

WORKFLOW DATABASE MODELING IN A WORKFLOW MANAGEMENT SYSTEM FOR BETTER LAND TRANSACTION TRANSPARENCY

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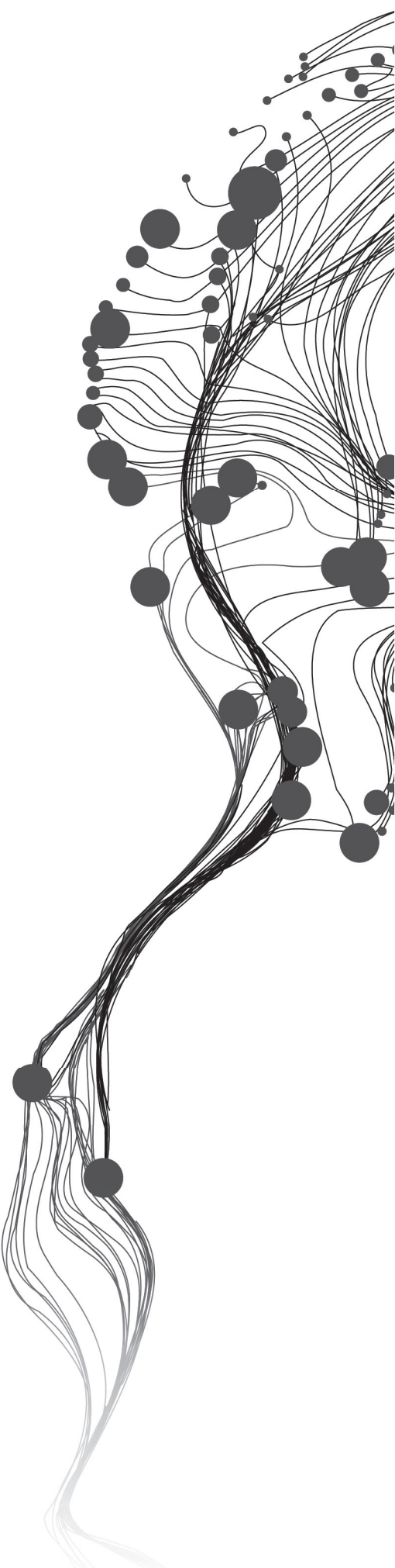
May, 2013

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ABSTRACT

Transparency in the field of land administration is getting increasingly attracting attention at national and international levels, especially in the delivery of land services (such as land transaction) to the citizens. Many researches on transparency of land transaction have mainly focused on land policy issues, marketing environments and corruptions. Nowadays, technologies can support transparency in a decisive way, if implemented in a correct way. Studies show that workflow technology is often used in processing business processes, and Workflow Management Systems (WfMSs) are the most popular systems because of its advantages in supporting process management. Since the database technologies are also highly developed and can easily be deployed, the main aim of this research is to model and test a workflow database in WfMSs for better land transaction transparency.

In this research, there are four steps for research methodology: namely reviewing literatures, interviewing the stakeholders, modelling and prototyping. First step is to find out the relationship between 'effectiveness and efficiency' with transparency, and to illustrate how these two concepts effect transparency in land transactions. Technically, it reveals that by adding a workflow database in WfMSs, it enhances transparency. Second step is about interviewing the stakeholders. This step was conducted within the stakeholders of individual land transaction in the Netherlands. The involved stakeholders and processes are described using UML use-case diagrams, the workflows of land transactions are depicted through UML activity diagrams. Third step consists of the analysis of information and states requirements, they are the precondition of modelling. A conceptual workflow database model is developed using UML class diagram. Fourth step is to prototype the conceptual workflow database by using ProcessMaker and MS Access software.

The research results show the efficiency and effectiveness as elements of transparency contribute to good performance, transparent and timely information supply. The research also emphasized that the careful identification of appropriate stages of land transaction is utmost important using the state diagrams to design workflow database. Finally the research recommends further research on different types of land transactions.

Key words: land transaction, transparency, parcel states, workflow management system, workflow database modelling

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ABBREVIATIONS AND ACRONYMS

BPM:	Business Process Management
CWA:	Cross-organizational Workflow Architecture
CSCW:	Computer-supported Cooperative Work
DBMS:	Database Management System
EA:	Enterprise Architect
FSM:	Finite-State Machine
IT:	Information Technology
LIS:	Land Information System
LTP:	Land Transaction Process
LKI:	Land Kadastro Information
PS:	Private Surveyor
REA:	Real Estate Agency
RA:	Reference Architecture
SQL:	Structure Query Language
TIO:	Transparency International Organization
URL:	Universal Resources Locator
UML:	Unified Modelling Language
WfMS:	Workflow Management System
WFMC:	Workflow Management Coalition

1. INTRODUCTION

1.1. Background

Land transaction is a frequent and complex socio-economic activity involved for land, people and relationship between them (Odgaard, 2002); it is the process in which rights on property is transferred between two or more stakeholders in case of conveyance sellers and buyers (Zevenbergen, 2007). It is also the most important business process of land administration services that supports efficient land market, and is accompanied by the workflow with many consistent steps associated to various stakeholders/organizations, such as customers, notary, surveyor and managers who require correct and transparent land transaction information, for example: ownership, price, location, boundary and other related information of properties.

Corruption is prevalent in many public sectors, yet land administration is one of the hardest hit. Desk research by van der Molen et al. (2006) reveals that land administration is not free from corruption and the wide variety of forms of corruption appears to exist in the land sector. Specifically, bribery appears that registration of property rights and change of title, acquiring land information, and cadastral land survey. Fraud appears that sales of land and dealing in shares of plantations etc. Nepotism, Favoritism, Clientelism appear that issuing such property rights to land that belong to others (also the State) is subject of corruption. Especially in the absence of transparency, a land market can hardly function: corruption and nepotism could take over, transaction cost becomes high and discourages many from engaging in the formal land market (Zakout et al., 2007). Take an example, in recent years, many major corruptions cases are associated with land transactions in China, because of some weaknesses in tackling corruptions and availability of land market information etc. (Nesru H. Koroso et al., 2013). So, based on potential measures against corruption categorized by van der Molen et al. (2006), transparency is an innovative approach to bring improvement in land market and enhancement in transparency in land transaction processes to anti-corruption. Specifically, when all information about rules, regulations, decision, procedures and movements of object “parcel” are visible, predictable, and understandable for all of stakeholders during land transactions.

Transparency is an important factor in real estate market as well as in land transaction processes (Lisec et al., 2008). As an efficient way to prevent corruption in land transaction, transparency is evaluated and improved from three perspectives: legal, structural and functional aspect ((Danilo, 2010). Legal transparency is about laws and regulations always come first to guide citizen or users go into right track (Danilo, 2010); structural transparency is about organizational settings, tiers decision making and making visible on the roles and mandates to customers or citizens. Functional transparency is to make clarity what steps are taking, who is responsible and how much cost and time are required for a certain process (Tuladhar, 2010). From technical perspective, enhance transparency in land transaction mainly focuses on functional and structural transparency. Functional transparency is about who or which department is processing customer’s work or what they are doing with it should be disseminated transparently, it is important because people need to know not only who own this parcel, how parcel looks like but also what is going on with their parcel, and all of stakeholders involving into process. Structural transparency is about organizational set-ups, institutional arrangements, and tiers of decision making process which would be clear and predictable (Phuong, 2012).

Currently, several technologies have been mentioned as solution to increase functional and structural transparency in land transaction system, such as workflow management, land information system, database

management, etc. Land transaction system is based on a Land Information System (LIS) to support management of real properties. Workflow technology, under the umbrella term of computer-supported cooperative work (CSCW), is considered a proven enabling technology in many areas, permitting improved effectiveness and process efficiency by facilitating, automating or controlling the corresponding business processes (Li et al., 2005). In order to meet requirements of functional and structural transparency of land transaction, workflow technology is more popular one by providing methodologies and software to match data and tasks in land transaction process and to deliver important information to customers (M. Mostafa et al., 2001).

1.2. Current status of research

Nowadays, WfMS has been used in business transaction (Vonk et al., 2003) and also in land transaction (Osch et al., 2004). Nevertheless, the world of technologies always goes forward with more advanced technologies. Workflow systems are used for transparent planning and controlling of every part of an organization – especially where employees work together and share information. Email, Skype, meetings and other costly manual coordination are minimized and general process efforts reduced. Meanwhile the system will increase productivity, improve quality and will allow visibility anytime (Slot et al., 2010). Workflow Management System (WfMS) is a software that helps to define, administer and coordinate different business processes, every organization has a variety of such processes, normally involving several employees and systems, for example: in Cadastre, when one case of land full ownership transfer happens, a WfMS could control and supervise all required tasks or steps for a land transaction request; in this situation, WfMS contribute a lot for efficiency and effectiveness of transparent land transaction system.

Now there are many researches on using WfMS in process management to improve transparency, some focus on using reference architecture, for example: using WfMS reference architecture (RA) to enhance functional transparency for land transaction workflow (Phuong, 2012). Experience on executing the WfMS shows components were very well executed and can enhance transparency in delivery and monitoring of land transaction services provided; some focus on using workflow model and workflow data model to enhance transparency. Take the research by Ying (2008) for example, in realizing optimization and integration of planning management process, a relation-based workflow model is built over conventional relational database system, workflow data model is described by UML use case diagram, and realized by database tables.

However, there are still some limitations of realizing transparency when land transaction perform in WfMS. It is researched by Phuong (2012) that during the workflows from one finished step to another new step, workflow data are generated and normally stored in specific data storage format and content of a specific WfMS software environment. So it is not visible for users totally that limit transparency of land transaction in some degrees.

1.3. Research problem and justification

Studies show obvious limitations of realizing transparency in land transaction supported by WfMS, workflow data are normally stored in specific data storage format and content of a specific WfMS software environment, these data are not visible and suitable for users. Meanwhile, with development of land market, land transactions occur more frequently. Transparency requirements for all stakeholders in land transaction process are increasing. There are two main requirements from professional users and citizens as following:

- for the professional users, they need clear responsibility, restrictions, and when and how certain steps were carried out during processing, they also need an efficiency way to manage data, trace back checking and modifying data when error occurs.
- for the citizens, they not only would like to know the final land transaction results, but also consistently have access to information throughout the whole transaction process, such as which stage transaction is in, including spatial data and workflow data generated by each workflow step.

So, based on the above limitations and requirements, a new research insight is rewarding--whether supplying workflow data which is invisible in WfMS to users (professional users and citizens) can enhance transparency of land transactions. Current Workflow Management Systems (WFMSs) use a Database Management System (DBMS) to store task descriptions, and implement all workflow functionality in modules that run on top of the DBMS (Ailamaki et al., 1998). In general terms, a database can be a storage place for information. Database technology is well-suited to handle several aspects of workflow management (Shankar et al., 2005). In recent studies, there are many papers talking about using Workflow technology in land transaction to improve transparency. However, there are none or very few studies in designing separated workflow database to disclosure invisible workflow data in WfMS, then organize them in suitable and visible way to improve transparency. So, all these discussions contribute to my research hypothesis.

1.4. Research hypothesis

This research proposes a hypothesis: " a separate workflow database in WfMS can enhance land transaction transparency."

1.5. Research objectives

Based on the research problem and the goal of enhancing transparency (for the purposes of effectiveness and efficiency) of land transaction, main research objective and sub-objectives are defined to solve research problem.

1.5.1. Main research objective

To develop a workflow database prototype for WfMS in land transaction.

1.5.2. Sub-objectives

- To identify information requirements for WfMS to enhance transparency in land transaction.
- To design a workflow database based on the above requirements.
- To test workflow database for efficiency and effectiveness.

1.6. Research questions

Based on the above research problem and objectives, in details research questions are also carried out.

1.6.1. Sub-questions

- *Sub-objective 1: to identify information requirements for WfMS to enhance transparency in land transaction*
 - What are the concepts of efficiency and effectiveness for transparency?
 - How do efficiency and effectiveness apply in land transaction?
 - What are information requirements in workflow database?

- **Sub-objective 2:** *to design a workflow database based on the above requirements*
 - Which role does the workflow database play in WfMS architecture?
 - How to design workflow database for WfMS in land transaction?
- **Sub-objective 3:** *to test workflow database for efficiency and effectiveness*
 - Who are the users? what are their preferences?
 - How to validate the workflow database in WfMS?

1.7. Research methodology

Following sub-sections explain the methodologies adopted in this research. The research methodology consists of desk research (through literature review), interviews with the stakeholders, modeling and prototyping are used. Research objectives, research questions with corresponding research methods are shown in Table 1-2.

1.7.1. Desk research

Desk research is totally based on literature reviews. This method is adopted to acquire support of theoretical knowledge which concerning about:

- Specific land transaction process in the Netherlands.
- Relationship between "efficiency and effectiveness" and transparency.
- Measuring indicators of efficiency and effectiveness for land transaction.
- The role of workflow database play in WfMS architecture.

1.7.2. Interviewing the stakeholders

In my research, besides theoretical knowledge extracted from the desk research, there are also many practical/field works. Interviews are adapted to clarify land transaction process and workflow database information requirements. For interview design and implementation, three elements are considered:

- Where can I collect these information?
- To whom can I make an interview with?
- How can I conduct the interview?

1.7.3. Modelling

Unified Modeling Language (UML) is a standardized general-purpose modeling language. It combines techniques from data modeling, business modeling (workflows), object modeling, and component modeling, and can be used with all processes and across different implementation technologies (Mishra, 2008). In general database modeling, conceptual and logical model of workflow database are described by UML, physical model of workflow database is realized by relational database tables (Ying, 2008). In this research, UML and Microsoft Access are selected to design and implement workflow database.

1.7.4. Prototyping

A prototype is a sample or model built to test a concept or process. It is designed to test and trial a new design to enhance precision by system analyst and users. It serves to provide specification for a real, working system rather than a theoretical one. In this research, to test whether the workflow database works in WfMS, then validate research hypothesis, a workflow database is implemented based on result of

desk research, interviews and modeling. The prototype structure, environment, input, output, software and case choice all need to be identified.

1.8. Research design

Research design is the operational plan to get the answers for research questions step by step. The following Figure 1-1 show research design which consists of four parts: desk research, interview, modeling and prototype.

Step 1: Through literature reviews to carry out answers of **question 1,2,4**. Specifically, to convince efficiency and effectiveness are the elements contributing to transparency (**answer 1**); to carry out measuring indicators of efficiency and effectiveness for land transaction (**answer 2**); to determine the role of workflow database in WfMS architecture (**answer 4**);

Step 2: Approaches consist of interviews and observations are selected to carry out answers of **question 3,6**. Specifically, to collect information requirements of workflow database (**answer 3**); to collect users' preferences' states and corresponding information in workflow database (**answer 6**);

Step 3: Answer 1, 2, 4 are the theoretical basement of research, then based on answer 3, 6, the workflow database is modeled conceptually by using UML(**answer 5**), and analysis of workflow database model is illustrated to answer **question 5**.

Step 4: Based on conceptual model of workflow database (answer 5), prototyping is selected to carry out the answer of **question 7**, so a functional prototype (**answer 7**) is designed and implemented validate capacity of workflow database whether enhance transparency of land transaction or not.

1.9. Resource required

Table 1-1 Hardware and software required in research

Hardware	Software
<ul style="list-style-type: none"> • laptop • Voice recorder (for recording interviews) 	<ul style="list-style-type: none"> • Microsoft Access 2007 • Enterprise Architecture (UML modeling) • ProcessMaker (WfMS) • Microsoft office (thesis writing, presentation, etc)

Table 1-2 Design of research method

Research Objective		To develop a workflow database prototype for Workflow Management System (WFMS) in land transaction						
Main	Sub	1. To identify information requirements for WfMS to enhance transparency in land transaction		2. To design a workflow database based on the above requirements		3. To test the workflow database for efficiency and effectiveness		
Research Question		1. What are the concepts of efficiency and effectiveness for transparency?	2. How do efficiency and effectiveness apply in land transaction?	3. What are information requirements in workflow database?	4. Which role does the workflow database play in WfMS architecture?	5. How to design workflow database for WfMS in land transaction?	6. Who are the users? What are their preferences?	7. How to validate the workflow database in WfMS?
	Research Method	Desk research (literature review)	Desk research (literature review)	Interviewing the stakeholders	Desk research (literature review)	Unified Modelling Language (UML);	Interviewing the stakeholders	prototyping
Expected Output		Concepts of efficiency and effectiveness for transparency	Measuring indicators of efficiency and effectiveness in land transaction	Information requirements	Role of the workflow database in WfMS architecture	Conceptual workflow database modelling	Exact user group; users' preferences	Workflow database Prototype

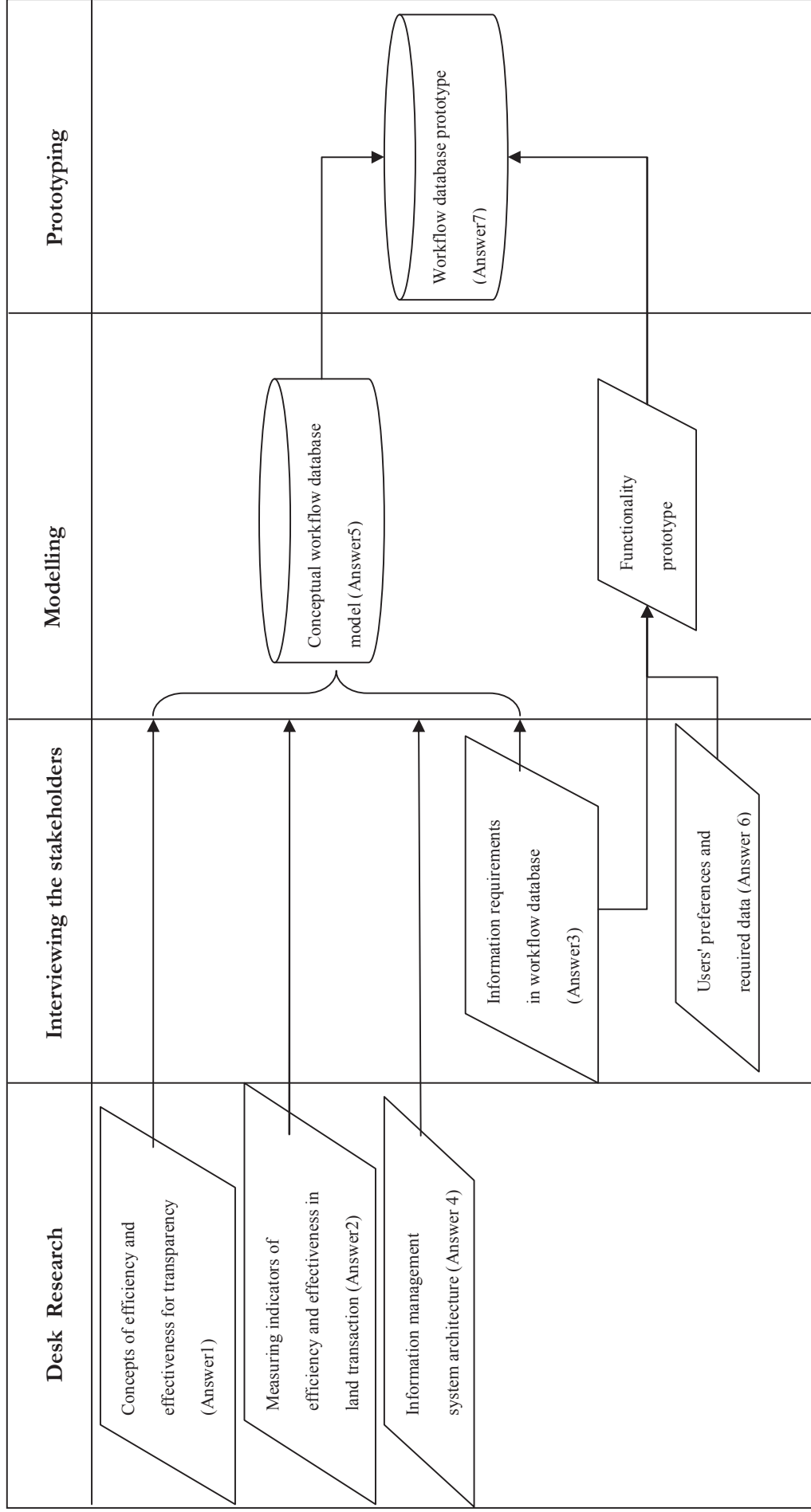


Figure 1-1 Details of research design

1.10. Thesis structure

The final thesis report is presented in six chapters. The contents of the chapters are briefly discussed below.

Chapter 1: Introduction

This chapter gives a general view of the research with background of topic, problem statement, objectives and questions, conceptual framework and methodology for realizing the idea.

Chapter2: Transparency for land transaction

This chapter firstly introduce land transaction in general terms. Secondly, efficiency and effectiveness's contributions to better transparency in land transactions are carried out with their measuring indicators; Then, from technical aspect, approaches and supporting tools for enhancing transparency are illustrated, especially ideas of designing a workflow database in WfMS to enhance transparency is proposed.

Chapter 3: Information requirements analysis for workflow database modeling

This chapter focuses on information requirements analysis for workflow database in WfMS. Firstly, the reasons of choosing individual land transactions in Netherlands are illustrated. Secondly, approaches of collecting information requirements are described. Thirdly, the results of information requirement collection are analyzed and illustrated by UML diagrams and description.

Chapter 4: States analysis for workflow database modeling

In this chapter, based on analysis of information requirements in the chapter3. The various parcel state changes, namely legal states, financial states, combined states and standard states are presented respectively. After states change analysis, the standard state changes are chosen for workflow database modeling. Finally, users preferable states and corresponding information in each state are identified under standard state changes.

Chapter 5: Workflow database modeling and prototyping

In this chapter, first part is modeling conceptual workflow database using UML class diagram. Then, in order to evaluate the workflow database's capacity of monitoring parcel states and corresponding information, a workflow database prototype is designed and implemented, the results of querying parcel states and information are available for the citizens and professional users, so the research hypothesis is validated in some degree. Finally, to discuss the way forward for improvement in the future.

Chapter 6: Conclusion and recommendations

This chapter gives the conclusion of the whole research and recommendations for the further.

2. TRANSPARENCY FOR LAND TRANSACTION

2.1. Introduction

This chapter focuses on transparency requirements for land transaction through literature reviews, including scientific papers, conference papers, books, lecture slides, etc. In section 2.2, concepts of efficiency, effectiveness, and aspects of transparency are illustrated, especially the relationship between transparency with 'efficiency and effectiveness' are analysed as a premise for this following research. In section 2.3, two cases of land transactions are introduced to explain land transaction process and potential transparency issues and corruptions issues. In section 2.4, approaches for improving transparency are developed from efficiency and effectiveness perspectives with indicators. In section 2.5, in order to realize the above approaches, some technologies are presented as tools.

2.2. Efficiency and effectiveness for transparency

Firstly, this section is to introduce concepts of efficiency, effectiveness and transparency, and how they applied in land transaction. Secondly, to find out the relationship of efficiency and effectiveness with the transparency for land transaction.

2.2.1. Concept of efficiency

Efficiency became an important technological value during the nineteenth and twentieth century, as part of the construction of modern industrial society. It is used in two different ways, as a general term describe the extent to which time or effort is well used for the intended task or purpose; as a specific technical assessment, it tied to measurements of performance in machines and thermodynamics of energy (Alexander, 2009).

The Oxford English Dictionary (OED) (Simpson et al., 1989) offers a series of useful definition of efficiency. Such as, "The fact of being an operative agent of efficient cause."; "Fitness or power to accomplish, or success in accomplishing, the purpose intended: adequate power, effectiveness, efficacy." and "The ratio of useful work performed to the total energy expended or heat taken in", etc.

With development of efficiency theory, efficiency has varying meanings in different disciplines. Besides in initial fields of physics and industries mentioned above, efficiency also is used in economics field associated with productivity, market, business, etc; In process reengineering, Roberts (1994) defines efficiency as "to the degree of economy with which the process consumes resources-especially time and money"; In administration, efficiency is to increase transparency within public authorities and simplification of rules and procedures for citizens and businesses.

In this thesis, because efficiency concept is applied in transparency issues and land transaction process, so efficiency focuses on organization/administration perspective. Organization efficiency lies in an organization's ability to maximize performance/profits, within organization efficiency is in terms of

efficient cooperation, awareness about fees, minimum time, minimum labour, availability of data, access to resources, etc. which are performance indicators.

2.2.2. Concept of effectiveness

Effectiveness is the capability of producing a desired result. When something is deemed effective, it means it has an intended or expected outcome, or produce a deep, vivid impression. Also, effectiveness is one of the most complex and least tackled problems in the study of social organizations, some problems arise with attempt to define the concept of effectiveness adequately (Georgopoulos et al., 1957).

Effectiveness has many usages. In medicine, effectiveness relates to how well a treatment works in practice; In human-computer interaction, it is defined as "the accuracy and completeness of users' tasks while using a system"; In management, effectiveness relates to getting the right things done, takes into consideration creating value and pleasing the customer. In process reengineering, Roberts (1994) defines effectiveness as "how well the process actually accomplishes its intended purpose, here again from the customer's point of view".

Be similar with efficiency concepts discussed above, here effectiveness also focuses on organization/administration directions. Researchers have addressed the concerns of effectiveness within organizations from several perspectives, including rational goal, open systems, internal process, participant satisfaction, competing values, and multiple constituencies (Atkinson et al., 2007). Based on this research background, effectiveness are great interest to all stakeholders, in terms of customization and rapid decision making.

Effectiveness is very much confused and misused with the term 'efficiency', and they are discussed always together. Efficiency is a measurable concept, quantitatively determined by the ratio of output to input, whereas effectiveness is a relatively vague, non-quantitative concept, mainly concerned with achieving objectives.

2.2.3. Transparency aspects

Transparency, in its narrow sense, refers to the description that is attached to an object through which one can see (Naranchimeg Bagdai et al., 2009). It is also known that transparency is the opposite of secrecy. Secrecy is the breeding ground for corruptions in its various forms, namely bribery, fraud, favoritism, embezzlement, favoritism and its variations or kickbacks (Sohail. M et al., 2009). As a core principle of good urban governance, transparency connotes the conduct of public business in a manner that affords stakeholders wide accessibility to the decision-making process and the ability to effectively influence it. Transparency system as an organizational systems that make complete, accurate and timely information available to stakeholders, it has clear procedures for public decision-making, and facilitate open communication between stakeholders (International et al., 2004).

According to International et al. (2004), there are three main elements of transparency, namely access to information, public participation and institutional reforms. The three elements are used strategically to

promote transparency both at central and local levels (Shrestha, 2009). Also, transparency has three main aspects: legal, structural and functional aspect. Policy, laws, regulations, charters, codes and rules should be publicly available (Danilo R.A., 2010).

'The law must be accessible and so far as possible intelligible, clear and predictable' (Bingham, 2011). 'Accessible' in this context means being 'public and ascertainable'. There must be simple and straightforward ways of finding out what the law is. Laws and regulations always come first to guide citizen or users go into right tracks. If the laws and regulations are hidden or unclear, people may misuse and misunderstand them. Therefore laws and regulations play a key role in enhancing transparency.

Structural transparency is not only about organizational set-ups, institutional arrangements, and tiers of decision making process which should be clear and predictable (Phuong, 2012), but also organizations are increasingly making goals transparent, then employees understand how his or her own goals and performance his or her better efficiency and effectiveness (Berggren et al., 2007). Generally land administration is not only one organization. It is a connection of organizations and institutions such as national, federal, local level, tax office, municipalities and etc. Structure of how they work and communicate with each other should be clear and connected.

From functional aspect, transparency concentrate on transparent level of information. Specifically, information is relating to: 'Who does what?', 'Who is responsible for what?', 'Who processes applications?', 'Who makes decisions?'. Information is one of the public priorities and thus who or which department is processing customer's work or what they are doing with it should be disseminated transparently. Functional transparency is important because people need to know not only who owns this parcel, how parcel looks like but also what is going on with their parcels.

In conclusion, there are many way to view the transparency issues. However, the most important thing is to know what we are looking for. This research focuses on enhancing transparency by utilizing different technologies, and evaluates transparency by efficiency and effectiveness. In this research, transparency in land transaction mainly focuses on structural and functional aspects for making transparency to all of stakeholders involving into the transaction processes. In other words 'transparency' is considered as a driving element that all decisions, land information and processes are available and easily accessible to all the stakeholders.

2.2.4. Efficiency and effectiveness in transparency

In sub-section 2.2.3, three aspects of transparency are illustrated. This section discusses to identify relationship and demonstrate to increase efficiency and effectiveness for enhancing transparency.

For a business to be successful, every business owner or manager needs to ensure that their business is operating as efficiently and effectively as possible (CPA, 2011). Efficiency and effectiveness are central terms in assessing business performance (Mouzas, 2006). Organizational performance comprises the actual output or results of an organization as measured against its intended outputs (or goals and objectives). Because organization performance is a kind of business performance, so an overall

organization performance can be fully evaluated by two distinct measures which are effectiveness and efficiency(Chiou et al., 2010).

As we mentioned above in sub-section 2.2.3, essentially transparency is the real demands from the citizens and professional users. For the citizens, they need functional transparency (i.e. more transparent information and better services for land transaction); For the professional users, they are operators and managers, and they need structural transparency (i.e. efficient cooperation in land transaction through information sharing). At the same time, essentially efficiency and effectiveness are important supply/source of organization performance.

In order to figure out relationship between 'efficiency and effectiveness' and transparency , an illustrative diagram Figure 2-1 is designed to relate two transparency demands with efficiency and effectiveness. The relationships at a broader level are shown below:

- Transparency on behalf of customers and professor users. Functional transparency represent customers' information needs; Structural transparency represent professional users' goals or needs.
- Efficiency and effectiveness on behalf of organizations' performance. They contribute to good performance from two points. One is transparent and relating to timely information supply and sharing; the other one is efficiency cooperation and effective performances.

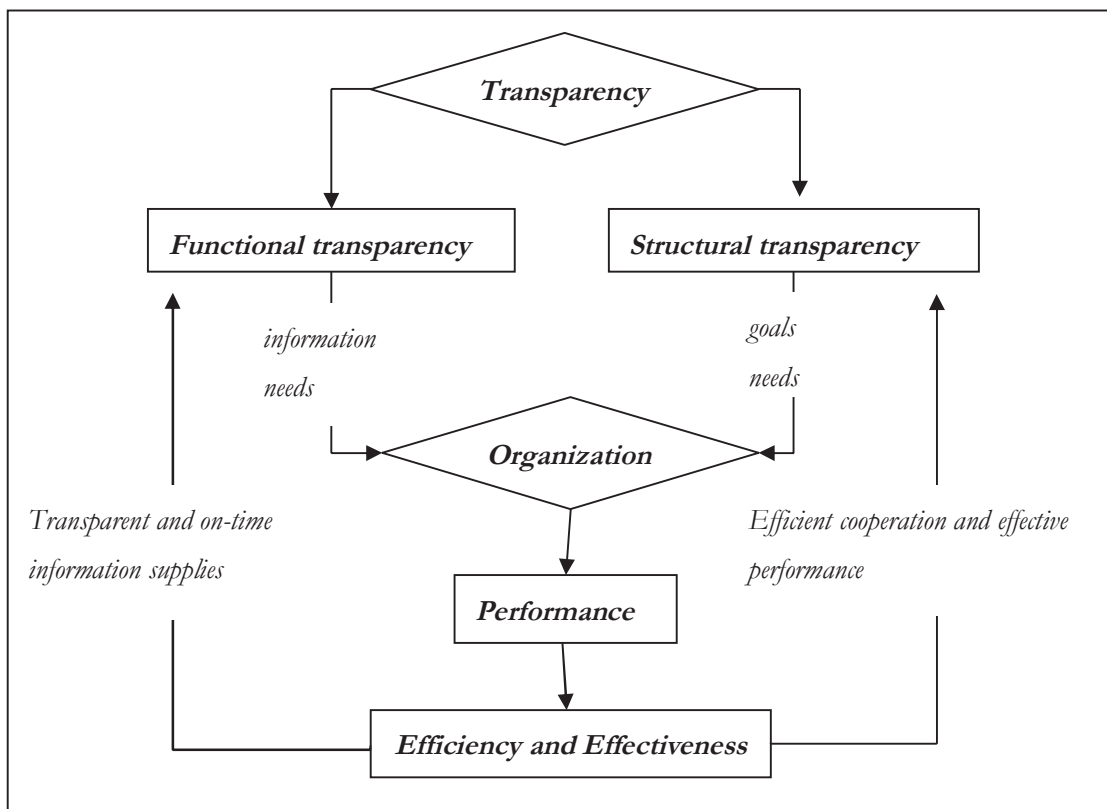


Figure 2-1 Relationship of "Efficiency and Effectiveness" and Transparency

Figure 2-1 demonstrates that increased efficiency and effectiveness can improve level of transparency for land transaction. Using this concept requires indicators of efficiency and effectiveness for transparency in land transaction are identified in following sections.

2.3. Transparency in land transaction

2.3.1. Different type of land transaction

A transaction can be defined as 'the transfer of goods or services from one individual to another' (Lindqvist, 2008). There are many kinds of transaction, in commerce: transaction is related with finance, real estate and so on. In computer science and database systems, it is mentioned as database transaction, atomic transaction, etc. In this thesis, transaction is related with land, transaction.

'What is land transaction?'

Generally, land transaction is about the exchange of land ownerships or land use rights by agreements using like deeds or titles. It is different with other transactions because that land transaction is a frequent and complex socio-economic activity, it involves land, people and relationship between them mentioned by Zevenbergen (2002). The traded goods are ownerships or land use rights. Land data is not only about administrative data, but also spatial data of land parcels.

Also, there are many kinds of land transactions. They are all based on parcel. Parcel is a unit of land, usually delineated according to land ownership or land use right. Different countries have different land rights. China cases could be an obvious example. In China land belongs to the country or collective farmers, every citizen only has legal land use right, not land ownership. Here are two kinds of land transaction classified by transaction scale (e.g. large scale and individual scale). The two cases are illustrated to reflect transparency issues in land transaction process through two representative examples. Case I is about land acquisition and Case II is about individual land transaction.

Case I: Short case from China: land acquisition

In China, land of a village belongs to all villagers, everyone has his land use rights. With the acceleration of urbanization, urban land is far from the needs of large-scale urban infrastructure construction. According to the contemporary law, local government own the right of expropriating farming land from villagers through the land acquisition. With increasing numbers and scales of land acquisitions, a serious of questions is often raised. One of them is about welfare and effectiveness loss during the process (Market, 2012).

In March 2012, in Xi'an city, Shaanxi province, a protestors parade took place. This story started from 2010, when a real estate company expropriated land (in downtown area) for building houses. The land is owned by one old village so called 'Sanyao'. Everything is legal in the whole acquisition procedures, including the negotiation process. The most difficult issue after land acquisition was the payments which were not paid to each villager. After investigation, the reason was found: the real estate company did not receive legal land ownership certificate from land registration department, because of registration in many jurisdictions suffered from bureaucratic delays. Furthermore, many jurisdictions use analogy paper-based documentation system and many power holders were involved during land acquisition. This is a very

typical example that land management organizations function inefficiently and lack of information sharing. All these lead to public's dissatisfaction.

Case II: Short case from "I PAID A BRIBE"- Individual land transaction

This is a case taken from website (2001)---'I PAID A BRIBE' about individual land transaction in a place in India where there are many kinds of bribe and people talk their experiences. This story is about 'HARYANA UDA OFFICIAL DELAYED TRANSFER OF HOUSE IN MY NAME 'TILL BRIBED'. The process started when 'I lost my job in Delhi in 2001 and got one in Oman but was not able to move as my papers to transfer my house in my name, which was pending. The dealing official informed me that he has sent the papers to Chandigarh and the transfer will be done when all the necessary documents are ready. However, I paid him RS. 800/- required by him and immediately he gave me the transfer documents which I need after his words above' (Anonyms, 2012). This is a typical example that non-transparency in workflow of land management organization leads to low effectiveness of organization performance and corruptions.

2.3.2. Transparency issues in land transaction

Above two examples clearly introduce an obvious phenomenon in land transaction i.e. lack of transparency and the resulting corruption. The essential reasons of the above two cases are lack of transparency and the consequent corruption in some degree. The definition of corruption varies among different scientific disciplines and varies depending on their discipline.

Recent findings by TI (2011) show that corruption can vary from small-scale bribes and fraud (e.g. administrative corruption), to high-level abuse of government power and political positions (e.g. political corruption). Corruption, whether administrative or political, does not favour the establishment of long-term national or local land strategies. When corruption is present in the land sector, related actions and decisions are driven by distorted interests and policies that favour the few.

In Case I: political corruptions are reasons of disputes. Political corruption in land sector aims to gain control over a country's resources for both what is above and beneath the ground. It can manifest as a result of opportunities created through land transactions, reforms and development projects that occur within a country, region or district (TI, 2011) . Above land acquisition is an example of land transaction in China. Besides it, there are state-owned lands that are privatized or leased. After zoning or construction plans are approved, land is expropriated for government projects. Political corruption may occur in such a case.

In Case II: administrative corruption influence individual transactions. Administrative corruption always take the form of small bribes that need to be paid to register property, change or forge titles, acquire land information, process cadastral surveys, and generate favourable land use plans (TI, 2011). Bribery also always occur in land transaction which is facilitated by complicated processes and limited information about available services and any applicable fees. The enormous prevalence of bribery in the land sector

creates a high informal cost for those trying to transfer land. It makes land administration services inaccessible to people who are not able to afford illegal payments.

The practical experience (similar with the above two cases) in many countries is that corruption exists where there is lack of transparency and by consequence it creates more corruption, and reduce public satisfaction and organization performance. In conclusion, there is demand to increase transparency in land transaction to curb the corruption. One of the ways to deal with corruption is increasing transparency. It is an innovative approach to anti-corruption.

2.4. Approaches for enhancing transparency in land transaction

Studies indicate that the citizens and professional users usually experience non-transparency in land transaction processes, because the processes are complicated. Citizens need a fast, simple and effective service, which indicates transparency as an important factor during the land transaction. Professional users need a clear and efficient coordination with other colleagues or partners in other organizations, which indicates transparency of information sharing as an important factor during their work.

2.4.1. Efficiency aspects

The measure of efficiency evaluates the performance of a decision making units with multiple inputs and multiple outputs, which are indicated by the ratio of the weighted sum of outputs to the weighted sum of inputs (Charnes et al., 2006) . Because land transactions are processes with various stakeholders such as buyers, sellers, real estate agency, notary, cadaster office and municipality, so we need transparent processes and time-saving cooperation among them improve efficiency.

Based on characteristics of land transactions and efficiency, in order to express efficiency in land transactions, a list of indicators with good practices are identified and given in the Table 2-1 (N.H. Koroso et al., 2013).

Table 2-1 Indicators for measuring efficiency in land transaction

	<i>Indicators</i>	<i>Good practices</i>
<i>Measures of efficiency in land transaction</i>	cost time per land transaction	minimum time (hour) required in per land transaction
	queue time per land transaction	Minimum time (hour) required in per step per land transaction
	resources per land transaction	Amounts of transaction cost (money, labours) involved in per land transaction
	percentage of on-time information delivery	% of on-time delivery between different stages in per transaction
	coordination among various stakeholders at each step	availability of clear mandate and strong commitment for cooperation (+/- or yes/no)
	satisfactory of tasks delivery mode	% of professional users who have positive view about tasks delivery

2.4.2. Effectiveness aspects

The measure of effectiveness evaluates the performance of a decision making unit (DMU) with respect to the strategic objectives, which is indicated by the degree to which it achieves the stated objectives (Asmild et al., 2007). Essentially, land transactions are services. Right things mean that the results of transactions meet citizens' needs, as well information of each stage meet professional users' needs.

Based on characteristics of land transaction and effectiveness, in order to express effectiveness in land transactions in specific level, a series of indicators with good practices are identified and given in the Table 2-2(N.H. Koroso et al., 2013)

Table 2-2 Indicators for measuring effectiveness in land transaction

Measures of effectiveness in land transaction	Indicators	Good practices
	service standard/quality	measure of perception about level of satisfaction (high/low) assessing time, processes and cost involved
	citizens' satisfaction	% of the citizens who have positive view about the service provided (satisfied) or general perception
	professional users' satisfaction	% of the professional users who have positive view about the service provided (satisfied) or general perception
	available information during land transaction process	% increment of information than that former procedure
	capability to respond to complaints	time cost in tackling customers' complaints

2.5. Tools to support above approaches

Research showed that in high developed countries, digital land tools contribute to sustainable development (World Bank, 2011). As experiences in countries like Germany shows transactions can be accelerated through digital services and thus be made more cost-efficient. They create better financial resources and leading to progressive process innovations.

2.5.1. Land Information System(LIS)

Technologies support transparency in a decisive way. As a solution for anti-corruption in land transaction, transparent, accessible and accountable land transaction system can create an environment for corruption-free land dealings.

The International Federation of Surveyors (FIG) has defined a Land Information System---LIS as a tool for legal, administrative and economic decision-making and an aid for planning and development. There are many types of LIS used for Land Administration depending on the different purposes. It can be used for Cadastre and Land registration, Land Use planning, and Land Valuation or for Land Resource

Management in general (Tuan, 2006). Because land transaction is a main function of Land Administration, so computer-based LIS also supports land transaction managements.

On one hand, a LIS consists of a database containing spatial referenced land-related for a defined area and; on the other hand, of procedures and techniques for the systematic collection, updating, processing and distribution of data (Tuan, 2006). More specifically, a LIS consists of the following components that enable it to function well in land transaction: data sets, processes or functions, hardware and software, and people (Tuladhar, 2004a):

- **Data sets:** They include two categories of data sets: cadastral data, which is directly connected with land ownership such as land parcel, land user, parcel legal situations, building, etc. and supporting data, which is relation data such as control point network, administrative boundaries, hydrology, transportation network, etc.

- **Processes or functions:** They are related to system processes and functions or data acquisition, data processing and storage, data maintenance, data analysis and data dissemination. These processes are optimized to provide products and services in effective and efficient manners.

- **Hardware and software:** They include IT equipment such as server, workstation, printer, and GIS, database software and communication networks. Currently, Geo-ICT has largely contributed to establish LIS. There are now a lot of specific hardware with high speed processor, big data storage, and advanced functions of GIS, database management system which spatial and no-spatial are easy to be integrated.

- **People:** The human resources, who are needed to develop, implement and support the system operation (Tuladhar, 2004b)

2.5.2. Workflow Management System(WfMS)

Workflow management systems (WfMSs) are among the most interesting systems for supporting modern organizations with a focus on processes rather than on structure (Eder et al., 1996). It is a technology mainly focusing on the automation of business processes. It is widely adopted in the enterprises for supporting production activities executed by the employees (Aversano et al., 2010). WfMSs are classified according to the features they provide and the types of processes they support. Workflow is the sequence of actions or steps used in a process, which is usually run by more than one involved parties and uses many different resources usually raised from set of operation rules (Pourabdollah et al., 2006).

Workflow technology enables the organization to capture both the information and tasks of process. It not only provides functionality to match resources and tasks in a process, but also provides important information to support process management (M. Mostafa et al. 2001, p.82). A workflow model is a description of a business process in sufficient detail that it is able to be directly executed by a workflow management system. A workflow model is composed of a number of tasks which are connected in the form of a directed graphics(Eder et al., 1996). The main advantages deriving from the use of WfMSs are the following (Fischer et al., 2000):

- efficiency improvement: Using WfMSs allows an enterprise accomplishing several objectives for improving its efficiency regarding the management of processes, resources, market, delegation, motivations.
- process control improvement: WfMSs introduce a standard way of organizing the work and include tools for validating the performed activities.
- service quality improvement: Possibility of selecting the resources by exploiting their specific during the workflow execution.
- training costs reduction: The costs for training human resources is reduced as the execution of the tasks is guided by the WfMSs.

The Workflow Management Coalition (WFMC) has a standard WfMS reference model (Bae et al., 2002), as shown in Figure 2-2. This reference model is used in Phuong (2012) research, the results illustrate that this architecture enhance the transparency of land transaction.

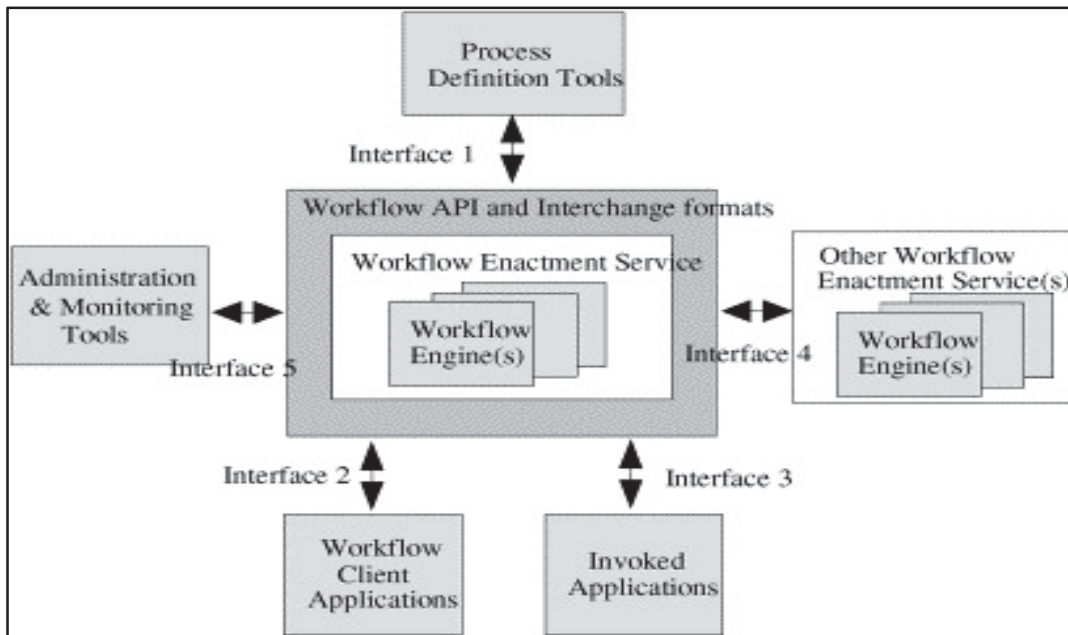


Figure 2-2 Reference model (WFMC)

Nowadays, with development of WfMSs, WfMSs are faced with some new requirements. Using WfMSs based on workflow reference architecture (Figure 2.2), business workflows are realized well with some degree of transparency, because WfMS store task description and implement functionality on top of DBMS. But since associated data are normally stored in the specific data storage format and content of a specific WfMS software environment, it is not visible and suitable for the users. Yet users (citizens and professional users) require better transparency including efficiency and effectiveness of their business services. As such, how to respond to the transparency requirements for land transaction is a challenging task for current WfMS.

The problems faced by workflow systems have a lot in common with problems already solved in databases technology. So, nowadays there is a considerable amount of research works underway regarding the most relevant ideas that can be taken from the transactional and database world to new WfMS world in which database technology have a significant impact on the evolution of workflow systems (Alonso, 1996). In Eder et al. (1996) research, database technology contribute to the developments of workflow systems in not only as a tool for the management of workflow relevant data but maps the dynamic workflow engine to the rules of an active database system. This means database systems facilitate the realization of workflow management systems in several ways. Active database can provide the necessary functionality to keep the workflow relevant data, business data as well as process data (Eder et al., 1996).

In conclusion, motivated by more requirements of transparency, and based on well developed database technology, designing a workflow database (active database) and integrate it into WfMS architecture is a good solution to enhance transparency (including efficiency and effectiveness) in land transaction process.

2.5.3. Workflow database management

In previous section 2.5.2, it is obvious that using database technology can meet WfMS requirements, a perfect strategy of data management is a factor for enhancing or increasing transparency in land transaction i.e. to introduce concept of workflow database with states changes of land transaction. So understanding the functions of workflow database and its role in WfMS are likely to enhance transparency of land transaction from database perspective.

It is convinced that disclosure of workflow data in land transaction process is necessary and needed urgently. Thus it is important to know which kind of workflow data and its form are required to enhance transparency. In this research, based on users survey about transparency requirements, most users related in land transactions (see the next chapter 3) mentioned that they need information, not only in the end results of business process, they also would like to know what happened timely during their business process. So it is advised that workflow database stores different states of land transaction to enhance transparency.

What is states? Land transactions information can normally be expressed in term of states, for example, negotiated stage, deeds prepared stages, land surveyed stage and so on. They are all states of land transactions. In each state, there are related information about price, operator, time etc. should be available for the citizens and professional users. Specific illustration of states and corresponding information are discussed in chapter 4.

In this respect, the role of workflow database is significant point in order to disclose the related information of the various stages of land transaction. In Phuong (2012) research, the model is based on Reference Model (WFMC) but the proposed mode as shown in Figure 2-3 brings the openness of the model. This model has a separate workflow database, focusing on being towards the complete transparency. In this research, one of the aims is to design a workflow database, which stores states information (i.e. workflow data) meeting users' state requirements of land transaction. The role of

workflow database is shown in Figure 2-3: workflow database is separately with WfMS internal database, the internal database gets extended with external WF database in order to accommodate state requirements. When the workflows of land transactions run in WfMS, each step has new information, in the point of states change, users' preferable information is retrieved from internal database to Workflow database. Finally, workflow database is filled with required workflow data in states enhancing land transactions transparency.

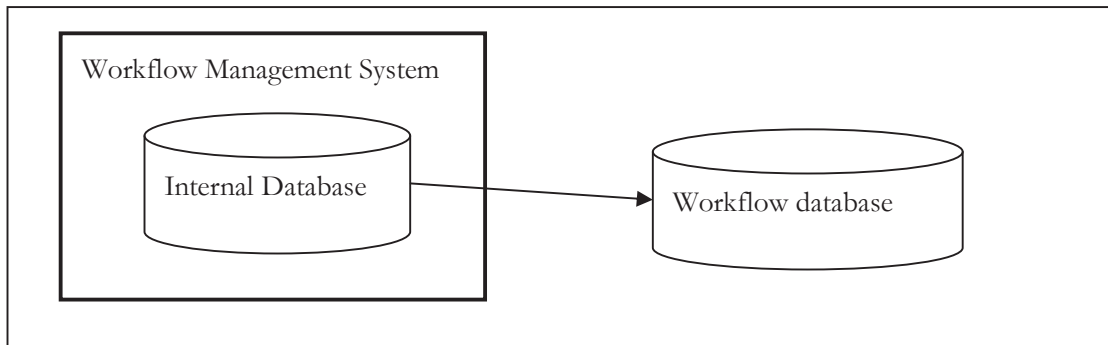


Figure 2-3 The role of workflow database in WfMS

Performing tasks within a workflow database often begins with assessing the needs of the projects, identifying those need access to specific functions, and creating the actual database. So, before designing workflow database, information requirements should be clear. The details of collecting this requirements will be discussed in Chapter 3.

2.6. Concluding remarks

In this chapter, it is convinced that increased efficiency and effectiveness enhance transparency in land transaction, meanwhile indicators of efficiency and effectiveness for better transparency are developed. From technical perspective, besides some common technologies used for land transactions, a workflow database for monitoring parcel states and corresponding information is advised to design in WfMS for better transparency (efficiency and effectiveness), its expected role and functions are depicted.

In next chapter, the information requirements collection and results analysis for workflow database modelling are illustrated.

3. INFORMATION REQUIREMENTS ANALYSIS FOR WORKFLOW DATABASE MODELLING

3.1. Introduction

Transparency concept, transparent requirements in land transactions, and limitations of transparency in WfMS are discussed in chapter 2. The concept of workflow database is also introduced as a database technology to enhance transparency of land transaction in WfMS.

This chapter mainly focuses on information requirements analysis served for workflow database modelling. In section 3.2, the reasons of selecting individual land transaction in the Netherlands are presented. In section 3.3, the approaches for collecting information requirements are introduced. Then in section 3.4, the results of information requirements collections are analysed.

3.2. Land transaction in business

As we mentioned in section 2.3.1, land transaction differ with other transaction because of land is immoveable assets, the trading goods are land rights. Along with various land administration histories, laws, regulations, land rights and involved stakeholders, there are many types of land transactions, for examples, land acquisition is a kind of land transaction that sellers are groups of owners (e.g. all villagers of one village) who own ownership of land rights, the buyer is company, enterprise, or state, etc. Based on differences on the business size, amounts of parcels, involved stakeholders, there is another kind of land transactions is individual land transaction, here individual refer to that deal concerning one land parcel object and seller and buyers. Then transaction is happened between one seller and one buyer until it finished.

Sometimes in land transaction business, there is a mortgage issue. According to Anglo-American property law (Cribbet et al., 1989), a mortgage occurs when an owner pledges his or her interest (right to the property) as security or collateral for a loan. However, the word *mortgage* alone, in everyday usage, is most often used to mean *mortgage loan*, it refer to a home buyer or builder can obtain financing (a loan) either to purchase or secure against the property from a financial institution, such as a bank or credit union, either directly or indirectly through intermediaries. Most Dutch banks and mortgage providers will normally allow the buyers to borrow up to 80-85% of the buying price. Life mortgages and savings mortgages are the most popular types of mortgage in the Netherlands. It can be beneficial to use off shore companies and property shareholding investment can have capital gains advantages. In Dutch law there is only one security right in registered property i.e. the in principle accessory right of mortgage. This is established by a notarial deed (mortgage deed) drawn up between parties and registered in the public registers (Hendrik Ploeger et al., 2005). More information of mortgage in Dutch case is described in 3.4.2.c.

In this research, the individual land transaction is chosen to represent land transactions. Further two types of Dutch land transaction are selected to represent land transaction processes---ownership full transaction

and subdivision. The reasons of selecting individual land transaction and Netherlands cases are described below:

3.2.1. The reasons of choosing individual land transaction

The several reasons are presented as follows:

- The research of individual land transaction seems more representative. Because, the amounts of individual land transaction is much more than that of land acquisition cases; individual land transaction is good basis for transparency analysis and workflow database design.
- Land transaction is essentially the main service of land sector, the main customers groups of land transaction are individuals, they have lots of transparency demands for land transaction.
- Land transactions are very important for land market. A prosperous market depends on frequency and improvement of individual land transactions. Increasing transparency is an important direction of good governance promoting the better and dependent land market.
- Compared with large scale land acquisitions, individual land transaction are free from political pressure, has more simple procedures for this research.

3.2.2. The reason of choosing cases in Netherlands are

- The Netherlands has high score of level of transparency in land sector. So from the study of the Dutch case, we can easily present information requirements and have idea about how to develop workflow database in transparent way, and what we can take into account to achieve transparency.
- Dutch Cadaster had introduced WfMS concept in early age of workflow (Oschi et al., 2004). Compared with other countries, Dutch Cadaster has a long history of developing a well functions cadastre system.
- Dutch Cadaster has plan of designing a workflow database in WfMS. So learning WfMS from Dutch Cadaster will bring ideas of designing workflow database.

Therefore for this research, the Netherlands cases seem convincing for designing criteria in terms of transparency in workflow database to realize efficiency and effectiveness in individual land transaction process.

3.3. Approaches for information requirements collection

Information requirements of workflow database are important preconditions for the workflow database modelling. In this section, the approaches for information requirements collections are illustrated specifically.

3.3.1. Information requirements

Once Dutch individual land transaction cases are chosen, there are three questions need to be answered for workflow database modelling.

- Who are the specific stakeholders participating in Dutch individual land transaction?
- What are the specific sequences of activities during the whole Dutch individual land transactions?
- What are the states of land transactions that need to be stored in workflow database?

3.3.2. Approaches for information requirements collection

a. Interviews the stakeholders

An interview is a conversation between two or more people where question are asked by the interviewers to elicit facts or statements from the interviewee. The main task in interviewing is to understand the meaning of what the interviewees say (Sayrs, 1998). Interviews are usually semi-structured based on a series of fixed questions with scope for the user to expand on their responses.

In order to make clear of specific process and related stakeholders during land transaction in the Netherlands, questionnaires are designed for collecting required information. The questionnaires are designed based on following objectives and criteria:

Objectives of designing questionnaires:

1. To find out how land transaction workflow really run in the Netherlands?
2. To find out what specific information input and output in each step of land transactions?
3. To find out who are unknown stakeholders in land transactions before interviews?

Through objectives of questionnaires, I develop guidelines for information to be collected such as:

1. Specific workflow of land transactions, including each activities and who operate what activities?
2. Specific inputs and outputs in each step of land transactions, including identifiable information of actors, duty and obligations of actors, all necessary documents, etc.
3. Some transparent requirements from different kind of actors. What information they would like to see during land transaction process?
4. Suggestions from actors about how to improve transparency of land transactions.

Brainstorming:

In this step, all possible questions for incorporating in the questionnaire are written. There are some useful rules (Larry M., 2002) to follow:

- Keep questions simple. Avoid ambiguous, leading, double-barrelled and hypothetical questions.
- Avoid words of more than three or four syllables and over-long sentences.
- In closed questions, allow the respondent the option of answering with 'not appropriate', 'don't know' or 'have no strong feelings'. This helps the respondent and avoids difficulties later in interpreting questions that have no responses.

After questionnaires(see the Annex 1,2,3,4) are designed, interview plan (see the Table 3-1) is formulated on base of appointments sequence with various kind of organizations. The specific content of interview plan is as follows:

1. Interviews are identified as semi-structured interviews;
2. It consists of face to face communication & interviewing the questionnaires;
3. Make appointments with 4 organizations & 7 actors who are known participated stakeholders.

Table 3-1 Interview plan in information requirements collection phase

Questionnaire no.	Organization	Actors (numbers)
Annex 1.	Real Estate Agency	Broker (2)
Annex 2.	Bank	Mortgage officer (1)
Annex 3.	Notary	Notaris (2)
Annex 4.	Kadaster	Workflow designer (2)

b. Observation

During the trip to Dutch Cadaster in Apeldoorn, besides interviews with Berry van Osch and Dr. Lemmen, there are also observations on mapping preliminary boundary operated by Mr. Berry. Mapping preliminary boundary process in Cadaster is recorded as follows:

Step 1: how to find the parcel on map?

Three choices: Parcel Identifier /Address (Figure 3-1)/ Zoom in/out on the map

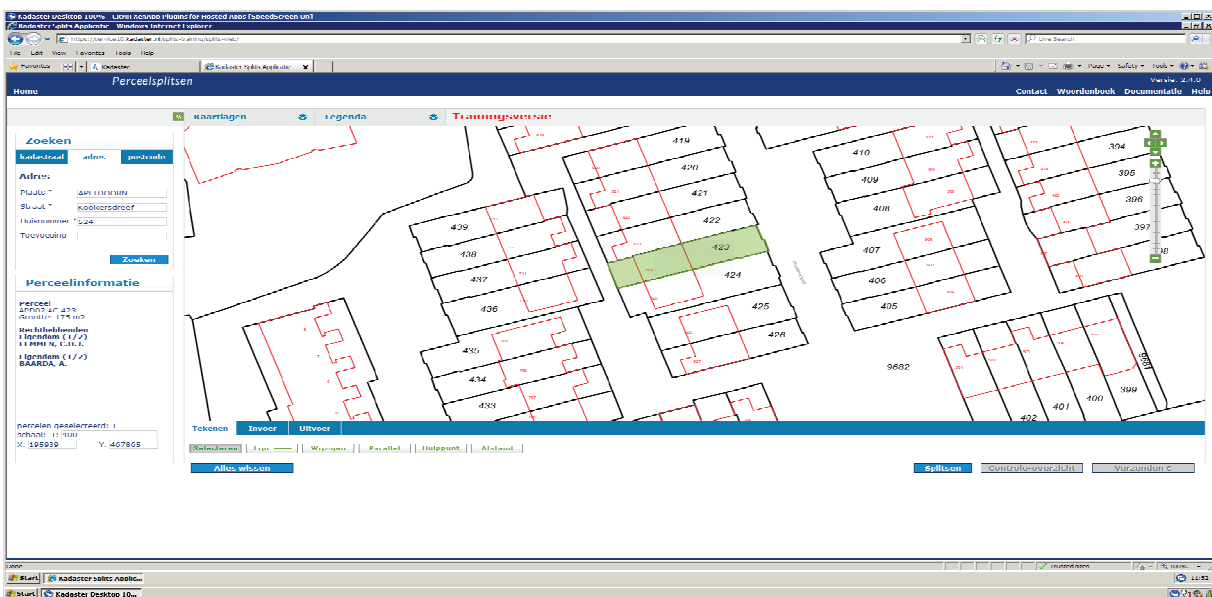


Figure 3-1 Find a specific parcel on map

Step 2: How to subdivide the parcel?

Two choices: using existing coordinates/ drawing with tools (Figure 3-2)

After subdivision, new parcel identifier and preliminary area are produced immediately (Figure 3-3)

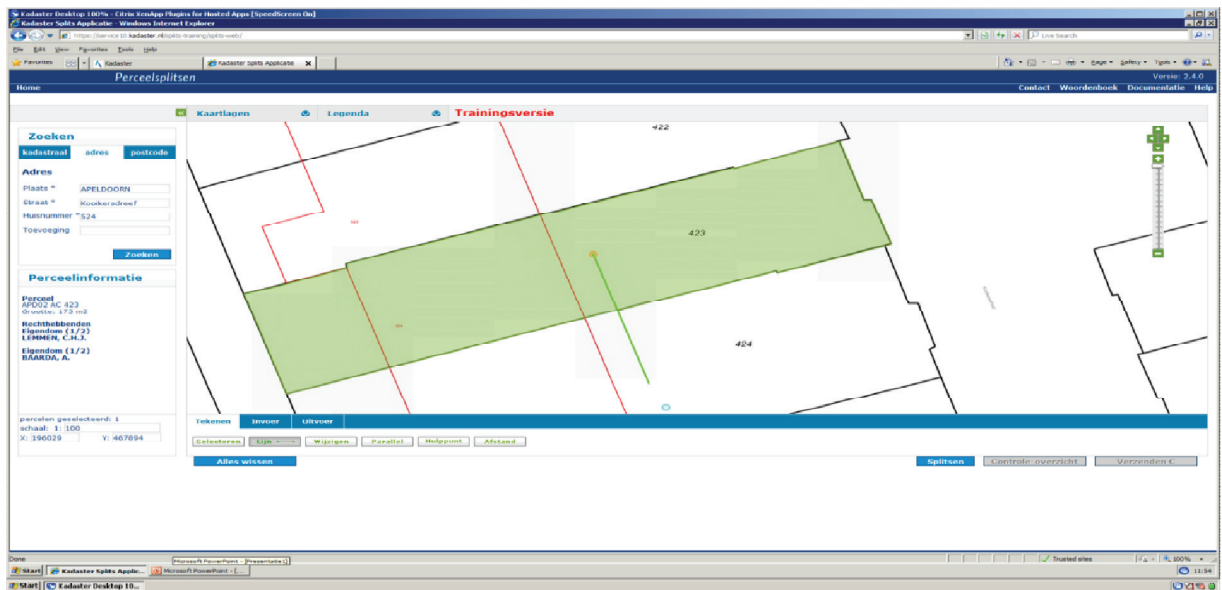


Figure 3-2 Draw new boundary with lijn tool

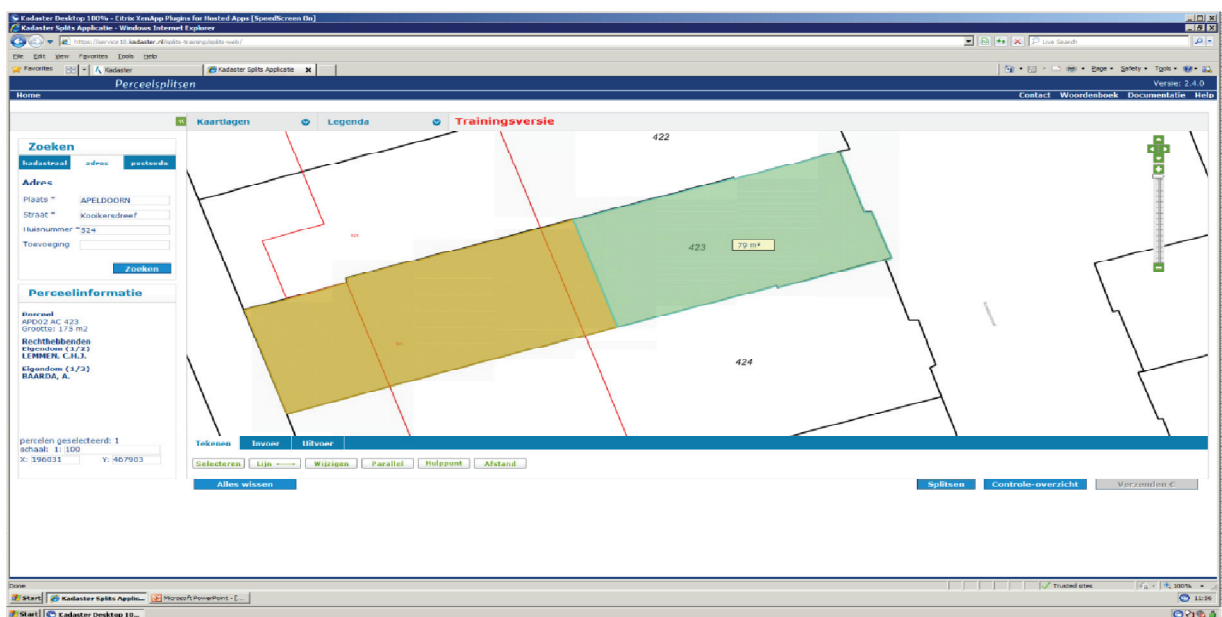


Figure 3-3 Preliminary areas after subdivision

Step 3: Submit options

After subdivision (splitsen button), there are two choices

- Controle-overzicht: produce new boundary map in PDF format which can be sent to buyer & seller to check
- Verzenden: conveyancing, at same time, E-Kadaster database is updated automatically

3.4. Results of information requirements analysis

In this section, various actors involved in land transactions are introduced with table description and UML use case diagrams, four typical cases: full transaction without mortgage (annex5); subdivision without mortgage (annex 6); full transaction with mortgage (annex 7); subdivision with mortgage (annex 8) are also illustrated by UML activity diagrams and descriptions.

3.4.1. Actors in land transaction

There are various actors involved in land transaction, here actors and their roles are introduced with their actions in Table 3-2. They are mainly classified to buyer and seller, bank, real estate agency (REA), notary, cadaster. At the same time, different involvement of actors in four cases are introduced by UML use case diagram (Figure 3-4, Figure 3-5, Figure 3-6, Figure 3-7).

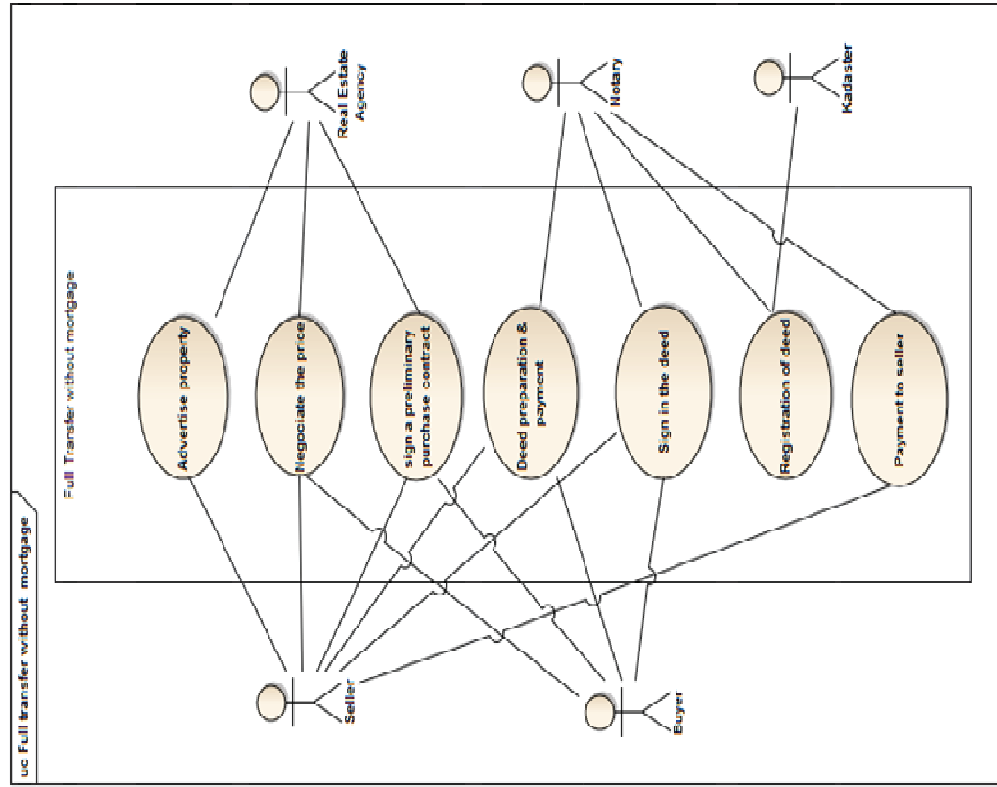
Table 3-2 Introduction of actors in land transaction

<i>Actors</i>	<i>Actions</i>
Seller	<ul style="list-style-type: none"> • person who have interest to sell the parcel • start of whole chain of land transaction • request Real Estate Agency to advertise land • sign on contract of advertisement • involve in negotiating price of the parcel • sign on purchase contract • pay service fees to REA and Notary • get payment of land from Notary
Buyer	<ul style="list-style-type: none"> • person who has interest in buying the land • request for buying land and connect to REA • involve in negotiating price of land • sign on purchase contract • pay service fees to REA • pay payment for buying land to Notary
Real Estate Agency (REA)/Broker	<ul style="list-style-type: none"> • not compulsory involved in land transaction • usually seller and buyer look for REA's help • sign a contract of advertising seller's land • go to the land, take pictures and prepare legal documents • advertise seller's land • negotiate and generate the price of land • prepare purchase contract
Notary (Notaris/Financial assistant)	<ul style="list-style-type: none"> • handle legal issues of land transaction and manage all payments • investigate information of owner and his/her land • check price of the land whether it is reasonable • prepare deeds and provisional subdivision plan (in subdivision case) • ask for seller and buyer 's signature and payments • conveyance deeds • pay fees to cadastre and tax to municipality
Kadaster (Registrar/ Surveyor)	<p>In central office</p> <ul style="list-style-type: none"> • planner receive surveying requests and distribute survey jobs by SAP and GIS support <p>In local office</p> <ul style="list-style-type: none"> • registrar do registration, check deeds and dealing with notary • surveyor check spatial data, legal guide the parties in the field and

	<p>surveying</p> <ul style="list-style-type: none"> • manager manage general things in the office, check changes, detects illegal transaction or wrong information in system • registrar produce and send confirmation to Notary
Bank	<ul style="list-style-type: none"> • handle financial issues of mortgage in land transaction. • as a lender who give a loan to borrowers to purchase land • choose to support transaction or not according to mortgage issues

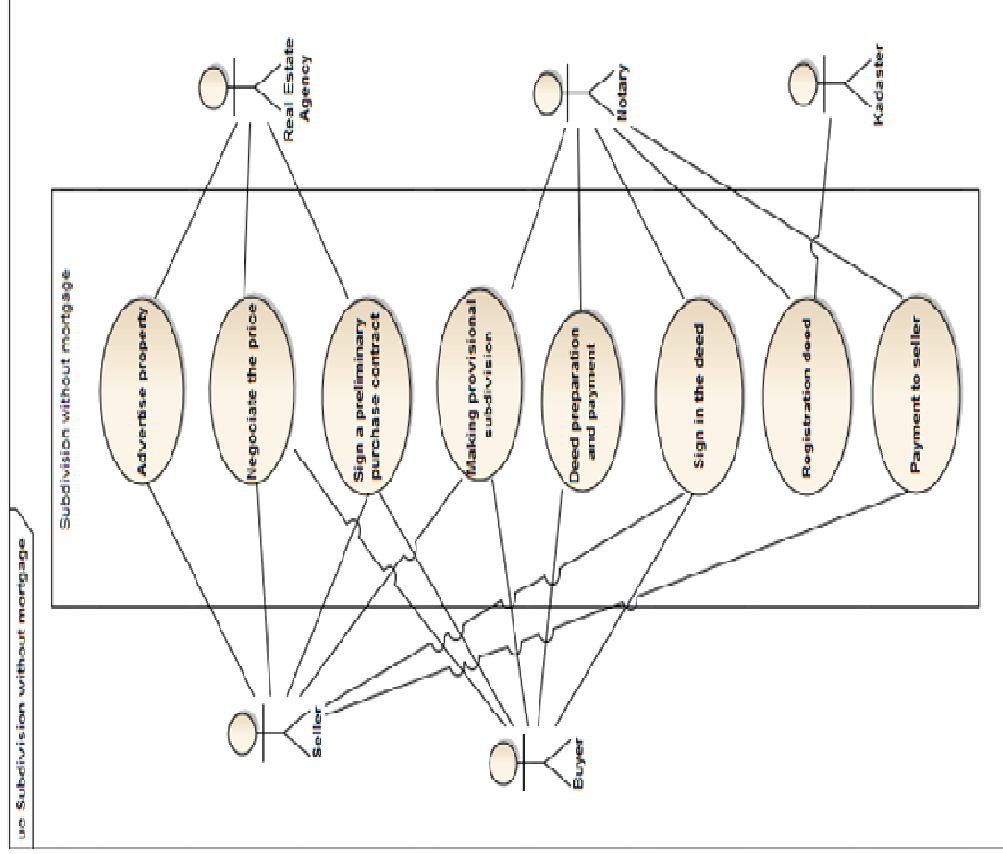
a) Actors in full transaction without mortgage

Figure 3-5 Use case diagram of full transaction without mortgage



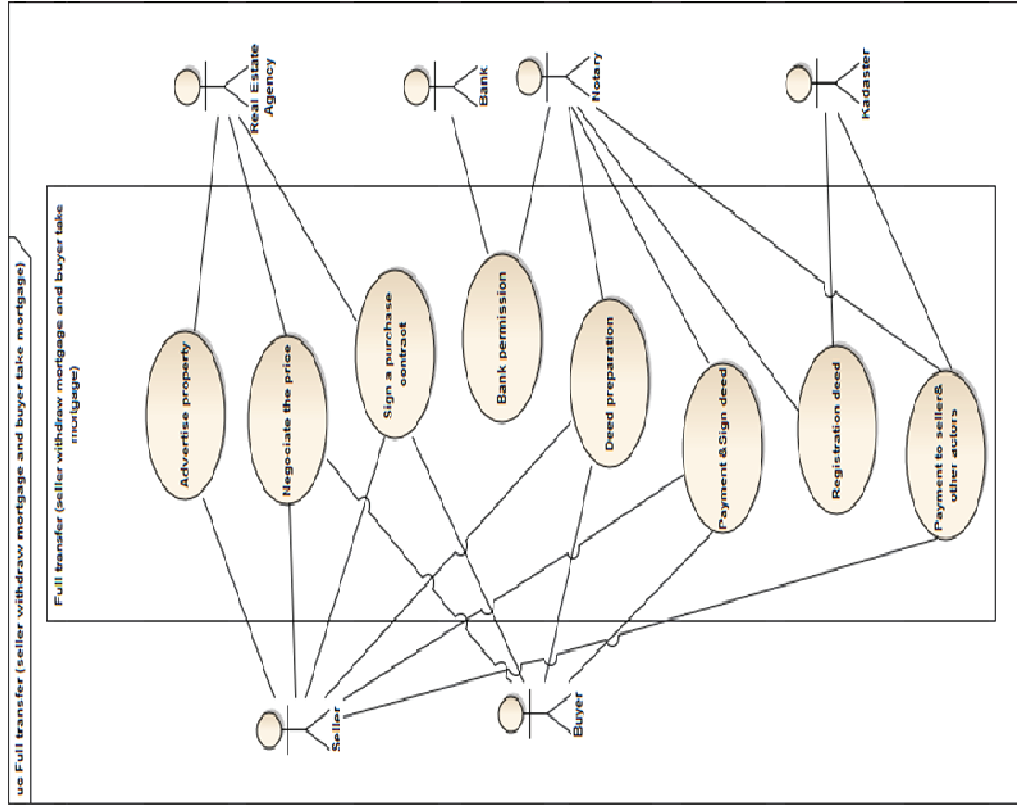
b) Actors in subdivision without mortgage

Figure 3-5 Use case of subdivision without mortgage



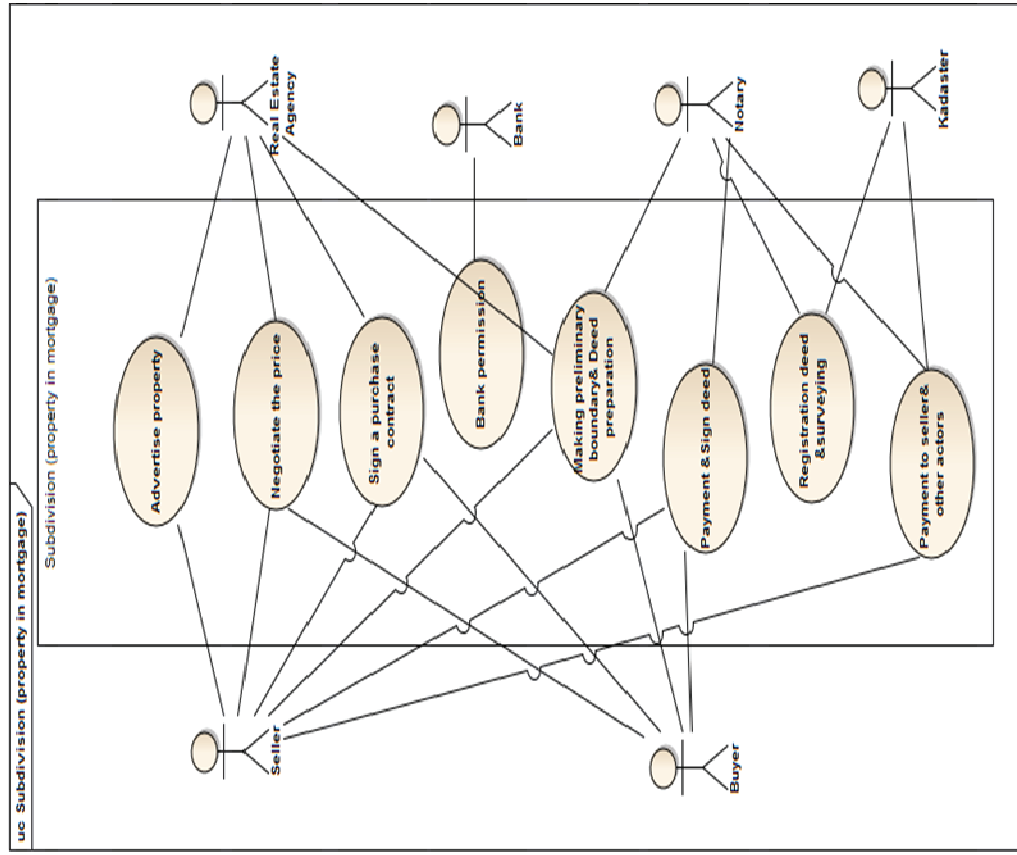
c) Actors in full transaction with mortgage

Figure 3-7 Use case diagram of full transaction with mortgage



d) Actors in subdivision with mortgage

Figure 3-7 Use case diagram of subdivision with mortgage



3.4.2. Land transaction procedure

As mentioned above, four typical individual land transactions in the Netherlands are illustrated to represent land transaction in this research:

- Full transaction without mortgage (annex 5)
- Subdivision without mortgage (annex 6)
- Full transaction with mortgage (annex 7)
- Subdivision with mortgage (annex 8)

The specific workflow of respective case is finished after interviews and illustrated by description and activity diagrams as following:

a. Full transaction without mortgage

The whole UML activity diagram is shown in annex 5, its description is described as follow:

(1) In REA: Because these four cases have same operations before they transferred from REA to notary, so operations related with REA, buyers and sellers are illustrated once. A land transaction starts from sellers contact REA and request for selling, then brokers take over cases and start to check eligibility of sellers, brokers have access to Municipality's database for checking construction permission and spatial planning, also has access to E-kadaster database for checking ownership and mortgage information. When all checking work finished, brokers sign advertisement contracts with sellers, and take pictures of parcels, prepare legal documents, settle prices and then advertise the parcels. Once a buyer comes to REA and has favour on this parcel. They come to negotiation stage and then sign purchase contract with agreements. After this, a broker takes the buyer and seller to notary office.

(2) In notary: If notaries agree with processing this business, they also start from check eligibility of sellers, buyers and their business. If everything is eligible, notaries assign parcel ID to new owners(buyers) after buyers pay for it, then prepare transfer deed and conveyance it to Cadaster. If buyers have no money to buy it, or this parcel is in mortgage, this situation is illustrated in case c and d.

(3) In Cadaster: After notary conveyance transfer deeds to registration office through email. Registrars choose any deed coming to his inbox but normally they follow the sequence. After receiving the deed, the registrars check information about notary and information of deeds such as an owner's name, address, parcels ID, mortgage deed, etc. If the deed is ineligible, it is returned to the notary to rectify it. Normally, the deed is eligible, then it is processed and confirmation is produced and sent to notary, the notary informs customers, with satisfaction of buyers and

sellers, the notary can charge customers and allocate fees to related stakeholders such as cadaster, the buyers.

(4) In whole procedure of transaction, there is an important concept---"E-Cadaster". E-kadaster is a virtual concept, it is the connection between cadaster and notary, in notary's computer, there is software supplied by cadaster for deed preparation and mapping preliminary boundary, when notary operates and confirms, data (administrative or spatial data) will be updated through E-cadaster, and then the registrar's function is only to check the eligibility of transfer/mortgage deed and current data, then produces and sends confirmation to notary as soon as possible.

b. Subdivision without mortgage

Subdivision without mortgage case (annex 6) is different with full transaction case in two points:

(1) Notarises use special software to mapping preliminary boundary at notary office with permission of buyers and sellers. After splitting, the data stored in E-Kadaster database are updated. Then notarises send transfer deeds to cadaster, registrars check deeds and produce confirmation.

(2) There is surveying in subdivision case, after registrar's checking, surveyors will check preliminary boundary, and if the boundary is not right, surveyors will revise it and update spatial data, then after surveyor's approval, registrars produce confirmation.

c. Full transaction with mortgage

The UML activity diagram of full transaction with mortgage is shown in annex 7

(1) Most Dutch banks and mortgage providers normally allow customers to borrow up to 80-85% of the buying price.

(2) The precondition of buying a piece of parcel by applying mortgage from bank, is a registered property owned by buyers is built on that parcel. Only fulfilling this precondition, banks arrange mortgages to applicants after they consider other related issues.

(3) If one parcel is in mortgage, before it is to be sold, the seller needs to repay all loan to bank, then he/she has right to sell it.

(4) The mortgage itself is not allowed to transfer with parcel transaction business, it is compulsive that mortgage must be repaid before parcel is transferred.

(5) Before assigning parcel ID to new owner, notaris needs permission from bank, if banks agree with the loan, they will support transaction, if buyer needs mortgage to buy that parcel, bank will arrange a new mortgage for the buyer.

(6) After the seller pays mortgage loan to the notary, then the notary cancels seller's mortgage deed.

d. Subdivision with mortgage

Compared with subdivision without mortgage case, in cases related with mortgage (annex 8), there are two different points:

(1) After mapping preliminary boundary, there is a new parcel ID generated, but the notaris does not assign the buyer name to new parcel, he/she need permission from bank firstly. For example, in Figure 3-8, after subdivision, there is parcel ID is 1101 and 1102, but owners are still A.

(2) After receiving bank's permission, notaris assigns the buyer name to new parcel, cancels old mortgage deed, prepares new mortgage deed, sends transfer deed and new mortgage deed to Cadaster. For example, in Figure 3-8, after receiving loan from the seller, the bank permits with transaction, the buyer name B is arranged to parcel 1102 by notaris.

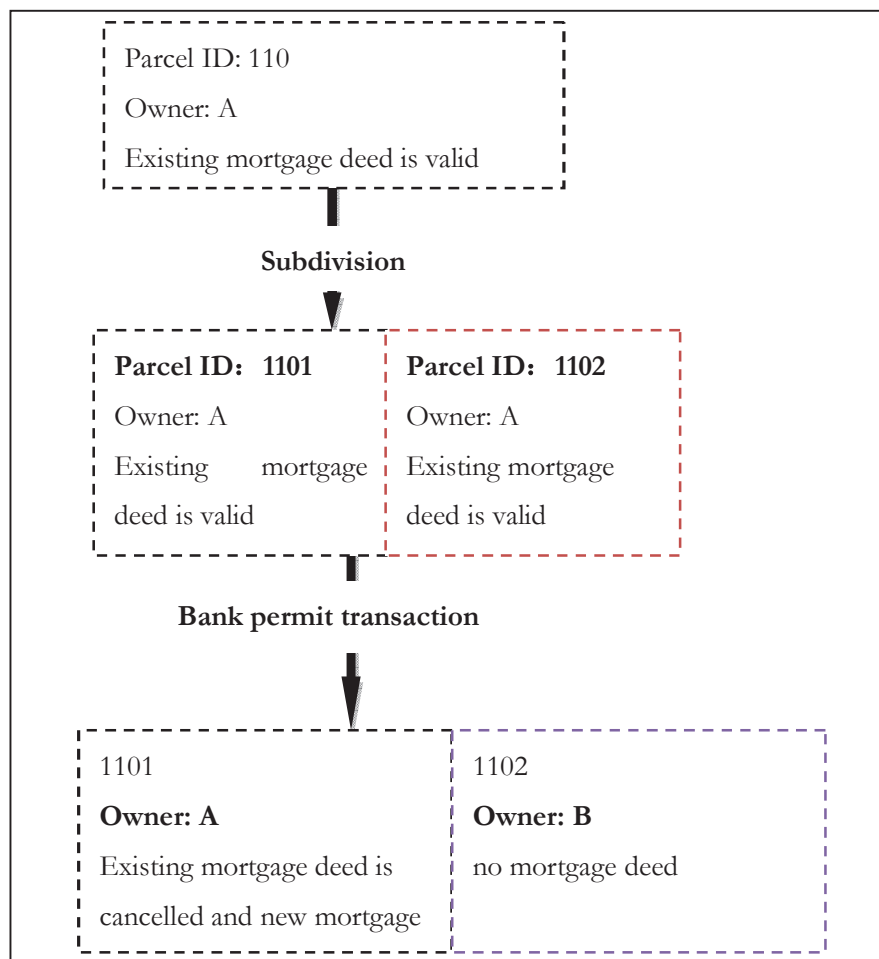


Figure 3-8 Example of mortgage deed changes along with subdivide action

3.5. Concluding remarks

In this chapter, individual land transactions in the Netherlands are chosen as cases in this research. Then, collecting information requirements for workflow database modelling through interviewing the stakeholders with specific questionnaire. The results of information requirements analysis consist of two parts: involved actors and specific workflows, the actors and

processes are identified through UML use-case diagrams, specific workflows of land transactions are depicted through UML activity diagrams.

In next chapter, based on the information requirements analysis results, the various parcel states are analysed for workflow database modelling, and users preferences are collected.

4. STATES ANALYSIS FOR WORKFLOW DATABASE MODELLING

4.1 Introduction

In chapter 3, information requirements analysis and its results are presented. The analysed results serve for following parcel states analysis.

In section 4.2, concepts of states and object behaviours are introduced, how results of information requirements analysis contribute to state changes analysis is illustrated. In section 4.3, various parcel state changes are depicted through UML state-machine diagrams respectively. In section 4.4, responding to the standard state changes, specific users' preferable information in each state is identified.

4.2 States analysis for modeling

The main contents of this section are introductions of state changes and object behaviors. And FSM machines are chosen for modeling various state changes.

4.2.1. States and state changes

a. States

In the vocabulary of object orientation, state is particularly prominent. A simple description of an object's state would involve whether the object exist or not very useful. We also need to understand how the object fits with other objects in our world(Martin et al., 1998). One general definition of object state is:

Object state is a collection of relationships an object has with other objects

Because parcel transaction is researched in this thesis, so parcel is core object, and its states are researched here. Figure 4-1 depicts other objects involved in land transactions, the centre object is parcel, it is mapped to several different objects with their relationships. These relationships then determine parcel state.

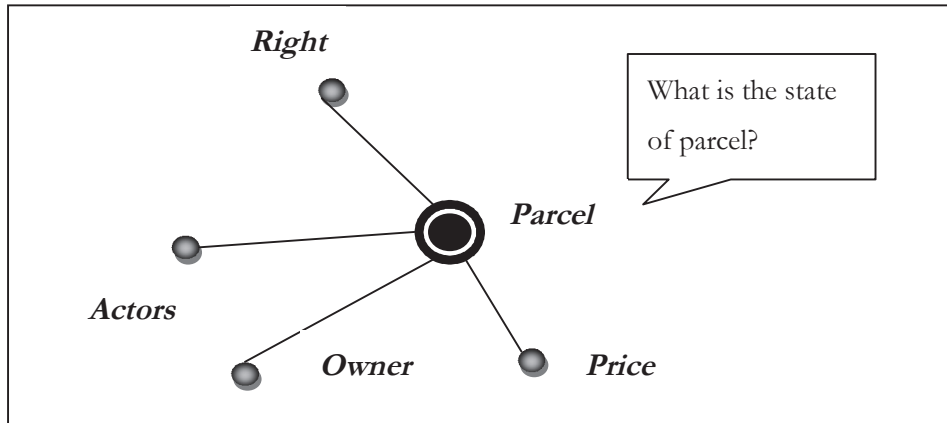


Figure 4-1 Parcel and its related objects which effect parcel states

Additionally, the relationships between parcel and other objects are: parcel is trading goods; right is trading essence; price is embodiment of parcel value; owner is people who has ownership of parcel; actors are stakeholders who affect progress of parcel transaction, e.g. buyer, seller, broker, notaris, registrar, etc; And parcel states start from the period of 'Request for parcel transaction' to 'Parcel transaction finished'.

b. State changes

State changes, also refer to object state changes. The expression, an object changes means that the state of an object changes. The general definition of object state change is

An object state change is the transition of an object from one state to another

In Figure 4-2, "parcel i" represents parcel and its state, from parcel 1 to parcel n, parcel itself is invariable physically, but its state is changing. State is one attribute of parcel.

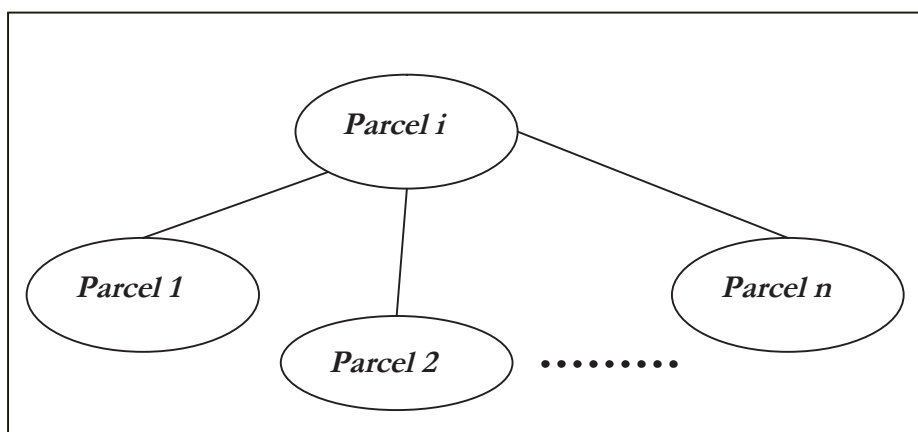


Figure 4-2 One parcel with its various states

In reality, state changes mean that one or more of an object's relationships change. From this perspective, an equivalent definition of state change could be

An object state change is a change in an object's relationships.

In this research, because parcel state is researched, so we focus on parcel state changes, essentially relationship changes. Relationships between parcel and other objects are depicted in 4.2.1.a, and object behaviour that occurs relationship change are illustrated in following sections.

4.2.2. Object behaviours

a. Object behaviours

Objects have two important characteristics, besides object state, another one is object behaviour, which occur object state change.

Behaviour specification tends to be represented in two basic ways---state-related and nonstate-related. In this research, we concern on state-related. State-related approach focuses primarily on specifying behaviour in terms of states and state changes. One popular technique adopted for Object-Oriented (OO) specification is the finite-state machine. A finite-state machine (FSM) is a hypothetical machine that can exist in only one of a finite number of states at any given moment, and one FSM can specify all the possible state transitions permissible for an object.

Each finite-state machine has a finite set of input stimuli that can reach it and trigger a state change. Each stimulus, then, is an event/trigger combination. An FSM state change is a function of its current state and a given stimulus. In addition to a finite set of stimuli and possible states, each FSM has a finite set of responses or output types that can be produced.

b. Finite-State Machine modelling

Finite-state machines are a popular form for representing OO behaviour. There are various kinds of FSMs from different researchers. When the operation is associated with the transition, the representation is known as the Mealy model of FSMs. When the operations are associated with the state, it is known as the Moore model of FSMs. When operations are associated with both the state and the transition, this is called Mealy/Moore combination model.

The current trend is to employ a combination of Mealy and Moore modelling techniques. In this way, the analyst can get the best of both techniques. Figure 4-3 illustrated the representation syntax as a combination of Mealy and Moore modelling techniques. For states, operations can be specified on transitions---along with the event type/trigger rule and a control condition.

Operations, events, triggers, and control conditions are process-related notions

- Operations: processes that can be requested as a unit and can carry out the state change.
- Events: define state changes that result from operations and invoke other operations via triggers.
- Control condition: ensure that a certain state exists before a certain operation can be triggered.

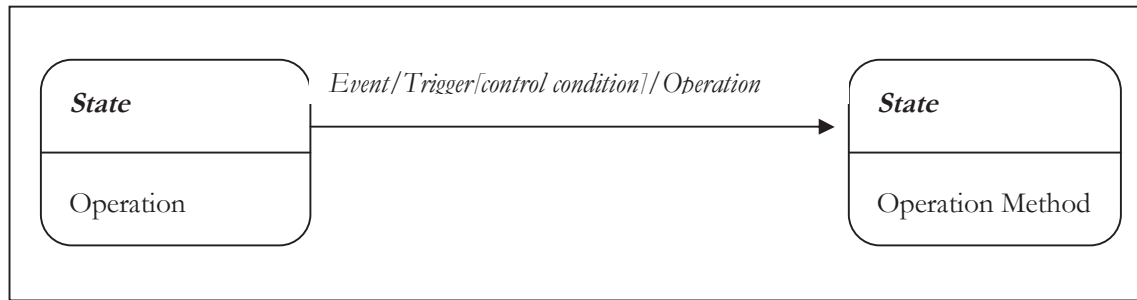


Figure 4-3 FSM representation used by Booch, Embley, OMT and UML employs a combination of Mealy and Moore

4.2.3 Information requirement analysis contributing to states analysis

The specific information requirements analysis consists of related actors and workflow of land transaction. These results in term of roles and information are used in workflow database modelling. All in all, in order to subdivide states more clearly and efficiently, four activity diagrams are concluded into one general workflow diagram shown in annex 9 which is suitable for more different cases, e.g. house transactions, etc. It is clear that information requirements analysis results helps for states analysis from following aspects:

- (1) The related actors (Table 3-2) in land transactions are candidates of who are interested in workflow database. They are potential interviewees for user preference and information collections.
- (2) The general workflow of land transactions (annex 9) make clear on the legal relationships between parcel right and each actor.
- (3) The general workflow of land transactions make clear of payments relationship between each actor.
- (4) The general workflow of land transactions also provides one possibility of parcel states in term of the standard states.

4.3. Variations of land transaction states

Based on the various relationships between parcel and its related object, there are four different ways to analyse parcel state changes, they are legal states and financial states, combined states, standard states.

4.3.1 Legal states and financial states

Actually, with proceeding of parcel transaction, the relationship between parcel and other objects is changing, this lead to parcel state change. So, there are different ways to identify parcel states based on various relationship. There are three kinds of state changes--- legal states and financial states (Figure 4-4), combination states(Figure 4-5), and standard states (Figure 4-6). State machine diagram of UML (Figure 4-3) is used to express each kinds of parcel states.

Legal states (lift diagram in Figure 4-4) are identified on base of relationship between parcel and right (*ownership of parcel*)

State1- initial parcel stage: '*ownership of parcel*' is owned by sellers initially.

State2- reserved parcel: transactions start with buyers join in and after successful negotiation, '*ownership of parcel*' is recorded in purchase contract which means.

State3- deeds prepared parcel: notaries handle with parcel transaction request. In full transaction case, notaries assign *parcel id* to buyer and prepare transfer deed after check; In subdivision case, notaries subdivide '*ownership of parcel*' and assign new parcel id to buyers; In case with mortgage, notaries operate mortgage deed and conveyance it to Cadaster with transfer deed.

State4- registered parcel: after receiving deeds, registrars check eligibility of deeds, if eligible, '*ownership of parcel*' is updated in E-kadaster database.

State5- confirmed parcel: '*ownership of parcel*' is confirmed on confirmation which is sent to buyers, sellers, notaries.

Financial states (right diagram in Figure 4-4) are identified on base of relationship between parcel and price (*value of parcel*).

State1- quoted parcel: '*value of parcel*' is evaluated in bank and represented as quoted price.

State2- advertised parcel: '*value of parcel*' is represented as advertised price and parcel is advertised in market.

State3- reserved parcel: '*value of parcel*' is recorded as sold price in purchase contract after successful negotiation.

State4- paid parcel: payments which represent sold price transferring from buyer to notary for temporary custody; or in case with mortgage, bank will operate mortgage part for customers.

State5- allocated payments parcel: after receiving confirmation and agreement of customers, payments and service fees which hold by notary is allocated to related stakeholders, Cadaster, notary, etc.

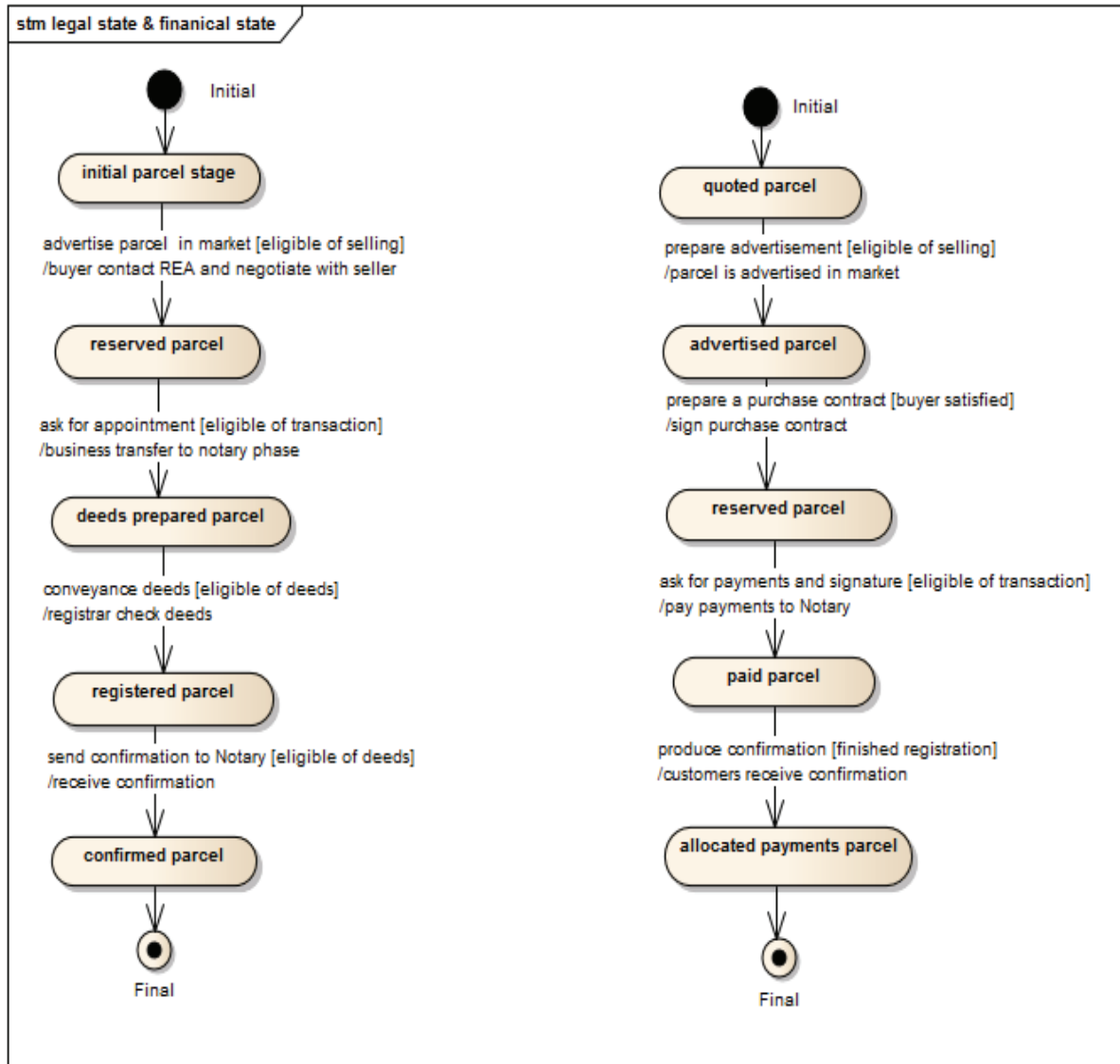


Figure 4-4 Legal states & financial states

4.3.2 Combined states

However, because various users have different requirements, legal states cannot alone satisfy users who focus on payments states. Financial states also cannot satisfy users who focus on legal right states. So from the users perspective, with different user requirements, the states can be combination of legal states and financial states. As show in following Figure 4-5, this is a combination state diagram to meet the transparency requirements of different stakeholders.

State 1- checked parcel in REA: '*ownership of parcel*' is checked by brokers in Real Estate Agency.

State 2- advertised parcel in market: *advertised price* is arranged and '*ownership of parcel*' is advertised in market.

State 3- negotiated parcel: buyers and sellers start to negotiate the price until *sold price* is decided.

State 4- reserved parcel: *'ownership of parcel'* and *sold price* are recorded in purchase contract with legal recognized.

State 5- checked parcel in Notary: business is transferred from REA to notary, firstly, notaris also need to check eligibility of *'ownership of parcel'* and related mortgage information. Also *sold price* will be checked because of taxes issues.

State 6- deeds prepared parcel: if transaction is eligible, notarises assign parcel id to buyers and then prepare deeds (transfer/mortgage) and conveyance them to Cadaster, and charge customers' payments (*"value of parcel"*).

State 7- checked parcel in Kadaster: registrars receive deeds and check eligibility of deeds and related information.

State 8- surveyed parcel by surveyor (optional): surveyors confirm the veracity of spatial data. If survey is needed, registrars send it to planners to allocate survey jobs to confirm spatial data. If survey is not needed, registrars produce confirmation after checked.

State 9- registered and confirmed parcel: registrar check information related with parcel in E-kadaster database and produce confirmation.

State 10- allocated payments parcel: after notaries receive confirmation and customers' satisfaction, notaries financial assistants allocate money to related stakeholders.

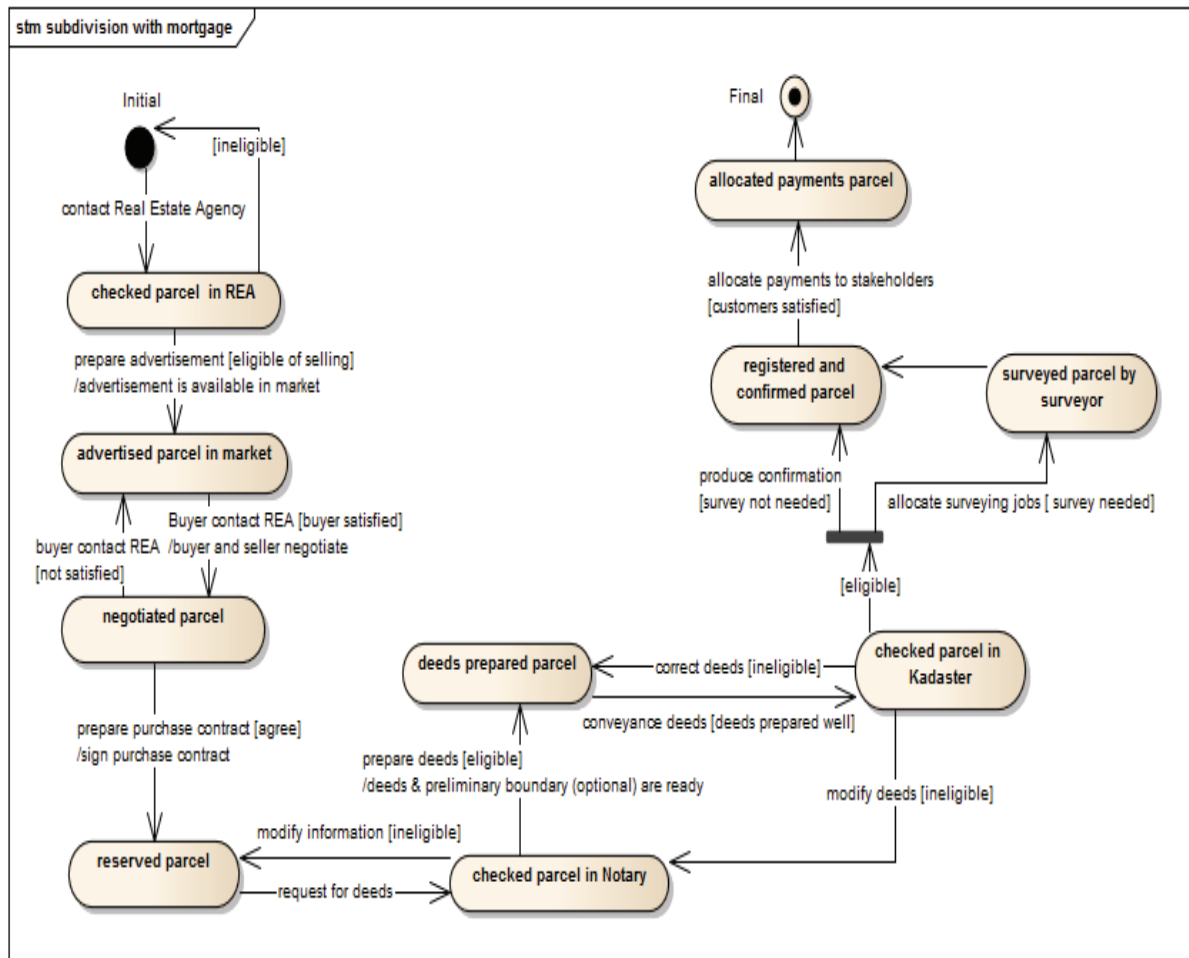


Figure 4-5 Combination states based on user information requirements

4.3.3 Standard states

Now there are three choices of transaction states--- legal states, financial states, and combination states. And then I made an interview with two experts in Dutch Cadaster as mentioned in chapter 3. This is an important meeting for deciding parcel state changes. After interviews, there are some reasons of identifying standard states change as follows:

- Annex 5,6,7,8 totally reflected the current and completed workflow of individual parcel transactions: full transaction without mortgage, subdivision without mortgage, full transaction with mortgage, subdivision with mortgage case respectively.
- They recommend me to draw one diagram which can reflect 4 cases or more rather than draw them separately, the outcome is annex 9, it can reflect various parcel transaction situations with many choice in one diagram.
- Most important idea is about 'standard states' of land transaction. Looks like annex9 dashed box, each box mean one state, so the state diagram (Figure 4-6) can indicate various property transaction cases.

- About modelling issues, comparing with previous 3 parcel states modelling, standard states are more efficient to model. Because in chapter5, there are designing prototype and validation, so modelling efficiently is a key issue need to be considered into parcel states identification.

After illustrating reasons of choosing standard states, specific analysis of it are described in section 4.2.4.

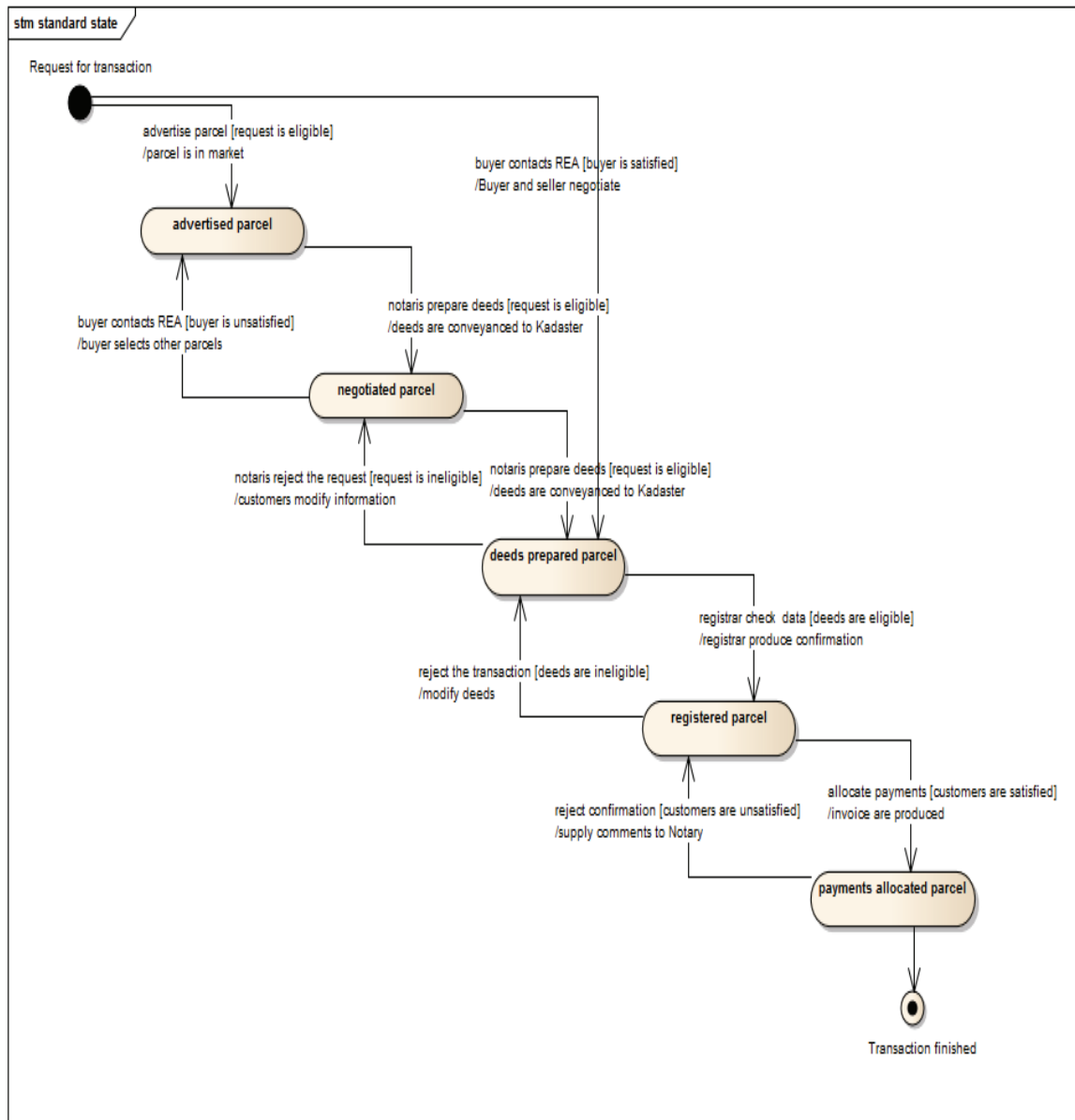


Figure 4-6 State machine diagram of standard states

4.3.4 Standard states analysis

After analysis of three kinds of parcel states during transactions, standard states are decided to represent parcel states in this research. In this annex 9, dashed box subdivide all activities into 5 boxes which is responding to states changes, object behaviours that trigger state changes also are illustrated richly. This section consists of states analysis and object behaviours analysis.

In order to illustrate state changes and responding object behaviours more clearly, parcel standard states in Figure 4-6 are replaced by more general figure with description; actually Figure 4-6 and Figure 4-7 represent same states essentially.

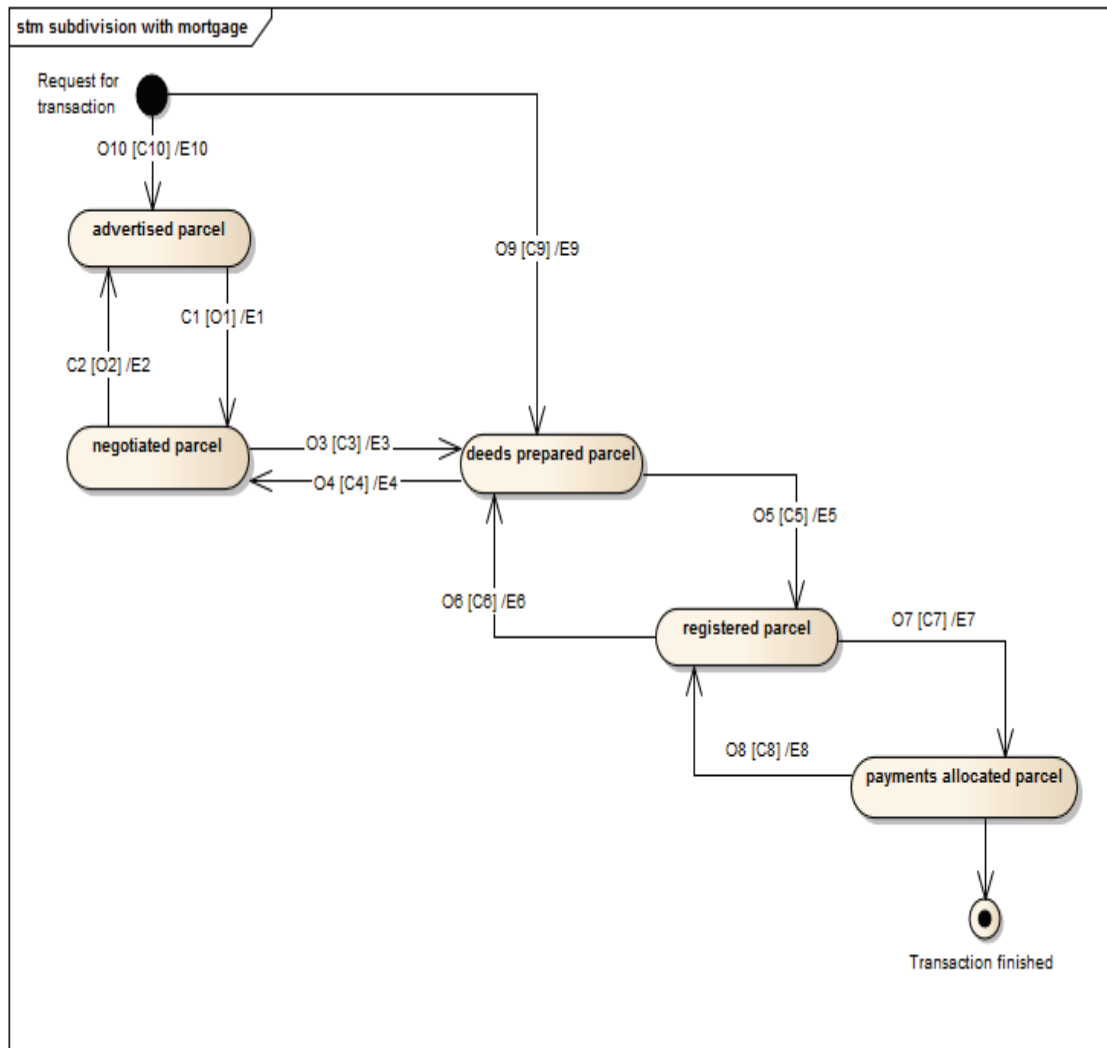


Figure 4-7 State changes depend on both operations and control condition (guard)

In Figure 4-7, **C** represents control condition that ensure that a certain state exists before a certain operation can be triggered condition; **O** represent operation which is a unit can carry out the state change. **E** represent the effect after responding operation. The specific description of control condition, operations and effects in whole parcel transaction are as following (Table 4-1):

Table 4-1 Specific description of control conditions, operations and effect.

States change	Control condition	Operation	Effect
Initial to State 1 (C10[O10]/E10)	<ul style="list-style-type: none"> - Exact and legal ownership and mortgage info. - Authoritative appraisal - Signed advertisement contract - Construction permission and spatial planning 	<ul style="list-style-type: none"> - Advertise parcel 	<ul style="list-style-type: none"> - Parcel is advertised in market
State 1 to State 2 (C1[O1]/E1)	<ul style="list-style-type: none"> - Buyer see advertisement from various ways - Buyer has eligibility of buying - Buyer is satisfied with parcel information 	<ul style="list-style-type: none"> - Buyer contact REA and seller 	<ul style="list-style-type: none"> - Buyer and seller start to negotiate - If negotiation is successful, they sign purchase contract - Then make an appointment with notary
State 2 to State 1 (C2[O2]/E2)	<ul style="list-style-type: none"> - Buyer is ineligible for buying - Buyer is not satisfied with that parcel - Negotiation is failed 	<ul style="list-style-type: none"> - Buyer contact REA 	<ul style="list-style-type: none"> - Buyer starts to look for new parcels in market - The parcel is still in market
State 2 to State 3 (C3[O3]/E3)	<ul style="list-style-type: none"> - Notary agree appointment with seller and buyer - Seller and buyer have eligibility of transaction - Support of transaction from bank (mortgage related case) - Construction permission and spatial planning 	<ul style="list-style-type: none"> - Notaris prepare deeds 	<ul style="list-style-type: none"> - Deeds are conveyed to Kadaster - If subdivision case, attachment is preliminary boundary map
State 3 to State 2 (C4[O4]/E4)	<ul style="list-style-type: none"> - Transaction request is ineligible - Bank refuse to support parcel transaction (mortgage case) - Municipality refuse parcel transaction 	<ul style="list-style-type: none"> - Notaris refuse parcel transaction request 	<ul style="list-style-type: none"> - Buyers and sellers try to modify their transaction request
State 3 to State 4 (C5[O5]/E5)	<ul style="list-style-type: none"> - Deeds are eligible - If subdivision case, preliminary boundary map is eligible 	<ul style="list-style-type: none"> - Registrar check information of deeds and database - If survey is needed, allocate surveying to surveyor 	<ul style="list-style-type: none"> - Registrar produce confirmation - If survey is needed, registrar needs approve from surveyor before produce confirmation
State 4 to State 3 (C6[O6]/E6)	<ul style="list-style-type: none"> - Deeds are ineligible 	<ul style="list-style-type: none"> - Registrar refuse transaction request and inform notaris 	<ul style="list-style-type: none"> - Buyer, seller and notaris try to modify deeds
State 4 to State 5 (C7[O7]/E7)	<ul style="list-style-type: none"> - Confirmation is produced - Buyer and seller are satisfied with confirmation 	<ul style="list-style-type: none"> - Notary financial assistant allocate 	<ul style="list-style-type: none"> - Invoices for each stakeholder are produced

		payments to stakeholders	
State 5 to State 4 (C8[O8]/E8)	- Buyer and seller are unsatisfied with confirmation	- Seller and buyer refuse confirmation	- Seller and buyer contact Notary and supply comments
Initial to State 3 (C9[O9]/E9)	- No REA's participation - Seller and buyer reach agreement directly and go to notary - Seller and buyer have eligibility of transaction - Support of transaction from bank (mortgage related case) - Construction permission and spatial planning	- Notaris prepare deeds	- Deeds are conveyanced to Kadaster - If subdivision case, attachment is preliminary boundary map

4.4 User preferable information analysis

After standard states are identified for workflow database modelling, then it is important to identify users' preferable states and corresponding information in each state.

4.4.1 User requirements collection

In this research, the objective is to develop a workflow database prototype in WfMS for better land transaction transparency. Land transactions are services for the citizens and professional users. It is important to have a good level of transparency from their perspectives, so designing a workflow database for WfMS is the user-oriented behaviours. Collecting user requirements is the precondition for designing workflow database. Based on description of land transactions and involved actors above, it is obvious that various users have the different roles and operations during whole land transaction, they have different transparency requirements on workflow database. Good communication is crucial for all requirements gathering, users' requirements must be captured correctly, they have to be realistic and achievable. Interviews the stakeholders are planned for collecting users' requirements. A user preferences choice table (annex 10) is designed for collecting users' preferable information at each state. There are two main questions being to be answered:

- (1) Among the related users, who are interested in parcel states?
- (2) In each state, What information they would like to know?

After interviews, these two questions are answered:

- (1) Users who have interests on parcel states, here users are more specific than users identification in Table 4-2 because: 1.who are users being more clear after interviews; 2.different users in one organization with different occupation have different transparent information requirements.
- (2) Preferable states and responded information: the answer of this part are illustrated in section4.3.2 and section 4.3.3.

Table 4-2 Interview plan in user requirements collection stage

<i>Organization</i>	<i>Actors</i>
Public	Buyer
	Seller
Real Estate Agency	Broker
Notary	Notaris

	Financial assistant
Kadaster	Registrar
	Surveyor

4.4.2. Preferable states of various users

Based on above states analysis and user identification, here in Table 4-3 is each user's preferable states during whole land transaction process.

Table 4-3 Preferable states of various users

<i>States</i> <i>Users</i>	No.1 Advertised parcel (optional)	No.2 Negotiated parcel (optional)	No.3 Deeds prepared parcel	No.4 Registered parcel	No.5 Payments allocated parcel
Seller	√	√	√	√	√
Buyer		√	√	√	√
Broker	√	√	√		
Notaris			√	√	√
Financial assistant					√
Registrar				√	√
Surveyor			√	√	

4.4.3. Preferable information of various users in each state

Based on preferable states (Table 4-3) and users preferable information choices (annex 10), each kind of users can choose what information they prefer to see in each state. After investigations, the final version of preferable information of various users in each state is identified in annex 11.

4.5. Concluding remarks

In this chapter, firstly various parcel state changes, namely legal state changes, financial state changes, combined state changes and standard state changes are analysed respectively. Secondly, the standard state changes are chosen for workflow database modelling, it consists of state no.1: advertised parcel (optional), state no.2: Negotiated parcel (optional), state no.3: Deeds prepared parcel, state no.4: Registered parcel, state no.5: Payments allocated parcel. Thirdly, the object behaviours' control conditions, operations and effects that occur each standard state change are described specifically. Fourthly, responding to each kind of users, their preferable states and information are identified.

After parcel state changes are identified and analysed, it is necessary to model the workflow database for storing states and corresponding information. Therefore, it will be arranged in next chapter.

5. WORKFLOW DATABASE MODELING AND PROTOTYPING

5.1. Introduction

As is stated in previous chapters, results of information requirements analysis and state changes analysis are essential preconditions for workflow database modelling and prototyping.

In section 5.2, the workflow database model (at conceptual level) is presented and analyzed through UML class diagrams. Then in section 5.3, a functional prototype is designed for evaluating the workflow database's capacity of monitoring parcel states and corresponding information. In section 5.4, the prototype is implemented and the results are illustrated. Finally, section 5.5 is about discussion on what can be done for optimizing this prototype in future.

5.2. Workflow database modeling

Based on the preconditions consist of information requirements analysis and state changes analysis, in this sub-section, a conceptual workflow database model is designed through using UML class diagrams.

5.2.1. Workflow database modelling(class diagram)

Workflow database is modeled using Unified Modeling Language (UML) class diagrams in this research, main database elements are the parcel states and corresponding information. UML class diagrams capture the logical structure of workflow database, it is a static model, describing what exists and what attributes and behavior it has. Class diagrams are most useful to illustrate relationships between Classes and Interfaces. Generalizations, Aggregations and Associations are all valuable in reflecting inheritance, composition or usage, and connections, respectively. The Figure 5-1 represents the conceptual workflow database model consists of standard parcel states and corresponding information, cadastral database connects with workflow database by attribute 'state'. Some important attributes of the class elements are illustrated in Table 5-1. Their specific contexts are analyzed in the next sub-section 5.2.2.

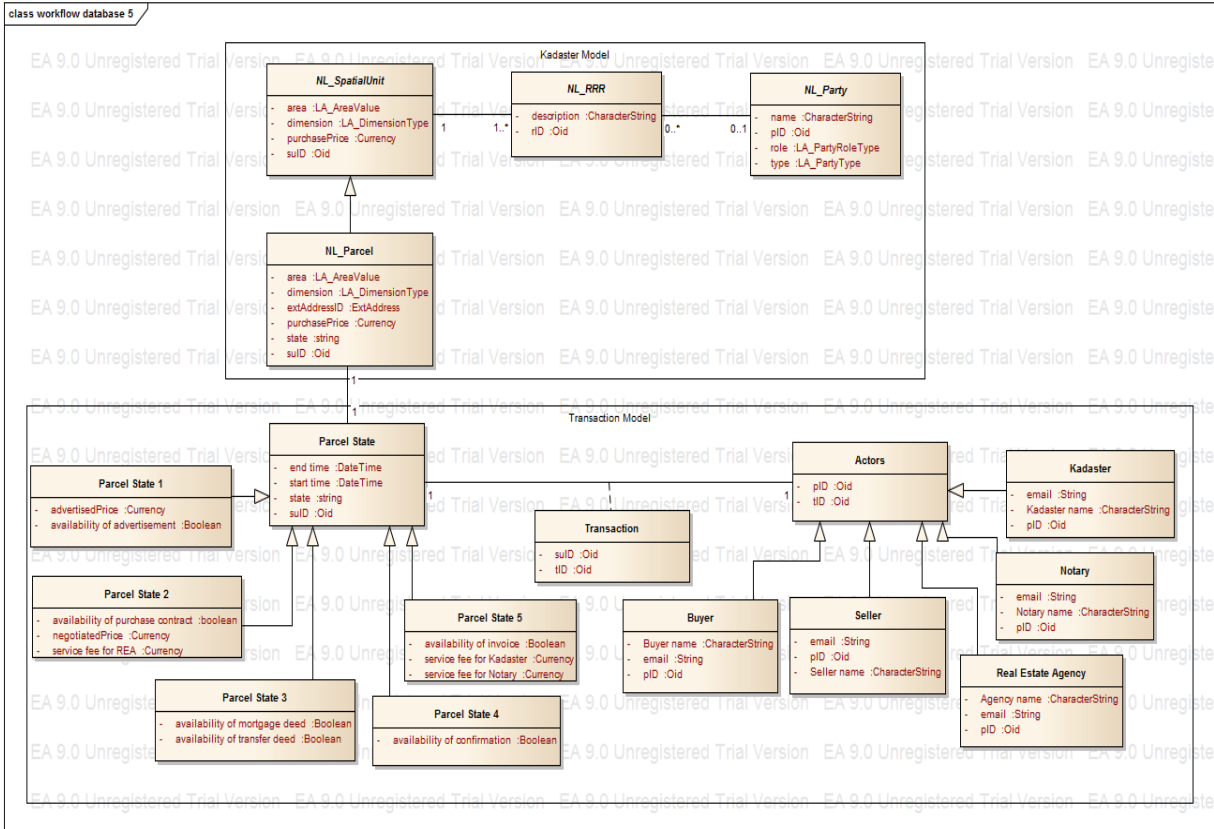


Figure 5-1 Class diagram of workflow database before prototype

Table 5-1 Description of some Attributes Name and Type

Attributes Name	Type	Description
state	string	Parcel state
suID	Oid	Spatial unit identifier
pID	Oid	Party identifier
tID	Oid	Transaction identifier
Availability of advertisement	Boolean	The status of advertisement (ready or not ready)
Availability of purchase contract	Boolean	The status of purchase contract (signed or not signed)
Availability of transfer deed	Boolean	The status of transfer deed (prepared or not prepared)
Availability of mortgage deed	Boolean	The status of mortgage deed (prepared or not prepared)
Availability of confirmation	Boolean	The status of confirmation (produced or not produced)
Availability of invoice	Boolean	The status of invoice (produced or not produced)

5.2.2. Analysis of workflow database model

Because workflow database is an external database which stores information of land transactions, and state itself is identified as an attribute of parcel in the cadastral database. So in workflow database modelling, combining the Cadaster model and Transaction model together to express the function of the workflow database more clearly. These two models are connected through suID.

a. Cadaster model

This model shows the basic relationship of objects, subjects, and rights in the cadastral database. Actually, parcels are not the only objects; ships, airplanes, etc. are also objects registered in the Cadaster. In this research, the NL_Parcel class has a generalization relationship with the NL_SpatialUnit class. Names of each class, their

attributes, use of municipalities and relationships are identified based on LADM standards and country profile the Netherlands. The basic attributes are as shown in Figure 5-2.

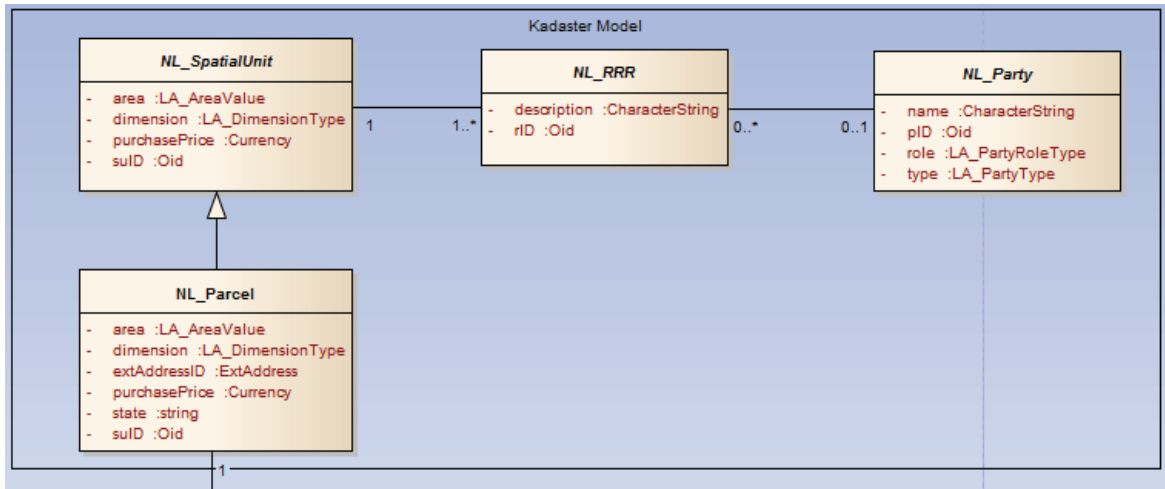


Figure 5-2 Kadaster model in workflow database modelling

b. Transaction model

Transaction model concludes two elements: parcel states and actors (stakeholders) involved in land transaction.

Parcel states: in Figure 5-3, there are totally 5 standard states able to represent parcel states from start to end, they are illustrated in section 4.3 and named as Parcel State 1, Parcel State 2, Parcel State 3, Parcel State 4, Parcel State 5, they have generalization relationship with Parcel State class.

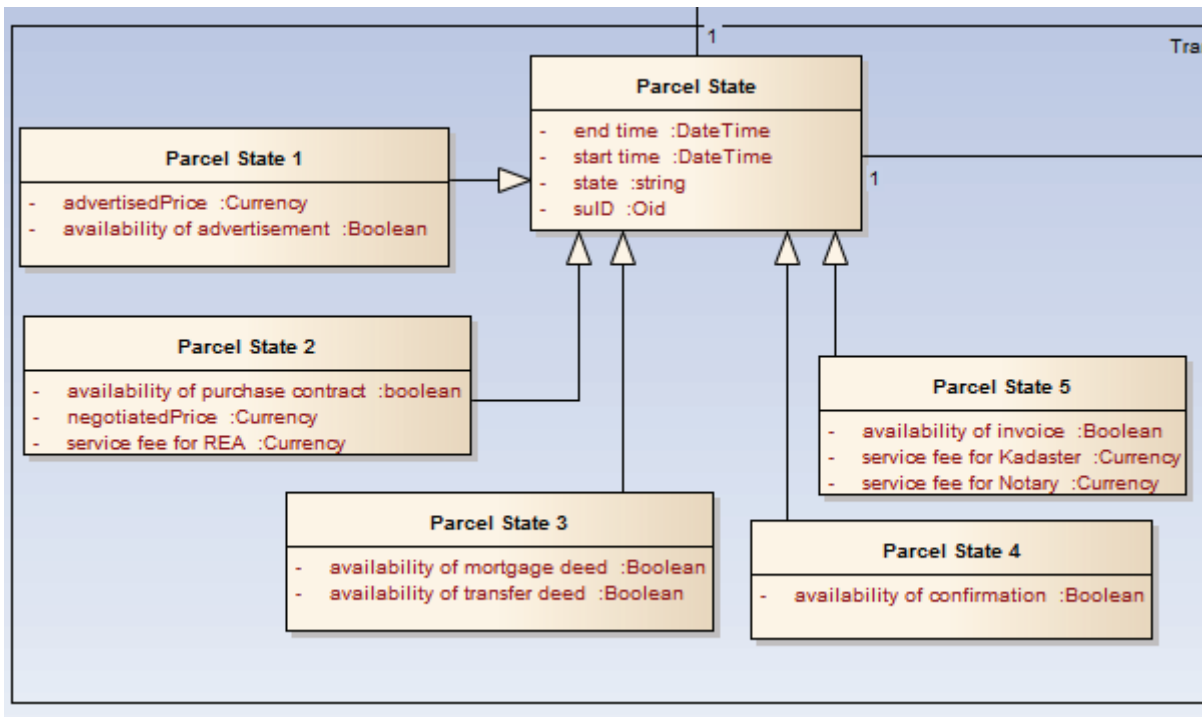


Figure 5-3 Parcel states model in Transaction Model

Actors: In Figure 5-4, there are totally 5 actors participating in land transactions---seller, buyer, real estate agency, notary, cadaster(cadastral officer). Although there are two kinds of actors here---natural person and non-natural person, it is not necessary to distinguish them in Transaction model.

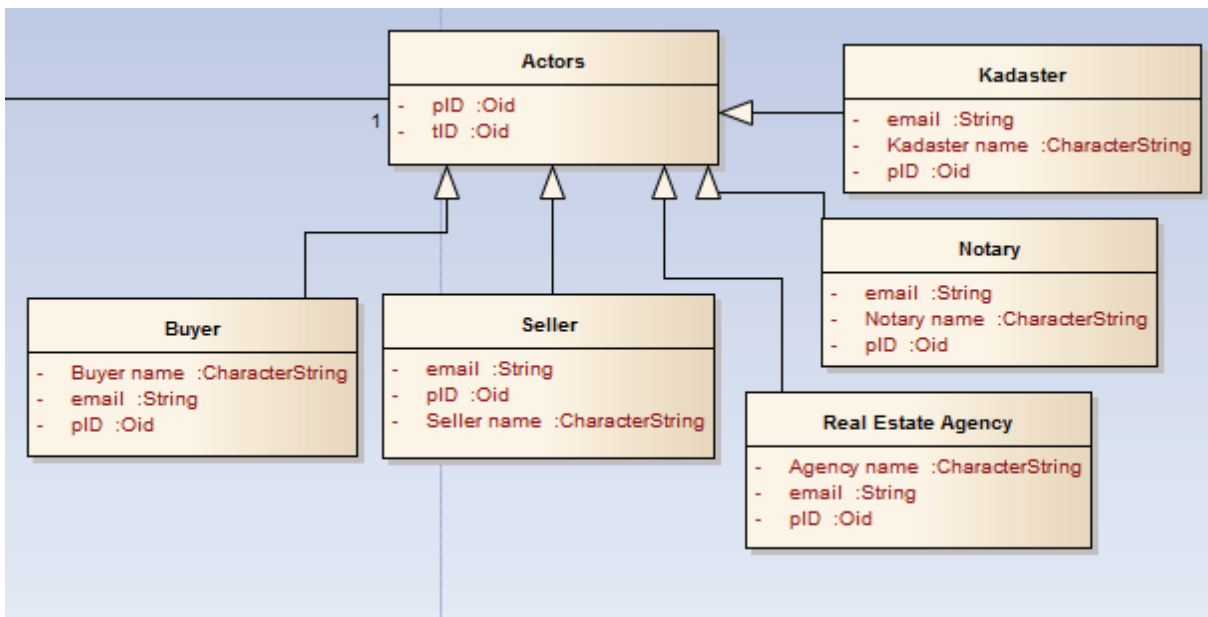


Figure 5-4 Actors model in Transaction model

Connection of Parcel States and Actors---Transaction

In workflow database, besides parcel state information is stored, the actors information is also stored in it. Each parcel connects to its responsible actors through transaction id (tID) which is identifiable in Figure 5-5.

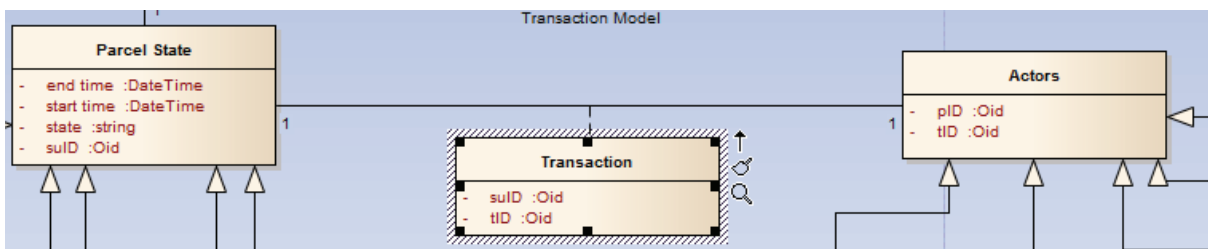


Figure 5-5 Transaction class connect Parcel state and Actors

All in all, this workflow database model is in design but not be implemented, it is not evaluated about its correctness and feasibility, so designing a workflow database prototype is essential for validation.

5.3. Prototype design

Transparent systems as organizational systems that make complete, accurate and timely information available to the stakeholders, have clear procedures for public decision-making, and facilitate open communication between stakeholders and decision makers. In this sub-section, a functional prototype is designed to evaluate the capability of workflow database model, whether it monitors parcel states successfully, and whether transparency is enhanced.

5.3.1. Concept of prototype

A prototype is an early sample or model built to test a concept or process or to act as a thing to be replicated or learned from. Also, it is designed to test and trial a new design to enhance precision by system analysts and users. It is a term used in a variety of contexts, including semantics, design, electronics, and software programming (PC. magazine, 2013). In short, prototype is a useful technique for testing proof of concept. In this research, prototype is used to test concept of 'workflow database in WfMS to improve transparency of land transaction'. If the workflow database supplies states and corresponding information, the research is validated.

5.3.2. Architecture of functional prototype

In order to make sure that the workflow database model supports transparency. An architecture of prototype is designed and it is shown in Figure 5-6

- Kadaster Database is as an external database to supply cadastral data for land transaction run in WfMS.
- WfMS is software supplying environment for land transaction case running.
- Workflow database is connected with WfMS internal database, and using SQL language to retrieve workflow data generated in each step from the internal database, and import them into workflow database in corresponding tables.

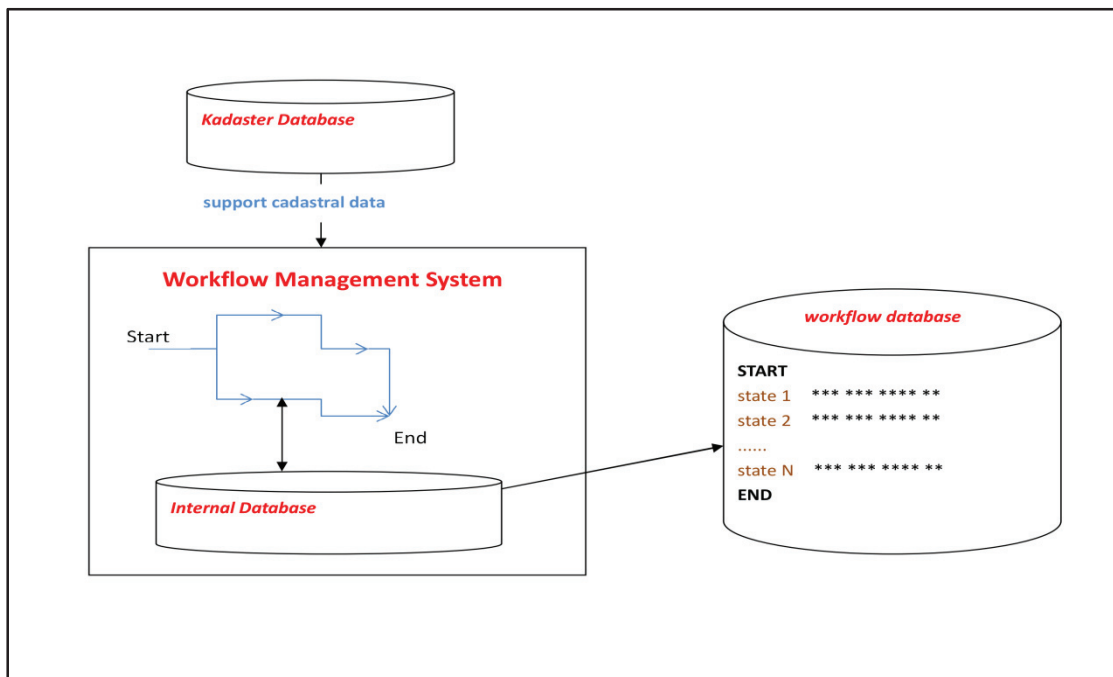


Figure 5-6 Prototype architecture in this research

5.3.3. Prototype environment

Here prototype environment refer to implementation platforms: WfMS choice, DBMS choice, etc.

a. Choice of WfMS

In this prototype, ProcessMaker software is selected as the most suitable workflow management system, it is developed by Colosa Inc., a developer of software solutions that enable companies to simplify workflow through the capture and automation of business processes. The characteristics and advantages of ProcessMaker are introduced:

- ProcessMaker is commercial open source workflow and business process management software available for organizations of all sizes with designing, automating and deploying business processes
- System administrators don't have to spend a lot of time programming, thanks to its intuitive point and click interface
- End users prefer ProcessMaker because it is so easy to use
- ProcessMaker is completely web based and accessed via any web browser
- ProcessMaker can connect to external database

ProcessMaker can manage numerous workspaces at a time. Each workspace has 3 MySQL databases to store internal information about processes, user permissions and reports. Nonetheless, ProcessMaker can also be configured to connect to external databases, allowing an organization to integrate ProcessMaker with other DBMS and business applications which utilize databases that is also the reason of choosing ProcessMaker as WfMS. The specific function of 3 MySQL database are:

- **wf_<WORKSPACE-NAME>**: contains the information required by the Process Engine, including information about processes, cases, users, PM Tables, etc.
- **rb_<WORKSPACE-NAME>**: contains the information about users to maintain a Role-Based Access Control (RBAC) system in ProcessMaker.
- **rp_<WORKSPACE-NAME>**: allow external applications to access data from ProcessMaker cases. Each Report Table creates a separate table in this database, which external databases can query.

The ProcessMaker databases can be accessed with a graphical interface by using phpMyAdmin (Figure 5-7). The Windows installer for ProcessMaker automatically installs phpMyAdmin by default. When a land transaction case is finished in ProcessMaker, workflow data are stored in internal database, from this graphical interface, workflow data for workflow database is available of querying.

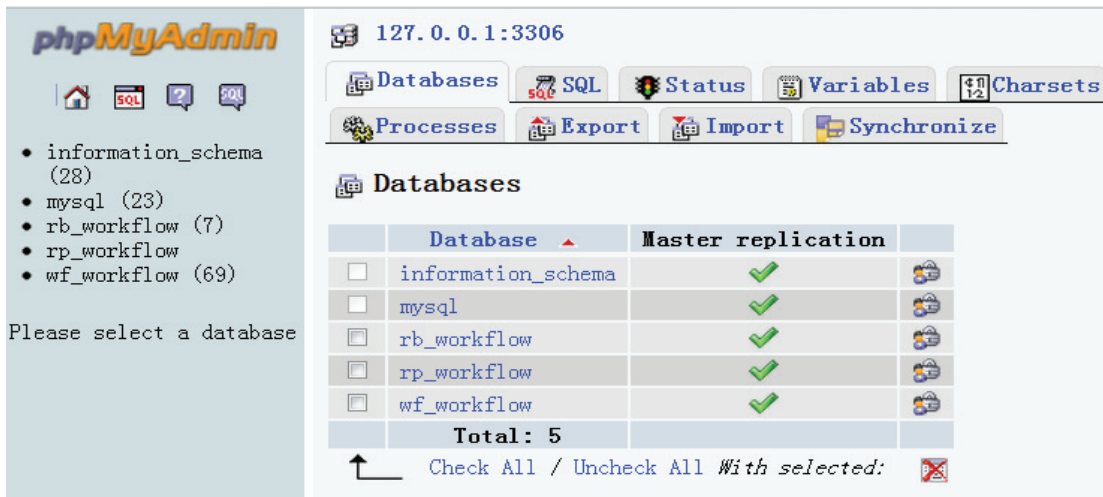


Figure 5-7 A graphical interface---phpMyAdmin

5.4. Prototype test

After designing the prototype, it is turn to test whether this functional prototype works or not. A full transaction with mortgage case is chosen for testing, the workflow database is implemented through MS Access 2007, then using SQL statements to query parcel states and corresponding information.

5.4.1. Case running

As mentioned in chapter 3, there are four typical cases to represent individual parcel transactions in the Netherlands, full transaction with mortgage case is chosen for testing prototype. The reasons for this choice are:

- (1) To conduct a validation of workflow database is necessary, most frequently used case is essential.
- (2) Subdivision is not a completely automated case because cadastral surveyor needs to carry out a survey in field.
- (3) Splitting parcel in Notary is down by specific software supplied by cadaster, cadastral database updates immediately after splitting. Getting this software is a barrier for this prototype.
- (4) Full transaction with mortgage is more easy to model and implement in ProcessMaker.

The transaction roles and sequences of related actors in this case are shown in Figure 5-8. Specific inputs of each step are shown in annex 13. In figure 5-8, the rectangles in blue are tasks, the vertical lines arrange these tasks to their handlers: Public, Broker, Notary, Cadaster, the specific users and corresponding accounts are recorded in annex 12. The sequences of operating these tasks are based on arrows directions. The rhomb means there is a judgement there.

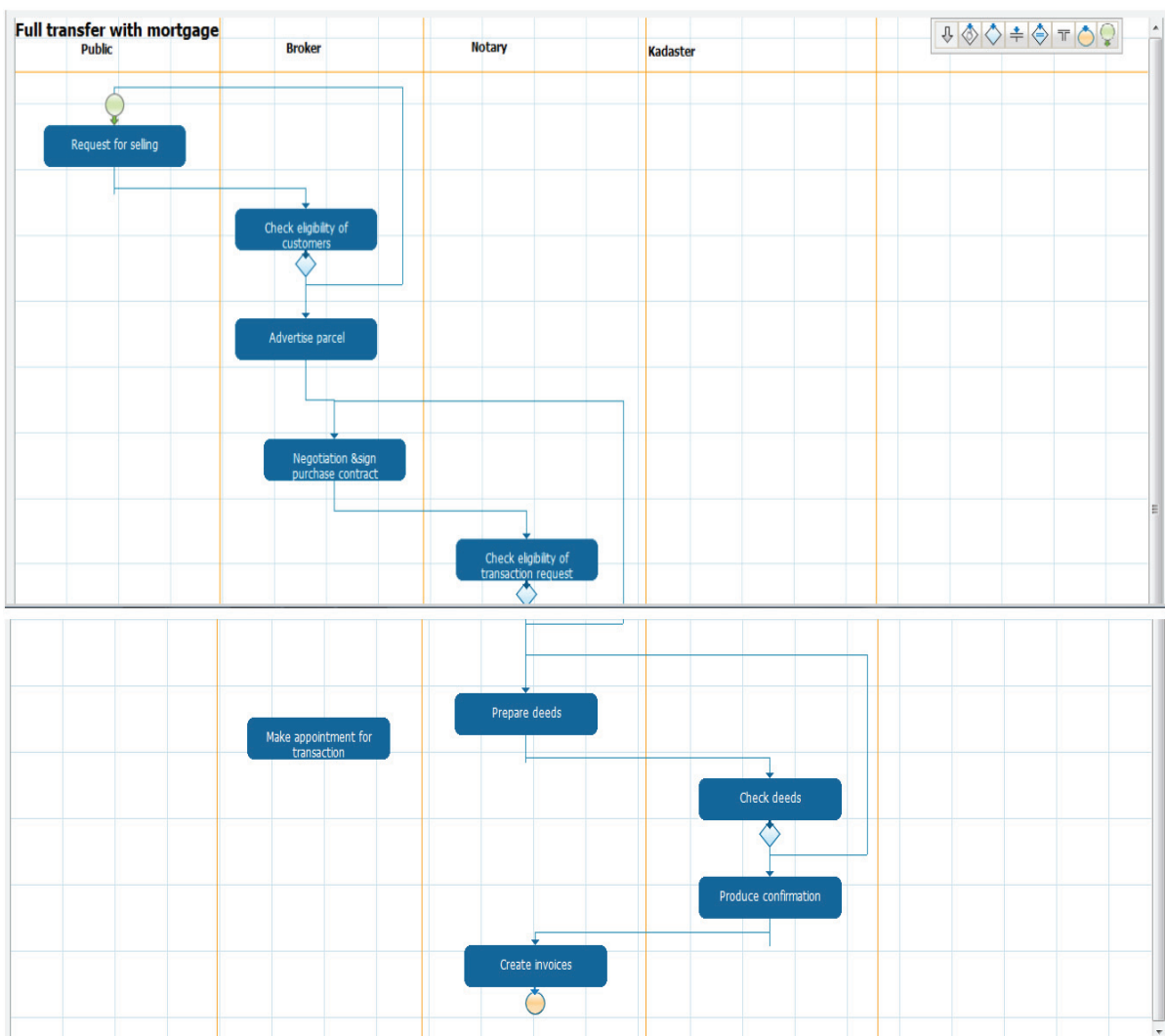


Figure 5-8 Land transaction role and steps in ProcessMaker by sequence

5.4.2. Implementation of workflow database

After the case is finished, the workflow data are generated and stored in internal database of ProcessMaker. Because of limited technical capacity, retrieving workflow data from internal database and inputting them into workflow database is not accomplished automatically.

The choice of DBMS software is Microsoft Access 2007. All the tables are established and filled in as shown in Figure 5-9, the relationship between tables and how tables connect with each other are shown in Figure 5-10. suID and tID are unique identifiers.

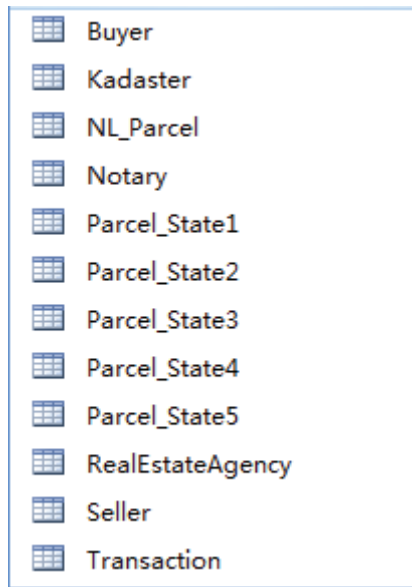


Figure 5-9 All tables in Microsoft Access are established and filled in

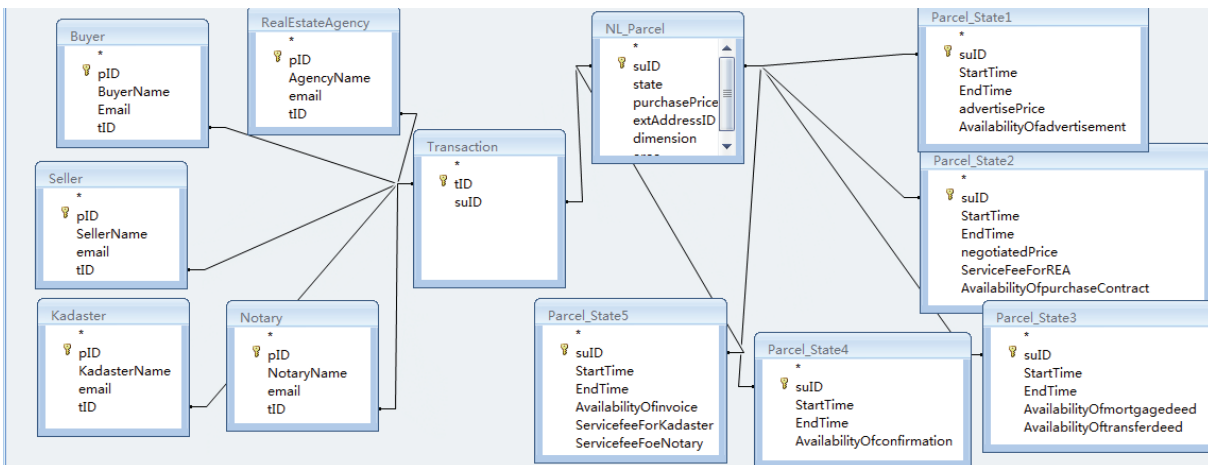


Figure 5-10 The relationship between all the tables

5.4.3. SQL queries for states information

After the workflow database is filled with all necessary data, the series of SQL statements (as indicated below) are written to query the parcel states of land transaction. The results are displayed.

- **Query 1:** `select * from Parcel_State 5 where suID=123456;`

suID	StartTime	EndTime	AvailabilityOfinvoice	Servicefe	Servicefe
123456	2013/1/15	2013/1/17	<input type="checkbox"/>	€20.00	€20.00

This query result shows 'invoices' are not available, so the parcel is not in state 5. At this time, for citizens, they can know that invoices are not available, their business are not finished at all; for professional users, such as registrars, brokers, they can inquiry the financial assistant of Notary directly about when they can receive their service fees, these behaviours may promote financial assistant's working efficiency. Why querying starts from state 5? Because if querying from Parcel_State 1, status of 'availability of advertisement' cannot represent whether parcel is in state 1 or in state 5, if parcel is in state 5, status of 'availability of advertisement' is same with parcel in state 1.

- **Query 2: select * from Parcel_State 4 where suID=123456;**

suID	StartTime	EndTime	AvailabilityOfconfirmation
123456	2013/1/10	2013/1/14	<input checked="" type="checkbox"/>

This query result shows 'confirmation' is available, so the parcel is in state 4. At this time, for citizens, they can know their business is in state 4, the confirmation is ready, they can download the confirmation and check it, and show their feedback to Cadaster; for professional users, such as financial assistant of Notary, he/she can produce invoices for other users instantly.

- **Query 3: update NL_parcel set state=4 where suID=123456;**

suID	state	purchaseP	extAddres	dimension	area	添加新字段
123456	4	€1,200.00	215448SD	2	250M ²	

This querying result shows in Table NL_Parcel, state is updated to 4. This query is for updating the value of state in Table NL_Parcel, in cadastral database, parcel state information is timely.

- **Query 4: SELECT NL_Parcel.suID AS suID, Transaction.tID AS tID, Parcel_State4.StartTime AS StartTime, Parcel_State4.EndTime AS EndTime, Parcel_State4.AvailabilityOfconfirmation AS AvailabilityOfconfirmation, Buyer.pID AS BuyerID, Buyer.BuyerName AS BuyerName, Buyer.Email AS BuyerOfEmail, Seller.pID AS SellerID, Seller.SellerName AS SellerName, Seller.email AS SellerEmail, Kadaster.pID AS KadasterID, Kadaster.KadasterName AS KadasterName, Kadaster.email AS KadasterEmail FROM NL_Parcel, [Transaction], Parcel_State4, Buyer, Seller, Kadaster WHERE NL_Parcel.suID=Parcel_State4.suID and NL_Parcel.suID=Transaction.suID and Transaction.tID=Buyer.tID and Transaction.tID=Seller.tID and Transaction.tID=Kadaster.tID and Parcel_State4.AvailabilityOfconfirmation=-1;**

suID	tID	StartTime	EndTime	AvailabilityOfcc	BuyerID	BuyerName	BuyerOfEn	SellerID	SellerNan	SellerEma	KadasterID	KadasterN	KadasterEn
123456	54321	2013/1/10	2013/1/14	<input checked="" type="checkbox"/>	28496	Yan Wang	28496@itc.n	29820	Dan Li	29820@itc.r	29793	Apoldern	29793@itc.nl

This query result shows the seller's preferable information when parcel is in state 4. This query is written from sellers' point of view, information of suID, tID, start time and end time, buyerID, buyer name, buyer email, KadasterID, Kadaster name are transparent for the seller, if seller have some problems suddenly, he/she can contact people or organization who are processing his/her business to solve problems. The efficiency and effectiveness are raised.

5.4.4. Discussion of prototyping results

In section 5.4.3, it is demonstrated that how a workflow database prototype works.

In the whole querying processes, first is to identify 'parcel state'. The state of parcel is decided by the availability of documents, and the query must start from 'availability of invoice', if it is not ready, then query 'availability of confirmation', if it is not ready, then query 'availability of mortgage deed/transfer deed', until availability of 'the document' is ready, then identify the parcel state. Why is the query based on this sequence? For example, if querying from Parcel_State 1, status of 'availability of advertisement' cannot represent whether parcel is in state 1 or in state 5, if parcel is in state 5, status of 'availability of advertisement' is same with parcel is in state 1. Second is to update the state attribute in cadastral database, this step is to maintain data timely. Third is to query specific information in each state for different users based on their preference.

All in all, the results of prototyping show that the citizens and professional users can query parcel state from workflow database prototype step by step, also can obtain them from cadastral database directly, they also can query the information in each state from workflow database prototype based on their preference. But the results seem complicated and disorganized. If information is conveyed to the users by this way, it is not an efficient service and may not satisfy the users. So how to supply the query results is discussed in following section 5.5.

5.5. The way forward for improvement

It is demonstrated how a prototype works in section 5.4. However, only the results of querying do not support the claim 'workflow database enhance transparency of land transactions' critically. Land transaction is a kind of customer-oriented services, users' reflections are important for judging the transparency is enhanced or not. The following sub-sections illustrate the way forward for validating research hypothesis.

5.5.1 User Experience

ISO 9241-210 (International Organization for Standardization, 2009) defines User Experience as 'User Experience (UE) involves a person's emotions about using a particular product, system or service. User experience highlights the experiential, affective, meaningful and valuable aspects of human-computer interaction and product ownership. Additionally, it includes a person's perceptions of the practical aspects such as utility, ease of use and efficiency of the system'. UE is dynamic as it is constantly modified over time due to changing circumstances and new innovations, so UE not only collects reflections from users, but also contributes to improvements of products, system or services.

Because land transactions are customer-oriented activities, the users have right to reflect their emotions about land transactions' transparency. In this research, based on some limitations of WfMS and transparency requirements from users, a workflow database prototype is designed and implemented. After implementation of workflow database prototype, UE should be conducted to validate whether users' preferences are satisfied or not, do they feel more better transparency.

In section 2.4, approaches for enhancing transparency is illustrated. From efficient and effective aspects respectively, some measuring indicators are identified for measurement of transparency. Through UE, these indicators will be collected, after collection they are analyzed for judgement of whether transparency improved or not.

5.5.2 Web-based application

After User Experiences (UE) is chosen to collect users' reflections of transparency level, it is necessary to find a way for conducting UE. Based on results of prototype and previous conclusion in this thesis, a web-

based application is a good choice. This web-based application is like a tracking system essentially, the workflow database is a tracking database, it supplies states and corresponding information to various users.

What is tracking system looks like in reality? For example, Mikko Kärkkäinen (2004) said tracking of shipments and conveying the tracking information to customers are perceived to be important customer service components for logistics service providers. These developments underline the importance of customers being able to locate shipments in-transit, and so better plan and monitor their operations.

Why the web-based application is designed by imitating the tracking system? Besides locations of shipments supplied to customers, the accessibility of delivery status at any time and the immediate notification of delays or other delivery problems is demanded by most customers, for example, the basic functionality of tracking systems is that when a tracked item (i.e. shipment) arrives at a predefined point in the distribution network (a checkpoint) the arrival is registered and a message regarding the arrival is sent to a tracking database (Kärkkäinen, 2003c), the message may contain only three basic attributes: the identity of the entity at the checkpoint, the location of the checkpoint, and the time of the arrival of the entity. Also, additional attributes concerning the consignment may also be recorded e.g. quality. Based on above examples, it is easy to find out that there are some attributes in common between shipments and parcels. In this research, in order to enhance transparency of land transactions, there are 5 standard states are identified to express parcel states and corresponding information. Similarly, the tracked items are parcels, a predefined point is an object behaviour (i.e. conveying deeds), when the parcel arrives, a message is sent to the workflow database and update parcel state to state 5. The workflow database is a tracking database for storing states of parcel and consignment, the message contain: identifier of Parcel, states of documents, time, related stakeholders and their information.

In conclusion, a web-based application, similar with tracking system, can be used for conducting User Experience. It supplies more efficient and effective customer services and collects their reflections of transparency level. Through the analysis of customers' reflections on whether transparency is enhanced or not, the research hypothesis can be judged more powerfully.

5.6. Concluding remarks

This chapter designs a conceptual workflow database model and develops a prototype for validation. Specifically, firstly designing the conceptual model of workflow database through UML class diagrams, then in order to validate its capacity of storing states information for better transparency, a functional prototype is designed and implemented. The results of querying parcel states and corresponding information are available to the citizens and professional users, so the research hypothesis is validated in some degree. In order to conveyance services (supplying parcel states and corresponding information) more efficiently in future, User Experiences and a web-based application for tracking parcel states are suggested and discussed finally.

After complete the workflow database modelling and prototyping part, the next chapter will give a review on all of these research questions. And recommendations will be proposed also.

6. CONCLUSION AND RECOMMENDATIONS

6.1. Introduction

This chapter provides the conclusion and recommendation based on the research findings as described in each of the previous chapters. The following section 6.2 presents a review of research questions under each objective. The section 6.3 then presents several recommendations for both implementing organization and the further research.

6.2. Conclusion

1. What are the concepts of efficiency and effectiveness for transparency?

In administration, administrative efficiency is to increase transparency within public authorities and simplification of rules and procedures for citizens and businesses. In management, effectiveness relates to getting the right things done, takes into consideration creating value and pleasing the customer. In this thesis, because efficiency concept is applied in land transaction process, efficiency here focuses on organization/administration efficiency. Organizational efficiency lies in an organization's ability to maximize performance or profits. So within organization efficiency is in terms of efficient cooperation, awareness about fees, minimum time, minimum labor, availability of data, access to resources and so on. Effectiveness also focuses on organization/administration effectiveness. Based on research background, effectiveness are great interest to all stakeholders, in terms of customization and rapid decision making.

Finally, after the analysis of relationship of efficiency and effectiveness with the transparency, it is clear that efficiency and effectiveness is on behalf of organizations' performance, they contribute to good performance from two points: one is transparent and on timely information supply and sharing to fulfill functional transparency; the other one is efficiency cooperation and effective performances to fulfill structural transparency. In conclusion, increased efficiency and effectiveness can improve transparency of land transactions.

2. How do efficiency and effectiveness apply in land transaction?

The premise of this question is 'increased efficiency and effectiveness can improve transparency of land transactions'. Efficiency and effectiveness improve functional and structural transparency of land transactions from fulfilling information needs and performance goals. The efficiency and effectiveness are applied in land transaction as shown in two tables (Table 2-1 and Table 2-2), in these two tables, relevant indicators of efficiency and effectiveness are depicted, such as cost time per land transaction, percentage of on-time information delivery, citizens' satisfaction, professional users' satisfaction and so on. Optimizing these indicators resulted in better performance and transparency of land transactions. In future, more indicators and specific measurements should be considered.

3. What are information requirements in workflow database?

A workflow databases is a place for creating, revising, and promoting pieces of work in a system. It is generally used to manage a project with multiple users within a shared virtual workspace or centralized tool. It is for storing a piece of data or documentation and delivery them to a customer. In order to make clear of specific data needs and its forms in the workflow database for WfMS, it is necessary to collect information requirements.

In the research problem, the workflow database is identified as a place to store workflow data which is not visible in WfMS internal database, the storing forms are parcel states and corresponding information. Approaches for collecting information requirements are interviews the stakeholders. The specific

information requirements analysis results consist of related actors and workflows of land transaction in the Netherlands:

- The related actors (Table 3-2) in land transactions are candidates of who are interested in the workflow database. They are potential interviewees for users' preference states and information collections.
- The specific workflows of four typical Dutch individual land transactions (Annex 5, 6, 7, 8) supply various possibilities of parcel state changes, finally the general workflow of Dutch individual land transaction (Annex 9) determine the standard states, this state changes are used in the workflow database modeling.

4. Which role does the workflow database play in WfMS architecture?

The role of workflow database in WfMS is shown in Figure 5-6. After literature reviews, the role of the workflow database is identified. Workflow database is separated from cadastral database and WfMS internal database, it is an external database as extensional to WfMS internal database to store states and corresponding information (workflow data), they are not visible in WfMS internal database normally. **错误! 未找到引用源。** shows architecture of prototype, cadastral database supplies cadastral data to support WfMS works, WfMS internal database stores workflow data generated in each step of operations in WfMS, workflow database only retrieves and stores workflow data in terms of each state.

After the prototyping test in chapter 5, as a separated database outside of WfMS architecture, the workflow database is successful to store workflow data retrieved from WfMS internal database, at the same time, it can supply states and corresponding information to the customers and professional users.

5. How to design workflow database for WfMS in land transaction?

After information requirements analysis and states analysis for workflow database modelling, it is clear that workflow data should be stored in terms of the standard state changes in the workflow database to enhance transparency, so preconditions of workflow database design is ready, then come to design stage. UML class diagrams are used to model workflow database conceptually as shown in Figure 5-1, it consists of two models: Cadaster model and Transaction model; Why there is a Cadaster model? Because workflow database is separately with cadastral database, meanwhile it supply parcel states to cadastral database. So, in Figure 5-1, how these two model connect with each other is explained.

In conclusion, based on preconditions of workflow database design, UML class diagrams are chosen to design conceptual workflow database model.

6. Who are the users? what are their preferences?

Land transactions are customer-oriented services, users' reflections are very important for related organizations' performance and developments. In this research, workflow database is for enhancing transparency of land transactions, users consists of the citizens and professional users as follows:

- The citizens consist of sellers and buyers.
- The professional users consist of real estate agencies (brokers), notaries(Notaris and financial assistants), cadasters (registrars, surveyors).

Besides these users are identified, their preference are collected and analysed through interviewing the stakeholders. Their preferable states are shown in Table 4-3, the specific preferable information in each state are shown in Annex 11.

In conclusion, users are among land transactions' stakeholders who have interests on parcel states information, it is better to find out more related users into consideration in the future; users' preferences consists of their preferable states and corresponding information in each state, there should be more workflow data stored in workflow database to enhance transparency.

7. How to validate the workflow database in WfMS?

In order to validate the workflow database conceptual model, a functional prototype is designed to implement workflow database. In the prototyping environment, ProcessMaker is chosen as WfMS. Microsoft Access is chosen as DBMS. A full transaction with mortgage case is chosen to run in ProcessMaker. After this case finished, all workflow data are generated and stored in ProcessMaker internal database. Because of limitation of my computer capacity, the workflow database is filled with workflow data through non-automatic way, I manually querying workflow data from internal database and input them into workflow database. The data are organized in terms of standard state changes. Then, firstly using SQL statements to query availability of document to identify the parcel state, then update parcel state value in cadastral database timely, finally querying information of the current parcel state.

All in all, with success of querying parcel state and state information from workflow database prototype, it shows that the workflow database can store workflow data in terms of standard states changes, it works in MS Access, the customers and professional users can query state and information successfully. So, the research hypothesis 'a workflow database in WfMS can enhance land transaction transparency' is validated to some extents from technical aspects. Based on this validated hypothesis, in future, many researches about enhancing transparency in WfMS can focus on using database technology, specifically to improve workflow database.

6.3. Recommendations

From this research, the following recommendations are put forward for facilitating decision-making of related organization and promoting further research.

a) The research recommends for related organizations:

- Transparency issues are interesting topic to be discussed in further. With increasing level of transparency, an unavoidable question should be considered by related organizations such as 'How to protect users' privacy during land transaction processes?'
- Because organizations like real estate agency, bank, notary, cadaster are participating in land transactions, it is important to identify suitable stakeholders for managing the workflow database and consider about how to manage it.

b) The research recommends for further research below:

- Because of limited time, the workflow database is implemented using Microsoft Access 2007. Since using SQL statement to query in MS Access is a little bit complicated, further research is required to use other efficient or effective WfMS and DBMS.
- In prototype test stage, full transaction with mortgage case is chosen for running in ProcessMaker only. The further research on subdivision process should be considered for implementation.
- In prototype test stage, retrieving the workflow data from ProcessMaker internal database and importing them into workflow database are not done automatically. Hence it is recommended for further efficient approach to conduct these activities automatically.

- The last but most important recommendation is a web-based application should be designed for users to track for states and corresponding information of their businesses. With this application, an User Experiences should be conducted to assess the satisfactions of users for transparency level.

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ANNEXES

Annex 1: Questionnaire for Real Estate Agency

Questionnaire for land transaction in Netherlands

(for Real Estate Agency)

INTERNATIONAL INSTITUTION FOR GEO-INFORMATION SCIENCE AND EARTH OBSERVATION

Bingbing Cheng Department: LA,ITC& CAU

Email: cheng27591@itc.nl

Phone: +31684724968

Date:

A. Basic information

Name of interviewee		Date	
Occupation			

B. Full transfer without mortgage

- 1) What information do you check when seller request for selling his/her property?

- 2) After confirming seller's information, if it is eligible, do you need to make a contract with seller before advertise property? what information should be in it?

- 3) What legal documents do you need to prepare?

- 4) Before you advertise property, how to generate the price? from seller or you or others?

- 5) Does a preliminary purchase contract be made by you for seller and buyer? What important information should be in it? Who have to sign on it?

- 6) When do you charge customers for service fees? and how much do you charge for per full transfer case in your phase?

- 7) How long per full transfer case costs when it is in your phase?

C. Subdivision without mortgage

- 8) Do you have software supplied by Kadaster for preliminary boundary determination?

9) If not, how do you record the part will be sold, or boundary?

10) How to determine the price of sold part? seller or you or others?

11) How much do you charge for per subdivision case in your phase? and how long it costs?

D. Full transfer with mortgage

12) Does REA know the property in mortgage if the seller does not mention?

13) Does this situation works or not? (The meaning is whether mortgaged property can be transferred or not?)

14) Can you represent seller and buyer to apply for mortgaged property transfer to bank? Or must be done by buyer and seller?

15) How much do you charge per full transfer with mortgage case in your phase? and how long it costs?

16) What information or confirmation do you need from bank to continue your business for buyer and seller?

E. Subdivision with mortgage

17) How to divide the mortgage payment? it is decided in REA or Bank?

18) How much do you charge per subdivision case in your phase? and how long it costs?

19) Do you have any other information supplied to me about these four cases?

Annex 2: Questionnaire for Bank

Questionnaire for land transaction in Netherlands

(for Bank)

A. Basic information

Name of interviewee		Date	
Occupation			

B. Full transfer with mortgage

- 1) Do you accept case like this?

- 2) What are the pre-condition for you to agree with mortgaged property full transfer?

- 3) When you finish financial issues, what are your output for they apply for mortgage deed?

C. Subdivision with mortgage

- 4) Do you accept case like this?

- 5) What are the pre-condition for you to agree with mortgaged property subdivision?

- 6) When you divide the mortgage payment, what are your output for they apply for mortgage deed?

- 7) Do you have any other information supplied to me about these four cases?

Annex 3: Questionnaire for Notary

Questionnaire for land transaction in Netherlands

(for Notary)

A. Basic information

Name of interviewee		Date	
Occupation			

B. Full transfer without mortgage

1) What information do you check when you receive the request for deed from seller and buyer?

2) What information should be on a transfer deed? and how long do you need to prepare a transfer deed?

3) When do you need payment from buyer?

Before signature Same time with signature

After signature and before submit the deed

4) When do you transfer payment to seller?

After signature in deed After registration of deed in Kadaster

5) When do you charge customers of service fees? and how much full transfer in your office?

C. Subdivision without mortgage

6) Do you have software supplied by Kadaster for preliminary boundary determination?

7) After preliminary boundary addressing and deed preparation, which department of Kadaster do you submit transfer deed to?

8) How long do you need to prepare a transfer deed with provisional subdivision?

9) How much per subdivision case costs in your phase?

D. Full transfer with mortgage

10) Do you accept case like this? if yes, you will create a new mortgage deed or edit old one?

11) The pre-condition of change information of mortgage deed? what information do you need?

12) Do you submit transfer deed and mortgage deed to Kadaster? to administrator or some other departments?

E. Subdivision with mortgage

13) Do you accept case like this? if yes, you will create a new mortgage deed or edit old one?

14) The pre-condition of change mortgage deed? what information do you need?

15) Do you have any other information supplied to me about these four cases?

Annex 4: Questionnaire for Kadaster

Questionnaire for land transaction in Netherlands

(for Kadaster)

A. Basic information

Name of interviewee		Date	
Occupation			

B. Full transfer without mortgage

- 1) When you receive a deed with private key from Notary, what are the sequence of checking deed and send notification to Notary?

- 2) Do you charge customers directly? Do you directly send confirmation to customers?

- 3) How long one full transfer case cost in your phase?

C. Subdivision transfer without mortgage

- 4) Which department receive the deed with preliminary boundary data?

- 5) What are the procedure of processing the deed with preliminary boundary data in Kadaster?

D. Full transfer with mortgage

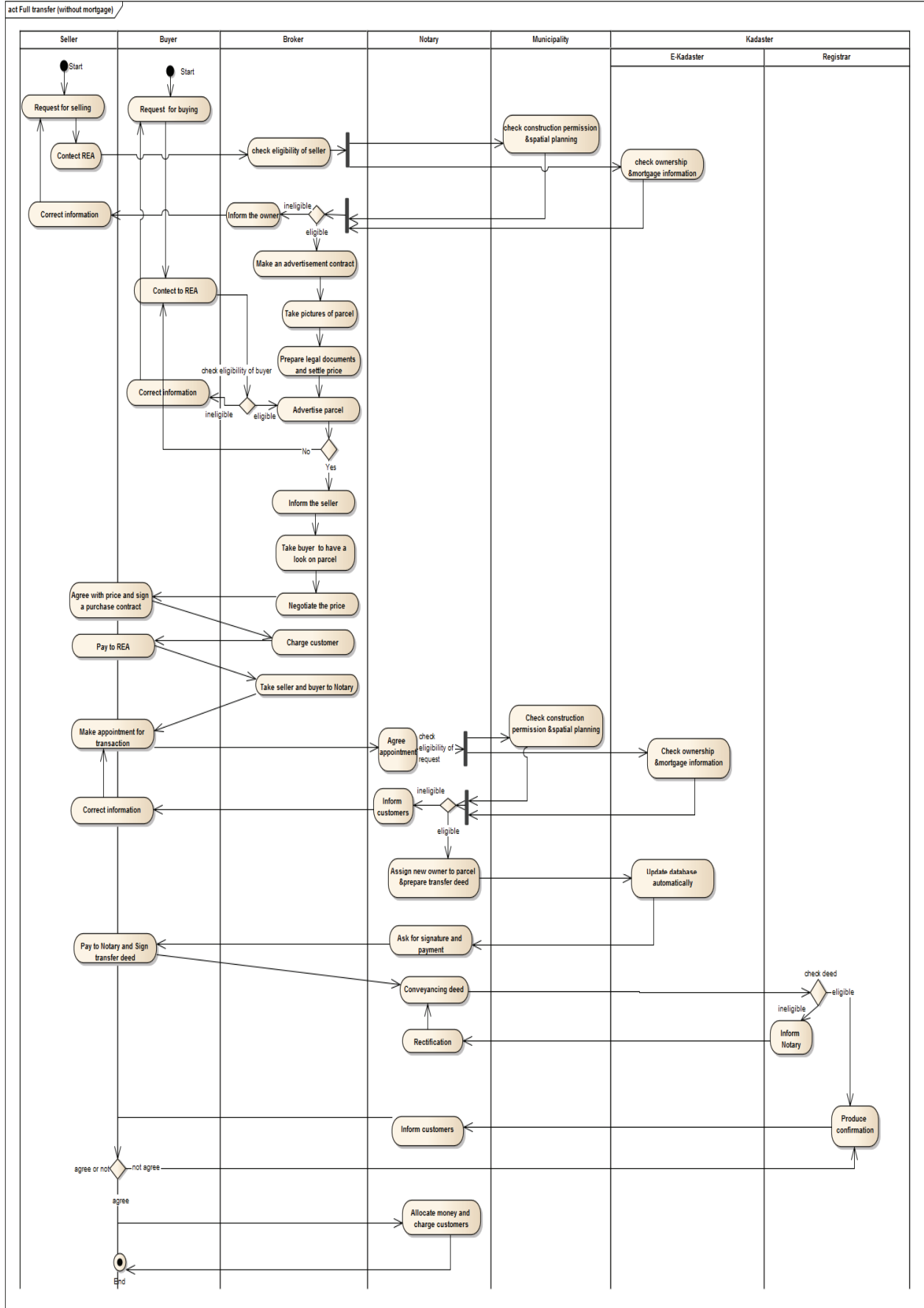
- 6) Which department receive the transfer deed and mortgage deed and process them? What are the procedure?

 - 7) Which actors Kadaster need to confirm after registration? (multi-choice)
- Bank
 Notary
 Real Estate Agency
 Buyer and seller

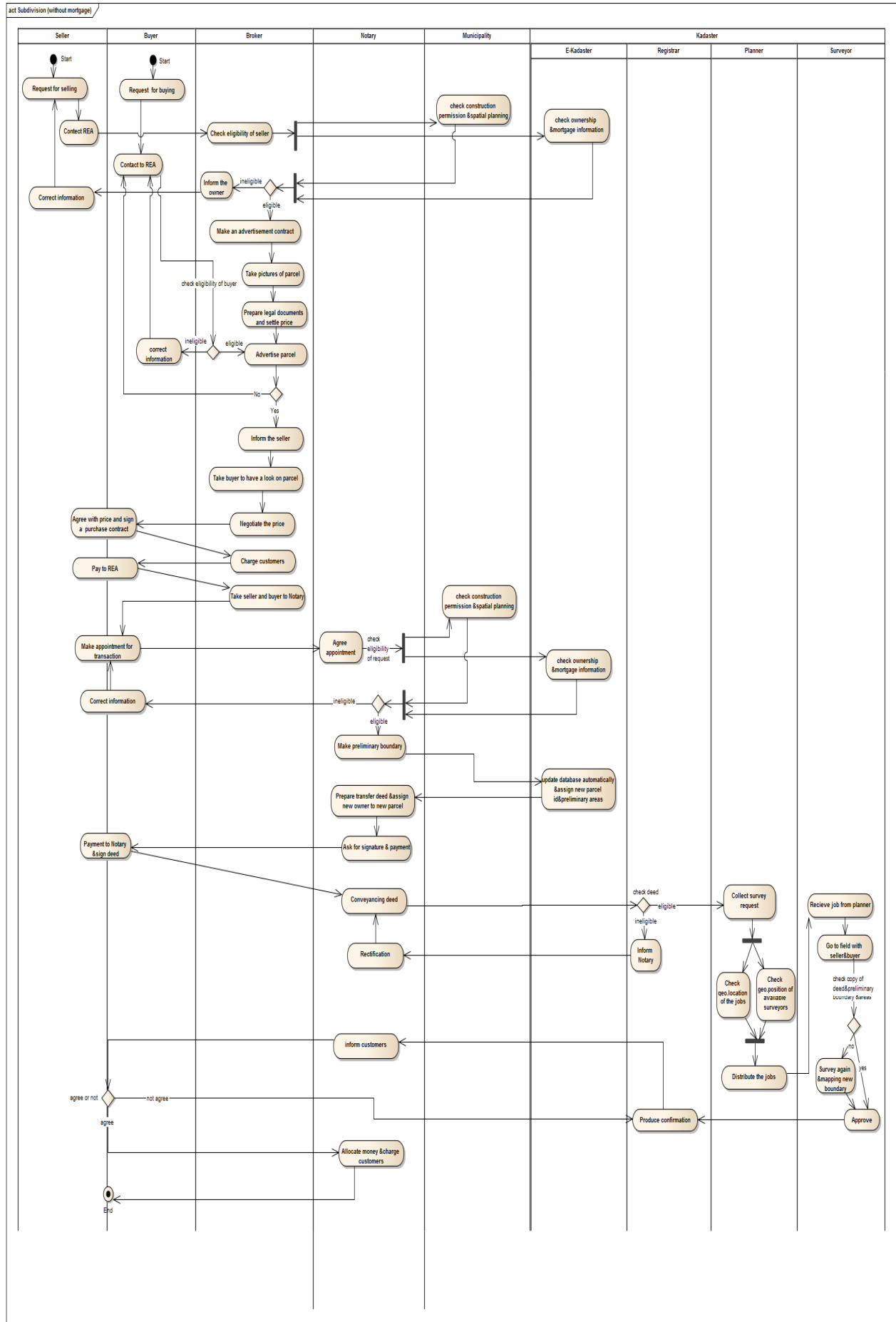
E. Subdivision with mortgage

- 8) Which department receive the transfer & mortgage deed and process them? What are the procedure?

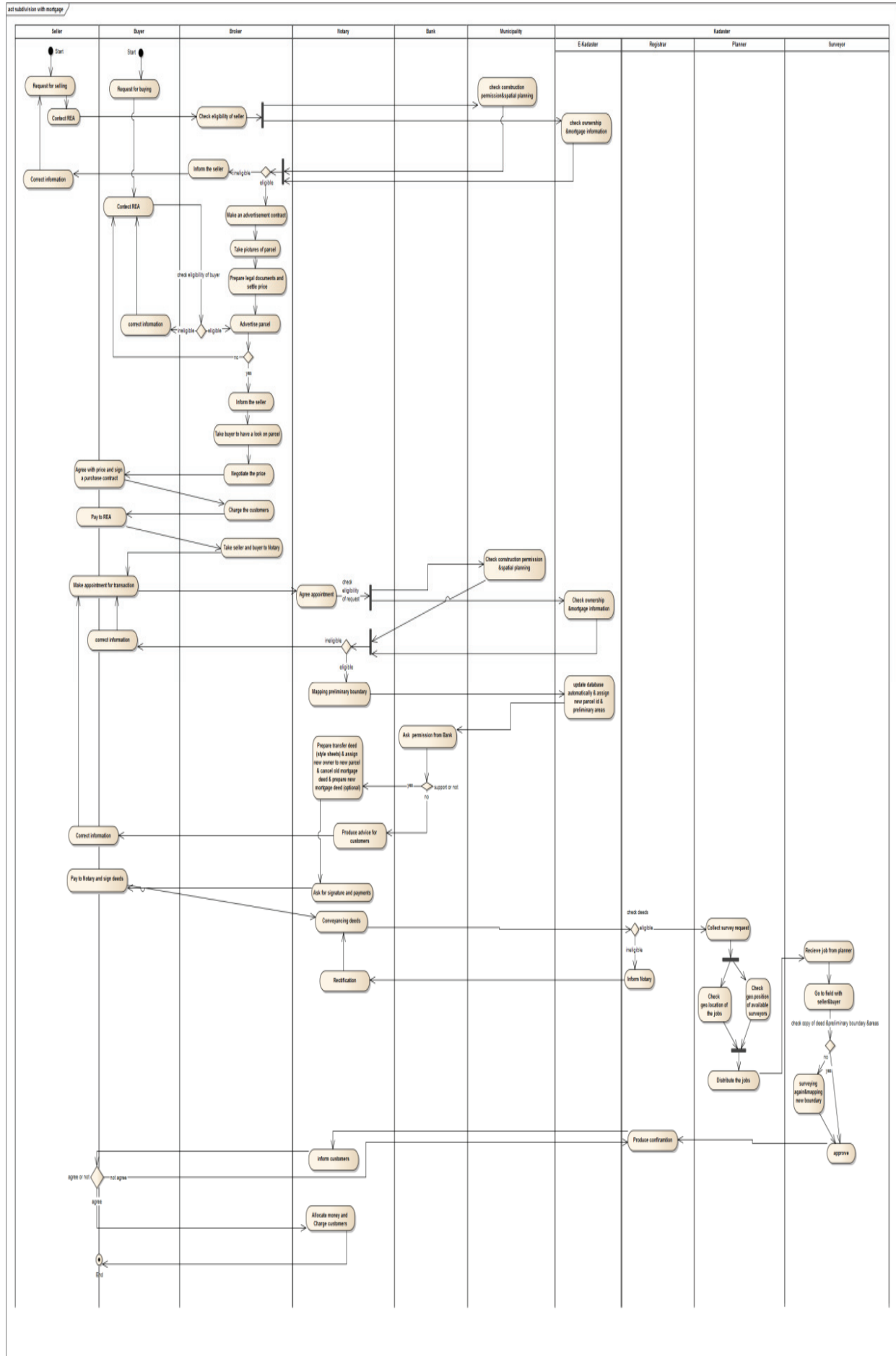
Annex 5: Activity diagram of full transaction without mortgage



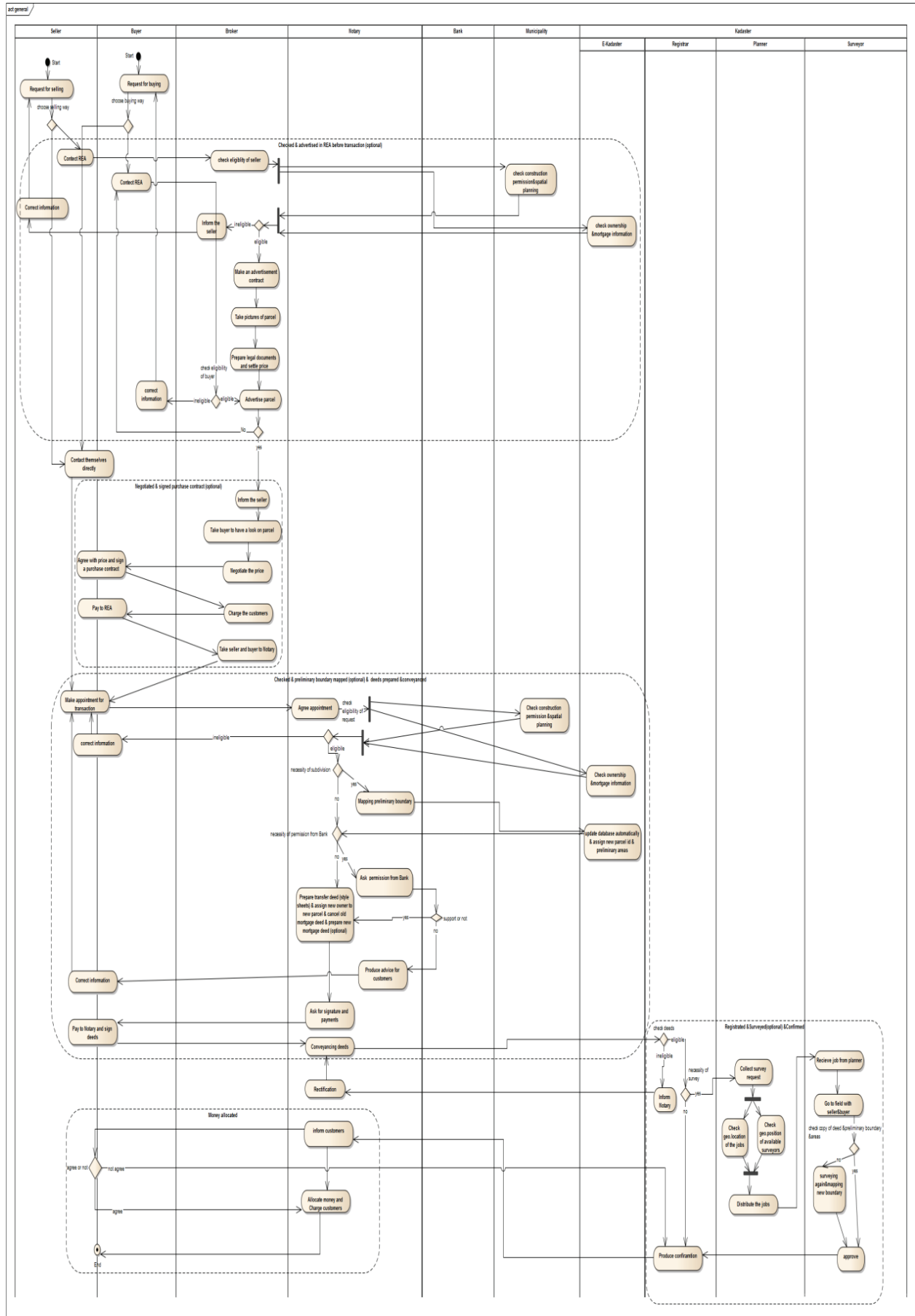
Annex 6: Activity diagram of subdivision without mortgage



Annex 8: Activity diagram of subdivision with mortgage



Annex 9: General workflow of parcel transaction in Netherlands



Annex 10: User preferences table

<i>States</i>	<i>No.1 Advertised parcel(optional)</i>	<i>No.2 Negotiated parcel (optional)</i>	<i>No.3 Deeds prepared parcel</i>	<i>No.4 Registered parcel</i>	<i>No.5 Payments allocated parcel</i>
Information					
seller name					
seller identifier					
seller email					
buyer name					
buyer identifier					
buyer email					
broker name					
loan bank					
notary name					
kadaster location					
parcel identifier					
quoted price					
advertised price					
negotiated price					
availability of purchase contract					
availability of advertisement					
availability of transfer deed					
availability of mortgage deed					
availability of confirmation					
availability of invoice					
service fees					
start time					
end time					

<i>Colours</i>	<i>Categories</i>
	Users and related information
	Parcel information
	Prices
	States of documents
	Time and fees

Annex 11: Preferable information of various users in each state

Preferable information of Seller in each state

<i>States</i>	<i>No.1</i>	<i>No.2</i>	<i>No.3</i>	<i>No.4</i>	<i>No.5</i>
Information					
seller name	√				
seller identifier	√				
seller email	√				
buyer name		√			
buyer identifier		√			
buyer email		√			
broker name	√				
notary name			√		
kadaster location				√	
parcel identifier	√	√	√	√	√
quoted price	√				
advertised price		√			
negotiated price			√		
availability of purchase contract		√			
availability of advertisement	√				
availability of transfer deed			√		
availability of mortgage deed			√		
availability of confirmation				√	
availability of invoice					√
service fees for seller					√
start time	√	√	√	√	√
end time	√	√	√	√	√

Preferable information of Buyer in each state

<i>States</i>	<i>No.2</i>	<i>No.3</i>	<i>No.4</i>	<i>No.5</i>
Information				
seller name	√			
seller identifier	√			
seller email/phone	√			
broker name	√			
notary name		√		
kadaster location			√	
parcel identifier	√	√	√	√
quoted price	√			
advertised price	√			
negotiated price	√			
availability of purchase contract	√			
availability of transfer deed		√	√	

availability of mortgage deed		√	√	
availability of confirmation			√	
availability of invoice				√
Service fees for buyer				√
start time	√	√	√	√
end time	√	√	√	√

Preferable information of Broker in each state

<i>States</i>	<i>No.1</i>	<i>No.2</i>	<i>No.3</i>
Information			
seller name	√	√	
seller identifier	√	√	
seller email	√	√	
buyer name		√	
buyer identifier		√	
buyer email		√	
broker name	√	√	
notary name			√
parcel identifier	√	√	√
quoted price	√		
advertised price	√		
negotiated price		√	
availability of transfer deed			√
availability of mortgage deed			√
availability of invoice			√
service fees for broker			√
start time	√	√	√
end time	√	√	√

Preferable information of Notaris in each state

<i>States</i>	<i>No.3</i>	<i>No.4</i>
Information		
seller name	√	
seller identifier	√	
buyer name	√	
buyer identifier	√	
broker name	√	
loan bank	√	
kadaster location		√
parcel identifier	√	√
quoted price	√	
negotiated price	√	
availability of transfer deed	√	
availability of mortgage deed	√	

availability of confirmation		√
start time	√	√
end time	√	√

Preferable information of Financial assistant in each state

<i>Information</i>	<i>States</i>	<i>No.5</i>
parcel identifier		√
availability of invoice		√
service fees of notaris		√
start time		√
end time		√

Preferable information of Registrar in each state

<i>Information</i>	<i>States</i>	<i>No.4</i>	<i>No.5</i>
seller name		√	
seller identifier		√	
buyer name		√	
buyer identifier		√	
notary name		√	
parcel identifier		√	√
quoted price		√	
negotiated price		√	
availability of transfer deed		√	
availability of mortgage deed		√	
availability of confirmation		√	
availability of invoice			√
service fees of Kadaster			√
start time		√	√
end time		√	√

Preferable information of Surveyor in each state

<i>Information</i>	<i>States</i>	<i>No.4</i>
parcel identifier		√
availability of transfer deed		√
availability of mortgage deed		√
start time		√
end time		√

Annex 12: Groups and Users Account in ProcessMaker

Department (Organizational Unit)	Group (Role)	User (Identity)	Credentials (User/Pass)
Public	Seller	Dan Li	29820/29820
	Buyer	Yan Wang	28496/28496
Real Estate Agency	Broker	Yuefei Zhuo	27586/27586
Bank	Mortgage Officer	Lucy Li	27777/27777
Notary	Notary Public	Chao Zhen	27590/27590
	Financial Assistant	Hui Li	25555/25555
Kadaster	Registrar	Kezhen Li	29793/29793
	Surveyor	David Li	26666/26666
Management	Process Designer	Admin	admin/admin

Annex 13: Specific inputs of each step operated in ProcessMaker for "Full transaction with mortgage" case

Step1: Request from seller

Request Details (seller)

Descriptive Title: Request for sell

Seller Name: Dan Li

* Seller Identifier: 29820

Address: Hengelosestraat

Email/Phone: li29820@ite.nl

Object Type: Parcel

* Object Identifier: 123456

Loan Bank: ABN

Motivation/Description: Seller would like to sell his parcel, parcel is in mortgage.

Submit Request

* Required Field

Step2: Operations by broker

▶ Next Step

Request Details

Descriptive Title	Request for selling
Seller Name	Dan Li
Seller Identifier	29820
Address	Mengelosestraat 99
Email/Phone	li29820@itc.nl
Object Type	Parcel
Object Identifier	123456
Loan Bank	ABN
Motivation/Description	Seller would like to sell his parcel, which is in mortgage

Review Details

Cadastral Identifier	
Permission of construction	<input type="button" value="Yes"/>
Permission of spatial planning	<input type="button" value="Yes"/>
Eligible or not	<input type="button" value="Yes"/>
General Comments	No comments

▶ Next Step

Advertisement

Descriptive Title	<input type="text" value="Advertisement"/>
Seller Name	Dan Li
Seller Identifier	29820
Email/Phone	li29820@itc.nl
Object Type	parcel
Object Identifier	123456
Motivation/Description	Seller would like to sell his parcel, which is in mortgage
Sold Price	<input type="text" value="1500 euro"/>
Availability of advertisement	<input type="button" value="Yes"/>

▶ Next Step

Negotiation Details

Seller Name	Dan Li
Seller Identifier	29820
Email/Phone	li29820@itc.nl
Object Type	parcel
Object Identifier	123456
Buyer Name	<input type="text" value="Yan Wang"/>
Buyer Identifier	<input type="text" value="28496"/>
Email/Phone	<input type="text" value="536284"/>
Sold Price	<input type="text" value="1500 euro"/>
Availability of purchase contract	<input type="button" value="Yes"/>

Step3: Operations by Notaris

▶ Next Step

Review Deed Request

Seller Name	Dan Li
Seller Identifier	29820
Buyer Name	Yan Wang
Buyer Identifier	28496
Object Type	parcel
Object Identifier	123456
Loan Bank	ABN
Sold Price	1500 euro
Permission of construction	<input type="text" value="Yes"/>
Permission of spatial planning	<input type="text" value="Yes"/>
Available of request	<input type="text" value="Yes"/>

▶ Next Step

Prepare Deeds

Object Identifier	123456
Availability of transfer deed	<input type="text" value="Yes"/>
Availability of mortgage deed	<input type="text" value="Yes"/>

Step4: Operations by Kadaster

▶ Next Step

Object Identifier	123456
Availability of transfer deed	<input type="text" value="Yes"/>
Availability of mortgage deed	<input type="text" value="Yes"/>

▶ Next Step

Produce Confirmation

Object Identifier	123456
Availability of confirmation	<input type="text" value="Yes"/>

Step5: Operations by Notary financial assistant

❏ ▶ Next Step

Create Invoice

Object Identifier 123456

Availability of invoice Yes