

# Development of Data Model for “Buying and Selling” of Immovable Property via UML Diagrams

Yakup Emre CORUHLU<sup>1</sup>, Tugay TOLUDAN<sup>2</sup>, Okan YILDIZ<sup>3</sup>, TURKEY

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## ABSTRACT

The immovable "buying and selling" is an administrative transaction made in Land Registry Offices under the authority of General Directorate of Land Registry and Cadastre (GDLRC in Turkish TKGM). These transactions are conducted through TAKBIS system, which is a good example for e-government applications. In the buying and selling process many properties can be mentioned according to the place where the real estate is located and the rights and restrictions on it. When these processes about transactions are carried out, needed data and some documents coming from other institutions are usually obtained by conventional methods rather than via e-government. The development of e-government will be extremely useful for the online execution of all transactions. It is very important to understand the authority, duties and responsibilities of the institutions involved in this process in an accurate and simple method. TAKBIS under e-government will enable the process efficiently to be carried out. UML is now known as an object-oriented modeling language used by many different disciplines in recent times. Especially after the conversion of LADM to the ISO standard, TUCBS studies in our country and many academic studies have been modeled with UML diagrams. With this modelling language, different presentations has been prepared for immovable trading types and transactions, and shown each trading practice process. With this context, possible situations that may be encountered in an immovable "buying and selling" have been evaluated and modelled. Thus, the relationship between the other applications within e-Turkey and TAKBIS where immovable "buying and selling" is conducted has been investigated. One of the most important findings in this context is that all immovable "buying and selling" operations still is not conducted via e-government. The model designed in the context will contribute to the inclusion of elements not managed through e-government into the system. Thus, the trading process will proceed faster and more accurately.

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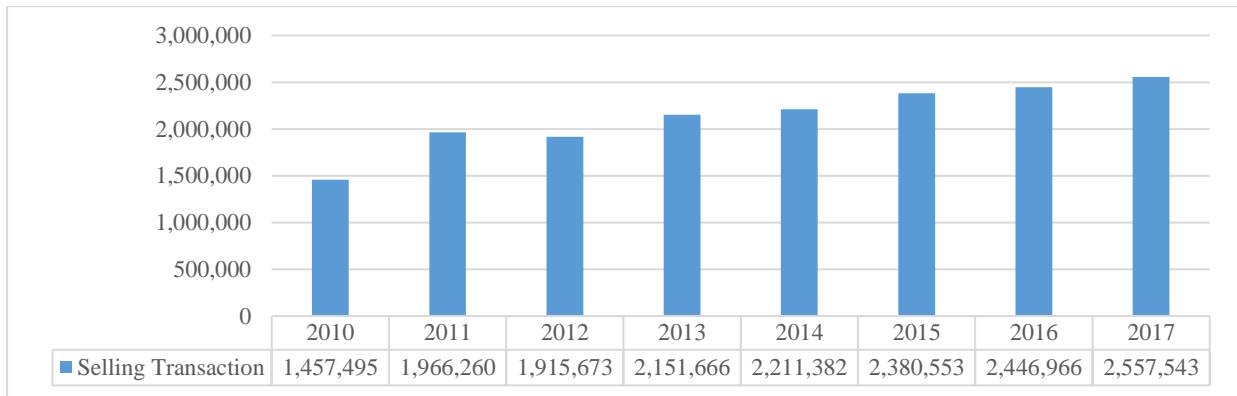
Yakup Emre CORUHLU<sup>1</sup>, Tugay TOLUDAN<sup>2</sup>, Okan YILDIZ<sup>3</sup>, TURKEY

## 1. INTRODUCTION

General provisions on ownership in Turkey, the issue, acquisition, loss of immovable property/real estate/real property, easement rights, limitations on real estate and immovable pledges related to limited real rights are included in Real Law of Turkish Civil Code (Official Gazette 2001). Selling transactions are the most common transactions, which carried out in Land registry office in Turkey. Besides, it is one of the most profitable elements in the public sector in terms of recycling. Immovable selling in Turkey are realized in the following ways:

- Selling by the request of proprietor,
  - Selling lower price than market value,
  - The compulsory liquidation,
  - Selling for the dividing up of an undivided property,
  - Selling according to the Article 11 of the law with number 1164,
  - Selling among public institutes,
  - Selling of immovable in the anthracite basin according to the law with number 3303,
  - Selling of Municipality Immovable,
  - Selling of immovable related to Organized Industrial Zones,
  - The alienation of shares by selling,
  - The bare ownership selling by taking over usufruct,
  - The alienation in return for the flat,
  - The immovable dispositive for ward,
  - Selling in accordance with the court decisions,
  - Selling of Treasury and Municipality Immovable according to the law with number 4706,
  - Selling to participant in the collective and the joint-owned property,
  - Selling and hypothec,
  - Selling according to the law with number 6292,
  - Selling according to the Article 7/a of the law with number 4749.
- (GDLRC 2014)

The total number of transactions made in Land registry office in Turkey in the year 2017 is 8,390,980 while 6,079,011 in the year 2010. The number of immovable selling transactions carried out within in Land registry office between the year 2010 and 2017 (URL-1 2018) has been presented in **Figure 1**. This figure shows that there is a systematic surge of selling transaction every year, except for the year 2012.



**Figure 1.** The number of Immovable Selling Transactions in Land Registry office between 2010 and 2017

According to the data of the year 2017, more than 8 million land registry transactions have been made and 2.5 million (30%) of these transactions are selling transactions. While the market volume created by selling transactions in year 2016 is 206 Billion Turkish Lira, this amount has increased to 309 Billion Turkish Lira with surge of 20% in year 2017 (URL-2 2018). These informations are very important in terms of showing the request for immovable buying and selling.

Immovable buying and selling process is collection of a variety of transactions involving many institutions and occupational disciplines. Buying and selling process among real persons is usually simple in terms of understanding, but some institutions are involved in buying and selling transactions cause to more complicated process. It must be known which documents will be needed in the process, in which order buying and selling process will take place, and which institutions will play a role in the process. Land Registry and Cadastre Information System (LRCIS- in Turkish TAKBİS), one of e-government projects in Turkey, has important functions at this stage. LRCIS project launched in year 2001 within GDLRC. Thanks to LRCIS project, some aims has been wanted to realized: (i) Planning, management and operation of TKGM services in a healthier, faster, reliable and effective manner, (ii) presenting ownership data more efficiently to other institutions and organizations, and (iii) converting Land Registry and Cadastre System to ‘Multipurpose Land Information System’ (Alkan and Can 2009). LRCIS collects data in a single database, provides to transactions are maintained in an integrated manner. Thus, LRCIS makes data loss due to lack of coordination reducing. In addition, GDLRC has provide to increase productivity, to define business processes, and to set standards launching to ‘Continuous Corporate Development Project’ (URL-3 2018). Redefinition and simplification of business processes in public institutions and presentation of public services in electronic environment bring about working quickly in public institutions (Turkish Court of Accounts 2006). It is necessary to review business processes, to structure them in accordance with information technologies, and to eliminate the contradictions among institutions. Integration of business processes into information technologies and restructuring as standard will reduce bureaucracy and increase productivity (Ozturk and Kılıç 2013). The Land registry office in Turkey is the way of improving service standards based on the

information technology. In this context, an online appointment system has been developed and business processes have been completed in reasonable time (URL-4 2018). Appointments can be made from the Land Registry offices for more than 40 contracted and non-contracted transactions. The person in the application can learn from the system which documents should be kept in order to complete the requested transaction. With the developed system, transactions are carried out in order and completed within minutes (URL-5 2018).

## 2. 'BUYING AND SELLING' PROCESS OF THE IMMOVABLE PROPERTY

The selling transaction is a contractual transaction based on preparing of authenticated contract with request of two or more person in the Land registry office. If the selling transactions take place outside the Land registry office, these transactions are invalid. In other words, the contract made in the notary is validated with registration to the land register. The factors that restrict or outlaw to the right of disposition must be paid attention before the selling. These factors are expressed in the Turkish Civil Code. In addition, how prohibitions and restrictions will be handled in the land register is explained in Article 48 and 49 of Land Registry Regulations. Information on restrictions and prohibitions that blocking the selling transactions are presented in **Table 1**. Personal annotations prevent the immovable property selling to third parties for a certain period. Personal annotations are regulated in Turkish Civil Code and Turkish Code of Obligations. While *contractual rights to promise for selling, pre-emption, rights to purchase, advance right to the vacated rank of pledgee, and construction in return for land share* are expressed in Turkish Civil Code, *right to recourse of donation, ordinary lease, and usufructuary lease* are given place to Turkish Code of Obligations ( Turkish Directorate General of National Property 2005).

**Table 1.** Restrictions and Prohibitions Related to the Disposition (GDRLC 2014; Official Gazette 1932, 2001; Turkish Directorate General of National Property 2005)

	<b>Restrictions and Prohibitions related to the Disposition</b>	<b>Instructions</b>
<b>Regulated in Turkish Civil Code</b>	Interlocutory injunction for Contentious Rights	The Interlocutory injunction is defined as a decision by the court, which is why the acquisition of a right becomes difficult, becomes impossible, or is worried about serious harm caused by delay. It is a legal protection for those who demand it
	Distrain, Bankrupt, and the Time for the Concordatum	The distraint is expressed as the confiscation of the debtor's immovable property on the request of the creditor and the registration of the land registry. The bankrupt notation is described as the right of the disposition of the immovable transferred to the Bankrupt's Assets. The bankrupt decision is taken by the authorized court. The time of the concordatum is duration of payment for the debtor. This time is detected by the authorized court on the request of the debtor. The debtor can't dispose over his immovable as long as the concordatum annotation is found .
	Setting up the Homestead	It is necessary to court decision for setting up of the homestead annotation. If the immovable meets the conditions of being a homestead and the objections are not accepted, the homestead can be sets up.
	Reversioner Appointment	Legator can assign to reversioner the heritage. First devisee is an intermediary for the process. The reversioner appointment annotation blocks the selling of the immovable for the specified time.

	Residential Building Annotation	The residential building is the place where the married couples operate all life activities. One or both of the couples can be requested for notation.
Regulated in the Other Laws	The Immovable Properties in the Article 30 of the Settlement Law	The Article is related to the immovable properties given refugees and immigrants. Selling distraint, pledge and donation transactions can not be realized on these immovable up to 10 years
	The Immovable Properties in the Article 7 of the Expropriation Law	The administration making a expropriation decision requests the expropriation notation from the Land registry office. If the institution does not submit the court decision declaring the registration of the immovable on behalf of the institution to the land registry office within 6 months from the date of the annotation, this annotation is deleted.
	The Immovable Properties in the Article 11 of the Law with Number 3083	The lands distributed in accordance with the provisions of this Law can not be divided into and the conveyancing of these lands can not be carried out except for the heritage provisions. These lands can't be the selling, the distraint, and the rent.

### 3. METHOD

Modelling is describing of the process of designing software applications and visualizing the data belonging to the software. Modelling provides the visualization of abstract concepts, and then allows for simple expression of business processes having detailed data. (URL-6 2018). The Unified Modelling Language (UML) developed by the Object Management Group (OGC) is described as an object-based modelling language. UML develops software systems, defines systematic data, visualizes them and analyses them through visuals. (Alkan and Ozfidan 2016; Coruhlu et al. 2015; Kaya 2014; Sag 2014; URL-6 2018). This modelling language, which is an example of conceptual design, identifies objects to be stored in the database, assigns the attributes of the objects, and finally the attributes are associated with the selected objects. (Aydinoglu and Yomralioglu 2006). UML diagrams are categorized under three main groups and 14 different diagrams can be used. The following table shows these diagrams and the diagrams used in the study.

**Table 2.** UML Diagrams Types (Uymaz and Kahramanlı 2016; Yesilbudak et al. 2011; URL-7 2018; URL-8 2018)

STRUCTURE DIAGRAMS	BEHAVIOUR DIAGRAMS	INTERACTION DIAGRAMS
Class*	Activity*	Sequence*
Object	Use Case*	Communication
Component	State Machine	Timing
Composite Structure		Interaction Overview
Deployment		
Profile		
Package		

\* Used Diagrams in the Study

Activity diagrams show the workflows and use cases in the system (Kaya 2014; Sag 2014). Activity diagrams are expressed in parallel and branching flows (Kaya 2014; URL-9 2018). These diagrams include object tracks. Object tracks provide information on the activities of the objects (URL-9 2018).

Class diagrams are preferred for expressing static business processes (Sag 2014; URL-10 2018). To understand the complicated structure of class diagrams, it is necessary to know the meaning of the figures in the diagram. The classes in the diagrams are represented by rectangles and the rectangles are presented in two or three parts according to the necessary. The parts of the rectangles refers to the class names, the properties of the classes, and the transactions respectively. In the representation of relations among the classes, the lines with triangular, the lines with diamond shaped, the straight line, and the dashed line can be used. The straight line emphasizes the collaboration among classes. While the class indicated by the line with the triangular is the main class and creates the classes associated with, the class showed by the line with diamond shaped include the other related classes. The multiple expressions (0, 1, 0..\* etc.) highlight relations among classes in terms of numerical. Symbol ‘\*’ means the infinity of related classes and consecutive points explains conjunction ‘or’ (URL-11 2018; URL-12 2018).

Sequence diagrams are often used among interaction diagrams and approach relation among objects in point of timing. (Kendi 2011; URL-13 2018). Sequence diagrams present the timing and duration of the functions realized by the objects. The filled arrow symbolizes synchronous messages. Synchronous messages means that no other message will be sent until the end of a transaction. (URL-14 2018).

Actors (users) via use case diagrams visualize the transactions. In this diagram, more than one user and use case are presented together. Relationships are generally avoided in detail by being presented in a simple way. The relationship between actors and use case in the diagram is usually indicated by the line with triangular or the straight line. (URL-15 2018).

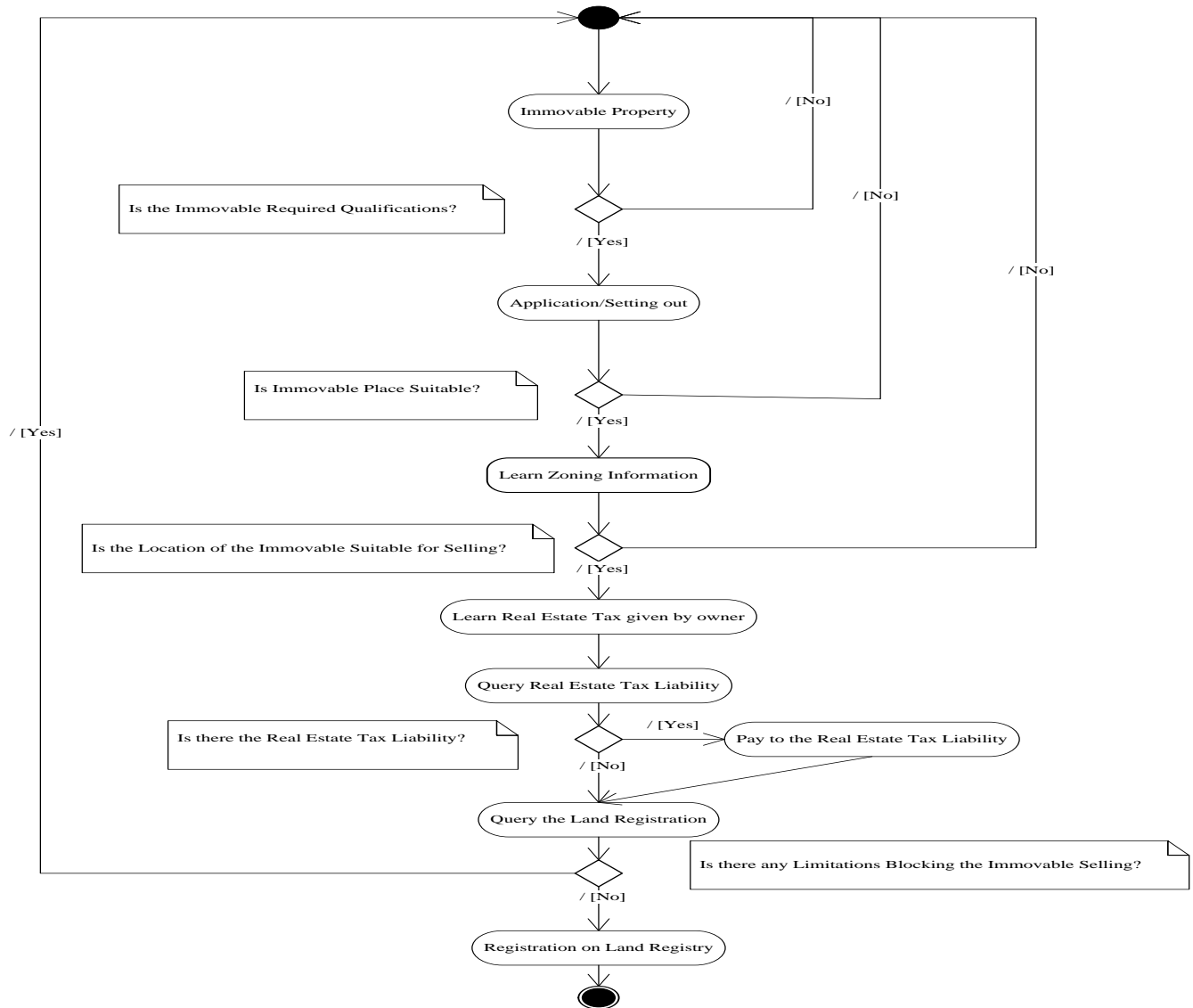
In this study, the buying and selling process of the immovable property with request of the owner is visualized via four diagrams described above. The workflow processes, the starting and the ends of the work, and the tasks related to the institutions involved in the workflow will be reduced to a simple and understandable level.

## 4. RESULTS

### 4.1. Presentation of Selling Process on Owner Request in Activity Diagram

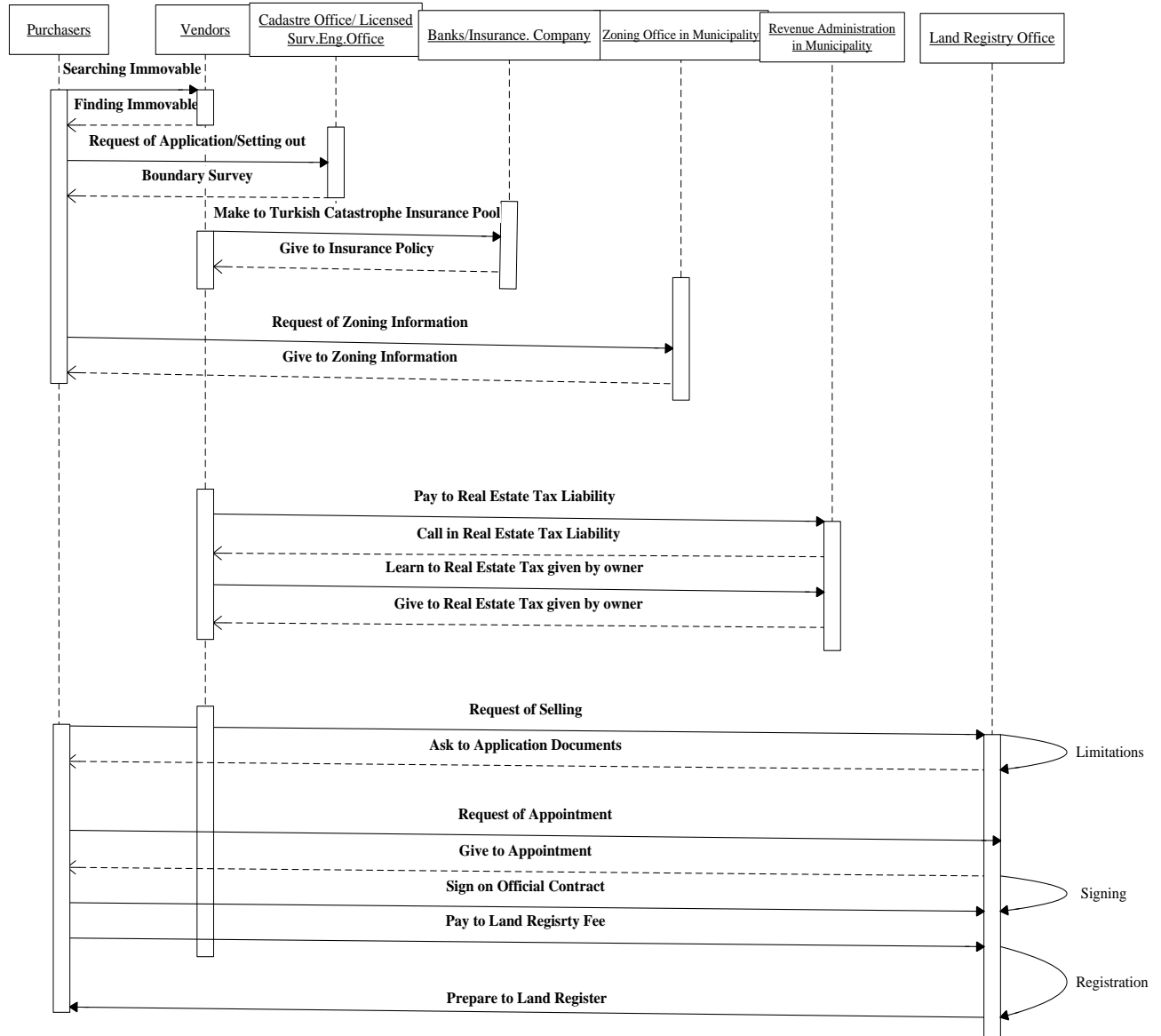
The activity diagram describes the features of the immovable property that is subject to selling should have. (**Figure 2**) The process is carried out in a specific order top to bottom. The activity diagram clearly demonstrates the order of actions regarding the immovable property. The criteria for land registration are stated as being appropriate for the selling of the location of the

immovable, the absence of real estate tax liability, and not the limitation on the immovable property blocking to the selling. The activity diagram does not provide information on the administrative units in the process. For example, determining whether the immovable is in place, the location of the immovable, and the property tax liability are included in the duties of the different administrative units, and these administrative units are not take in the activity diagram.



**Figure 2.** Presentation of selling process on owner request in activity diagram

## 4.2. Presentation of Selling Process on Owner Request in Sequence Diagram



**Figure 3.** Presentation of selling process on owner request in sequence diagram

In the above diagram (**Figure 3**), the tasks and responsibilities of real persons and legal entity are visualized during the process. The documents required by the vendor and the purchaser and the administrative units to be used for the getting of these documents are expressed. The selling of the immovable property between the vendor and the purchaser is completed with land register. As shown in the diagram, the buyer requesting to the Land registry office must supply

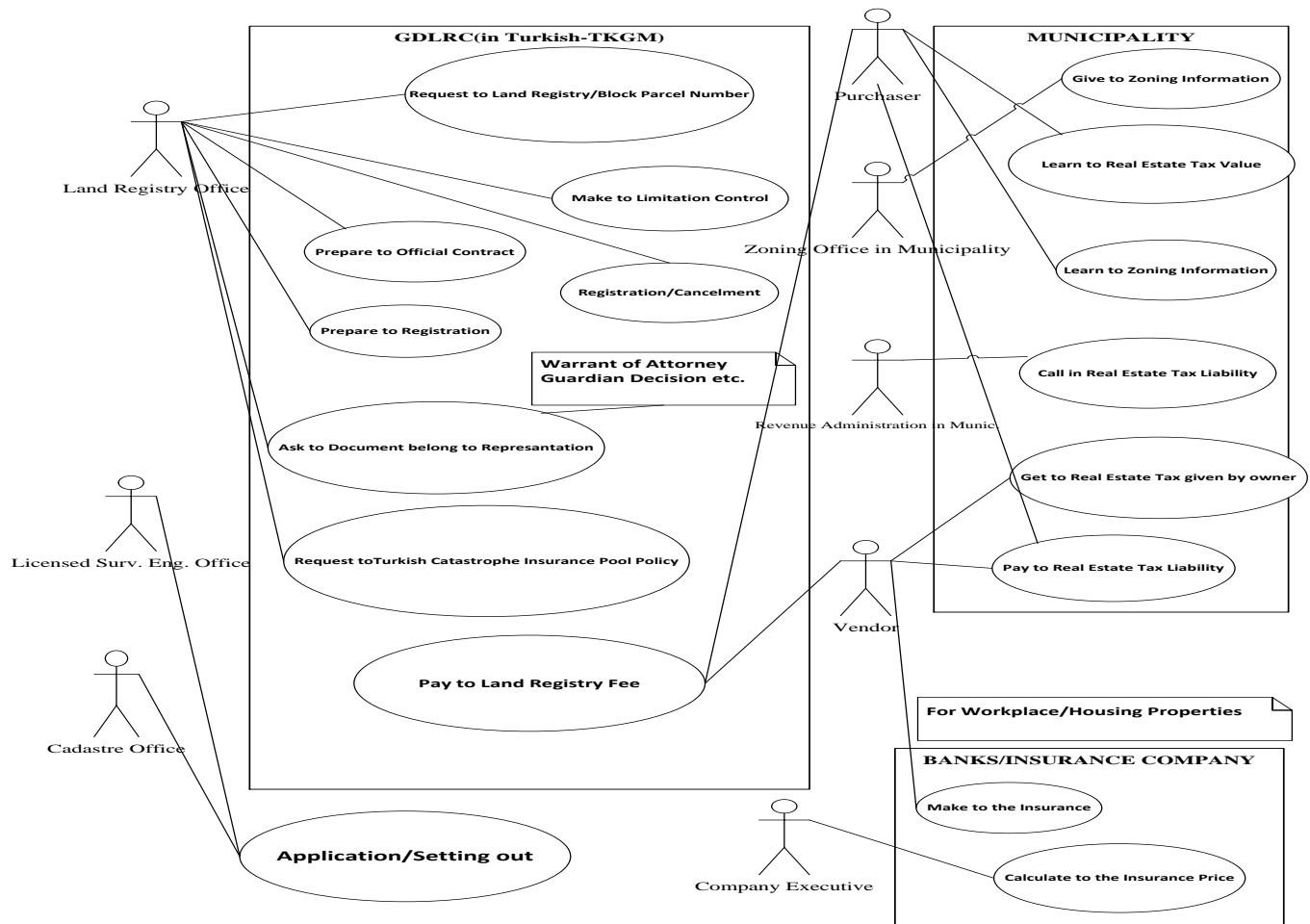


the required documents in the order given. There should be not limitations on the immovable property blocking to the selling. The vendor must carry out the natural disaster insurance and the real estate tax payment transactions and thus bond with the immovable property.

### **4.3. Presentation of Selling Process on Owner Request in Use Case Diagram**

Use case diagrams are defined as vendor, purchaser, administrative units, actor (user). The tasks that actors undertake during the selling process are revealed in the use case relationship. At the same time, the units to be consulted to for the getting of the documents is shown.

In this context, the vendor and purchaser, the Land registry office, the Zoning office in municipality, the Revenue Administration in municipality, the Cadastre office / Licensed Surveying Engineering office, and, in some cases, the Company / Bank executive are actors in the process, and the responsibilities of the actors are visualized with their case diagrams. GDLRC, municipalities, Insurance Companies/Banks are the effective units in completing of the transactions (**Figure 4**).



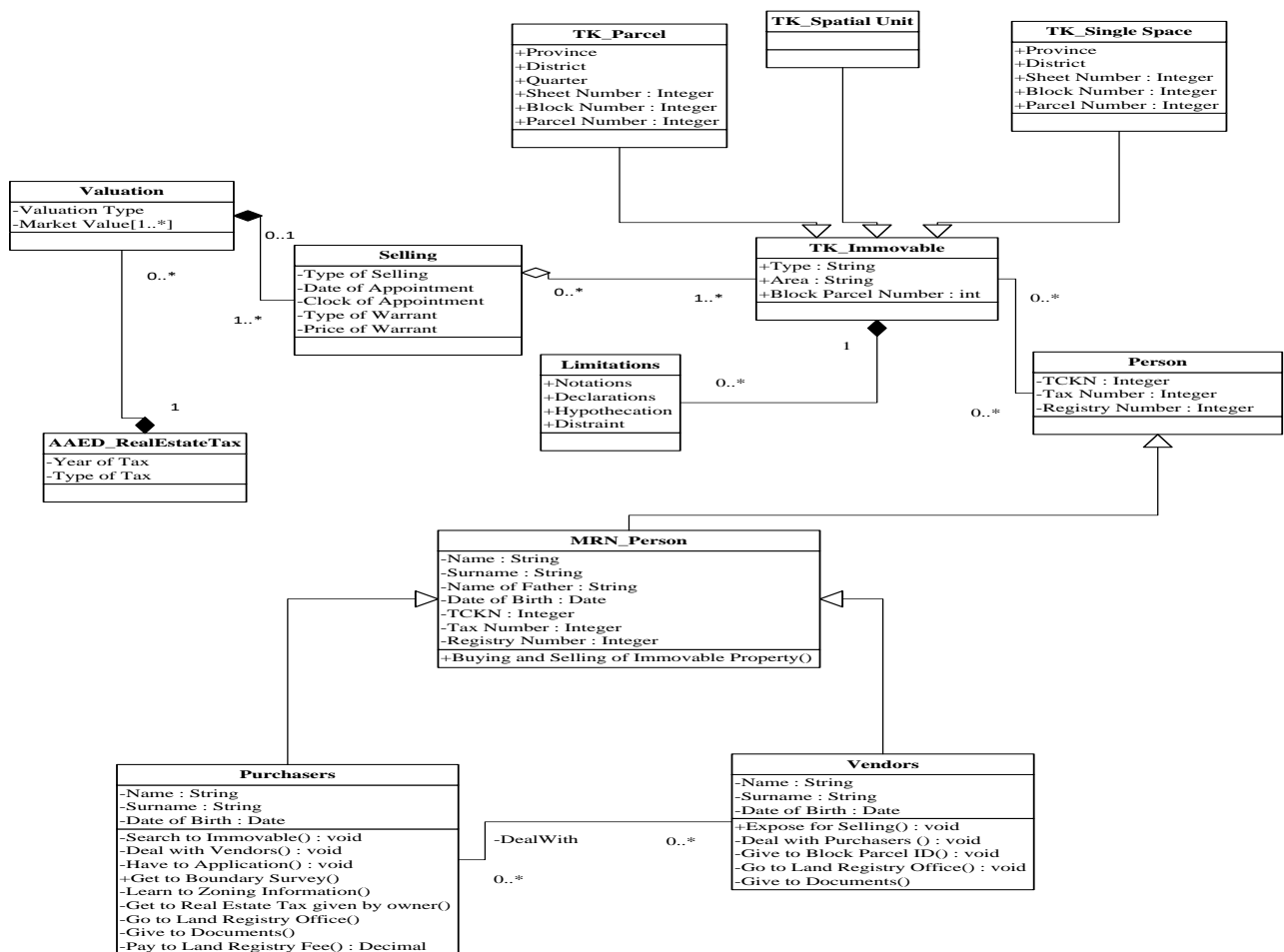
**Figure 4.** Presentation of selling process on owner request in use case diagram

#### 4.4. Presentation of Selling Process on Owner Request in Class Diagram

In **Figure 5**, assets in the selling process are classified and the relationship among them is visualized. TK\_ Immovable, TK\_ Parcel, TK\_ Spatial Units, and TK\_ Single Place classes is gotten as land registry-cadastre data set. While MRN\_ Person class expresses to the Central Civil Registration System (in Turkish MERNIS) data set, AAED\_ Real Estate Tax describe to the minimum land real estate value.

The relationship between the vendor and purchaser is related to the selling of the immovable property is written to the line indicating the relationship. In order to query the immovable, the parcel information of the immovable, the spatial units, and the single place if the condominium is established should be considered. In other words, the parcel class, the spatial unit class, and the single class derive from the immovable class. For this reason, the line with an empty triangular indicates the relationship among the classes. Selling class includes the immovable class. The line with an empty diamond shaped presents the relationship among these classes.

Limitations indicate whether it is an obstacle to the selling of the immovable property. Therefore, the request of the disposition on the immovable requires the class of limitations. A similar relationship exists between the selling class, valuation class, and real estate tax class. The line with a full diamond shaped presents the relationship among these classes.



**Figure 5.** Presentation of selling process on owner request in class diagram

## 5. DISCUSSION

Turkey's membership process to the European Union is contributed to the innovations in many areas. The process also has an impact on land management. In this context, studies on the creation of TUCBS, a national data infrastructure of Turkey, accordance with INSPIRE directives and ISO data standards have been initiated. e- Government applications based on the

immovable property in which all the administrative units associated with the immovable can manage processes set up in this way. LRCIS (in Turkish TAKBIS), one of the e-government applications in Turkey, quickly have been completed its development. All the Land registry office have begun to serve over TAKBIS by year 2012. The integration of other institutions into the e-government process in a short period will enable institutions to participate in data exchange via the common system.

The buying and selling of the immovable property is heavily requested in Turkey. The public institutions have increased the area of this request by presenting the selling of their immovable properties. In particular, the legislation published in the last 10 years in Turkey has expanded the scope of the selling of immovable belonging to the public institutions. Recent legislations has made it possible to selling Treasury agricultural land, the immovable in the scope of the Article 2/b with Law number 6831 (called the 2B immovable in Turkey), and public housing.

Buying and selling process of the immovable property is a comprehensive process that can create a relationship among real persons or between real persons and legal entities. Each administrative unit follows different ways of selling the immovable. It is also known that the selling of the immovable is one of the most popular transactions in Turkey. When the request intensity and process differences are taken into consideration, a model is needed that allows the process to be understood in a comfortable manner. The UML, used in the study, and other modeling languages are in a position to answer this necessary.

## **6. CONCLUSION AND SUGGESTIONS**

In the environmental, economic, social and political issues, taking of the common decision is difficult. Countries should consider business processes from a broader perspective. Coordinating the technology and information infrastructure that support geographic data sets allows the data from different sources being harmonized with each other. In this context, in order to use and share geographical information effectively, studies have been made about the technologies and standards to be used in Turkey, and because of these studies, the information systems have initiated to use.

The establishment and the usage of information systems are carried out with the use of e-government applications and these works are operated under the e-Turkey project. E-Turkey project aims the passing of all the public institutions to the e-government applications. Some institutions even provide information systems to third parties via e-government. In defining the conceptual data models of these information systems, the basic principles of ISO/LADM standards and accepted principles such as INSPIRE should be taken as basis.

The buying and selling of the immovable t is a process in which many different activities are carried out and different institutions and organizations are involved. If the processes of the institution in the process and the tasks of the employees are not known, it will be inevitable that the process becomes complex. This brings with it workload and time loss. The immovable acquisition is one of the most fundamental right of property, and there are certain special

situations that restrict this right. Public rights and restrictions on immovable affect the acquisition. These situations needs to be well known in the process. In addition, it should be well known how and in what order the transaction will be carried out, which institutions are involved, which documents must be taken during the transaction. For all these reasons, it is necessary to the common database that will provide an accurate analysis of the activities carried out during the selling of the immovable and that will appeal to everyone.

In this study, UML model language, which is used actively in developing object-based software, has been used and it is possible to access a common database, which appeals to every employee. UML diagrams allow to be carried out applications based on the immovable property for the selling transactions and the acceptance of common data standards such as INSPIRE. the immovable buying and selling process and all relational situations visualized with diagrams via the study. In this way, the people involved in the process will be able to understand the selling process through the visuals without having to know the operation of each process.

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## CONTACTS

<sup>1\*,2,,3</sup> Karadeniz Technical University, Department of Geomatics Engineering, Trabzon, Turkey

[1\\*yecoruhlu@ktu.edu.tr](mailto:yecoruhlu@ktu.edu.tr), [2toludantugay@gmail.com](mailto:toludantugay@gmail.com), [3okan.yildiz@ktu.edu.tr](mailto:okan.yildiz@ktu.edu.tr)