows has to respect the defined requirements.

5. DESIGNING AND VALIDATING NEW WORKFLOWS

The above chapter presents the existing situation in the updating of land information in Rwanda. The design requirements are defined in a way that removes the identified obstacles for the right holder when reporting changes. This chapter presents, in the first section, two new workflows to update land information proposed to Rwanda. One integrates the parcel subdivision and parcel donation; and another is for mortgage registration. Both designs are based on the defined requirements. The second section is about the validation of the designed workflows and finally, a summary of the chapter.

5.1. Proposed workflows to update land information

The design of proposed workflows is based on the defined requirements. The proposal starts with an inter-connection of systems for which databases are needed in the updating of land information. The connection will reduce the number of submitted documents and save the time and the money that the right holder spends when looking for them. The systems to be connected with the Land Administration Information System (LAIS) are the following:

- (i) The **National Identification Project** gathering information on every Rwandan who has an identity card (from 16 years old). The identity card number is unique to every citizen. The same database will contain information about the marital status of those people as the official age to get married in Rwanda is 21 years old. With this information, the certificate of marriage or celibacy will not be required as the marital status will be known from this database.
- (ii) The **Electronic Mortgage Registration System (eMRS)**, already connected to LAIS, gathers information on registered mortgages. It leads to a secured transaction as the new owner knows, in advance, if the parcel is mortgaged or not. At the same time, the bank offering the mortgage knows if there is any other mortgage on the concerned parcel.
- (iii) The **Court** that will have a database on juridical cases received or resolved, especially those related to land. This will allow checking if there is no pending case in the court on the parcel for which the information is to be changed or if the disputes are resolved.
- (iv) The **Rwanda Revenue Authority**, as a government institution in charge of collecting taxes, will give information about land taxes if they are or are not paid. This will lead to a secured transaction as the new owner will know, in advance, the taxes situation. It will also allow calculating what the new owner will have to pay in the future.
- (v) The **Banks**, through the service of e-payment., the District Land Bureau will check if the required fees were transferred to the district account. This will be done by providing key information like the identity card number of the right holder and the application identification number. With this information, the payment will be linked to the owner and to the change being recorded. No need to submit payment slips thus less number of submitted documents.

This system inter-connection will be in a way that allows retrieving information on the parcel for which the information is to be changed. The design of the proposed workflows is based on this connectivity.

5.1.1. Integrated workflow for parcel subdivision and parcel donation

The workflow integrates two processes of parcel donation and parcel subdivision that are separate in the existing situation. Logically, there is always a reason behind the subdivision of land parcel into two or more parts. It can be either to transfer the rights of a part or to change its land use. So, as the parcel subdivision is followed by another change in land information; why not combine two workflows instead of having two separate processes. In this case, the right holder applies only once and, at the end, two or many different land certificates are produced (for example: one for the Donor and another for the Receiver).

In this proposed workflow, a Donor can either apply online or do physical application. The workflow will follow the steps described below (Table 5.1). The activity diagram describing the workflow is in the Annex 1: the left side of the diagram is for online application while the right side is for the physical application.

Step	Online application	Physical application
Application	<p>The Donor, as the right holder, asks for an account to be able to apply online.</p> <p>The IT Manager gives the account and provisional password that may be changed by the applicant.</p> <p>The Donor logs-in, completes the application form and uploads a scanned land certificate. After submission, s/he gets an application identification number as a sign that the documents were sent.</p> <p>The District Land Officer (DLO), after opening her/his account, sees all the received applications. By using the Unique Parcel Identifier (UPI), s/he retrieves information about the concerned parcel by verifying if the Donor is the owner and the only owner; if the parcel is not mortgaged; and if there is no juridical case pending or unpaid land taxes. When everything is correct, the application is sent to the District Surveyor for field work and processing.</p> <p>If there is a problem, the DLO writes a rejection report and sent it to the Donor via her/his account.</p>	<p>The Donor or Receiver goes to the Village* leader, to get a list of requirements and an application form. The Donor, as the right holder, completes the form and attaches the original land certificate. The application documents are taken to the Professional in charge of Land Registration (PLR) as front desk officer at the District Land Bureau (DLB). This one checks the Unique Parcel Identifier (UPI) versus the owner; if the parcel is not mortgaged or if there is no juridical case pending or unpaid land taxes. If there is no problem, the PLR scans and uploads the application documents into LAIS and gives to the Donor an application identification number automatically generated by the system. S/he archives the physical documents and sends the digital copy to the DLO.</p> <p>If there is a problem in the application, the documents are returned to the Donor with an explanation of what is wrong.</p> <p>The DLO does another checking. When everything is correct, the digital application is sent to the District Surveyor for field work and processing. If there is a problem, the DLO writes a rejection report and sent it to the PLR who informs the Donor through a phone call.</p>
Preparation of field surveying	<p>The District Surveyor receives the application after logging in. By using the UPI, s/he locates the parcel in the initial dataset and how to get there. S/he prepares a map for field measurements where s/he overlays the initial parcel boundary to the aerial image, and visualises neighbouring parcels (in case their owners have to be contacted). S/he then fixes an appointment for the field survey with the Donor through a phone call and email notification for online application.</p>	

Field surveying	<p>Once on the field, the District Surveyor confirms the shape of the parcel using a printed map and guided by the Donor and the Receiver. S/he identifies corners to be measured. With a hand held GPS, the District Surveyor takes the coordinate points of selected corners, first for the whole parcel and then for the new boundary. After measurements, s/he completes the field report and attaches the used map showing, approximately, where the coordinate points were taken. Then, s/he explains and shows to the Donor and the Receiver what s/he did and asks them to sign if they agree with it.</p>	
Processing	<p>In the office, the District Surveyor scans and uploads the field report into LAIS and starts the processing. S/he projects the coordinate points and overlays the new measurements to the existing datasets. The combination of these two methods (map and GPS) should normally give an acceptable accuracy. For more accurate surveying, the tools like differential GPS or total station may be used but it will always depend on the purpose of the measurements and on what the right holder needs.</p> <p>If there is something wrong, the District Surveyor goes back to the field to correct the mistakes. But if the measurements are okay, s/he splits the parcel, gives new UPIs to the created parcels and produces cadastral plan for each of them. Those cadastral plans are digitally sent to the DLO to starts the transfer of rights.</p>	
Right transfer	<p>The DLO prepares the transfer agreement and sends it to the applicant together with the cadastral plans to check the content. S/he also specifies the day that they will come to sign the transfer agreement.</p> <p>The Donor and the Receiver both check the documents. If they agree, they respond to the invitation.</p> <p>On the agreed day and time, the Receiver pays the required fees, using e-payment. The transfer agreement is signed by the Donor (and spouse if any) and the Receiver with their witnesses. On this day, the Donor submits the original land certificate so that it can be cancelled.</p>	<p>The Professional in charge of Land Registration (PLR) contacts the Donor and the Receiver to come to sign the transfer agreement.</p> <p>On the agreed day and time, the DLO prepares the transfer agreement that s/he shows to the Donor and the Receiver together with the cadastral plan. They check the documents and if they agree with the content, the Receiver pays the required fees received by the DLO. The two parties sign the transfer agreement together with their witnesses. The spouse of the Donor, if any, should also sign to avoid that the parcel is transferred without mutual consent.</p>
	<p>After signing, the DLO notifies the transfer agreement; scans and uploads it into LAIS. The application, with the notified transfer agreement, is digitally sent to the LAIS Professional to add the change into the database. After that, the LAIS Professional sends the application to the Deputy Registrar of Land Titles so that s/he can approve the transfer. After approval, the database is updated and new land certificates are ready for issuance.</p>	
Issuance	<p>The DLO (or PLR in physical application) checks the land certificates that are ready for issuance and notifies their owners.</p> <p>The new land certificates are printed and issued by the DLO when their owners come to collect them.</p>	

*Village is the smallest administrative unit in Rwanda, made of at least 10 households.

Table 5.1 Description of the integrated workflow for parcel donation and parcel subdivision

5.1.2. Changes brought by the integrated workflow

The design of the new workflow that integrates two changes: parcel subdivision and parcel donation brought many positive changes not found when they are separated as it is the case in Rwanda. The Table 5.2 gives more details on those positive differences. This is in case the right holder wishes to donate a part of her/his land parcel.

Step	Separate workflows	Integrated workflows
Application	The owner first subdivides the parcel and gets two land certificates on her/his name and second s/he transfers the concerned part.	The transfer of a part of a parcel will be done in one workflow and produce two different land certificates with different owners as shown by the diagram in the Annexe 1.
	The application to register a change is only done physically at the District Land Bureau.	There will also be a possibility to apply online.
	The information about change registration is only provided at the District Land Bureau.	The information will be provided by either the Village leader (local leader very closer to the people) or obtained online.
	The actors involved in the workflow are 8 for parcel subdivision (which goes up to 10 if the two grass roots surveyors intervene) and 6 for parcel donation (Figure 4.2 and Figure 4.1).	The actors involved in the whole process will be 5 for online application and 6 for physical application as illustrated in the diagram in the Annex 1.
	The submitted documents are up to 20 (9 for parcel subdivision – Table 4.2 and 11 for parcel donation – Table 4.1).	Only 2 documents will be submitted: original land certificate and a completed application form.
	In one process of change registration, the applicant comes to the DLB 4 times. And the only time that s/he is contacted is when the District Surveyor comes to take field measurements.	In the whole process, the applicant will come to the DLB only 3 times among which 2 times s/he will be contacted before coming. If s/he applies online, s/he will come only 2 times after being asked to come
	Physical presences are shown by dashed circles. One circle groups tasks done on the same day (Figure 4.1 & 4.2 & 4.3).	Physical presences are also shown by dashed circles where one circle groups tasks done on the same day (Annex 1).
	The required fees are paid before submitting the application as the payment slips are among the submitted documents.	The fees will be paid at the moment of signing the agreement, after being sure that the service asked will be provided.

Surveying	Two separates actors are involved in the field survey using two different approaches: District Surveyor with a hand held GPS and Grass roots surveyors with a printed aerial image on which there is initial dataset.	Only the District Surveyor will be in charge of taking measurements and s/he will be using a printed aerial image with initial dataset and a hand held GPS. More accurate surveying tools will be used when needed.
	The new measurements collected by the District Surveyor are processed by the GIS Professional; and both produce cadastral plan.	The District surveyor will do the whole processing work and produce one cadastral plan.
Processing	The application is submitted at the DLB and processed at the Office of the Registrar of Land Titles.	Application will be submitted and processed at the DLB.
	The land information database is only accessed by actors at the Office of the Registrar of Land Titles.	The land information database is accessed up to the DLB.
	The application documents move physically from one actor to another.	The application documents will be scanned and shared electronically.
Issuance	The (new) right holder comes to the DLB to see if the new land certificate(s) is (are) printed.	When the new certificates are ready, both the Donor and Receiver will be informed through a phone call or SMS or notification.
	The new land certificate(s) is (are) printed and waits when the owner will come to collect it (them).	The printing will be done when the owner of the land certificate is there to collect it to avoid keeping lots of papers.

Table 5.2 Innovation in the integrated workflow

5.1.3. New workflow for parcel mortgaging

The new workflow for registering mortgage is designed also based on the defined requirements. The description provided below gives more details on how the process will be conducted.

- (1) **Application:** To know the requirement, the right holder will go either to the bank where s/he is applying for mortgage or check requirements on the website of the bank. S/he will fill the application form to be submitted with the valuation report. The application documents will be submitted to the Credit Analyst. This one will check if the applicant is the owner and only owner

of the parcel and his/her identification; if there is no other mortgage on the parcel or no juridical case; and if all land taxes were paid. If everything is correct, the right holder will be asked to pay the required fees by approving that the money can be withdrawn from her/his account that s/he should have in that Bank. If there is a problem, the documents are returned back to the customer with an explanation of what is wrong.

- (2) Processing:** When the application is accepted, the Credit Analyst will prepare the Abstract of Mortgage Agreement (AoMA) using the Electronic Mortgage Registration System (eMRS) and send it to the applicant through address email to allow her/him to check it in advance. If no email available, the right holder will check the AoMA before signing in front of the Notary.

On the agreed day and time, both the right holder and the Credit Analyst will meet at the Notary and sign the AoMA. The Notary will notify two documents and everyone will get a copy of the AoMA. Back to the office, the Credit Analyst will scan and upload the notified AoMA and other applications documents into the eMRS. S/he will send the digital file to the Registrar General to approve the mortgage registration.

After logging in the eMRS, the Registrar General will check the application sent and start approving, if everything is correct. Where there is a problem, the application will be sent back to the Credit Analyst with an explanation of what is wrong. When approved, the parcel mortgaged will be added into the database of registered mortgages.

- (3) Issuance:** The Credit Analyst will check the approved mortgages and contact the applicant through phone or email. The certificate of mortgage registration will be printed when the owner will come to collect it.

The activity diagram in the Figure 5.1 represents the above description. The new workflow for registered mortgage has respected the design requirements like the first integrated workflow.

5.1.4. Changes brought by the new workflow for mortgage registration

The proposed workflow for updating land information due to parcel mortgaging has brought positive changes not found in the existing workflows as described by the Table 5.5.

Existing workflow	Proposed workflow
5 actors are involved in the process (Figure 4.3).	3 actors will be involved in the process as the Figure 5.1 shows it.
The submitted documents are 8 (Table 4.3).	2 documents will be submitted: completed application form and a valuation report.
The required fees are paid before submitting the application as the payment slips are among the submitted documents.	The fees will be paid after the Credit Analyst has checked if the mortgage will be provided.
The payment is done in a different bank than the one offering the mortgage.	The money will be withdrawn from the right holder account that s/he should have in that bank offering her/him mortgage.

Table 5.3 Changes in the new workflow for mortgage registration

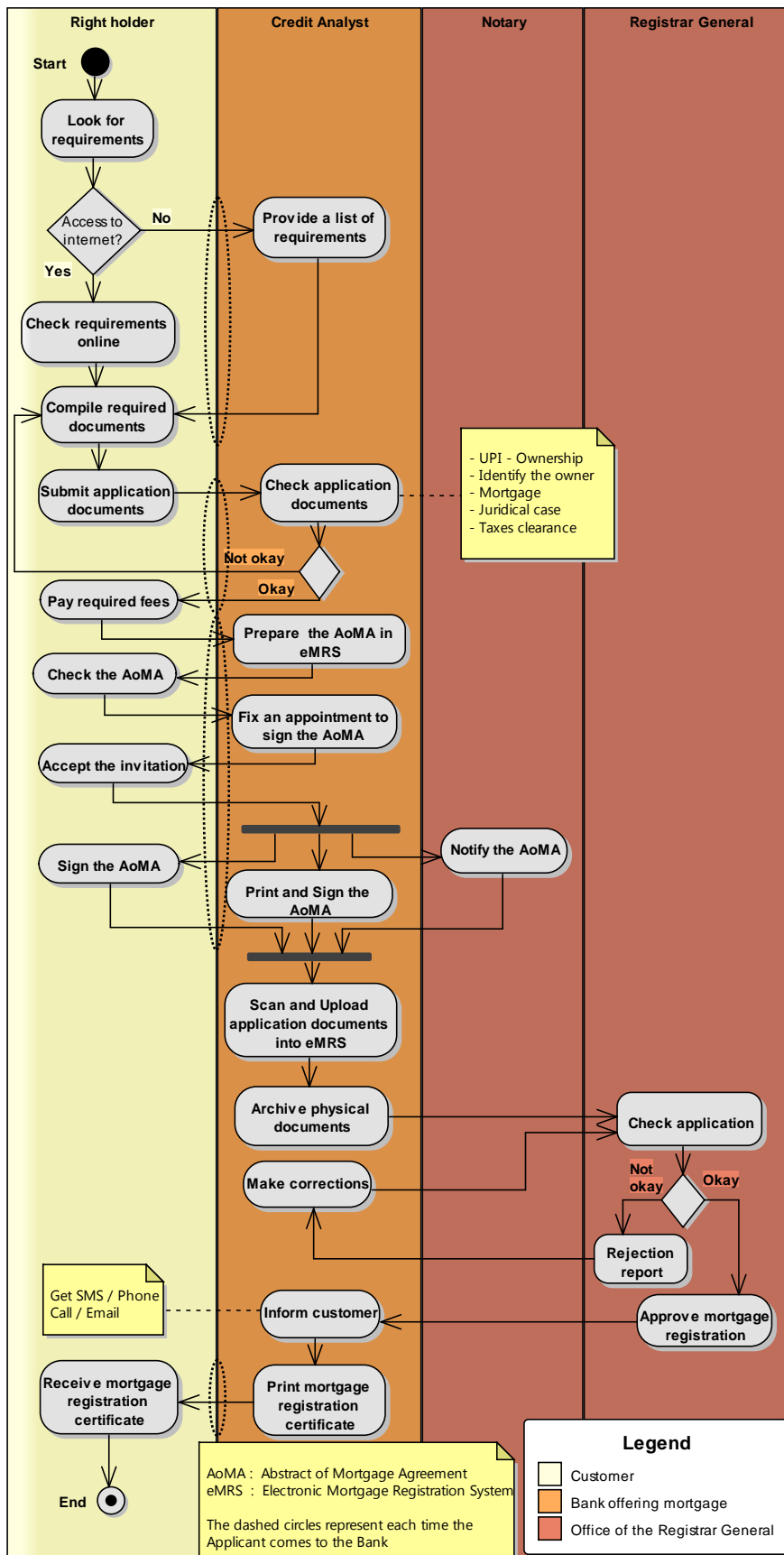


Figure 5.1 New workflow for mortgage registration

5.2. Workflows validation

The presentation of the new designed workflows to the interviewed actors would have been the best way of doing validation. The actors would have assessed if the new workflows will improve the situation. As this was not possible, other ways of validating the workflows are used for the purpose of the research. Two types of validations are done as specified in the research methodology. The purpose is to reach the possible highest quality of the new designed workflows. The first validation is an assessment of the design requirements by checking if the identified obstacles were handled. The second validation is a focus group discussion to analyse if the designed workflows will improve the existing situation in the updating of land information in Rwanda. Both validations ways are detailed below.

5.2.1. Assessment of the design requirements

The above clarifications of differences between the existing situation in the updating of land information in Rwanda and the proposed situation show that some obstacles are tackled in the new designed workflows. A cross-check of requirement by requirement gives a real picture of how those obstacles are faced. Both customer and system requirements are analysed and 4 levels of validation are possible:

- (i) **Validated:** is used in case the design requirement is met by the new designed workflow but not the existing situation.
- (ii) **Partially validated:** is used when the design requirement is partially met by the new designed workflow.
- (iii) **Not validated:** is used in the case the design requirement is not met in the new designed workflow.
- (iv) **Already valid:** is used when the design requirement is met both by the new designed workflow and the existing workflows.

The Table 5.4 compares the existing workflows of parcel donation (Figure 4.1) and parcel subdivision (Figure 4.2) against the integrated new workflow (Annex 1).

Among 16 design requirements:

- 10 are validated;
- 2 partially validated;
- 1 not validated; and
- 3 are already valid.

The conclusion is that the integrated new designed workflow is better than the two separated existing workflows as many requirements are validated. This means that the related obstacles are removed. However, there still some limitations in the design that open this research to further researches as not all the requirements are validated.

The Table 5.5 gives more details on the design requirements validation done for the new workflow to register mortgage versus the existing workflow.

Among 10 design requirements possible for this workflow (excluding the ones related to surveying):

- 6 are validated;
- 1 is partially validated;
- 2 are not validated; and
- 1 is already valid.

The conclusion is that the new workflow to register mortgage is also better than the existing workflow. As in the first integrated workflow, there are still rooms for further research as some requirements are partially validated or not validated at all.

Design requirement	Existing workflows	New integrated workflow		Level	Comment
Customer requirements					
<i>Easy way of getting information: local officers or online.</i>	Information on change registration is enquired at the District Land Bureau (DLB).	The information will be available both online and at the Village leader.		Validated	A list of requirements will be given to the Village leader and also uploaded on the District website.
<i>Reduce the number of times that the right holder has to come to the DLB.</i>	The right holder comes 8 times to the DLB (dashed circles in Figure 4.2& 4.1): - 4 times during parcel subdivision ; and - 4 times during parcel donation.	The customer will come to the DLB: - 2 times if s/he applies online; or - 3 times in physical application (Dashed circles in Annex 1).		Validated	In the physical application, the submission of the application at the District reception was removed.
<i>Contact the customer when her/his presence is needed.</i>	The customer is contacted only during parcel subdivision to fix an appointment for field measurements (Figure 4.2).	The customer will be contacted: - To fix an appointment for field measurements; - To sign the transfer agreement; and - To collect new land certificate.		Partially validated	Those who have neither a phone nor an email address will not be contacted. A day when they can come back will be given.
<i>Services of updating land information under one roof -> one stop centre.</i>	- To subdivide the parcel, the customer has to enter 3 offices (Table 4.2); and again - 2 offices when s/he directly does right transfer (as the certificate of marital status provided by the Sector is valid for 3 months) (Table 4.1). - Additionally, the application is not processed at the DLB.	- Either in online application or physical application, the customer will only have to enter the DLB; and - The application will be processed at the DLB and the approval will be digitally done at the Office of the Registrar of Land Titles.		Partially validated	The processing of the application is still done at two offices as the Deputy Registrar has to approve the change and his office is on provincial level.
<i>Combination of workflows.</i>	When the parcel is subdivided in order to transfer the rights of a part of that parcel, the customer has to follow two separates workflows: first subdivide the parcel and then transfer the rights.	The customer will follow only one workflow when s/he wants to transfer the rights of a part of her/his parcel (Annex 1).		Validated	Parcel subdivision is combined with the transfer of rights.

<p>Reduce the number of actors.</p>	<ul style="list-style-type: none"> - Parcel subdivision involves 8 actors on which may be added 2 grass roots surveyors (Figure 4.2); plus - 6 actors involved in parcel donation (Figure 4.1). 	<p>For the whole process:</p> <ul style="list-style-type: none"> - 5 actors will be involved in online application (Annex 1 – Left side); and - 6 actors for physical application (Annex 1 – Right side). 	<p>Validated</p>	<p>No need of a GIS Professional in the updating of land information as spatial data processing will be done by the District Surveyor.</p>
<p>Reduce the use of physical documents.</p>	<ul style="list-style-type: none"> - In parcel subdivision, among 8 actors, 6 use physical documents to perform their tasks (Figure 4.1). The Deputy Registrar and the LAIS Professional use digital copy. - In parcel donation, among 6 actors, 5 use physical documents to perform their tasks (Figure 4.1). Only the Deputy Registrar uses digital copy. 	<ul style="list-style-type: none"> - For online application (Annex 1 – Left side), among 5 actors, only the District Land Officer will touch the physical document (transfer agreement) that s/he will scan after notification. - For physical application (Annex 1 – Right side), among 6 actors, only the Professional in charge of Land Registration and the District Land Officer will touch the physical documents scanned after being used. 	<p>Validated</p>	<p>The physical documents are scanned before being sent to the next actor.</p>
<p>Reduce the number of submitted documents.</p>	<p>In total, 20 documents:</p> <ul style="list-style-type: none"> - 9 documents for parcel subdivision (Table 4.2) ; and - 11 documents for parcel donation (Table 4.1). 	<ul style="list-style-type: none"> - Only 2 documents will be needed: completed application form and original land certificate. 	<p>Validated</p>	<p>With the system inter-connection, many documents will not be required. The information will be accessed from their system database.</p>
<p>Registration fees determined based on the capacity of people to pay.</p>	<p>The registration fees are high especially for the changes which did not involve money like donation, parcel exchange or succession.</p>	<p>The cost analysis was not covered by the new designed workflow.</p>	<p>Not validated</p>	<p>A cost analysis required to validate this requirement was not covered by the research.</p>
<p>Required payments should be done after confirming that the required service is possible.</p>	<p>Both in parcel subdivision and parcel donation, the required payments are done before the application is submitted as the payment slips are submitted with other application documents.</p>	<p>The customer will pay the required fees after the application is checked and accepted. This is before signing the transfer agreement.</p>	<p>Validated</p>	<p>The customer will pay for the service that s/he will receive.</p>

System requirements				
<i>Land information accessed by internal actors involved in updating process.</i>	In both parcel subdivision and parcel donation, actors at the DLB do not have access to land information database.	The land information database will be accessed also by actors at the DLB.	Validated	The LAIS will be operational at the District level.
<i>Different and controlled level of access to land information database.</i>	Both for parcel subdivision and parcel donation, the internal actors who have access to the land information database, have different level of access.	The controlled access will remain. The internal actors will have different level to access the land information database.	Already valid	The requirement is met in both the existing situation and the new designed workflow.
<i>Field measurements and data processing done by one actor.</i>	For parcel subdivision, 4 actors are involved in the processing of spatial data: - District Surveyor, - GIS Professional, and - 2 grass roots surveyors.	The District Surveyor will do the whole processing of spatial land information.	Validated	<u>Condition:</u> There have to be more than one Surveyor per District and sufficient infrastructure (transport) to support them. Unless they may be overloaded.
<i>Start with the initial measurements when taking new measurements.</i>	The District Surveyor starts from scratch when taking new field measurements.	The initial dataset will be used as a reference for new measurements.	Validated	The land information will be accessed at the District level.
<i>Simple surveying tools easy to manipulate.</i>	The surveying uses aerial image and a hand held GPS. They are simple to use after a short training.	Still the surveying will use the aerial image and a hand held GPS.	Already valid	The requirement is met in both the existing situation and the new designed workflow.
<i>Flexible accuracy that meets the purpose.</i>	High accuracy surveying tools are only used for big areas for the purpose of spatial planning.	The accuracy will depend on the purpose of the survey where the instruments with high accuracy may be used if needed.	Already valid	The requirement is met in both the existing situation and the new designed workflow.

Table 5.4 Validating the design requirements for the integrated workflow

Design requirement	Existing workflows for mortgaging	Proposed workflow for mortgaging	Level	Comment
Customer requirements				
<i>Easy way of getting information: local officers or online.</i>	Information on mortgage registration is available online (Figure 4.3).	Still the information will be available online.	Already valid	The requirement is met in both the existing situation and the new designed workflow.
<i>Reduce the number of times that the customer comes to the bank offering mortgage.</i>	The customer comes to the bank 4 times if s/he does not access the internet and 3 times if s/he has internet (Dashed circles in the Figure 4.3).	Still the customer will come 4 times if s/he does not access the internet and 3 times if s/he has internet (Dashed circles in the Figure 5.1).	Not validated	The number of the physical presence cannot be less. So no change done.
<i>Contact the customer when her/his presence is needed.</i>	The customer is contacted to come to sign the AoMA* (Figure 4.3).	The customer will be contacted: - To sign the AoMA*; and - To collect the certificate of mortgage registration (Figure 5.1).	Partially validated	Those who have neither a phone nor an email address will not be contacted. A day to come back will be given.
<i>Reduce the number of actors.</i>	5 actors are involved in the workflow (Figure 4.3).	3 actors will be involved (Figure 5.1).	Validated	The Credit Analyst will do the task of the Legal Officer. The checking will be done by the Registrar General before approval and not the Mortgage verifier.
<i>Reduce the use of physical documents.</i>	Among 5 actors, 3 use physical documents to perform their tasks. The documents are scanned by the Legal Officer after AoMA* notification (Figure 4.3).	Among 3 actors, 2 will use physical documents. The documents will be scanned by the Credit Analyst after AoMA* notification (Figure 5.1).	Validated	The physical documents are scanned before being sent to the next actor.
<i>Reduce the number of submitted documents.</i>	7 documents are submitted during mortgage registration (Table 4.3).	2 documents will be submitted: completed application form and valuation report.	Validated	With the system inter-connection, many documents will not be required. The information will be accessed from their system database.

Registration fees determined based on the capacity of people to pay.	The registration fees are high.	The cost analysis was not covered by the new designed workflow.	Not validated	A cost analysis required to validate this requirement was not covered by the research.
Required payments done after confirming that the enquired service is possible.	The required payments are done before the application is submitted (Table 4.3).	The customer will pay the required fees after the application is checked and accepted (Figure 5.1).	Validated	The customer will pay for the service that s/he will receive.
System requirements				
Land information accessed by internal actors involved in updating process.	The Credit analyst does not have access to land information database.	The Credit analyst will have access to the land information database.	Validated	The Credit analyst needs to access the land information database as s/he is doing the checking and completing the AoMA.
Different and controlled level of access to land information database.	In the mortgage registration, the Legal Officer has the right to view the land information.	At the same time, the Credit analyst will have the right to view the land information.	Validated	The Credit Analyst will have same access rights as the ones had by the Legal Officer in the existing situation.

*eMRS: Electronic Mortgage Registration System

*AoMA: Abstract of Mortgage Agreement

Table 5.5 Validating the design requirements for the new workflow of mortgage registration

5.2.2. Focus group discussion

After validating the design requirements, the ideal thing was to present the new workflows to the interviewed actors in the updating of land information. They are the ones to approve if the proposed workflows will improve the situation or not. As it was not possible to find them, another option was to use different people but who have an idea on how the updating of land information is being conducted in Rwanda. This is why the new designed workflows were presented to a group of five students from Rwanda (Table 5.6) with a purpose to analyse if the workflows will improve the existing situation. Those students have different experiences in land administration in Rwanda as shown by the Table 5.6. They all work for the Department of Lands and Mapping (DLM) at different level.

Each of the participants received, the day before, a copy of the three workflows of the existing situation and the two proposed new workflows. The discussion was held in one of the room at the ITC International Hotel from 8:00 pm to 10:00 pm on 22nd January 2014. The guiding question was:

“Do you think that the proposed workflows will improve the situation for the right holder who report changes?”

Responsibility in the DLM	Operating Level	Number of participant
District Land Officer (DLO)	District	3
Professional in charge of Land Registration	Province	1
Director of Land Administration	National	1

Table 5.6 Participants in the focus group discussion

One by one, the five participants asked questions to get more clarifications concerning mainly the new designed workflow combining the parcel subdivision and the parcel donation. This is because they know very well these existing workflows as, for the District Land Officers and for the Professional in charge of Land Registration; they are among their daily activities. For the Director of Land Administration, he participated in the establishment of the procedure manual to register changes in land information. A little was said about the workflow for mortgage registration as not well known by the participants. This change is managed by a different institution.

Positive points in the integrated workflow:

The participants agreed with the changes brought by the integrated workflows combining parcel donation and parcel subdivision, especially the idea of:

- Having an integrated workflow instead of two separate workflows when the different changes are done on one parcel. This reduces the time and money spent by the right holder when following two workflows.
- The use of ICT to provide information on the updating process or get them at lower level. The right holder should not come on the DLB to ask for it.
- The access of land information at District level that allows a proper checking before accepting the applications.

Suggestions to improve the workflow:

The focus group suggested the following changes in the first version of the proposed workflow presented to them:

- The payment should be done at the District Land Bureau instead of the Bank to reduce the travel time and cost for the right holder.
- Information on change registration should be obtained at the Village level instead of the Cell level. The Village is the smallest administrative unit in Rwanda. This is very practical for rural areas where the Cell officer can also be far from people due to scattered settlements.
- They should be a front desk officer to receive the applications and give more explanations on the updating process instead of being done by the District Land Officer. The land officer may be overloaded and not having enough time for the right holder.
- One actor should be involved in the processing of spatial data instead of two actors. They argue that it is better to process the data you collected than give them to another actor to do it for you. They proposed the involved actor to be, only, the District Surveyor who will also does the cadastral plan instead of being the GIS Professional doing it.
- The new measurements should only use the aerial image instead of GPS. The idea was not accepted by the group saying that the sporadic updating should help upgrading the quality of collected data during systematic registration. So a combination of both methods will be better.

After the discussion, the designed workflow that integrates parcel subdivision and parcel donation was updated based on the above comments. Even terminologies that were not clear enough were rectified. The workflow presented in this research in the Annex 1 is an updated version after the focus group discussion.

5.3. Design limitations

The new workflows were designed based on the defined requirements generated from the identified obstacles in the existing situation. Most of the design requirements were validated which shows that the new designed workflows are better than the existing situation. However, some requirements were not validated at all or partially validated. This is the case of the registration fees that should be reduced and the contact of a right holder who has neither a phone nor an email address. This means that the related obstacles were not handled. These limitations in the new designed workflows for updating land information in Rwanda suggest that this research can be extended. In addition to this, these requirements may be validated by the right holders who may confirm if the new workflows will improve their situation. This would be done before the implementation of the new workflows.

5.4. Summary

In the design of the workflows to update land information, it is possible to meet customer and system requirements as it is proven in this chapter. Two workflows are proposed to Rwanda to improve its updating process. The validation of both the integrated and mortgage registration workflows proves that they are better as many of the identified obstacles for the right holder when reporting changes are tackled. As a general condition for both designs, the systems for which the information is used in the updating of the land information must be connected with the land information database. The requirement about the registration fees is not validated as the cost analysis required is not covered by the research.

6. CONCLUSIONS AND RECOMMENDATIONS

The previous chapters relate in details literature on land information updating; present the existing situation in the updating of land information in Rwanda and finally the proposed workflows to improve the updating process. This chapter concludes the research by describing how the fixed objectives were achieved and conclusions drawn from the results. It also recommends how the proposed updating workflows can be implemented in Rwanda and what further researches on the updating land information can be extended.

6.1. Summary of conclusions

This research was conducted in order to assess how the updating of land information in Rwanda is currently being done, find out probable obstacles for the right holder when reporting changes and to design alternative solutions to overcome them. The main objective was to design a workflow for updating land information in Rwanda that handles the identified obstacles to ensure that changes are reported and included in the land register. This was achieved through 5 sub-objectives each having a specific research question answered along the way.

Sub objective 1: *Understand existing workflows for updating land information in Rwanda.*

The first sub-objective was achieved through the data collection done in Rwanda. The field work allowed understanding the “*as is*” situation of the workflow for updating land information. In this regard, five institutions involved in the updating process were visited: the Musanze District Land Bureau; the Office of the Registrar of Land Titles in the Northern Province; the Department of Lands and Mapping; the Office of the Registrar General and the KCB - Rwanda. Internal actors (people working for those institutions) involved in the updating workflow as well as external actors (right holders coming to report changes) were interviewed. The interviews allowed collecting needed information to model the existing workflows: the required documents and payments to apply for change registration; the actors involved and their tasks on each step; the techniques to accomplish a task; and the office where the tasks are carried out. The research question to be answered was: “*How are the existing workflows for updating land information in Rwanda due to parcel donation, parcel subdivision and parcel mortgaging?*” Only three workflows were selected in this research based on some of the identified obstacles for the right holder when reporting changes. The rights transfer through parcel donation (Figure 4.1) is linked to the obstacle of high registration fees; the parcel subdivision (Figure 4.2) is linked to accuracy mismatching between existing and new measurements; and the mortgage registration (Figure 4.3) is linked to the complexity of change registered in separate institutions. The three workflows were clearly described under the Section 4.1 and presented using the Unified Modelling Language (UML) activity diagrams. The input of the modelling was from the primary and secondary data collected on the field.

The field data collection revealed that some of the identified obstacles were resolved. This is the case of the Land Administration Information System (LAIS) from the Department of Lands and Mapping connected to the Electronic Mortgage Registration System (eMRS) from the Officer of the Registrar General. The registration of mortgage separately done is no longer a problem. The registered mortgages are visible in the land information database after being approved. This is one of the achievements performed in the updating of land information in Rwanda and more others are detailed in the Section 4.2.1.

Sub objective 2: *Identify obstacles in the existing workflows for updating land information in Rwanda.*

The main driver behind the research was to get all the changes in land information reported and recorded in the land register. The research question was: *“What obstacles are in the existing workflows for updating land information in Rwanda due to parcel donation, parcel subdivision and parcel mortgaging?”* To answer this question, an analysis, combined with the interviews and direct observations from the field work, was done on the three modelled workflows. The remaining obstacles for the customer found were: long travel distance to the District Land Bureau; coming several times to places where the change is being reported (district or bank) due to a weak use of Information Communication Technology (ICT) in service delivery; long updating process due to an analogue approach still in use and to the many actors involved in the process; many required physical documents for which some are found in different places; and high registration fees added to other costs spent to compile the required documents. The updating system itself has other issues like some internal actors who do not have access to land information; long surveying process; accuracy mismatching between existing and new measurements; and insufficient infrastructure to support the process. Those remaining obstacles suggested that there is opportunity for improvement and these were proposed in the next objective.

Sub objective 3: *Define requirements to design workflows for updating land information in Rwanda.*

The definition of the design requirements was achieved based on the identified remaining obstacles in the updating of land information in Rwanda. The research question to be answered was: *“What could be the requirements to design workflows to update land information in Rwanda due to parcel donation, parcel subdivision and parcel mortgaging?”* The requirements were defined in way that removes obstacles for the customer when reporting changes. Each identified obstacle was linked to one or many design requirements. Two categories of requirements were used: customer requirements as what the right holders (customers) want the system to do for them and the system requirements as what the system needs to have in order to respond to the customers’ needs. The customer requirements include requirements like: easy way of getting information; reduced number of times that a right holder comes to the district or bank offering mortgage; one stop centre of services related to land information updating; integrate workflows in case two or many changes are occurring on a same parcel; reduce actors involved in the workflow; reduce the use of physical documents; reduce the number of submitted documents; and pay required fees after confirming that the enquired services will be provided. The system requirements include requirements like: different and controlled levels of access to land information database; new field measurements that should start from initial boundaries; simple surveying tools; and flexible surveying accuracy that should depend on the purpose and the needs of the right holder. Based on the literature, these requirements were defined under six aspects proposed by authors to assess land information systems performance. Those aspects are: accessibility to the land office; process time; information sharing; registration fees; and surveying approach when updating spatial land information. The defined design requirements are good as they were generated from the existing obstacles. This means that the obstacles are removed if the design respects the requirements.

Sub objective 4: *Design new workflows for updating land information in Rwanda.*

Two workflows for updating land information in Rwanda were proposed and designed in accordance to the defined requirements. The research question under this objective to be answered was: *“How new workflows for updating land information in Rwanda due to parcel donation, parcel subdivision and parcel mortgaging can be designed based on the requirements?”*

The design started with a proposal to connect systems for which databases are needed in the updating of the land information. The inter-connection will be between the National Identification Project (with information on every citizen from 16 years old); the Electronic Mortgage Registration System (with information on registered mortgages already connected); the Courts (with information on received cases about land disputes); the Rwanda Revenue Authority (with information on taxes); and Banks (with its e-banking service). Based on this system connection, following workflows were designed:

- (i) An integrated workflow (Annex 1) that combines right transfer through parcel donation and parcel subdivision. Instead of following two separate workflows when reporting two changes occurred on a same parcel; the right holder only applies once and two different land certificates are produced and issued: one to the Donor and another to the Receiver. This combination has removed many of the identified obstacles like the multitude of submitted documents, actors involved in the process, times spent by the right holder on the process, and so on. In this new workflow; the right holder has even the possibility to either apply online or use a normal physical application.
- (ii) A new workflow for registering mortgage was also proposed based on the design requirements. Instead of the right holder paying the required fees in a separate bank, the money is deducted from her/his account that s/he should have in that bank offering her/him mortgage. In addition, the payment is done after confirming that the mortgage will be offered. Other changes made are the submitted documents and involved actor reduced.

Sub objective 5: *Validate the new workflows for updating land information in Rwanda.*

The validation of the new designed workflows was done in two ways (Section 5.2.): an assessment of the design requirements and a focus group discussion. The research question to be answered was: “*How valid are the new designed workflows for Rwanda in relation to the design requirements?*”

The first validation was aiming to confirm if the design requirements were met and the identified obstacles removed. In both new workflows, most of the requirements are met. A few of them are either already met in the existing and the new workflows; or partially met or not met at all. The requirements validated are: the number of times that the customer has to go to the district or the bank offering mortgage that is reduced, the same as the submitted documents and the actors involved in the process; the ICT is used to provide information on updating process or apply online; and the required payments are done after the application is accepted. To contact the customer when her/his presence is required is partially met in the designs as those with no phone or email address will not be contacted. The determination of fees registration based on capacity of people to pay is not met in the designed workflows as the cost analysis is not covered in this research.

The second validation was done through a focus group discussion. The aim was to get different views on the designed workflows by analysing if the new workflows will ease the work done by the right holder. The participants in the discussion agreed with the changes brought by the new workflows. They proposed other changes like the information on change registration that may be available at the village level; the required payment done at the bank was proposed to be at the District Land Bureau; the processing of spatial information change that should involve one actor.

The design has some limitations as not all the requirements were validated or partially validated. These limitations suggest that this research can be extended as recommended below.

6.2. Recommendations

The existing process of updating land information in Rwanda was well described and presented in three workflows of right transfer through parcel donation, parcel subdivision and mortgage registration which were the focus of this research. Most of the identified obstacles for the right holder when reporting changes were removed in the two proposed workflows.

For a reliable conclusion whether the new workflows are better than the existing workflows in the updating of land information in Rwanda,

- The designs have to be presented to both internal and external actors involved in the updating process before implementation. Their views are the ones to rely on to confirm whether the proposed workflows will improve the existing situation or not.

To maximize the benefits brought by the new designs, it is recommended to the government of Rwanda to:

- Evaluate the modalities and possibilities of implementing the proposed workflows and reviewing other workflows in the updating of land information in accordance to the defined design requirements;
- Do a customer satisfactory survey to know more about obstacles that are discouraging the right holders to report changes in land information. Their views will show where the weaknesses are so that the procedures proposed to them can be improved;
- Extend the inter-connection of the key databases for which information are needed in the updating of land information as proposed by this research. This will faster and secures the land transactions. The connection between Land Administration Information System and Electronic Mortgage Registration System is a proof that it is possible;
- Provide sufficient infrastructure for the maintenance phase. The District Surveyor should be provided transport means to allow a proper field work to upgrade the quality of the spatial land information;
- Look forward to use e-services delivery as, worldwide, a digital approach is taking over to the analogue approach.

For further researchers that will be interested in the domain of updating land information, it is recommended to:

- Expand the conceptual workflows designed in this research by using the Workflow Management Systems or other techniques to automate the process like Process Maker. This will allow identifying more requirements that cannot be discovered in a conceptual design;
- Extend the research by doing a cost benefit analysis of the maintenance phase where large-scale registration programs have been completed in short period of time using the general boundary approach; and investigate more on how the upgrading of those boundaries can be done in more accurate and cost effective way.

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ANNEX 2: QUESTIONNAIRES FOR INTERVIEW

1. Questions for Customer interview

Interviewee Number:... Date:...../10/2013 Start time:... : ... End Time: ... : ...

I am Mireille BIRARO and I am doing a research on Land Information Maintenance: Assessment and option for Rwanda. The purpose of this **10 minutes** discussion with you; is to help me to **understand the process that you followed when you want to report a change in Land Information.**

This interview is only for academic purpose and the information that you will give is confidential.

Do you allow me to record this discussion?

Interviewee address: District:..... Sector:.....
 Cell: Village:.....

Question	Notes
1. For what reason are you coming to the District Land Bureau (DLB)? <i>(Report a change or Check status of the application or Collect the new land certificate or Other)</i>	
2. How many times did you come to the DLB?	
3. How did you know that you have to come to the DLB?	
4. How do you travel from your home to the (DLB)? <i>(walking, public transport, own transport)</i>	
5. How long does it take to get to the DLB?	
6. What do you think of the distance from your home to the DLB? <i>(Long or short or Do not mind)</i>	
7. If long, where do you wish the land services to be delivered?	
8. What are the required documents are you coming with?	
9. How did you know that those documents are required?	
10. When did you know that you have to bring them?	
11. At which office did you get the required documents?	
12. How long did it take to get those required documents?	
13. Where are the offices where you acquired those documents?	
14. How did you get to those offices?	
15. How long did it take you to get there?	
16. What do you think of those required documents? <i>(Many and not all of them are important or Many but important or Do not mind)</i> Why?	
17. If “many and not all of them are important”, which one do you find important?	
18. Which payments did you have to do? <i>(For documents or other services)</i>	
19. How much did you have to pay for each payment?	
20. Where did you pay?	
21. What do you think of the fees? <i>(High or Reasonable or Cheap)</i> Why?	
22. If high, how much do you think you can pay?	
23. Where do you submit your application for change in Land Information?	
24. Do you think that your neighbors also come to report changes in Land Information? Why?	
25. What obstacles do you think are in reporting process?	
26. What are your suggestions to improve the reporting process?	

2. District Land Officer interview

Date:...../10/2013

Start time:... : ...

End Time: ... : ...

I am Mireille BIRARO and I am doing a research on Land Information Maintenance: Assessment and option for Rwanda. The purpose of this **10 minutes** discussion with you; is to help me to **understand the process that you followed when you want to report a change in Land Information.**

This interview is only for academic purpose and the information that you will give is confidential.

Do you allow me to record this discussion?

Question	Notes
1. What are the steps in the Land Information maintenance process?	
2. Which step do you participate in?	
3. What is your task in that step?	
4. What types of changes in Land Information do you receive?	
5. How many for each type have you received so far? (<i>Transaction reports if available</i>)	
6. Who apply for the changes in Land Information?	
7. What required documents to accept an application for changes in Land Information?	
8. Why are those documents required?	
9. Where do we get those required documents?	
10. How do we know that we have to bring them?	
11. What types of payments do you require?	
12. How much do we pay for each type?	
13. Where do we pay?	
14. Who has to pay? (<i>New owner or former owner</i>)	
15. Why do we have to pay?	
16. What do you think of the fees? (<i>High or Reasonable or Cheap</i>) Why?	
17. If high, how much do you think the land owner can pay?	
18. What do you check in the application?	
19. When do you check? (<i>before or after the application is received</i>)	
20. What tasks do you perform on the application?	
21. From whom do you receive the application?	
22. To whom do you submit the processed application?	
23. How do you submit the processed application? (<i>Digitally or Physically</i>)	
24. How does the applicant get a feedback?	
25. After how long does he get the feedback?	
26. Do you think that all changes in Land Information are being reported? Why?	
27. What obstacles do you think are in reporting process?	
28. What are your suggestions to improve reporting process?	
29. What obstacles are in the Land Information maintenance process?	
30. What are your suggestions to improve maintenance process?	

3. District surveyor interview

Interviewee Number:..... Date:...../10/2013 Start time:... : ... End Time: ... : ...

Presentation:

I am Mireille BIRARO and I am doing a research on Land Information Maintenance: Assessment and option for Rwanda. The purpose of this 10 minutes discussion with you; is to help me to understand the process that you followed when you want to report a change in Land Information.

This interview is only for academic purpose and the information that you will give is confidential.

Do you allow me to record this discussion?

Question	Notes
1. What steps are in surveying process?	
2. What tasks do you perform on each step?	
3. From whom do you receive the application?	
4. How do you receive the application? (<i>Phone call or Digital application or Physical application</i>)	
5. To whom do you submit the results?	
6. How do you submit the results? (<i>Digitally or Physically</i>)	
7. What types of changes in spatial Land Information do you receive?	
8. How many for each type have you received so far? (<i>Report if available</i>)	
9. What surveying tools do you use in measurements?	
10. What is their accuracy?	
11. This accuracy is similar everywhere? (<i>urban - residential and rural - agricultural area</i>)	
12. What is education level of the person who does the measurements?	
13. What are other surveying tools you know that can be used?	
14. If any, why do not you use them?	
15. How long one measurement can take?	
16. After how long does the applicant get a cadastral plan?	
17. How does he get the cadastral plan?	
18. What requirements to accept the application?	
19. How much do we pay?	
20. Where do we pay?	
21. What do you think of those fees? (<i>High or Reasonable or Cheap</i>) Why?	
22. If high, how much do you think land owner can pay?	
23. Who checks the quality of the new measurements?	
24. What does he check?	
25. How does he check?	
26. Who approves the cadastral plan?	
27. Do you have access to the initial measurements done during systematic land registration?	
28. How do you match the new measurements with the initial measurements?	
29. What happens if there is accuracy mismatching?	
30. What do you think are the causes of mismatching?	
31. What can you suggest to minimize those accuracy mismatching?	
32. Do you think that all changes in spatial Land Information are being reported?	
33. What obstacles do you think are in the process of reporting changes in spatial Land Information?	
34. What can you suggest to improve the reporting process?	
35. What obstacles are in the maintenance process of spatial Land Information?	
36. What can you suggest to improve the maintenance process?	

4. LAIS Professional interview

Interviewee Number:..... Date:...../10/2013 Start time:... : ... End Time: ... : ...

Presentation:

I am Mireille BIRARO and I am doing a research on Land Information Maintenance: Assessment and option for Rwanda. The purpose of this **10 minutes** discussion with you; is to help me to **understand the process that you followed when you want to report a change in Land Information.**

This interview is only for academic purpose and the information that you will give is confidential.

Do you allow me to record this discussion?

Question	Notes
1. What are the steps to register a change in non spatial Land Information?	
2. What task do you perform on each step?	
3. What types of changes in non spatial Land Information do you receive?	
4. How many for each type have you received so far? (Transaction report if possible)	
5. From whom do you receive the request for change in Land Information?	
6. How do you receive the request?	
7. What tasks do you perform on the request?	
8. To whom do you submit the processed request?	
9. How do you submit the processed request?	
10. What are the requirements to record a change in non spatial Land Information?	
11. How do you record changes in non spatial Land Information?	
12. What do you check in the request?	
13. What happens if there is a problem in the request?	
14. Who approves the change in non spatial Land Information?	
15. How does he approve the changes?	
Do you have access the central database?	
16. If yes, how do you access it?	
17. What type of access do you have? (Viewer or Editor or Manager)	
18. How do you add your work in the central database?	
19. What obstacles are in the recording process of non spatial Land Information changes?	
20. What can you suggest to improve the recording process?	
21. What the obstacles do you think are in the maintenance process of Land Information?	
22. What can you suggest to improve the maintenance process?	

5. GIS Officer (province) interview

Interviewee Number:..... Date:...../10/2013 Start time:... : ... End Time: ... : ...

Presentation:

I am Mireille BIRARO and I am doing a research on Land Information Maintenance: Assessment and option for Rwanda. The purpose of this **10 minutes** discussion with you; is to help me to **understand the process that you followed when you want to report a change in Land Information.**

This interview is only for academic purpose and the information that you will give is confidential.

Do you allow me to record this discussion?

Question	Notes
1. What are the steps to register a change in spatial Land Information?	
2. What tasks do you perform on each step?	
3. What types of changes in spatial Land Information do you receive?	
4. How many for each type have you received so far? (Transaction report if possible)	
5. From whom do you receive the request for change?	
6. How do receive the request for change in spatial Land Information?	
7. What tasks do you perform on the request?	
8. To whom do you submit the processed request?	
9. How do you submit the processed request?	
10. What are the requirements to record a change in spatial Land Information?	
11. How do you record spatial Land Information changes?	
12. Do land surveyors have access to spatial Land Information?	
13. How do you match new measurements with the initial measurements from systematic land registration?	
14. How do you check the quality of those new measurements?	
15. What happens if there is accuracy mismatching?	
16. What do you think are the causes of mismatching?	
17. What can you suggest to minimize those accuracy mismatching?	
18. Who approves the changes in spatial Land Information?	
19. Do you have access to the central database?	
20. If yes, how do you access it?	
21. What type of access do you have? (Viewer or Editor or Manager)	
22. How do you add your work in the central database?	
23. What are the obstacles in process of recording changes in spatial Land Information?	
24. What can you suggest to improve the recording process?	
25. What obstacles do you think are in the maintenance process of Land Information?	
26. What can you suggest to improve the maintenance process?	

6. Deputy Registrar of Land Titles interview

Interviewee Number:..... Date:...../10/2013 Start time:... : ... End Time: ... : ...

Presentation:

I am Mireille BIRARO and I am doing a research on Land Information Maintenance: Assessment and option for Rwanda. The purpose of this **10 minutes** discussion with you; is to help me to **understand the process that you followed when you want to report a change in Land Information.**

This interview is only for academic purpose and the information that you will give is confidential.

Do you allow me to record this discussion?

Question	Notes
1. What steps are in the process of Land Information maintenance?	
2. Which step do you participate in?	
3. What is your task in that step?	
4. What types of changes in Land Information do you receive?	
5. How many for each type have you received so far? (<i>Transaction report if possible</i>)	
6. From whom do you receive the request for change in Land Information?	
7. How do receive the request for change?	
8. What are the requirements to process the request?	
9. What do you check in the request for change in Land Information?	
10. How do you check the request? (<i>Observation on the screen if possible</i>)	
11. What tasks do you perform on the request?	
12. To whom do you submit the processed request?	
13. How do you submit the processed request?	
14. For what do we have to pay when applying for change in Land Information?	
15. How much do we have to pay?	
16. Where do we have to pay?	
17. What do you think of those fees? (<i>High or Reasonable or Cheap</i>) Why?	
18. If high, how much do you think land owner can pay?	
19. Do you think that all changes in Land Information are being reported? Why?	
20. What obstacles do you think are in reporting the changes in Land Information?	
21. What can you suggest to improve the reporting process?	
22. What obstacles are in the process Land Information maintenance?	
23. What can you suggest to improve the maintenance process?	

7. Coordinator of GIS unit interview

Interviewee Number:..... Date:...../10/2013 Start time:... : ... End Time: ... : ...

Presentation:

I am Mireille BIRARO and I am doing a research on Land Information Maintenance: Assessment and option for Rwanda. The purpose of this **10 minutes** discussion with you; is to help me to **understand the process that you followed when you want to report a change in Land Information**. This interview is only for academic purpose and the information that you will give is confidential.

Do you allow me to record this discussion?

Question	Notes
1. What is your task in the maintenance process?	
2. What are the steps to register a change in spatial Land Information?	
3. What types of changes in spatial Land Information do you receive?	
4. How many for each type have you received so far? (Transaction report if possible)	
5. What are the requirements to update the central database?	
6. How do you do the updating of the central database?	
7. How often do you do the updating?	
8. What do you check before the updating?	
9. How do you access the work done on provincial level?	
10. What happens if there is a problem in the work done?	
11. Who has access to spatial Land Information?	
12. Which type of access does s/he have? (view, editor or manager)	
13. How do they get access the central database?	
14. What obstacles are in the recording process of changes in Land Information?	
15. What can you suggest to improve the process?	

8. Database manager interview

Interviewee Number:..... Date:...../10/2013 Start time:... : ... End Time: ... : ...

Presentation:

I am Mireille BIRARO and I am doing a research on Land Information Maintenance: Assessment and option for Rwanda. The purpose of this **10 minutes** discussion with you; is to help me to **understand the process that you followed when you want to report a change in Land Information.**


This interview is only for academic purpose and the information that you will give is confidential.

Do you allow me to record this discussion?

Question	Notes
1. What is your task in the maintenance process?	
2. What are the steps to register a change in non spatial Land Information?	
3. What types of changes in non spatial Land Information do you receive?	
4. How many for each type have you received so far? (<i>Transaction report if possible</i>)	
5. What are the requirements to update the central database?	
6. How do you update the central database?	
7. How often do you update it?	
8. What do you check before the updating?	
9. How do you access the work done at provincial level?	
10. What happens if there is a problem in the work done?	
11. Who has access to the central database?	
12. Which type of access does s/he have? (view, editor or manager)	
13. How does s/he access the central database?	
14. What obstacles are in the recording process of changes in Land Information?	
15. What can you suggest to improve the process?	

ANNEX 3: APPLICATION FORM FOR CHANGE REGISTRATION

1. Application form for sub-division



FORM 1

APPLICATION FORM FOR PARCEL SUB-DIVISION

Person information

I/We:

Status:

ID/Passport:

Address:

Telephone number: E-mail:

OR

Company/NGO/Professional association/Church/Cooperative/Other:

I (authorised representative):

ID/Passport:

Address:

Postal address:

Telephone number: E-mail:

Kindly request a sub-division of a parcel

Parcel information

UPI:

City of Kigali/Province:

District:

Sector:

Cell:

Motivation for the request for sub-division of the parcel

.....

.....

Required documents for the transaction

Physical presence or representation with certified Power of Attorney or Court decision	
Prove of identity	
Extract of marriage certificate or certificate of celibacy	
Application form, signed by the registered owner(s), with motivation for sub-division	
Emphyteutic Lease Contract for the parcel to be sub-divided	
Certificate of Registration of Emphyteutic Lease for the parcel to be sub-divided	
Conditional Freehold Title or Freehold Title for the parcel to be sub-divided	
Extract of the Cadastral Plan for the parcel to be sub-divided	
Approved Fiche Cadastrale for each to be sub-divided parcels	

.....

Date of application
Signature of the applicant(s)

Received and verified by the District Land Officer from:

.....

Date:

Signature: Stamp

2. Application form for donation



FORM 8

APPLICATION FORM FOR TRANSFER OF RIGHTS ON A PARCEL BY DONATION

Person information (By the Donor).

I/We:
 Status:
 ID/Passport:
 Address:
 Telephone number: E-mail:

OR

Company/NGO/Professional association/Church/Cooperative/Other:.....

I (authorised representative):

ID/Passport:

Address:

Postal address:

Telephone number: E-mail:

Kindly request for transfer of rights on a parcel by donation

Parcel information

UPI:

City of Kigali/Province:

District:

Sector:

Cell:

Motivation for the request for transfer of rights on a parcel by donation

.....

.....

Required documents for the transaction

Physical presence or representation with certified Power of Attorney or Court decision	
Proof of identity of the donor	
Extract of marriage certificate or certificate of celibacy of the donee	
Notarised donation form, signed by the donor	
Acceptance letter of the donation and proof of identity of the donee	
Emphyteutic Lease Contract for the parcel to be donated	
Certificate of Registration of Emphyteutic Lease for the parcel to be donated	
Conditional Freehold Title or Freehold Title for the parcel to be donated	
Extract of the Cadastral Plan for the parcel to be donated	

.....
 Date of application Signature of the applicant(s)

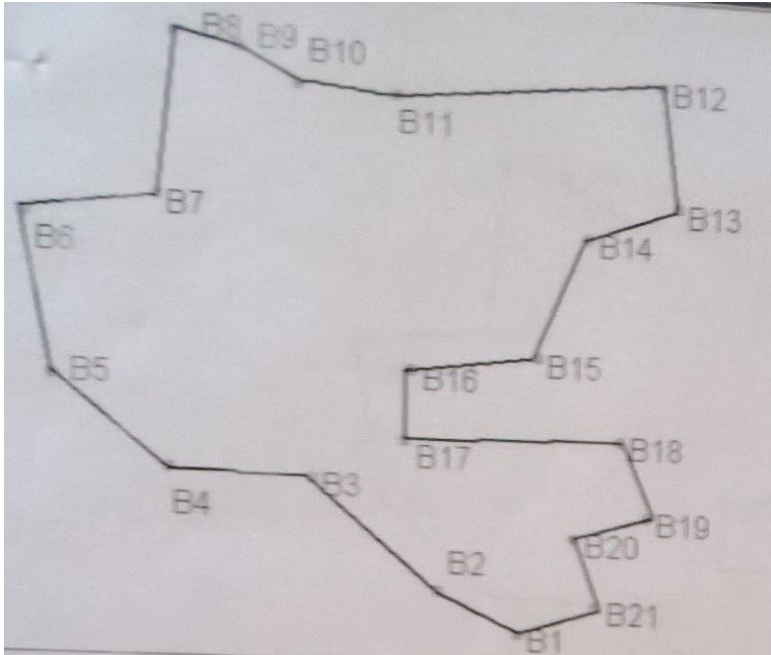
Received and verified by the District Land Officer from:

.....

Date:
 Signature: Stamp

ANNEX 4: CADASTRAL PLAN

1. New measurements using a GPS



BOUNDARY DETAILS				
Beacon	Latitude	Longitude	From	To
B1	0464642	4835791	B1	2
B2	0464628	4835798	B2	3
B3	0464606	4835817	B3	4
B4	0464582	4835818	B4	5
B5	0464562	4835833	B5	6
B6	0464557	4835860	B6	7
B7	0464579	4835864	B7	8
B8	0464582	4835892	B8	9
B9	0464593	4835890	B9	10
B10	0464603	4835884	B10	11
B11	0464620	4835883	B11	12
B12	0464667	4835887	B12	13
B13	0464670	4835866	B13	14
B14	0464654	4835860	B14	15
B15	0464645	4835839	B15	16
B16	0464623	4835836	B16	17
B17	0464622	4835824	B17	18
B18	0464660	4835825	B18	19
B19	0464665	4835812	B19	20
B20	0464652	4835808	B20	21
B21	0464656	4835796	B21	1

2. New measurements overlaid to the existing dataset

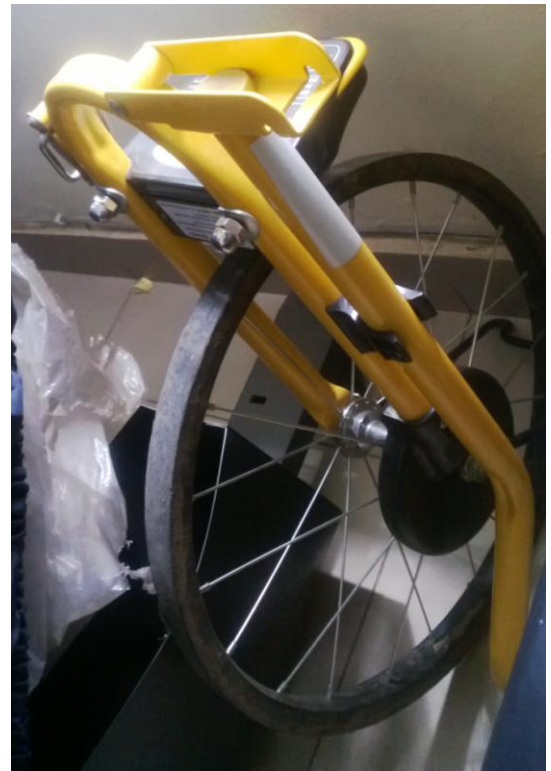


ANNEX 5: SURVEYING TOOLS

GPS



Electronic measuring wheel



Printout for field checking

