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GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**DESIGN AND IMPLEMENTATION OF DATABASE MANAGEMENT SYSTEM FOR  
IRAQ/DUHOK LAND REGISTRATION**

**MASTER DEGREE THESIS  
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### THESIS ACCEPTANCE AND APPROVAL

This thesis entitled as “**Design and Implementation Database Management System for Iraq/Duhok Land Registration**”, prepared by Hassan Ali Mohammed MOHAMMED under the supervision of Assist. Prof. Dr. Volkan Müjdat TIRYAKI has been accepted as a MASTER DEGREE THESIS on 21/06/2019 in the Department of Electrical and Electronic Engineering of the Graduate School of Natural and Applied Sciences at Siirt University by the jury members given below.

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## THESIS NOTIFICATION

I hereby declare that this paper is my unique authorial work, which I have worked on alone. All information bases, references, and literature used or excerpted through an explanation of this work are correctly cited and listed incomplete reference to the owing cause.



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Note: In this thesis, the use of original and other source notifications, tables, figures, and photographs without reference, it is subject to the provision of law No — 5846 on Intellectual and Artistic Works.

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## ABBREVIATIONS AND SYMBOL LISTS

<b><u>Abbreviation</u></b>	<b><u>Explanation</u></b>
<b>2TA</b>	: Two Tier Architecture
<b>3TA</b>	: Three Tier Architecture
<b>COM</b>	: Commercial
<b>CSS</b>	: Cascading Style Sheets
<b>DBMS</b>	: Database Management System
<b>DIS</b>	: Draft International Standard
<b>DLR</b>	: Directorate Land Registration
<b>DFD</b>	: Data Flow Diagrams
<b>EMLRS</b>	: Electronic Management Land Registration Systems
<b>ERM</b>	: Employee Registration module
<b>EsRM</b>	: Estates Registration module
<b>ESM</b>	: Estate Status module
<b>EsOM</b>	: Estate Owners module
<b>E-Government</b>	: Electronic Government
<b>FDIS</b>	: Final Draft International Standard
<b>FIG</b>	: International Federation of Surveyors
<b>G2C</b>	: Government to Citizen
<b>G2G</b>	: Government to Government
<b>G2B</b>	: Government to Business
<b>GE</b>	: Google Earth
<b>GDI</b>	: Geographic Data Infrastructure
<b>GDLRC</b>	: General Directorate of Land Registry and Cadastre
<b>GIS</b>	: Geographic information system
<b>GPS</b>	: Global Positioning System
<b>HTML</b>	: Hypertext Transfer Protocol
<b>IH</b>	: Internals Hosts
<b>IT</b>	: Information Technology
<b>ISO</b>	: International Organization for Standardization
<b>JS</b>	: JavaScript
<b>LMS</b>	: Land Management System
<b>LEM</b>	: Login Employee module
<b>LADM</b>	: Land Administration Domain Model
<b>OTM</b>	: Operation Type module
<b>PD</b>	: Staff for each Directorate
<b>PHP</b>	: Personal Home Page
<b>PLA</b>	: Participatory Land Administration
<b>PSD</b>	: Staff for each Sub-Directorate
<b>RDBMS</b>	: Relational Database Management System
<b>SD</b>	: Sub Directorates
<b>TAKBIS</b>	: Turkish Land Registry and Cadastre Information System
<b>URL</b>	: Uniform Resource Location
<b>VIM</b>	: View Information module
<b>WA</b>	: Web Application
<b>WWW</b>	: World Wide Web

## ÖZET

### YÜKSEK LİSANS TEZİ

## İRAK/DUHOK TAPU KAYDI VERİ TABANI YÖNETİM SİSTEMİ TASARIMI VE UYGULAMASI

M.Sc. Thesis

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İçinde bulunduğumuz çağda, teknoloji insan yaşamının birçok alanında merkezi bir rol oynamaktadır, ancak tapu kaydı için hâlâ klasik kağıt baskı tabanlı yaklaşımlar kullanılmaktadır. İnternet tabanlı yöntemler, kağıt kullanmanın dezavantajlarının üstesinden gelmek ve farklı devlet sektörleri arasında iletişim için mükemmel olanaklar sunmaktadır. Günümüzde, Bilgi ve İletişim Teknolojileri (BİT), profesyonel elektronik sistemler oluşturarak Elektronik devlet (E-devlet) sistemine doğru büyük adımlar atmak için kullanılmaktadır. E-devlet sisteminin en önemli bölümlerinden birisi Elektronik Tapu Kaydı'dır (ETK). Duhok Tapu Müdürlüğü, alt müdürlükleriyle birlikte, birçok veri üzerinde çalışmaktadır. Bu müdürlüklerde klasik kağıt baskıya dayalı yaklaşımlar kullanılmaktadır, ve bir ETK sistemi oluşturulması hem zaman hem de kağıt israfından kurtulmak için gereklidir. ETK sistemi aynı zamanda E-devlet sistemi ile entegrasyonu kolaylaştıracaktır. Tapu kayıt yönetiminin iyileştirilmesi bir tarafta tapu kayıt personeli ile diğer tarafta idare ve finans müdürlükleri arasındaki iletişimi olumlu yönde etkileyecektir. Bu tezde Duhok tapu kaydı için etkili bir ETK sistemi geliştirilmiştir. Geliştirilen tapu kaydı veri tabanı yönetim sisteminin Çalışan Kayıt Modülü, Emlak Kayıt Modülü, İşletme Tipi Modülü, Emlak Sahipleri Modülü, Emlak Durum Modülü, Bilgi Ekranı Modülü ve Çalışan Giriş Modülleri bulunmaktadır. Önerilen ETK'nın tasarım ve uygulama aşamalarında HTML, CSS, PHP, MySQL, JavaScript, jQuery, Ajax ve Bootstrap araçları kullanılmıştır.

**Anahtar Kelimeler:** E-devlet sistemi, tapu tescili, veri tabanı, iletişim teknolojisi.

## **ABSTRACT**

**M.Sc. Thesis**

### **DESIGN AND IMPLEMENTATION OF DATABASE MANAGEMENT SYSTEM FOR IRAQ/DUHOK LAND REGISTRATION**

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**The Graduate School of Natural and Applied Science of Siirt University  
The Degree of Master of Science  
In Electrical-Electronics Engineering**

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In this era, technology is playing a central role in many areas of human life, but the classical hardcopy-based approaches are still being used for land registration. The Internet-based methods provide excellent facilities for overcoming the drawbacks handwritten-based style and communication among different government sectors. Nowadays, the Information and Communication Technology (ICT) is used to build professional electronic systems as big steps towards the Electronic government (E-government) system. One of the most important section of the E-government is the E-Land-Registration (ELR). Duhok Land Directorate, together with its sub-directorates work on a huge amount of data to process. These directorates suffer from the classical hardcopy-based approaches, so building an ELR system will reduce both the time consumption and paper waste. The improvement of the land registration system will also allow integration with the E-government system. The improvement of the land registration will enable communication between the land registration staff in one side and administration and financial directorates on the other. In this thesis, an efficient ELR system for Duhok land registration is proposed. The services of the database management system cover Employee Registration Module, Estates Registration Module, Operation Type Module, Estate Owners Module, Estate Status Module, View Information Module, and Login Employee Module. HTML, CSS, PHP, MySQL, JavaScript, jQuery, Ajax, and Bootstrap tools were used for the design and implementation stages of the proposed ELR.

**Keywords:** E-government system, land registration, database, communication technology

## 1. INTRODUCTION

The Land Administration Domain Model (LADM) can reach the Final Draft International Standard (FDIS): International Organization for Standardization (ISO) FDIS 19152. We can regard this as the last stage, that precedes the stage of growth as an International Standard (this is predicted in July 2012), coming after a standard development process which is for four years in ISO/TC211 (Geographic Information) and six years later to an arrangement in the commission of International Federation of Surveyors (FIG), but the legitimate thought of a standard such as this one was opened into 2002 FIG Congress in Washington D.C. (Lemmen et al., 2012). The land title evidence has registered as indefeasible ownership. On the other hand, many citizens tend to suffer from frauds. Because of the rising number of fraud and the poorness of the registration system in the country, the current research has the objective of providing a solution to the mentioned issue (Abdullah et al., 2017).

Societal drivers together with economic condition demolition, equality between the two genders, endemic identification, proper housing, property farming, food safety, global change in climate, and sensible governance have a significant impact on the design of land management style. Likewise, the chances offered by high tech progress conjointly affect the methods of design as well. LADM tries to regulate both; the info model presents a homogenous international terminology for real estate administration. As world is customary, it will encourage the event of code applications and will quicken the application of land administration systems that assist property aims and goals.

The LADM covers essential elements that are connected to the information of land administration together with those about real estate, under water, under the surface, and on the surface. The quality is an abstract approach with three packages connected to certain parties (whether they are people or organizations); essential body Sub Directorates, rights, liabilities, and limitations (rights of property holding), individual Sub Directorates (parcels, and also the law related area of constructions and profit networks) with a sub package for measure, and illustration meaning geometry and topology (Lemmen et al., 2015).

The 7th FIG that handles the topics of cadastre and land management proposed that a view has to be progressed and processed for cadastre in the next twenty years in

XXth natural congress back to the year 1994. Confined to the limits of this section, the working group finished its long-term research and shared an article titled as "Cadastre 2014 - A Vision for A Cadastral System in the Future" back in 1998. In the capacity of this proposal, the collective work finished its long-term studies and shared an account under the title "Cadastre 2014 - A Vision for A register System within the Future" back in the year 1998. This research was entitled "The Vision of Cadastre 2014," which identifies the idea of the way cadastre develops and looks like in the upcoming 20 years. This report contain the accounts of confirming the cadastre to be worldly integrable and forming the survey future work is presented to the world by FIG. The nation we live in held a lot of research, activities, and programs so that to confirm the new cadastral system in the guidance of the Vision of Cadastre 2014 that is beneath the administration of the General Directorate of Land Registry and Cadastre (Polat and Alkan, 2018).

Registration and management of land in the country of Bangladesh are regarded as significant obstacles to the growth of the economy. In a time that the current system is encumbered with vast paper records, information technologies (IT) can significantly ease the inherent delays and difficulties of the system (Toaha and Khan, 2008).

Lack or shortage of real estate knowledge on customary lands restricts the progress and functioning of land strengthening. The notion of Participatory Land Administration (PLA) is progressed in the background of the growth of crowdsourced, volunteered, and participation-based models provide new visions to neogeography and neo cadastre, and fit-for-desire and pro-poor land control (Asiama et al., 2018). Up to date, in Ghana, acquisition of real estate is not smooth and easy as required. It is confronted by many obstacles like unsafety of real estate administration and control, deficient land planning, nonobservance in the real estate market that leads to deceit, clash, struggle, annoyance, and worry. Even though there are distant lands in Ghana, there are also more problems in acquiring suitable land unless the proper procedure is adopted (Gyamera, 2018).

Furthermore, there is general indiscipline and lack of transparency in the Ghanaian land market. It is to be noted that this is featured by many sales of residential collections, land inroad and random progress and developing the process. Deeds of real estate are considered the foundation of the whole land reforms, so an update that is both online and regular is vital. The aim of the system of the land records that are based on

the web, thus, has been to afford a fast, safe, and translucent reach to those land registrations and the land records through the use of social media and other means of communication. Further, this is going to reassure the process of land registration, which will decrease the load of the work on the land registration directorates. Also, this will confirm real estate registration or legal parcel documentation because of system simplicity and flexibility. (Tagoe and Mantey, 2011).

### **1.1 Aim of the Thesis**

The main aim of this study is to design and implement Electronic Management Land Registration System (EMLRS) to be used in the Iraq-Duhok Directorate of Real Estate Registration in Duhok with three directorates Duhok, Zakho, Sumel, and four branches sub-directorate which are Akre, Shekhan, Amedi, and Bardarash.

Along with the traditional system adopted by the Directorate now and after taking the approval from the Directorate General and obtain approval from the Parliament to develop a law for all the directorates in Iraq, all districts will operate by the electronic system only.

### **1.2 Thesis Outline**

This research study is formulated into five chapters. Chapter 1 provides the whole work and presents an overview of the subjects argued here. Literature review and theories related to the study are briefly outlined in the second chapter. Chapter 3 involves the method, the design, and implementation of the system. The obtained results with related discussion are addressed in the fourth chapter. Conclusions and recommendations for future work are discussed in Chapter 5.

## **2. LITERATURE REVIEW**

In 2008, Toaha and Khan explored the problems related to the current system for land registration and records (Toaha and Khan, 2008). They offered an IT-based alternative, which is going to be pure in implementation, but active and adequate at the same time. Therefore, almost all the efforts in the past that were made to computerize were partly unsuccessful. A system is designed to curtail the difficulty (Toaha and Khan, 2008), consumption of money, stoppage, and cadre corruption. Their system intended to put every step in this procedure into the computer, starting from cadastral surveying reaching to creating new records. The honestly and openly accessible satellite representation of the Google Earth software will highly assist cadastral analyses. They addressed the distinct problems pasturing from the safety of data to access and data access.

In 2010, Shange proposed an approach that is based on the system into land registration analysis through employing the case of the KwaZulu-Natal Deeds Registry in Pietermaritzburg (Shange, 2010). The research sought to; (i) research and analyze the LRS (entirely) regarding its main processes, data keeping, and data distribution and (ii) evaluate, depending on the nature of the data keeping, data distribution, and processes, the turnaround time of which was manual and computerized. The Conveyancers who are in charge of documentation drafting and Deed Registry, including deed examination, and approval. The interrelation between the two ensured the adequate implementation of complicated legislation connected to land registration. To get more in-depth thoughts into the plans of the real estate registration system, the major informant interviews were organized, and many documents were analyzed to understand where that data came from, and how they are formatted, as well as the processes being performed, storage and accessibility of data, in addition to the internal and external data, flow across Conveyancers, Deeds Registry and other stakeholders.

Similarly, the real estate registration system was broken down into several Data Flow Diagrams (DFDs); i.e., the context for the entire system, top-level meaning that the system is made of major subsystems, and lower level meaning the detailed subsystems so that to recognize the main data storage, data distribution, and processes. The charts, electronic and manual data storage, processes and data flow were identified, the turnaround time was manual, and the computerized systems were taken and



contrasted. A general case of documentation of transfer - from the act (documentation) of selling to the registration of the deed of the assignment is employed. The results displayed that profound achievement in turnaround time, from 7 to 9 days could be identified through computerization of certain main data stores or keeping, processes, and data flows or distribution. Recommendations for development were then composed depending on the system diagrams, charts, and turnaround times. Thus, the ability of a holistic model to land registration analysis and development was demonstrated.

Tagoe and Mantey (2011) held a study which produced findings of records that are friendly to the user and that are based on the web for the real estate registrations. From these records, authentic subscribers and users were able to view and access to safe land registrations in the nation. The modern system brought translucence and enhanced the method in which real estate registrations were kept and managed in the state. The system did not just manage the process of real estate record and land registration preservation, but it also provided a lot of inseparable advantages.

Lemmen et al. (2012) presented an outline of the final or usually minor adjustments from DIS to FDIS. Majority of changes are progressing to raise the resilience of the LADM, as relations between rights and random groups of spatial Sub Directorates or parcels. As a result, with more resilience, the concept of conformance testing was modified. Moreover, the always rising enactment of the LADM was outlined and exemplified through several new nation profiles. This obviously showed the need, especially the increasing support for the LADM over the previous years. In addition to the ever-increasing number of affirmative votes for the LADM within ISO.

Zevenbergen (2002) addressed 'Systems of land registration,' especially their attitudes and consequences (in the well-processing of these systems). He focused on the high-tech, fair and legal, and regulatory aspects of systems of land records and their accords. Furthermore, the influences on the processing of orders of land records are cured by a (comparative) case study in four countries. Estate claims and rights are complicated foundations that demand a range of terms and conditions that must be met (the rights institutional framework) for success. This sounds applicable to property and estate rights and claims in land need. Apart from comparably closed local Sub Directorates, a well-functioning system of land registration looks as though it is one of

these terms and conditions, yet not the only one. Figure 2.1 shows four partial perspectives of land registration.

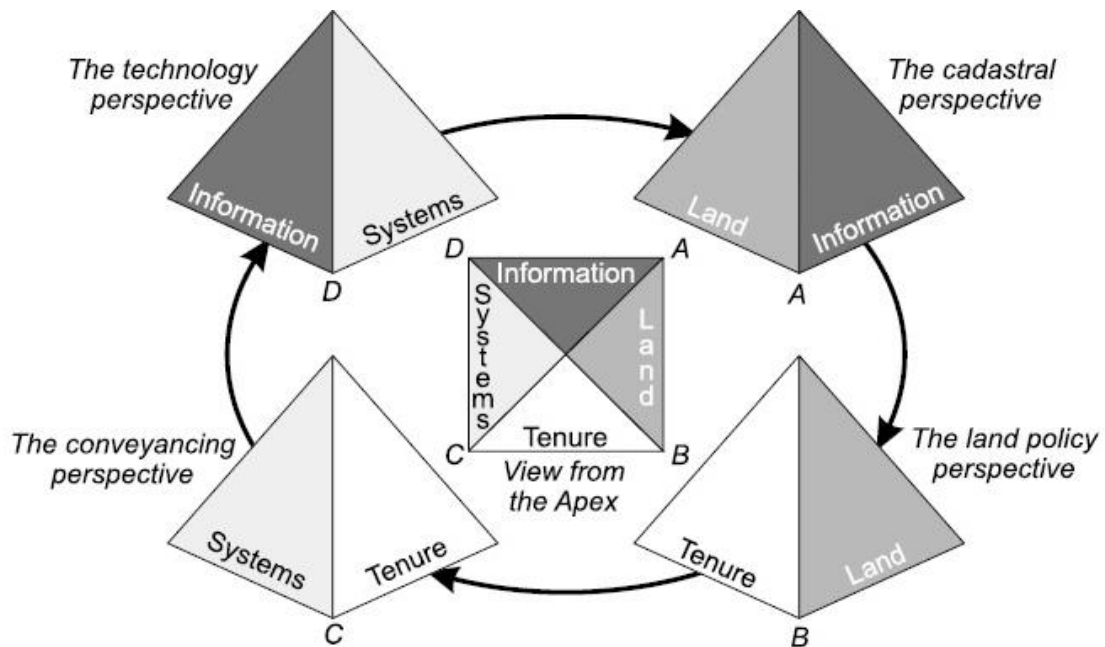


Figure 2.1: Four partial perspectives of land registration (Nichols, 1993)

Polat and Alkan (2018) reported a study that aimed to investigate the researches and activities that were done by both private and public sectors and organizations until the year 2014. This research estimated the performance of Turkey "Cadastral 2014", to identify its status in other states and to sum up the ongoing condition for "Cadastral 2034". The control and method of actions that are not contingent to the records in the cadastral technical assistance and the actions of liability of the responsibilities that are conditional to the files and are held by licensed topographical and cadastral directorates. This will lead to making these two projects, as instances for both public and private organizations and sectors, work together beneath the authority and administration of General Directorate of Land Registry and Cadastre (GDLRC) (TKGM in Turkish), 100% success confirmed in the application of principle two of cadastre 2014. GDLRC held contributions for much better services with the money it grabs for services it provides to the civilian people. In this regard, this money regained as services, and the sustainable cadastral system is out in practice. That is why the final rule of Cadastre 2014 is achieved successfully. If we compare Turkey to other Europe countries, the way

it performs on Cadastre 2014 is favorable for Cadastre 2034, and the transfer to the new cadastre would quickly be finished with the finishing of dearth.

Lemmen et al. (2015) examined the incentive, demands, and objectives for progressing LADM. In addition to that, the measurement itself was illustrated and competent in future maintenance. Even though the standard is very young, as it was born on December 1, 2012, yet it was probably demonstrating a number of the effects of LADM and some examples were given. All the data in real estate management are expected to be put in deeds and to be original. Those are called source documents, and they are the foundation for constructing reliable and trustworthy land administration — moreover, the foundation for executions and the foundation of relatively new land rights in real estate management. LADM can support the developing enhancement of Cadastro, involving both the geographic and other elements and of assisting fit-for-purpose cadastral demands. LADM can employ and function to aid organizational assimilation, for instance, between cadastral agencies and the usually disparate land registry. LADM can assist in reconciling excessive government databases to decrease too much data repetition that is available now.

Lemmen et al. (2017) prepared the “2017 world bank conference on land and poverty” and they described the continuing progress and standardization in real estate management. Standards are related in connection to construct and cultivate and progress a real estate management. Measures such as the ISO 19152 LADM are assisting in jump-starting new first steps and are relating top-down and bottom-up activities altogether. The LADM eases the current setting of land administration and can work as the main point of any real estate management system. LADM is resilient, well implementable, and employs as a significant source of state-of-the-art general information on this subject. Several trends in the scope and the maintenance of the standard were given and argued in their function that connected for the progress of another edition of the LADM over the years to come. These methods included no land administration processes for the beginning data acquisition, data keeping, and data sharing. This is because these processes were regarded as country-specific when the first edition of LADM was made ready; a generic and global method was about to be hard to be modeled. This idea may need reconsideration currently.

Abdullah et al. (2017) highlighted the controversy surrounding indivisibility, and the notion of federalism in the real estate management systems in Malaysia. The electronic real estate systems and fraud avoidance accounts in the country were also analyzed. While other jurisdictions had title assurance fund, it was not available in Malaysia. Thus, he suggested the tightening of security measures to prevent fraud. As we can see in the instances mentioned above, the cases showing a few frauds regarding registration in Malaysia is not outlining any cutback and decline. We can show that there is susceptibility to fraud in the system of Malaysian title registration. Except for the internal deficiency of the real estate statutes on the problem of invisibility, which makes authentic holder without compensation when their real estate's pass on to the unguilty third parties. Having no state-guaranteed makes assurance fund as a remedy for disturbed authentic features regarding the date, with no much ability of the real estate law system to provide protection for them.

Furthermore, the paper-based and electronic-based real estate recording system was shown to be subject to fraudulence and new kinds of cybercrimes. Even though title insurance was able to be a choice to recognize against damage or loss coming from deficiency on the title to real property, yet it seems to be an inappropriate system to be used in Malaysia. So far because of popularity, the ratio of participation by users, and general outreach of general insurance in the Malaysian population point out to the rising possibility of silent agreement of title insurance, only when it could have been introduced in Malaysia. Not only this but also when title insurance can be made obligatory, it can turn to point out to non-confidence, having no safety and having no trust in real estate management system and gives a disadvantaged recognition to the investors and the people about the government capacity to offer a secured real estate administration mechanism. That is why further attempts are needed in order to confirm that the registration system is safe, trustworthy, reliable, and fraud-free.

Gyamera (2018) addressed the most difficult aspects for the acquisition of the suitable land in the country of Ghana and suggested to solve the upcoming conducts. Fairness of real estate, owning the real estate, land right, and the tenure system was explained in Ghana. The many processes in the acquisition of a parcel of land right from buying up to title/deed registration have been clarified. The place of getting land and how to get it without albatross for all kind of socio-economic progress was also founded. Prefaces to the cadaster system, deed and title registration were explained and

previewed in Ghana as well. The land enterprise in Ghana has a significant number of difficulties as a consequence of fast and hasty urbanization, big demand-driven in the land market and weak institutional framework. Gyamera reviewed these difficulties, and he offered recommendations and suggestions to deal with solutions (Gyamera, 2018). He was able to conclude that there are needs to further investors in Ghana because lands are available, and there is betray for industries, infrastructure, and socio-economic progress and development.

Asiama et al. (2018) produced a study included gathering land data relating to farms in more than two weeks, employing a cell phone application and an orthophoto, which founded on PLA. The results showed that though PLA could assist land building, more thorough research needed on the way it could integrate into the formal system of land registration. They suggested that the safety of the mechanisms have to be made small to limit fraud. Checking trail has to be held more and more to check any things that are not normal in the systems. Moreover, control of outreach to the system has also to be limited regulated. Specified officers have to be given permission to do certain tasks in the system, and the inclusion of many officers is a brilliant way to avoid insider's fraud. Essentially, there is a need for changes in the organizational culture in the aspects of physical alternations, like organizational structure, management things, plans and processes, action policies, small budgets or resource allocation, and knowledge system. Besides, variations should also be made on the behavior, for example, estimates provided to quality, greatness, communication, inventions, and workers' cooperation.

Aydinoglu and Bovkir (2017) addressed the administrating land information efficiently and regarded it to be the main factor in attaining proper land administration that can succeed and sustain in the land progress. To administrate land, each government owns a land plan and system of management. A Land Management System (LMS) makes a recognition, recording, and sharing of knowledge and data possible and in line with land plans and plans through efficiently employing technological knowledge. In this regard, LMSs are put to achieve the demands connected to the land, to give tenure confirmation and to administer natural resources ascertainably. In Turkey, the demanding call for technological knowledge and information in addition to Geographic Information Systems (GIS) was acknowledged by general offices and foundations at the beginning of the 1990s. The real estate registry and Cadastre

Information System Project (TAKBIS in Turkish) began to take care of land recording and cadastre information and processes all over Turkey. Through employing a standard framework, the purpose of this project was to digitize real estate recording and cadastre information and to do all projects and questions in a digital surrounding.

However, a wide range of research about new E-government projects named Turkish National GIS (TUCBS in Turkish) started to find a national Geographic Data Infrastructure (GDI) giving way for the effective administration of geographic data and correlates with national-level user demands and Infrastructure for Spatial Information in Europe (INSPIRE) stipulations. Aydinoglu and Bovkir (2017) gave data together with various offices and meet stakeholder demands, the information methodology of the real estate Registry and Cadastre Data Theme is tested and enhanced. In the process of the design, the ISO 19152 LADM and INSPIRE Cadastral Parcels are checked and implicated as the international basic standards. The important rights, limitations, and liabilities are connected to real estate in the registration system of Turkey. Mortgages founded about rights, cadastral maps, standard subdivision of two-dimensional (2D) space with particular names, were investigated to the point and documentation types were elucidated in short within the edited real estate registry, and cadastre data method. Regarding it a case study, data-sets from various resources have been altered to open data-sets that are in line with this model, which allows for data interoperability in land-related applications. The model should be maintained easily and naturally as far as possible for efficient data transformation and administration.

## **2.1 Electronic Duhok DLR Development Tools**

In this study, we have built up Electronic Duhok Directorate Land Registration (DLR) from many tools involving Hypertext Mark-up Language (HTML), Cascading Style Sheets (CSS), and Personal Home Page (PHP), My Structured Query Language (MySQL), JavaScript, Ajax, and Bootstrap framework is useful used for designing the World Wide Web (WWW) and web server.

## **2.2 HTML**

The first ever programming language which is good to talk about when it comes to arguing about Web programming would certainly be HTML. The acronym letters were taken from the beginning of the “Hypertext Mark-up Language”. There was no

chance to have WWW as it is today if it were not for this language. Indicating from the name, the HTML is a "markup" language, and it broadly implies that it to base on the employment of tags to produce functioning. Simply the "code" in an HTML file is text having tags that add performance, processing, and various looks to the page (Duckett, 2011). It can be regarded as a translated client-side language, which means that for an HTML page to be looked at, a browser has to download it first from a server into a client machine and later implement the code line by line. HTML is related to URI. Each URI means a method to assign to a page, an image, or maybe an email Web Application Design and Implementation: Apache 2, PHP5, MySQL, JavaScript, and address. The place of a page is a URI frequently named URL (Universal Resource Location) (Robbins, 2018).

### **2.3 CSS**

Cascading Style Sheets, admirably pointed out as CSS, is a plain easy design language designed and planned to clarify the action of accomplishing web pages attractively. CSS holds the look and feel part of a web page (Grant, 2018). If the user employs CSS, it will provide with controlling the text color, the fonts style, spacing between paragraphs, sizing, and laying out the columns, using various background images or colors, in addition to many other various effects (Dean, 2019). CSS is simple and could be learned and understood easily, yet it gives strong control on the offer of an HTML document. Very often, CSS is mixed with the markup languages HTML or XHTML (Robbins, 2018).

### **2.4 Ajax**

The word Ajax occurred for the first time in 2005. The acronym means Asynchronous JavaScript and XML. In other words, it implies the use of a group of ways and methods that are constructed into JavaScript to shift information between a server and a browser in the background. A perfect instance of this technology is Google Maps, where the process of downloading new sections of a map are done from the server whenever it becomes necessary. The process of Ajax between client-side and server-side is presented in Figure 2.2 (Huereca, 2011). There is no need for a page refresh. Employing Ajax does not merely considerably reduce the bulk of data that we need to send back and forth, but it also makes web pages that stands to reason dynamic,

and it allows them to perform like self-contained applications. The outcomes are much better for the user interface with improved receptivity (Robbins, 2018).

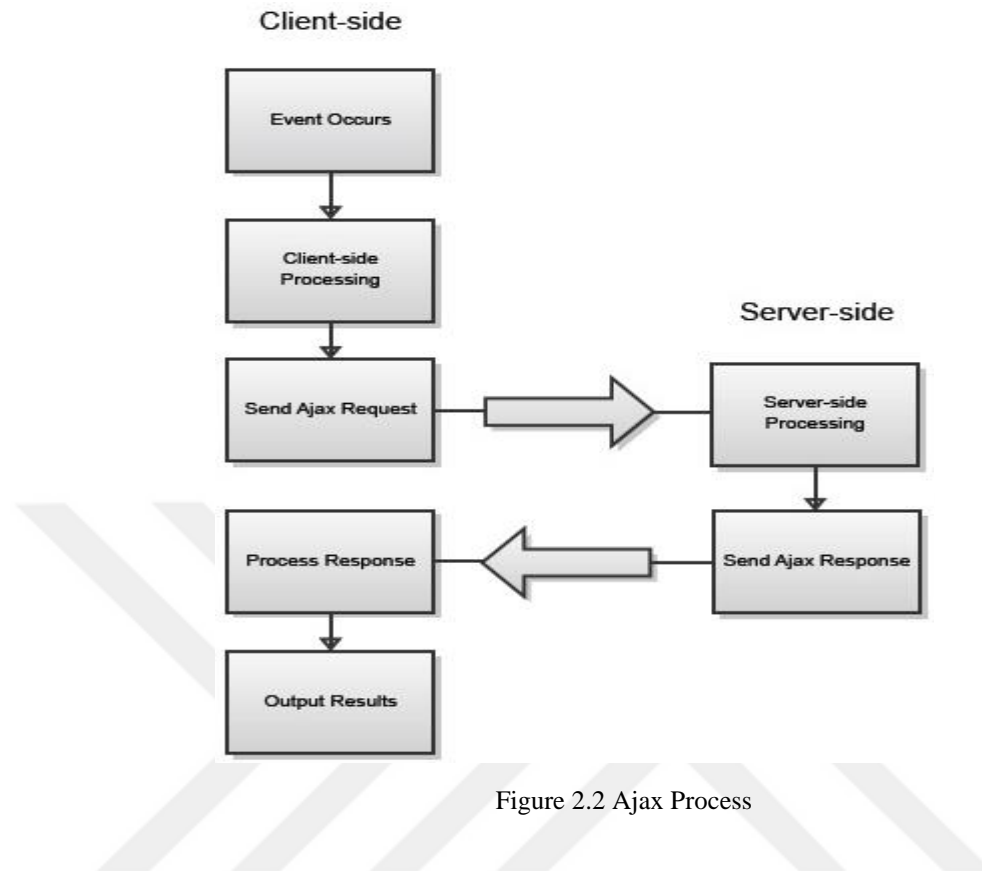


Figure 2.2 Ajax Process

## 2.5 Bootstrap

Bootstrap is a scheme that is front-ended for constructing active websites. Mark Otto and Jacob Thornton developed bootstrap in 2011 (Spurlock, 2013). It can be considered an application framework, blog, and other various Content Management System applications. The way it mixes each of HTML, CSS, and JavaScript simplifies building reliable and robust sites outwardly of the addition of such data coding systems (Singh and Bhatt, 2016). It is based first in mobile design strategy. The beginner or programmer can get the code or more information from the <http://getbootstrap.com/> (Patel, 2014).

## 2.6 JavaScript

This programming language is aided by the whole recent web browsers that serve to idealize implementing many different characteristics in the level of the web browser. In other words, the client. JavaScript (JS) is capable of including HTML



pages, and it is also capable of executing at page loading or when specified events on the page occurred, for example, when a button is clicked (Lemay et al., 2016).

When behaviors are added data to the HTML documents, they become more interactive. Animations or buttons might perform many different processes. That is why JS is going to be employed to fulfill these missions as a result of JS being a programming language for the web (Nixon, 2018).

## **2.7 PHP**

The Personal Home Page (PHP), which is also called Hypertext Preprocessor, is considered a standard open source HTML ingrained scripting language. In the mid-1990s it was originated by Rasmus Lerdorf as “Personal Home Page Tools,” (Rooks, 2017). This language was used by a lot of web servers involving Apache HTTP Server and Microsoft’s Internet Information Server; and it was regarded as the favorite Linux Web scripting language (Nixon, 2018).

PHP is the machine trailing many dynamic web functions and applications. Its extensive feature set, approachable syntax, and assistance for various functioning systems and web servers have made it an optimal language for fast web development and also the methodical building of complicated systems (Gilmore, 2018). The main reason for the success of PHP to be a functional web scripting language is because it has origins as a tool to process HTML shapes and make web pages. That is why PHP is considered web-friendly to a great extent. Also, it is actively immoral regarding external libraries and applications. PHP can do speaking to a significant number of databases, and it recognizes many Internet protocols. Moreover, PHP simplifies parsing form data and making HTTP orders and demands (Dean, 2019).

## **2.8 MySQL**

This is a Relational Database Management System (RDBMS) which is very quick and robust. Using a database, the person becomes able to effectively keep, do a search, classify, and restore data. MySQL server has authority overreaching the data to confirm that many different users can work with it all at once, to bring and serve quick reach to it, and to make sure that only users that are authorized can get access. Therefore, MySQL is considered both a multithreaded and more than one server. It employs Standard Query Language (SQL), the standard database query language worldwide

(Nixon, 2018). There are more than 10 million installations so it is one of the most popular database management system for web servers.

## **2.9 WWW**

The WWW is considered the base to a sizeable client-server system having many servers that spread worldwide. Every server sustains a group of documents, each of which saved as one file. However, documents might be generated upon demand as well. The server welcomes demand and orders to fetch a document and shifts it to the client. The server is also able to welcome to the requests for storing a new document. The simplest way to point to a document is by employing a reference named a URL (Herman and Swiss, 2014).

## **2.10 Web server**

There is a need to have a web server whenever any web-based application is meant to implement. When we are talking about the web server, it is mean a chunk of software that administers web pages and provides the way for them to be there for the 'client' browser through a local network or via the Internet. It is possible to access the web server either remotely or locally. Several web servers are there including Apache, Internet Information Services IIS, Netscape Web Server, etc. we can begin the communication between a web server like click or type a URL and a browser into the address box of the browser. Any conversation contains two chunks: one of them is the demand for knowledge from the browser software, and the other is the reply from the server addressed in the URL (Alshehri and Drew, 2010).

## **2.11 E-Government**

There are many definitions for e-government. One of them is that it is a web-based services that include local, state and the federal government. Government operations, engagement of citizens, provision of services is performed using internet. Information gain, filings, payments and other actions are some examples for the interaction through www. (Palvia and Sharma, 2007).

The overall architecture of E-Government Adoption is present in Figure (2.3). The relationship between the dimensions User Characteristics, Website Design, Service Quality, E-Government Adoption and Satisfaction (Kumar et al.,2007).

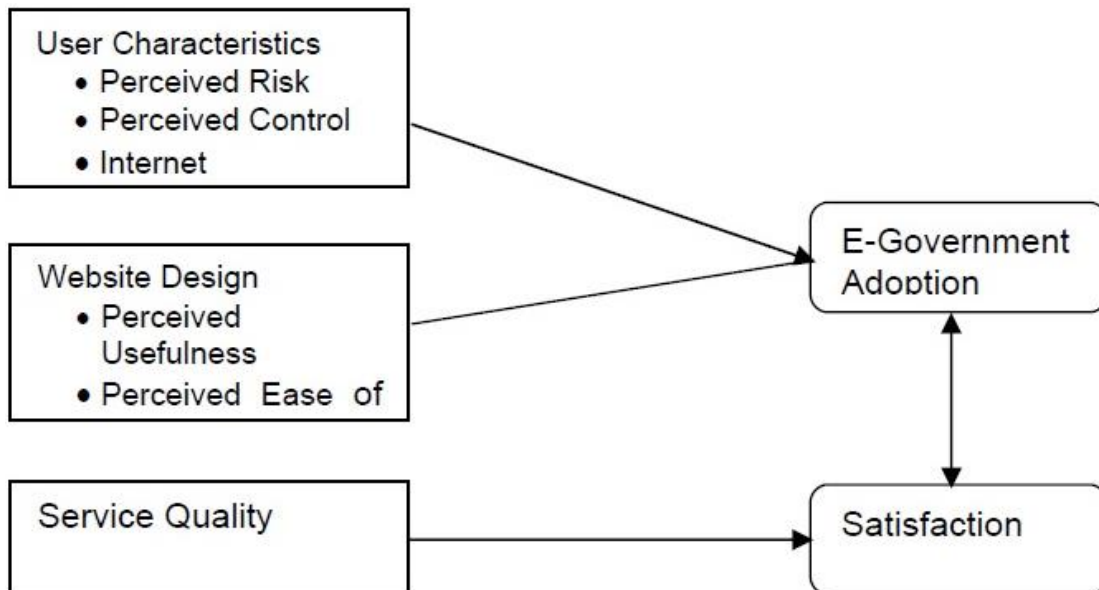


Figure 2.3: E-Government Adoption

There is a United Nations / American Society for Public Administration (UN/ ASPA) study showing that there are Five Stages of E-government Models, which are as follows:

- 1- Emerging: making the same independent official site for news or information.
- 2- Enhanced: Content and information to update with more excellence.
- 3- Interactive: people can make benefit from user services.
- 4- Transactional: Users are able to make payments and do financial transactions online.
- 5- Seamless: E-services are used to fully integrate the administrative, and boundaries (Imtiaz and Rahman, 2014; Alshehri and Drew, 2010).

## 2.12 Database

The database is an extensive archive of data that can be employed to gathers by a lot of departments and users. Rather than being disconnected files with redundant data, every data item can be integrated into a minimum number of duplications. The database becomes no longer owned by one department, rather it can be a shared corporate resource. The database takes not only the organization's operational

information but also a description of this data (Beighley, 2007). For many users, a database is any collection of data items used in work like phone books, laundry lists. However, the databases and database technology own the main effect on the increasing use of computers. It can be inferred that databases have an important role in all fields in which computers are used such as business, engineering, medicine, and library science (Ma and Ye, 2015).

### **2.13 Database Management System (DBMS)**

DBMS is a gathering set of programs that administrate the database structure and govern the data that are kept in the database (Chen et al., 2011). DBMS can be adapted to a computer system that gives the ability to users to make and keep a database (Beighley, 2007). The DBMS is a general-purpose software mechanism that makes the processes of defining, constructing, manipulating, and sharing databases for various users and applications much more comfortable (Ma and Ye, 2015).

The DBMS is solving these problems

- 1- data redundancy
- 2- inconsistency
- 3- program-data dependence
- 4- inflexibility
- 5- poor data security
- 6- and an inability to share data among applications (Jin et al., 2018).

### **2.14 Land Registration**

The land registration can go through from many cases, all of them to detect the ownership of peoples (Xue et al., 2016). All legal land must be recorded in the land registration office (Mustafa, 1984); the Duhok DLR is a significant office to transfer land citizens from a seller to buyer. The surveyor used cadastre map with Global Positioning System (GPS) and GIS for rural land. The process to change the Land Owners is:

- 1-Request deed from Directorate.
- 2- Request form to selling the lands.
- 3- Revelation.

- 4- Confirmation from another directorate about that land.
- 5- Payment of the fees.
- 6- Approval by both parties (seller and payer).
- 7- Auditing.

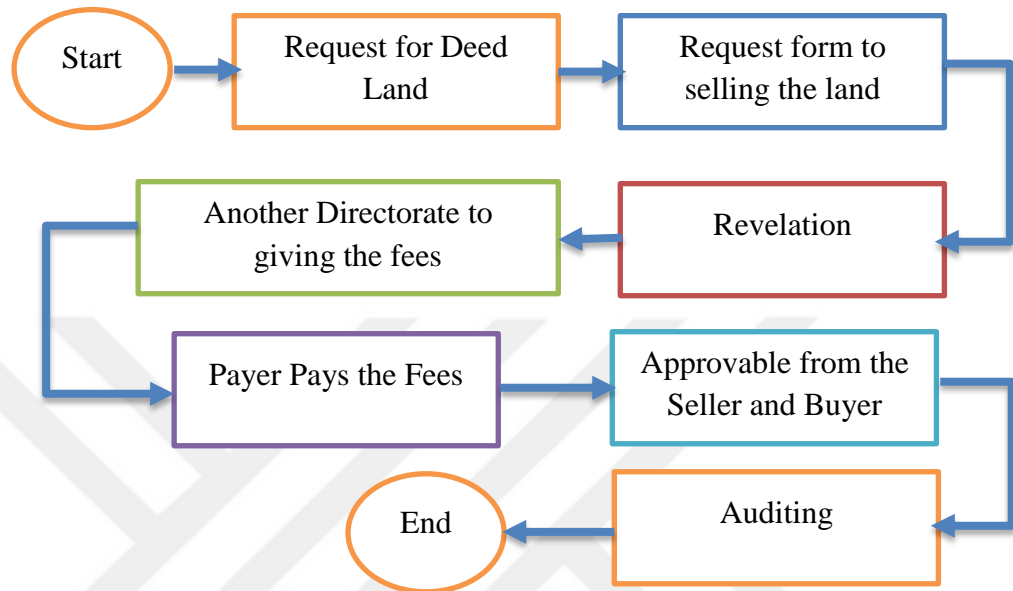


Figure 2.4: The process to change the Land Owners

- 1- Request deed from Directorate when the seller wants to sell his land, the first thing is to request a deed from the directorate to get a new one.
- 2- The request form for selling the lands. The request form is writing all information about the lands, such as the governorate name, district name, province name, province number, land number, seller name, payer name, and so on.
- 3- Revelation. When the seller does the above, the directorate will send the Evaluation Committee to evaluate the value of the real estate.
- 4- Confirmation from another directorate: In this step, the Duhok DLR set the seller and payer to another directorate to confirmation and taking the tax.
- 5- Payment of fees: In the Duhok DLR the payer gives the fees.
- 6- Approval by both parties (seller and payer). The seller and payer will confirm to change the ownership from seller to payer, and the payer will be a new owner for the real estate.

7- Auditing: This step is significant to check all the information and accept the process.



### **3. THE DESIGN AND STRUCTURE OF THE PROPOSED EMLRS**

#### **3.1 Introduction:**

In this chapter, the functional and nonfunctional requirements will be explained. Also, all hardware devices and software tools that are needed to design a suitable and efficient web-based EMLRS for Duhok DLR. The proposed system is designed to change the manual system (hard copy) that is currently used by Duhok DLR admin and employees to computerize via web-based information system (soft copy). The system designed by the requirements of the Duhok DLR structure, which consists of three DLR and four Sub Directorates (SD). This system will provide: communication among the DLR and SDs to decreasing time-consuming for process performance, Saving Money, increasing accuracy and tasks administration with less effort.

#### **3.2 Architecture of the EMLRS**

The overall architecture of EMLRS is present in Figure 3.1. The infrastructure of a web application depends on this system for technical implementation. From down-up architecture, there are three main layers represent this system:

- Presentation layer: this layer consists of many tools, including the following and many others:
  - o HTML.
  - o JavaScript (includes: Ajax and jQuery).
  - o CSS.
  - o Bootstrap.

In this layer, the user (i.e., the client) will access the web application at the client-side and communicate via a web browser Mozilla Firefox, and Chrome with the upper layer (logic layer) to request the human resource component. The new tool is a Bootstrap (i.e., its correct version was improved during 2014). This tool provides the capabilities of merging functions of both CSS and HTML with beautiful additional effects. Adding to that, the web designer can use HTML and CSS individually without Bootstrap tool.

- Logic Layer: this layer belongs to the side of the server, which is written in PHP language and communicates plus the presentation layer through HTML forms and JavaScript queries.
- Data layer: Is the layer that called a responsible for storing all incoming data to a MySQL database via a logic layer.

### 3.3 EMLRS Design

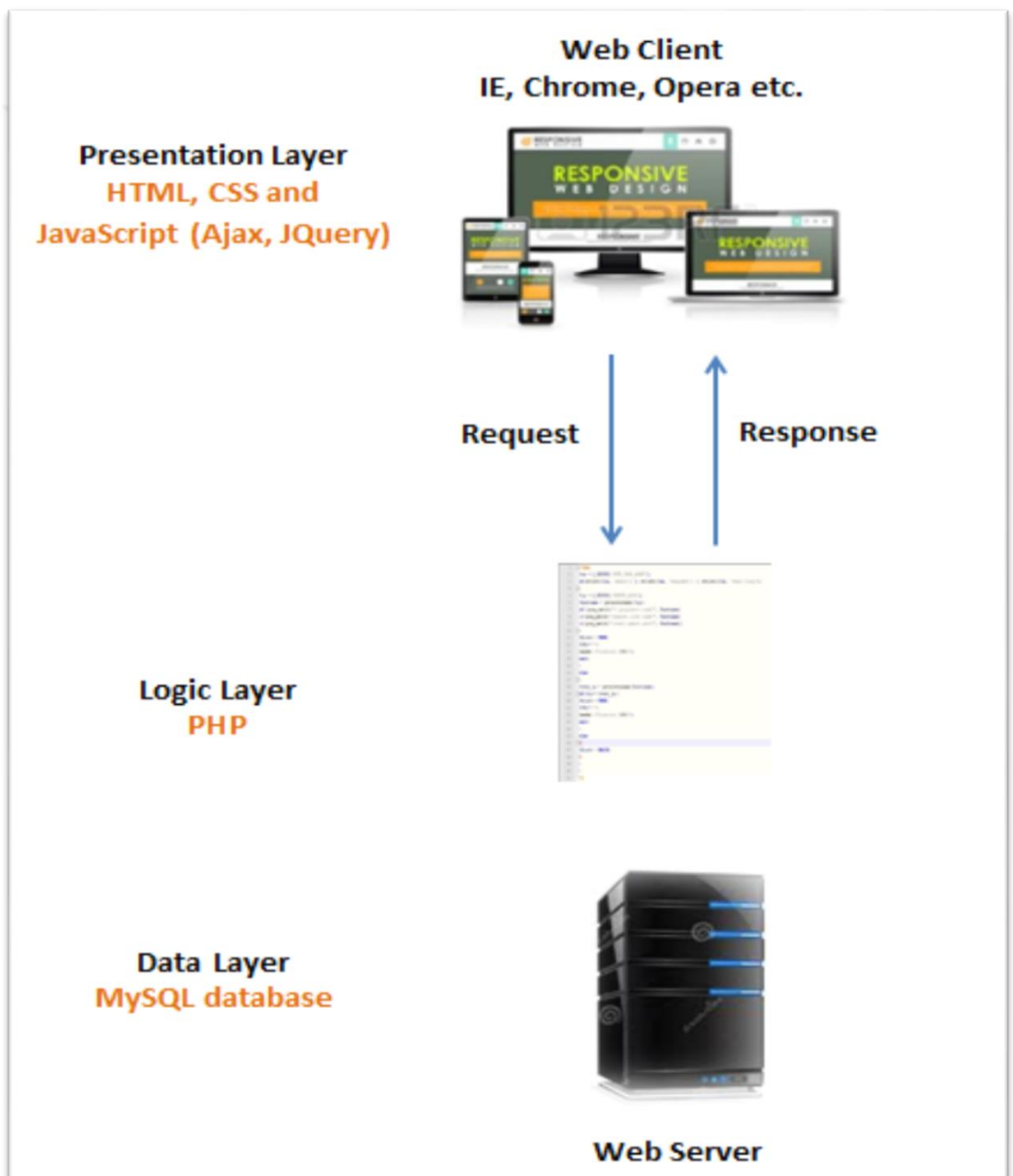




Figure 3.1: Architecture of EMLRS

The mechanism of using depended tools with EMLRS for Duhok DLR design consists of several steps:

- a) **Webpage Design:** the first step is designing the related webpage elements (i.e., forms, tables, text areas) using HTML tool.
- b) **Webpage Effects:** the additional effects (i.e., hover, color, focus, resize ...etc.) Can be added to the webpage elements using CSS tool.
- c) **Processing:** this step needs both of (PHP and JavaScript) tools, and it is responsible for: checking the acceptance (validity) of the entered data and providing the necessary calculations to produce the wanted outputs.
- d) **Saving and Retrieving:** all inserted data will be saved and retrieved using the tools PHP and SQL.

### **3.4 System Requirements**

To design and implement EMLRS for Duhok DLR, some requirements are needed to achieve this project such as functional, and non-functional demands and needs, hardware, and software needs.

#### **3.4.1 Functional Requirement**

Functional requirements result from considering what a system is supposed to accomplish and the services that apply. Employee has the authority to: enter the data into the database system, prepare system reports and other outputs, and identifying the descriptions of data to enter into the system. There are four main types of functional requirements: System Administrator, Admin, Employee, and Applicants (Abdulazeez et al., 2018).

- a) **System's Administrator:** is a person who manages the overall system, has the authority to access to all modules, the ability to insert, view, edit and delete data, and giving the power to other users.
- b) **Directorate Admin:** each directorate has a directorate admin who is responsible for giving the employee permission, changes the employee permission, and has access to all modules of his directorate.

- c) Admin (i.e., Employee): each Sub Directorates or directorate usually has more than one employee. Each one represents the admin of the module that used for his Sub Directorates of the office that he is working. These offices may be one of the (Directorate, or sub-directorate). Also, this Admin has the authorization to insert, view, edit, and delete data related with his permission.
- d) Employee (Staff): each staff can access his profile and view his personal information, salary, leaves, job, summary service, and archive. However, he has no authority to delete or manipulate the data.

### **3.4.2 Nonfunctional Requirements:**

Non-functional requirements or sometimes called system qualities describe the system attributes such as Security, Usability, Authenticity, Accessibility, Extensibility, and Availability.

- Security: the essential feature in any system is how to protect the information system against unauthorized access or modification of data. The security use at both the client and the server (Hanstad, 1998). E-government used this point to make the system protects using some algorithms (Anderson et al., 2015).
- Usability: refers to how the easy user (employee) interfaces use or the methods of improvement for easy to use, the system during system design. It provides a friendly user interface (Toaha and Khan, 2008).
- Authenticity: in the performance of employees or users, the system performs its function without any failure. That means that the employee's work.
- Accessibility: Each employee or user can access the system in his Directorate or Sub Directorate within the limits of his permission: for example, the user and the administrator and the main administrator (Toaha and Khan, 2008).
- Extensibility: the ability of the system to accept the important extension of its capabilities without changing the infrastructure. Both in terms of regime change and information.
- Availability: means the ability of the system to perform its designated function, where necessary, without any deficiencies or defects that lead to system malfunction or slowdown (Hanstad, 1998).

### **3.4.3 Software requirements**

EMLRS are designed for Duhok DLR with multiple modules to perform many tasks; there is a need for some hardware such as:

Windows operating system, MySQL Database (phpMyAdmin), Hypertext Markup language HTML. PHP, JavaScript (Ajax and jQuery), CSS, Bootstrap, Web browser, for example (Firefox, Opera, etc.), and Internet service.

### **3.4.4 Hardware Requirements:**

There are two ways for hardware implementation related to hardware requirements: Server-side and Client-side.

- **Server-side:**

The final structure of the proposed system will consist of two servers (one for the Web Application (WA) and the other for DBMS) to be considered as three Tier Architecture 3TA. However, for instance, a test implementation for the proposed system, there will be only one server (for both Web Application and DBMS) to be considered as two-Tier Architecture 2TA (Abdulazeez et al., 2018).

- **Client-side:**

The client-side consists of two parts Internal Clients and External Clients.

**Internal Clients:** there will be (D directorates within Duhok DLR); for each directorate, there are (SD sub-directorates). Adding to that, each staff considered as an internal client (PD persons for each directorate and PSD persons for each sub-directorate as staff).

So, there will be:

One host as the primary Admin.

PD staff for each Directorate.

PSD staff for each Sub-Directorate.

Internals Hosts (IH) =  $1 + (D*PD) + (SD*PSD)$ .

If PD=10, PSD=6, then:

$IH=1 + (3*10) + (4*6) = 55$  Hosts

External Clients: there will be (M hosts) to be considered as Users that want to insert at Duhok DLR. Adding to the above hosts, the suggest system needs to the related peripheral devices for each Sub Directorates such as Printers, Scanners, Internet service provider.

### **3.5 Proposed Duhok DLR Modules**

The proposed Duhok DLR has been designed to provide essential services at Duhok DLR and SDs. The proposed Duhok DLR consists of seven modules, Three directorates, and four SDs. The SDs are Akre, Barderash, Shexan, and Umedeaya. University admin authorizes all Institutions admins that in turn authorize all Sub Directorates s admins to belong their institutions. Also, Directorates admin has full authorization of all system's modules. While the Sub Directorates admin has the authority of all Sub Directorates belong to his institution. Finally, the Sub Directorates admin has the authority of just his Sub Directorates. Each module is designed to meet employee's requirements at Duhok DLR used friendly using: add, view, edit, delete, and print. The admins and designed modules are:

1. Employee Registration Module (ERM).
2. Estates Registration Module (EsRM).
3. Operation Type Module (OTM).
4. Estate Owners Module (EsOM).
5. Estate Status Module (ESM).
6. View Information Module (VIM).
7. Login Employee Module (LEM).

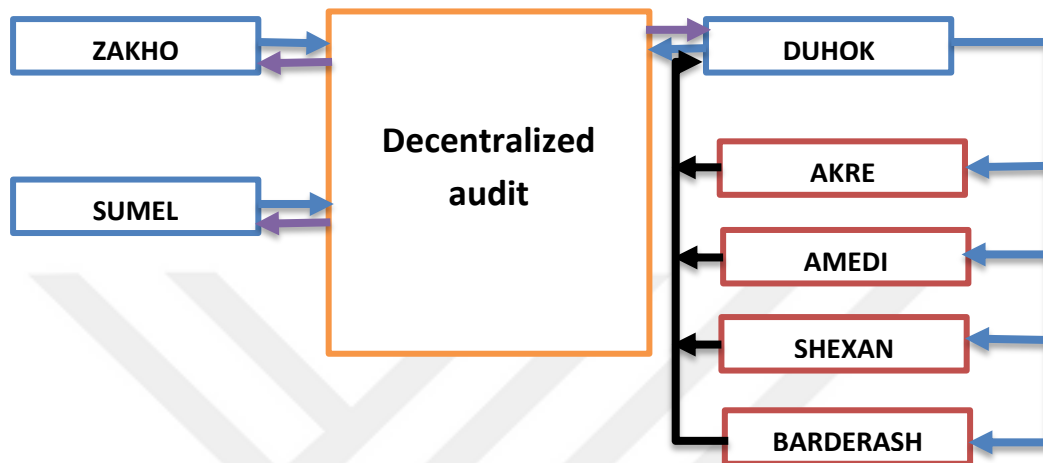


Figure 3.2 Structure of modules connections for the proposed Duhok DLR.

### 3.6 Modules of the Proposed System

The proposed EMLRS system for Duhok DLR consists of seven modules. Each one has been offered and designed to provide the specific service related to that module. The following subsections illustrate these modules with their DFD.

#### 3.6.1 Employee Registration Module (ERM).

As the first step for any to be one of the DLR employees is to apply online to Duhok DLR. Each employee must register in the system (E-Duhok DLR) or enter their information by the authorized employee to the employee can access the method according to his/her privileges. The require employee details are. Employee name, Employee title, Employee degree, and his/her address with email — this Info in very necessary, especially the user name and password. The staff can change the password which assigns at the beginning while he/she is not able to change the username because the username is the name of the real employee. A module has been built to flow its mechanism, as shown in Figure 3.3.

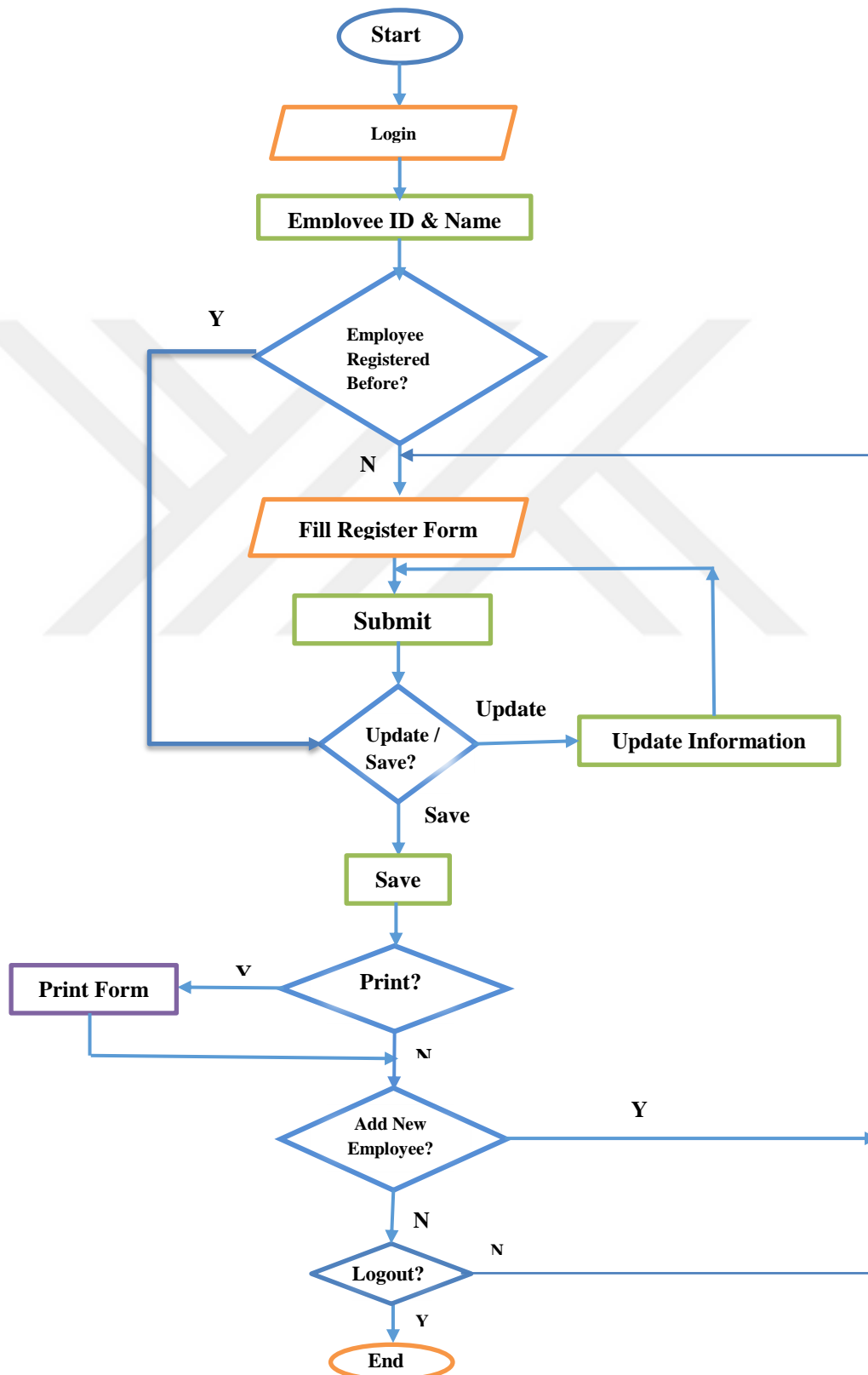


Figure 3.3: Data Flow Diagram of Employee registration module

### 3.6.2 Estates Registration Module (EsRM).

The registration of the property is the main point of the Directorate of Real Estate Registration under the authority of the expert employee. This employee will enter all information related to the property (piece), whether it is real estate, apartment, house...etc.

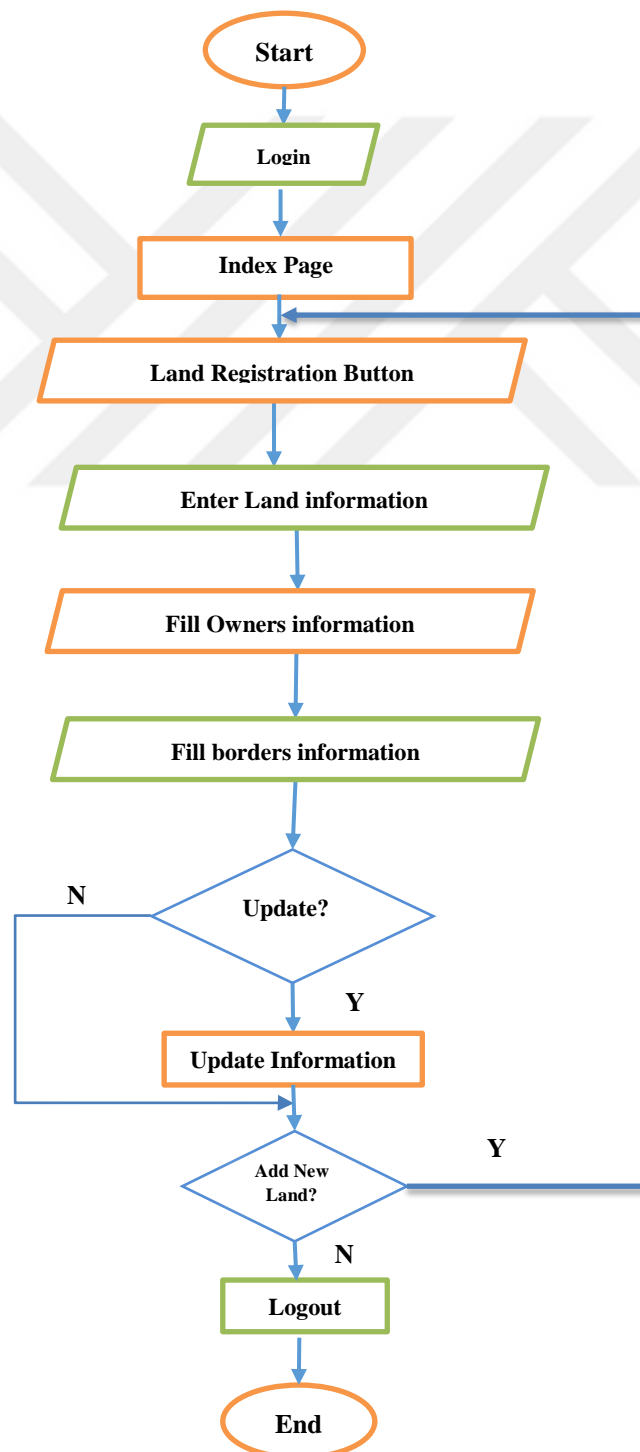


Figure 3.4: Data Flow Diagram of staff registration module.

### 3.6.3 Operation Type Module (OTM)

OTM module is affected by the EsOM module. This module keeps track of any acknowledgment about owners. There are two types of operation: change owner, do not change owners. The first one has no effects on the land but on the owner. The sanctions have some effects of the acknowledgments in reverse direction. Adding all owners that have changed their shares within the same period. This module is designed to accept inserting the acknowledgments and sanctions for each operation of Duhok DLR. Dataflow is shown in Figure 3.5.

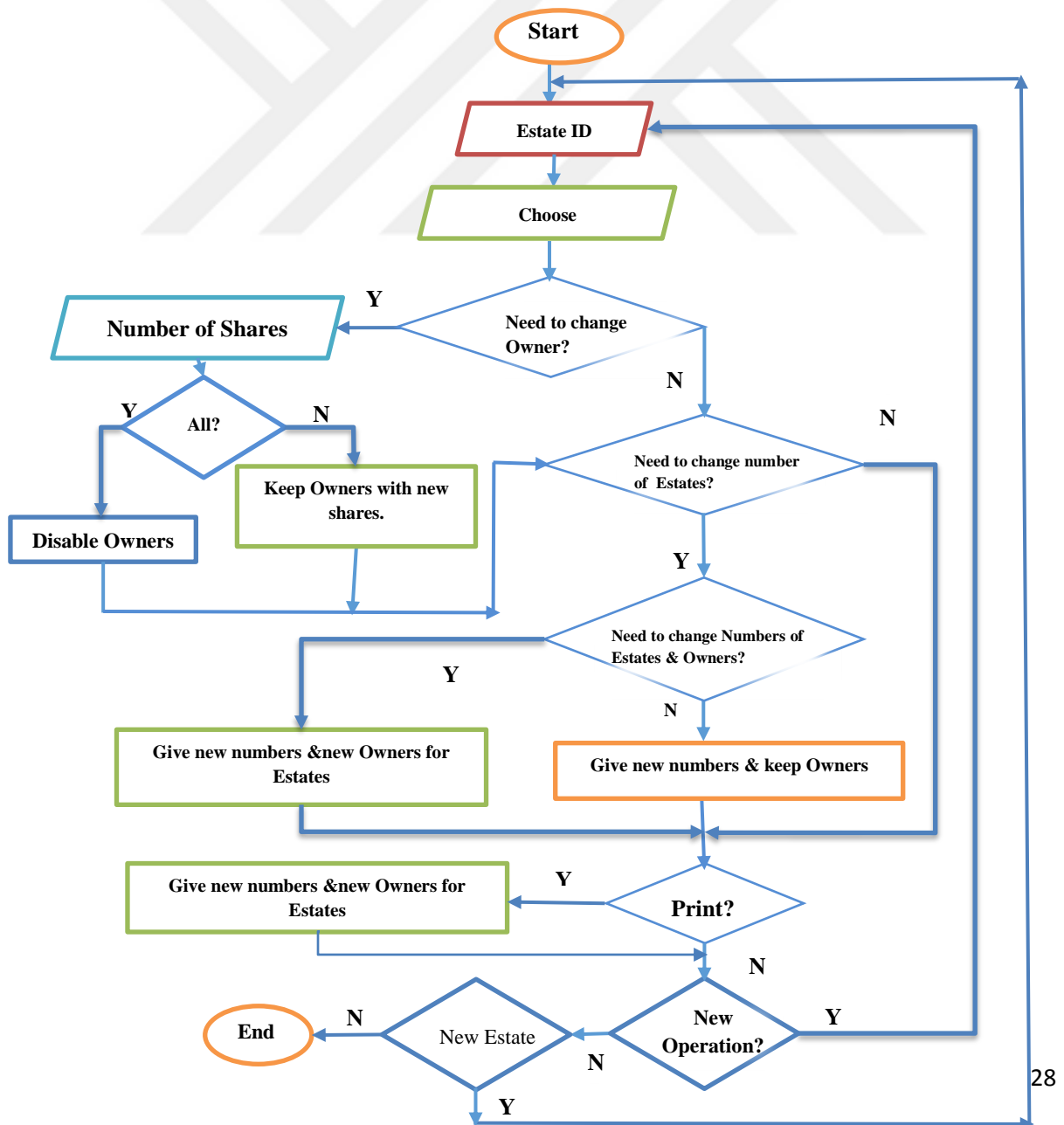




Figure 3.5: Data flow diagram of the operation type module.

### 3.6.4 Estate Owners Module (EsOM)

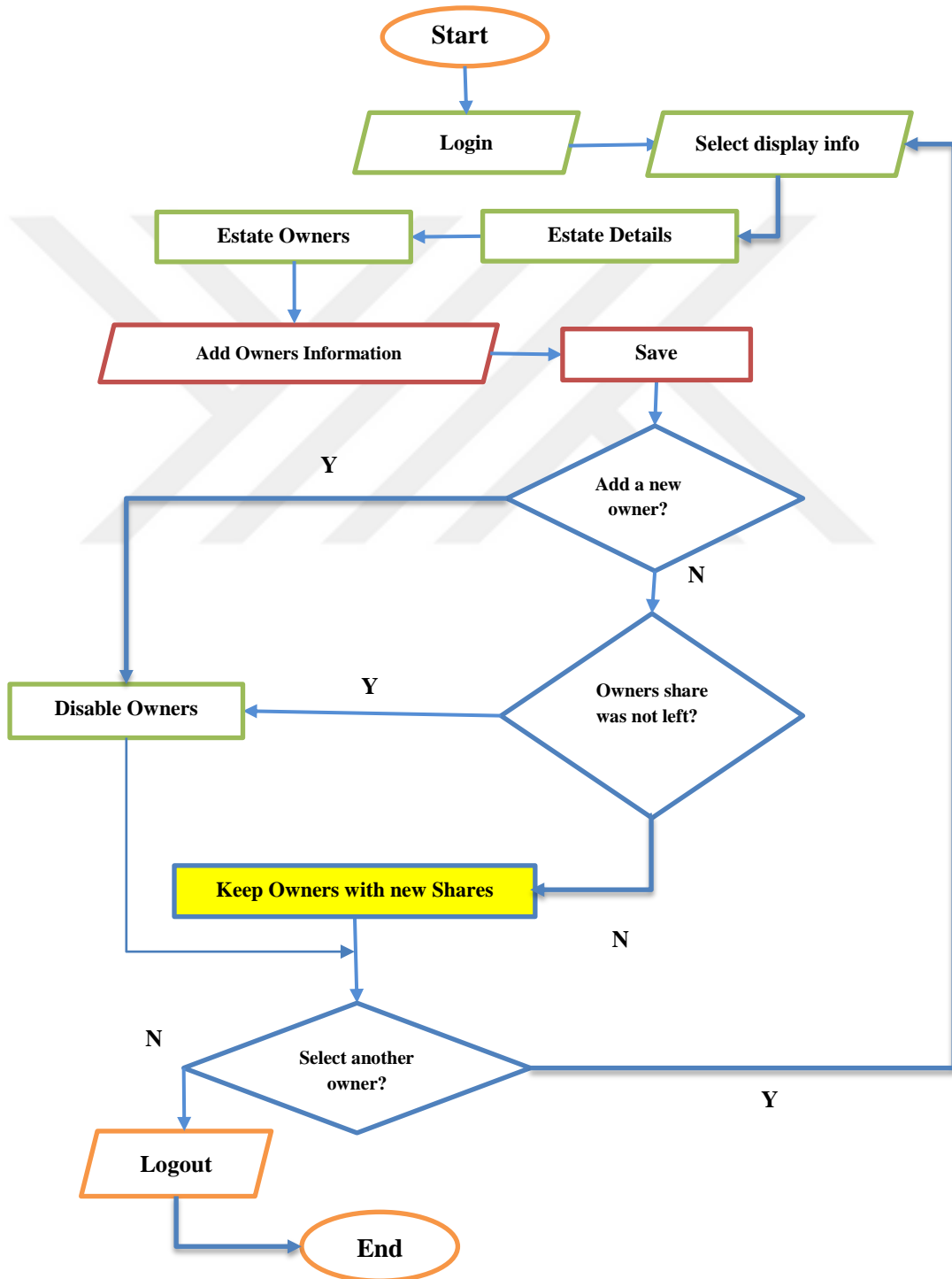


Figure 3.6: Data flow diagram of EsOM.

One of the essential primary point of Directorate of Real Estate Registrations to the documentation of the owner's properties. Whether the property as belonging to one person, group of persons, state, companies, and government or non-government organization. The change includes the property owners and the ratio of the owner's shares. Figure (3.6) illustrates the dataflow of EsOM.

### **3.6.5 Estate Status Module (ESM)**

The modifications on the real estate do not take place unless the real estate is free of obstacles such as mortgage and reservation. The operations of the contraindications are subject to a mortgage, lifting or reservation and raising them is very important, special procedures shall be applied by the Duhok DLR or its SD branches because it affects the rights of the dependents or the detainees, any change needs special approvals. Figure 3.7 shows the dataflow diagram of this module.

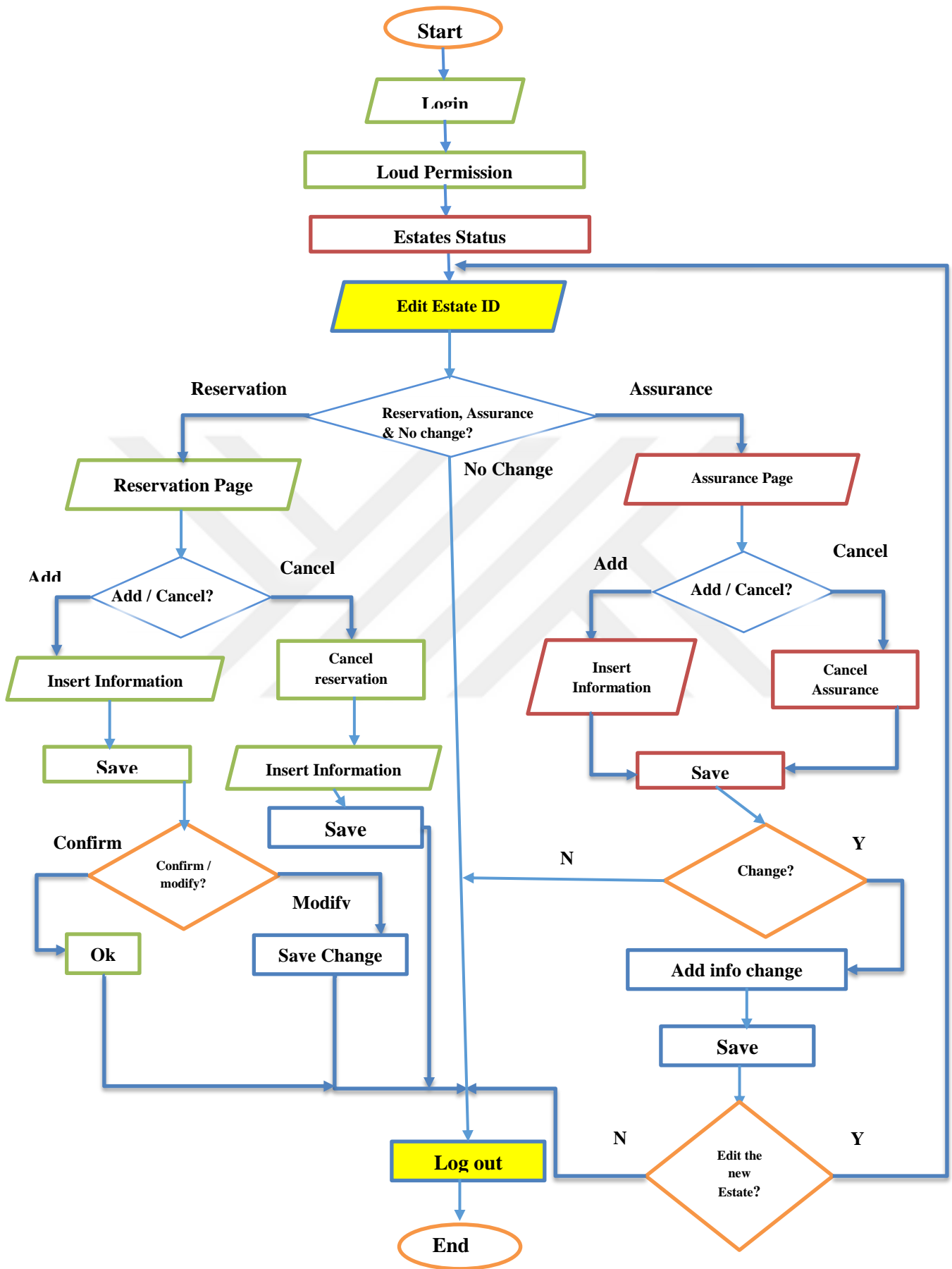


Figure 3.7: Data flow diagram of ESM.

### **3.6.6 View Information Module (VIM).**

This module allows for the careful investigation by the authorized employee whether these data are the names of the owners, estate number, area of the property or the proportion of shares, etc. all these administered by the Directorate of Real Estate Registration and its appendices.

It is not allowed by the system to repeat any number within one area. The system will alert the user that the number of duplicated, which is the advantages of the program. Data flow of VIM is illustrated in Figure 3.8 and 3.9.



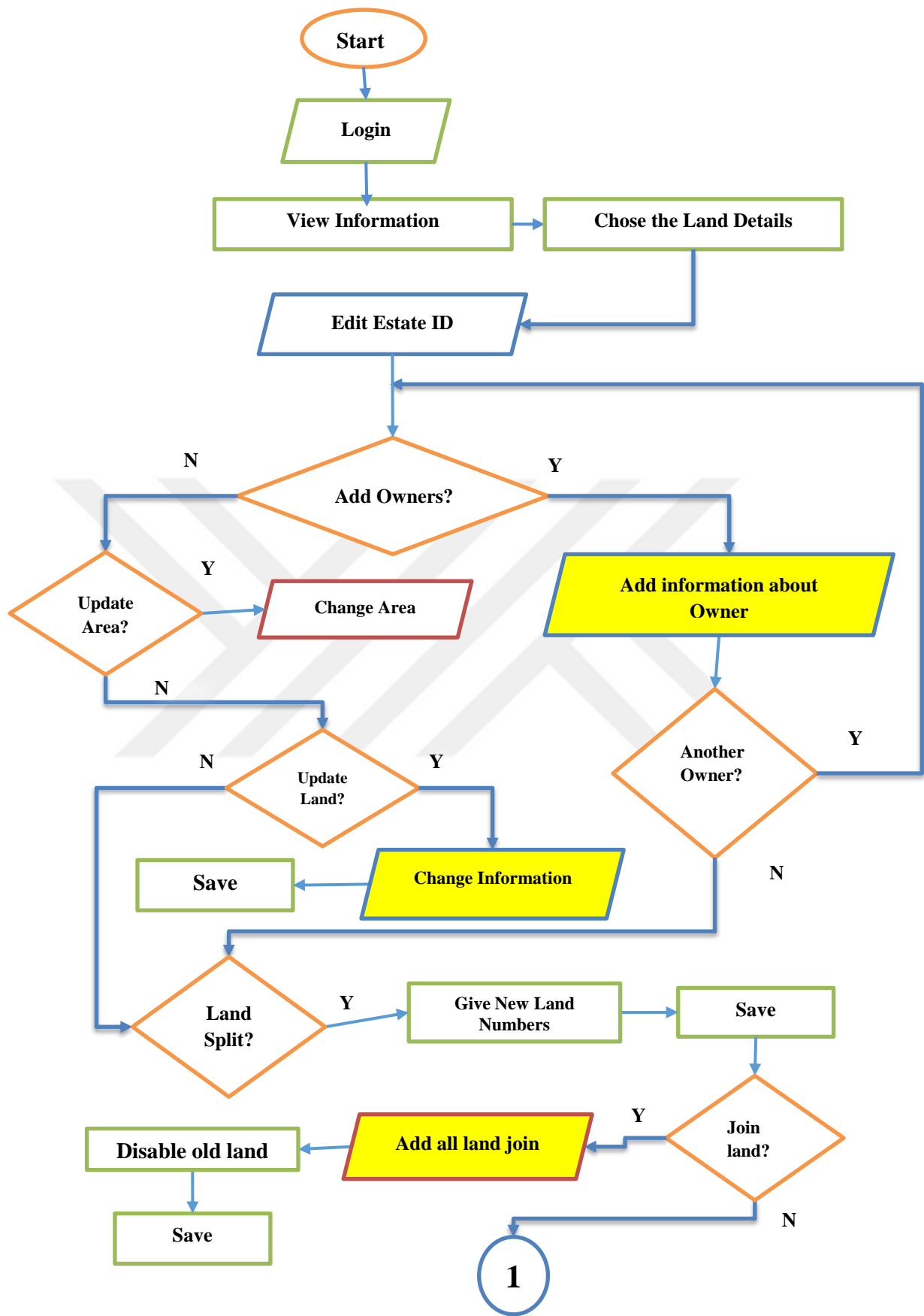


Figure 3.8: Data flow diagram of VIM.

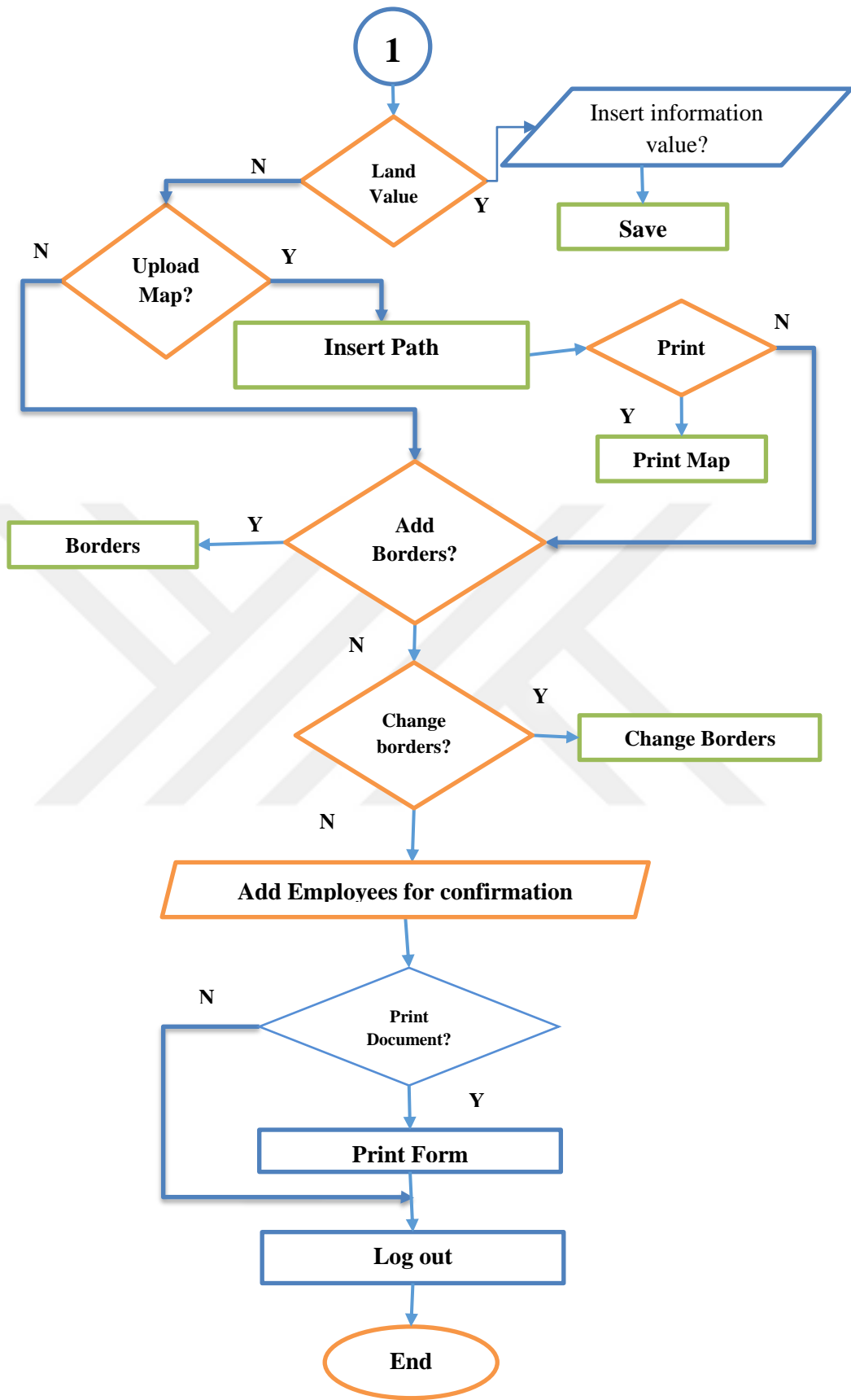


Figure 3.9: Data flow diagram Supplement of VIM.

### 3.6.7 Login Employee Module (LEM)

Accessing the system is only for employees with certain privileges. All employees cannot access the program, and they must register before using the method according to his/her privileges given to them. This information is essential for the system, especially the username and password. The employee can change the password when he/she wanted or stay on the password that given to him. However, the user cannot change the user name because the username is the original employee name. Dataflow of LEM is shown in Figure 3.10.

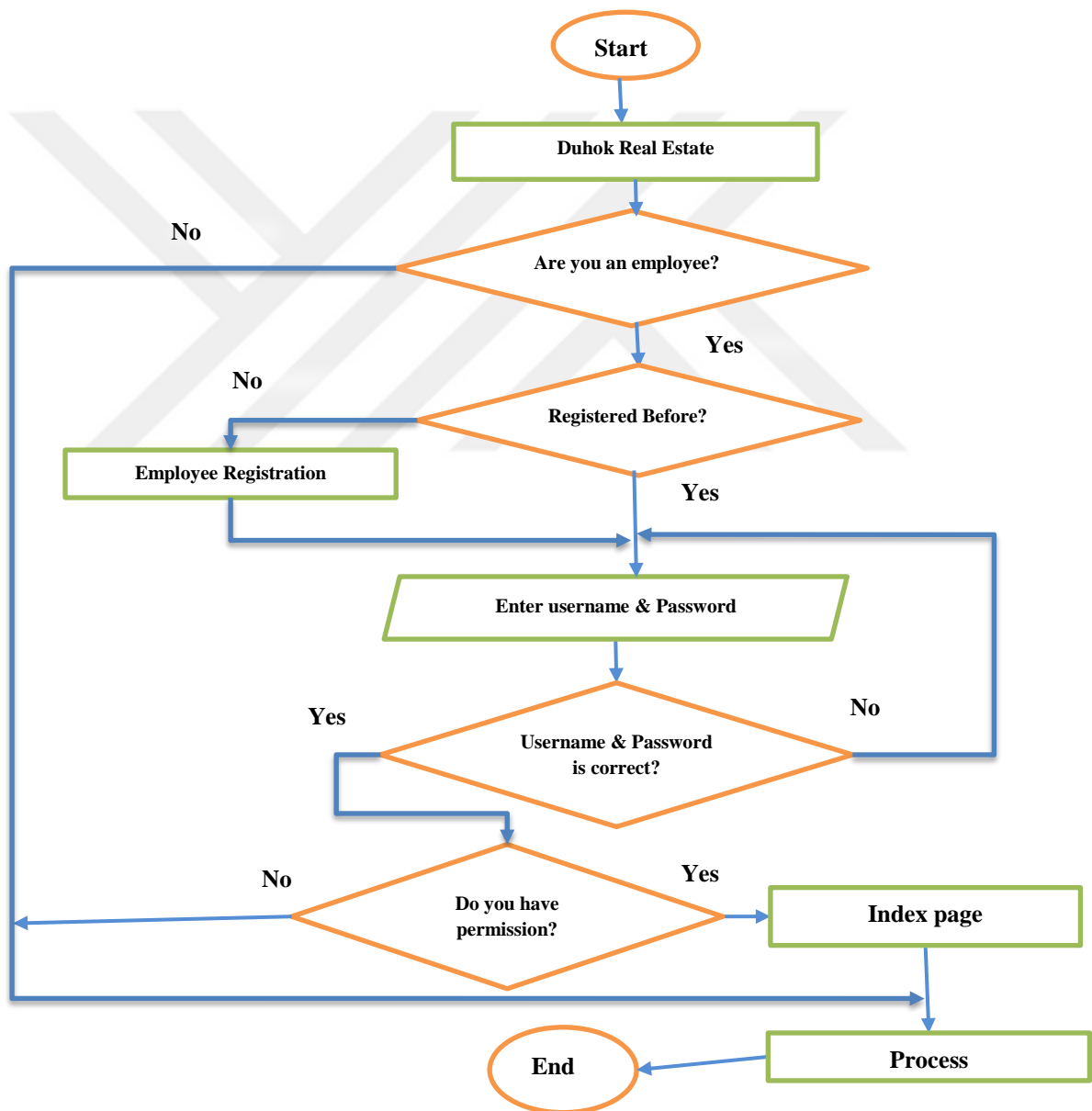


Figure 3.10: Data flow diagram of LEM.





Figure 3.11: Duhok DLR system database tables and their relations.

Table 3.1: Table of Duhok DLR System functions

	TABLE NAME	DESCRIPTION
1	axes	Used to store the direction
2	borders	Used to store the real estate borders
3	booking_land	Used to store all the information about the booking
4	departments	Used to store all the departments in Duhok DLR
5	district	Used to store all the district
6	emp_history	Used to get the name of the employee and timestamp how interred to systems or change the information
7	fee_type	Used for insert information about fee types like descriptions, fixed tax and rate tax
8	fees_evaluation	Used for insert information real estate evaluation
9	governorate	Used to store the name of all governorate
10	land_assurance	Used to store all information about mortgage at real
11	land_changes	Used for when any change in the mortgage happened
12	land_employee	Used to store the information of each employee at Duhok DLR
13	land_registry	Used to store the information of each real estate
14	land_rights	Used for the insert information about the new landowner and his shared
15	permissions	Used to store all permission that gave to the user
16	province	Used to store the name of all province
17	rights	Used for insert information rights
18	sub_district	Used to store the name of all sub governorate

## 4. RESULTS AND DISCUSSION

### 4.1 Introduction

This chapter deals with the implementation of E Duhok DLR system modules that have been mentioned in chapter three of two panels; Employee and Admin. The system implemented in three directorates, which are: Duhok DLR, Zakho DLR, and Sumel DLR. The purpose of this implementation is to show the strengths and weaknesses of the system. The implementation covers all the modules, which are: Login Employee, Employee Registration, Estates Registration, Operation Type, Estate Owners, Estate Status, and View Information. The results of evaluated according to the systematic samples.

### 4.2 Electronic Duhok DLR System

Homepage of Electronic Duhok DLR System provides the ability to access three main directions: Duhok DLR System, Zakho DLR System, and Sumel DLR System, Figure 4.2 illustrates the Electronic Duhok DLR System homepage. Both registered employees can access the homepage of the website. After the user inserts the correct username and password, he will get access to the Electronic Duhok DLR System, as shown in Figure 4.1. Then the user can select any direction according to his privileges that will be provided by the system automatically depending on his position.



Figure 4.1: E-Duhok DLR Site login page



Figure 4.2: DDRL Home Page (after login)

### 4.3 Employee Information Panel

There are fifteen components to aggregate the activities of the employee panel implementation. These components are a (name, Phone Number., Job Title, Date of Birth, Salary, Number of Book, Date of Book, Place take, Type of Increase, Date Merit, Class, Ranked, Notes, Email, and Address). Figure (4.3) represents these Components.

After inserting all information about employees, the admin can change or update the new data for the employee. The admin can increase or decrease permission.

Employee Information

Employee name :

Employee date of birth :

Date of book :

Date merit :

Employee notes :

Phone number :

Employee salary :

Place take :

Employee class :

Employee email :

Job Title :

Number of book :

Type of increase :

Employee ranked :

Employee address :

[Home](#) [Add](#) [Reset](#)

Employee name	Phone number	Title Job	birth Date	Employee salary	book Number	book Date	Out Place	increase Type	Merit Date	Employee class	Employee ranked	Employee notes	Employee email	Employee address
صلاح صالح عبدالقادر	07504583335	محقق عملي 2	0000-00-00	900000		0000-00-00			0000-00-00	3	5			
لالان فرست مصطفی		معاون قضائي 4	0000-00-00			0000-00-00			0000-00-00	0	0			
صلاح صالح مصطفی		محقق عملي 2	0000-00-00			0000-00-00			0000-00-00	0	0			
حسن علي محمد	07504553434	معاون رئيس اميراج	1970-02-01	1000000		0000-00-00			0000-00-00	0	0			

Figure 4.3: Employee Information Components.

Employee Information									
Employee name	Phone number	Title Job	Employee salary	Type of increase	Employee class	Employee ranked	Employee notes	Employee email	Employee address
Aliz Gorgeaz		Surveyor Boss	1200000		2	5			

الهاتف : Phone number <input type="text"/>	عنوان الموظف : job Title <input type="text" value="Surveyor Boss"/>	الراتب : Employee salary <input type="text" value="1200000"/>
نوع الزيادة : Type of increase <input type="text"/>	الدرجة : Employee class <input type="text" value="2"/>	المرتبة : Employee ranked <input type="text" value="5"/>
الملاحظات : Employee notes <input style="width: 100%;" type="text"/>	البريد : Employee email <input type="text"/>	عنوان الموظف : Employee address <input type="text"/>

Figure 4.4: Employee Information Update.

## 4.4 Land Registration

There are twenty-seven components needed for land registration such as Folder name, Folder number, Province Name, Province number, Piece number, ...etc. Figure 4.5 represents these Components.

اسم المجلد : Folder Name <input type="text" value="ليثوت"/>	رقم المجلد : Folder Number <input type="text" value="416"/>	رقم الصفحة : Page Number <input type="text" value="53"/>
المحافظة : Governorate <input type="text" value="Duhok"/>	القضاء : District <input type="text" value="Duhok"/>	التاحية : Sub District <input type="text" value="Duhok"/>
اسم المقاطعة : Province Name <input type="text" value="Aeatot"/>	رقم المقاطعة : Province Number <input type="text" value="86"/>	رقم القطعة : Piece Number <input type="text" value="2/3031"/>
اسم المحطة : Area Name <input type="text"/>	رقم الباب : Door Number <input type="text"/>	رقم الدار : Home Number <input type="text"/>
اسم الشارع : Street Name <input type="text"/>	رقم الطابق : Number Of Floor <input type="text"/>	رقم الشقة : Number Of Flat <input type="text"/>
رقم العصابة : Building number <input type="text"/>	حقوق الارتفاق : Easement <input type="text"/>	المشتملات : Content Piece <input type="text" value="عرصة (Land)"/>
النوع الصف : Description <input type="text" value="ownership"/>	النوع المعاملة : Fee Type <input type="text" value="Ownership"/>	الملاحظات : Notes <input type="text" value="عرصة"/>
نوم : Donum <input type="text" value="0"/>	أولك : OLK <input type="text" value="2"/>	متر مربع : Seq. Meter <input type="text" value="48.57"/>
		ديسيمتر مربع : Seq. Decemeter <input type="text" value="0.0"/>

Figure 4.5: Land Registration.

## 4.5 Land View Details (Information)

Before we insert in to view details page, the user can choose the land he wants to work in Figure 4.6 and 4.7 represents these components.

Home Add New

// table header

#	Land Id	Folder name	Folder No.	Page No.	Gov. name	Land No.	Province Name	Province No.	
1	116	الدائمي	505	51	Duhok	2/3466	Aeatot	86	Details
2	108	الدائمي	477	150	Duhok	2/1062	Aeatot	86	Details
3	107	الدائمي	477	149	Duhok	2/1725	Aeatot	86	Details
4	130	الدائمي	480	42	Duhok	7/2036	Shindoxa Alshimaleaye	83	Details
5	110	الدائمي	477	152	Duhok	2/408	Aeatot	86	Details
6	106	الدائمي	477	148	Duhok	2/195	Aeatot	86	Details
7	127	الدائمي	480	39	Duhok	7/1168	Shindoxa Alshimaleaye	83	Details
8	125	الدائمي	480	38	Duhok	7/2033	Shindoxa Alshimaleaye	83	Details
9	128	الدائمي	480	40	Duhok	7/2034	Shindoxa Alshimaleaye	83	Details
10	129	الدائمي	480	41	Duhok	7/2035	Shindoxa Alshimaleaye	83	Details
11	126	الدائمي	480	37	Duhok	7/1761	Shindoxa Alshimaleaye	83	Details
12	124	الدائمي	480	32	Duhok	2/50	Malta Eslam	13	Details
13	123	البيوت	416	53	Duhok	2/3031	Aeatot	86	Details

Figure 4.6: View Info.

Home Back Land Owners Update Area Add Employee Edit Split Land Join Land Value Land Upload Map Land Report

Main information		Land Area		Land Borders		
Land #	129	Donum	0	<b>Axes Description</b>	<b>Land No.</b>	<b>Details</b>
Last update	2019-04-14 11:36:31	Olk	2	North	7/1803	
Folder Name	الدائمي	Seq. Meter	0	West	7/2034	
Folder Number	480	Seq. Decemeter	0	South	7/2034	street
Page Number	41	Name Employee 1		East	7/2036	
Goverment	Duhok	Job Employee 1		Add new border		
District	Duhok	Name Employee 2		<b>Old Land</b>		
Sub District	Duhok	Job Employee 2		Old Land	7/1168	
Area Name		Name Employee 3		Old Date	2019-04-14	
Land Number	7/2035	Job Employee 3				
Province Number	83	Content Piece	عرصة			
Province Name	Shindoxa Alshimaleaye	Description	ownership			
Door Number	0					
Home Number	0					
Street Name						
Floor Number	0					
Flat Number	0					
Building Number						
Fee Type	Split					

Figure 4.7: View Details for Land.

The Land view details contain many forms such as landowners, borders, update area, edit land, ...etc.

### 4.5.1 Land Owners

There are fourteen components needed for add Land owner such as Folder name, Folder number, Record date, Owner name, Number of shares, Nationality id, Owner gender, ...etc. Figures 4.8 and 4.9 represent these Components.

### Land Owner

Folder Number : رقم السجل: <input type="text" value="480"/>	Record Number : رقم الصفحة: <input type="text" value="20"/>	Record Date : تاريخ التسجيل: <input type="text" value="04/09/2013"/>	Operation Type : ماهية المعاملة: <input type="text" value="sale(بيع)"/>
Owner Name : المالك: <input type="text" value="بيل عبدالله حسن"/>	Shared By (Number Of Shares): مقدار الاسهم: <input type="text"/>	Nationality ID : رقم الجنسية العراقية: <input type="text"/>	
Nationality Date : تاريخ الجنسية: <input type="text" value="mm/dd/yyyy"/>	Owner Gender : جنس المالك: <input type="text" value="Male"/>		
Right type : نوع الحق: <input type="text" value="Assurance"/>	Right Owner Name : أسم صاحب الحق: <input type="text"/>	Shared By (R. Owner) : مقدار الاسهم: <input type="text"/>	
Employee Name : أسم الموظف المختص: <input type="text" value="شفيان عادل سليم"/>	Notes : الملاحظات: <input type="text" value="07504580256 تلفون"/>		

Figure 4.8: Land Owners.

### Land Owners Rights

Folder	Page	Date	Transaction Type	Owner Name	Shared By	Owner No.	Issued Date	Owner Gender	Right Type	Right Owner Name	Shared By	Employee Name	Remarks	Status
480	20	2013-04-09	sale(بيع)	بيل عبدالله حسن				Male	Assurance			شفيان عادل سليم	07504580256 تلفون	
416	53	2009-05-07	Ownership	جمال سليمان حسن				Male	documentaion			حسن رمضان حبيب		

Figure 4.9: Land Owners Rights.

### 4.5.2 Land Borders

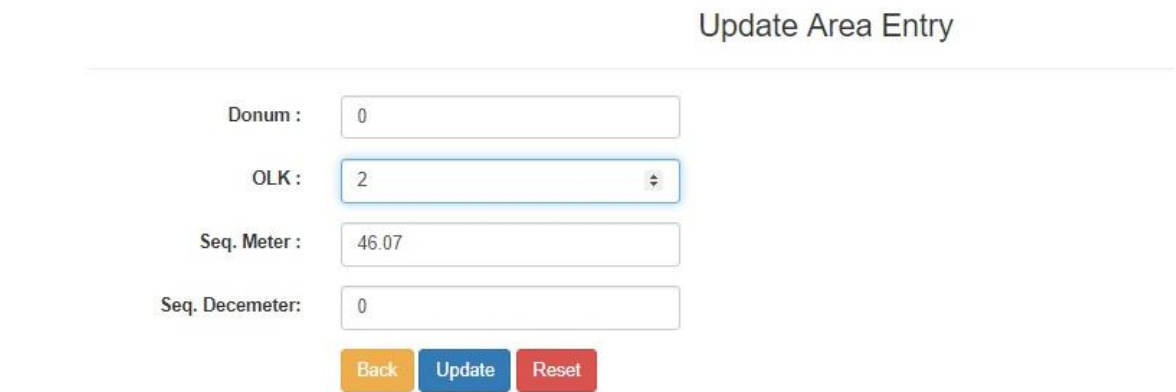
There are three components needed to add Land border: Axes, Land No, and Details. Figure (4.10) represents these Components. There are four main border directions, which are north, south, east, and west.

Axes:	<input type="text" value="North"/>
Land No.:	<input type="text"/>
Details:	<input type="text"/>

Figure 4.10: Land border.

### 4.5.3 Update Area

There are four components needed for update land-area: Donum, Olk, Seq. Meter and Seq. Decimeter. Figure 4.11 represents these Components.



Update Area Entry

Donum :

OLK :

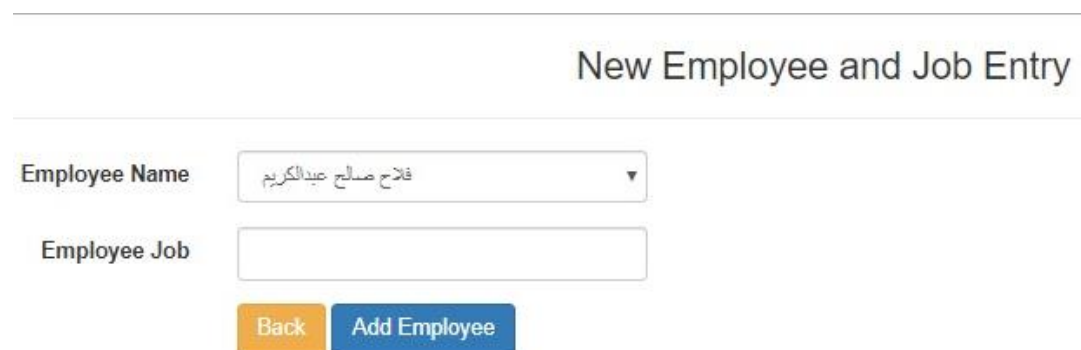
Seq. Meter :

Seq. Decemeter:

Figure 4.11: Update area.

### 4.5.4 Employee Approving

There are two components needed for employee approving: employee name and employee job. This option used when all entered data are correct, or some of them are not correct that needs to be changed. At least three employees should sign for the approving. Figure 4.12 represents these components.



New Employee and Job Entry

Employee Name

Employee Job

Figure 4.12: Add an employee.

### 4.5.5 Edit Land

The edit land used to update land information when some data entered by mistake. Figure 4.13 represents these components. It can consider that they are the same components as of land registry except for the area component.



Folder Name : اسم المجلد الدائمي	Folder Number : رقم المجلد 480	Page Number : رقم الصفحة 42
Governorate المحافظة Duhok	District القضاء Duhok	Sub District الناحية Duhok
Province Name اسم المقاطعة Shindoxa Alshimaleaye	Province Number : رقم المقاطعة 83	Number Of Piece : رقم القطعة 7/2036
Area Name اسم المحطة 	Door Number : رقم الباب 0	Home Number : رقم الدار 0
Street Name اسم الشارع 	Number Of Floor : رقم الطابق 0	Number Of Flat : رقم الشقة 0
Building number : رقم العمارة 	Easement : حقوق الارتفاق 	Content Piece : المشتتات 
Description : النوع الصنف ownership	Fee Type : النوع المعاملة Split	Notes : الملاحظات 

Back Update Reset

Figure 4.13: Edit land.

#### 4.5.6 Split and Join Land

Land splitting means dividing land it into more than one part. Figure 4.14 represents a split land operation. Figure 4.15 represents an accepting.

Land No.	Province name	Folder Name	Folder No.	Page No.	Donum	Olk	Seq. Meter	Seq. Decemeter
1/1168	Shindoxa Alshimaleaye	الدائمي	480	39	0	6	46.07	0
7/2034	Shindoxa Alshimaleaye	الدائمي	480	40	0	2	0	0
7/2035	Shindoxa Alshimaleaye	الدائمي	480	41	0	2	0	0
7/2036	Shindoxa Alshimaleaye	الدائمي	480	40	0	2	0	0

Figure 4.14: split land.

Land No.	Province name	Folder Name	Folder No.	Page No.	Donum	Olk	Seq. Meter
2/1062	Aeatot	الدائمي	477	150	0	9	20
2/3031	Aeatot	ايبوت	416	53	0	2	48.57
2/3470	Aeatot	الدائمي	505	55	0	4	68.22
2/3469	Aeatot	الدائمي	505	54	0	4	0.98

localhost:63342 says  
 Are you sure to split land?  
OK Cancel

Figure 4.15: Accept split real estate.



Joining land means merging two or more lands to be one land. Figure 4.16 represents join land operation, while Figure 4.17 represents accepting the changes.

Back + Join

### Join Land

Land No.	Province name	Folder Name	Folder No.	Page No.	Donum	Olk	Seq. Meter	Seq. Decemeter
1/1168	Shindoxa Alshimaleaye	الدافعي	480	39	0	6	46.07	0
<input type="text" value="7/1761"/>	Shindoxa Alshimaleaye	الدافعي	480	37	0	0	21	0
<input type="text" value="7/2033"/>	Shindoxa Alsharqeaye	الدافعي	480	38	0	0	41.57	0

Figure 4.16: join real estate.

localhost:63342 says  
 Are you sure to join land?

OK Cancel

Land No.	Province name	Folder Name	Folder No.	Page No.	Donum	Olk	Seq. Meter	Seq. Decemeter
1/1168	Shindoxa Alshimaleaye	الدافعي	480	39	0	6	46.07	0
<input type="text" value="7/1761"/>	Shindoxa Alshimaleaye	الدافعي	480	37	0	0	21	0
<input type="text" value="7/2033"/>	Shindoxa Alsharqeaye	الدافعي	480	38	0	0	41.57	0

Figure 4.17: Accept a join real estate.

#### 4.5.7 Value of Land

There are seven components needed for entering value land: Value land, land price, land date, fee date, value notes, employee name, and surveyor name. Figures (4.18 and 4.19) represent these components.

### Values Land Entry

Land Value: القيمة <input type="text" value="6000"/>	Land Price: البذل <input type="text"/>	Land Fees: الرسم <input type="text"/>	Fee Date: تاريخ الكنف <input type="text" value="02/24/2013"/>
Value Notes: الملاحظات <input type="text"/>	Employee Name: الموظف <input type="text" value="فرهاد عيايكر ضر"/>	Surveyor name: المساح <input type="text" value="عبدالعزيز محمد سعيد"/>	

Back Add

id	Land Value	Land Price	Land Fees	Fee Date	Employee Name	Surveyor name	Value Notes
----	------------	------------	-----------	----------	---------------	---------------	-------------

Figure 4.18: Values of land.

## Values Land Entry

Land Value: القيمة	Land Price: البذل	Land Fees: الرسم	Fee Date: تاريخ الكشف
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text" value="mm/dd/yyyy"/>
Value Notes: الملاحظات	Employee Name: الموظف	Surveyor name: المساح	
<input type="text"/>	<input type="text" value="فاتح صالح عبدالكريم"/>	<input type="text" value="فاتح صالح عبدالكريم"/>	
<input type="button" value="Back"/> <input type="button" value="Add"/>			

id	Land Value	Land Price	Land Fees	Fee Date	Employee Name	Surveyor name	Value Notes
35	6000	0	0	2013-02-24	فرهاد عبايكر عمر	عبدالعزيز محمد سعيد	

Figure 4.19: Values land after editing.

### 4.5.8 Upload Map

The employee who has permission to upload map first he choosing a map from the destination and upload it to the system. Figure 4.20 represents the upload map operation.

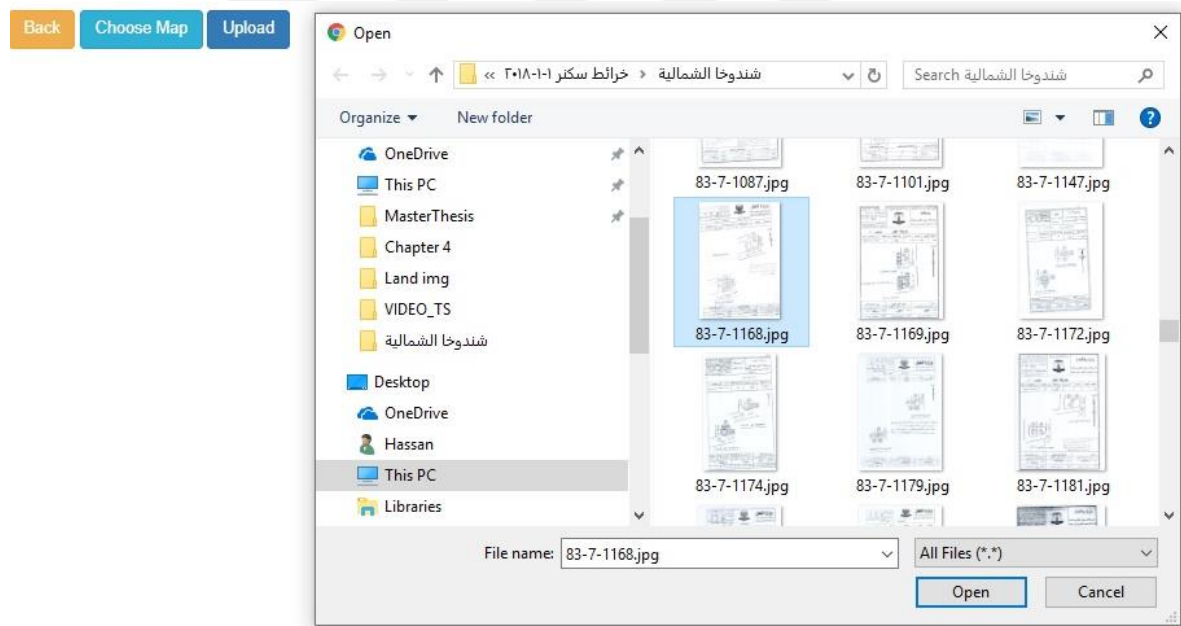


Figure 4.20: Upload map.

### 4.5.9 Land Report Document

The most crucial step for the document is the make report for a land. Then the primary identification of the real estate is to know its owner or owners. The report document contains all or most important information about the real estate such as; destination, number of the land, area, owners, without forgetting name and number of the folder. Figure 4.21 represents components of land report deed.



description of currently permanent estate registry			Governorate	District	Subdistrict	Street	No of floor	No of flat
Number	Date	No of cover	Duhok	Duhok	Duhok		0	0
56	2015-05-14	505						

description of currently permanent estate registry from which information is transferred			Sequence of state	Name of Q.	No of column	No of piece	No of area	Name of area
Number	Date	No of cover	—	—	0	2/3471	86	Asatot
—	—	—						

The owner or the authorized of this land : حميد حسين احمد	Class of Estate :
	The contents :

Borders			Type of Estate :
North-East	2/3283	public road	ownership
North-West	2/3469		
South-West	2/3472		
South-East	2/3217		Easement:

Area	M2	Okk	Donum	Voucher verdict	description of currently permanent estate registry to which information is transferred		
	0	3	12.9		Number	Date	No. of cover
					—	—	—

Type of deal : Split			Request By: Request Date: After Fees Were Paid: IQD Invoice No.: Name of the functionary: <i>حسن علي احمد</i> Date: 2019-05-26  Manager of estate registration office
Value	Fees	Land Fees	
Dinar	Dinar	Dinar	
0	47000000	0	
2015-04-22	land		

Figure 4.21: Report land (deed).

## 4.6 Fee Type

There are four components needed for additional fee type form: Description, fixed tax, rate tax, and note, as shown in Figure 4.22.

For updating, the data will change when a mistake occurred during data entering. Figure 4.23 explains that.

Fee Types

Description: الوصف:	Fixed Tax: الثابت:	Rate Tax (%): النسبة:	Note: الملاحظات:
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

[Home](#) [Add](#) [Reset](#)

Id	Description	Fixed Tax	Rate Tax	Note	
22	sale(بيع)	0	3%	بيع	<a href="#">Edit</a>
24	افراغ	0	3%		<a href="#">Edit</a>
25	Swap(مبادلة)	0	3%	مبادلة	<a href="#">Edit</a>
26	رهن	7500	0.5%		<a href="#">Edit</a>
27	فك الرهن	0	3%		<a href="#">Edit</a>
28	بيع بالمزايدة	0	3%		<a href="#">Edit</a>
29	union	3000	0.5%	توحيد بعضي الجزء الموحد منه ويختار اكبر الاجزاء منه الموحد منه حسب المادة 12 فقرة 2	<a href="#">Edit</a>
30	excretion	3000	0.5%	افراز	<a href="#">Edit</a>

Figure 4.22: Fee type.

Update Fee Type

Description:	<input type="text" value="Split"/>
Fixed Tax:	<input type="text" value="3000"/>
Details:	<input type="text" value="0.5"/>
Note:	<input type="text" value="افراز"/>

[Back](#) [Update](#)

Figure 4.23: Fee type update.

## 4.7 Land status

In this option, we search for land by using id number for more security. Figures 4.24 and 4.25 show that the employee will get permeations.

Figure 4.24: Land status.

Land ID	Land No.	Province name	Folder Name	Folder No.	Page No.
86	6/39	Shaxke	shaxke	16	48

Figure 4.25: Land status after search id.

### 4.7.1 Reservation Land

This option can put or cancel the reservation for land. There are seven components needed for add reservation form: Folder No, folder Name, folder date, document no, reservation date, from the place, and note. Figures 4.26 & 4.27 illustrate the reservation land, while Figure 4.28 represents the reservation removing.

#	Folder No.	Folder Name	Folder Date	Document No.	Reservation Date	From Place	Employee	Notes
1	64	الدائمي	2019-03-19	210B	2019-03-26	Hikmet	حسن علي محمد	Confirm Modify
2	165	10 Aqari	2018-10-10	3455	2018-08-10	bank aqari	حسن علي محمد	
3	152	shaxke	2019-03-18	125	2019-03-26	baladeaya	حسن علي محمد	
4	165	10 Aqari	2018-09-16	1546	2018-09-16	Aqari	حسن علي محمد	

Figure 4.26: Reservation Land.

## Change Reservation Land

Folder No. : العدد	Folder Name : المجلد	Folder Date : تاريخ الحجز	Document No. : رقم الكتاب
64	الدائمي	03/26/2019	210B
Booking Date : تاريخ الكتاب	From Place : الجهة الواردة	Notes : الملاحظات	
03/26/2019	Hikmet		

Back Save Changes Reset

Figure 4.27: Change Reservation Land.

## Cancel Reserving Land

Land ID	Land No.	Province name	Folder Name	Folder No.	Page No.
86	6/39	Shaxke	shaxke	16	48

Back

#	Folder No.	Folder Name	Booking or Reserving Date	From Place	Document No.	Employee	Notes
1	165	10 Aqari	2018-08-10	bank aqari	3455	حسن علي محمد	
2	152	shaxke	2019-03-26	baladeaya	125	حسن علي محمد	
3	165	10 Aqari	2018-09-16	Aqari	1546	حسن علي محمد	
4	102	بروشكي	2019-03-20	Aqari	20B	حسن علي محمد	
5	65	الدائمي	2018-06-28	baladi	210B	حسن علي محمد	
6	16	shaxke	2018-09-11	baladi	25	حسن علي محمد	

Figure 4.28: Cancel Reservation.

### 4.7.2 Mortgage Land

There are twenty-nine components needed for adding mortgage such as mortgager or Owner, mortgager Nationality, Debtor Name, Debtor Nationality, Mortgagee, Mortgagee Nationality, Number of Shares, Amount of Debt, date of entitlement, degree of mortgage, His time, ...etc. Figure 4.29 represents these components.

## Land Mortgage

Current or Owner : الراهن	Current Nationality : جنسية الراهن	Debtor Name : اسم المدين	Debtor Nationality : جنسية المدين
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Mortgagee : المرتهن	Mortgagee Nationality : جنسية المرتهن	Mortgage Type : نوع الرهن	By who : بيد من حجزته
<input type="text"/>	<input type="text"/>	assurance تأكيد	<input type="text"/>
Franchise cause : حق الامتياز وسببه	Amount of Shares : مقدار الاسهم المرهونة	Amount of Debt : مقدار الدين	Debt is it : الدين هل هو
<input type="text"/>	<input type="text"/>	0	grasped مقبوض
date of entitlement : تاريخ استحقاقه	degree of mortgage : درجة الرهن	His time : ومغته	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Payment by installments : هل الدفع بالاقساط	Amount of premium : مقدار القسط	date of entitlement : تاريخ استحقاقه	<input type="text"/>
Yes نعم	<input type="text"/>	<input type="text"/>	<input type="text"/>
interest rate : نسبة الفائدة	initial date : تاريخ ابتدائه	final date : تاريخ انتهائه	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Donuts Right : هل الرافضون متضامنون بالحق	Mortgagees right : المرتهنون متضامنون بالحق		
Yes نعم	Yes نعم		
Property leased : هل العطر مزاجر	duration of rent : مدة الاجار	when start : متى تبدأ	name of tenant : اسم المستاجر
Yes نعم	<input type="text"/>	<input type="text"/>	<input type="text"/>
Rental terms : شروط الاجار	Notes : الملاحظات		
<input type="text"/>	<input type="text"/>		

Back Add Reset

Figure 4.29: Land mortgage.

## 4.8 Search Land

The search land is a crucial step for getting information. In this case, the permission can get information by six ways such as All, Land ID, Land Number, Owner Name, Old Owner, and Old folder-page. Figure 4.30 represents this case.

### Real Estate Search

Home Search On:  Enter your search

- All
- Land ID
- Land Number
- Owner Name
- Old Owner
- Old folder-page

Figure 4.30: Land Search.

## 4.9 Sample of Statistics

Duhok DLR is the essential directorate in Duhok governorate. When we are working at the record for 2017, we got these results:



- 1- The maximum of activity is in July and the minimum activity in Feb.
- 2- The maximum Type of transaction is Sale, and the minimum is Ownership.
- 3- The proportion of women owned by the pieces is right as it reached 2293 compared to 3675 men in the year 2017.

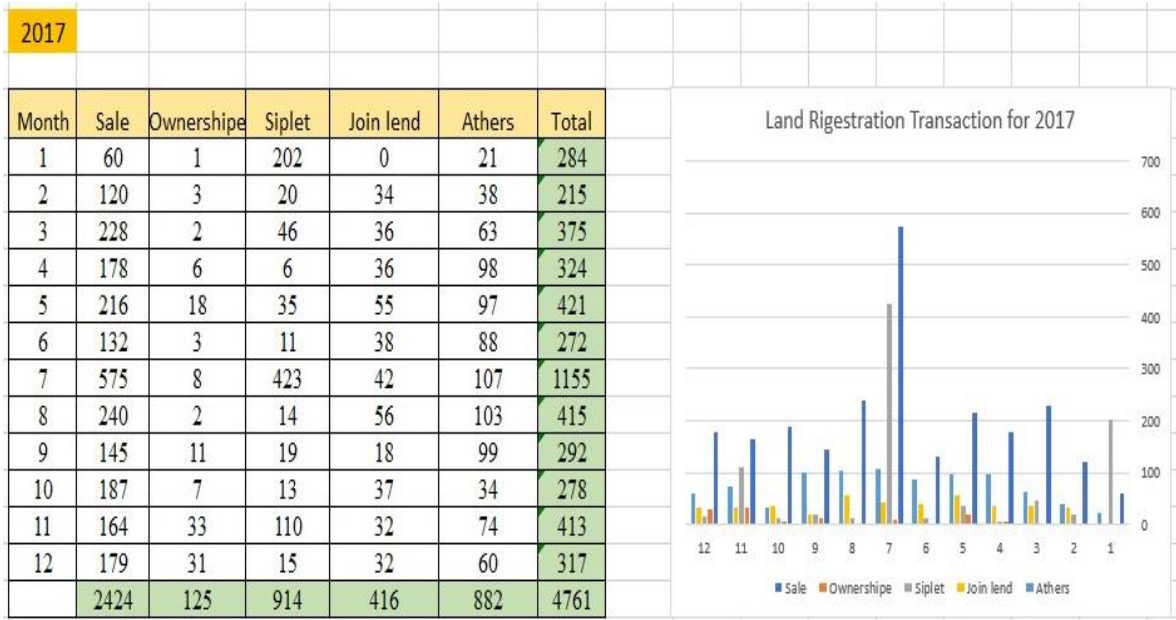


Figure 4.31 Table and graph of types of transactions in 2017

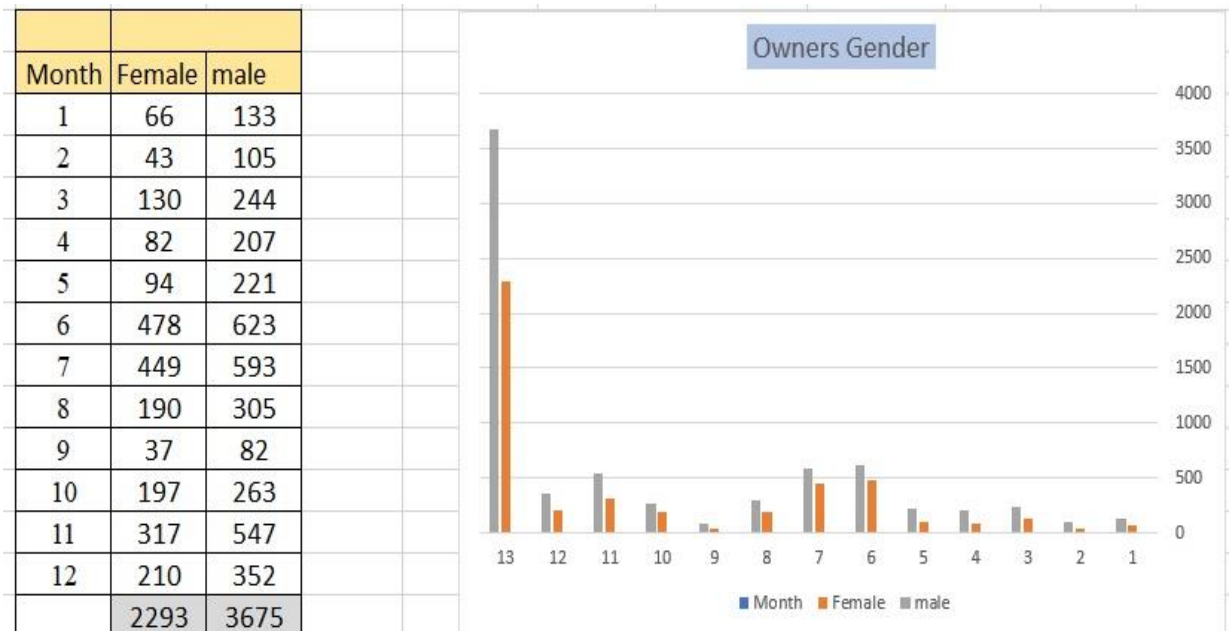


Figure 4.32 Table and graph of types of owner's gender in 2017.



## **5. CONCLUSIONS AND FUTURE WORK**

### **5.1 Conclusions**

The important conclusion points from the proposed Duhok DLR system can be summarized as follows:

1. In this thesis, an efficient electronic DBMS for Iraq/Duhok land registration has been proposed, designed, and implemented to Duhok Land Registration Directory named Electronic Duhok DLR System. The proposed system improved administration and financial mechanisms of all Duhok Directorate and converted their workflow from the current paper-based approach to electronic-based one. The proposed system can be used to combine all DLRs campuses, including all related sub-directorates in one system to be managed electronically.
2. The proposed Duhok DLR system improved the communication system between the DLR staff in one side and the administration and financial directorate and sub-directorates in another side remotely with full flexibility. The communication style has done via the Internet.
3. The Duhok DLR system has been designed economically: money-consumed, time-consumed, less-efforts, and more accurate. Hence, this system can be adopted to other directorates inside Iraq.

### **5.2 Future Work**

1. The thesis focused on the design and Implementation of Database Management System for Iraq/Duhok Land Registration, which is done for the first time at Iraq. So, for improving this system, it is suggested to concentrate in future on the security of the system with professional algorithms such as Secure Hash Algorithm (SHA).
2. It is preferable to expand the proposed system to include other related offices (such as banks, electricity office, water distribution office, and tax office) for more flexibility and proper processing.
3. The proposed system depends on a remote server as the first step. So, it is suggested to convert to the local server at Duhok.

4. Depending on the efficient performance of the proposed system, it is suggested to copy this system for all Iraq directorates. Hence, a complete DLR system will be prepared around Iraq.
5. Using a Geographical Information System to determine the GPS coordinates for lands-maps, which will minimize land-fixing errors.



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