THE ROLE OF INFORMATION SYSTEMS IN APPLICATION OF HUMAN RESOURCES MANAGEMENT SYSTEM IN PRESIDENCY OF DIYALA UNIVERSITY

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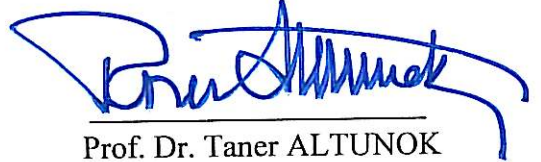
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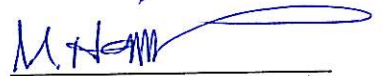
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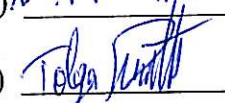**Examination Date: 02.01.2015**

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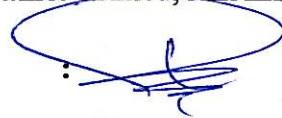|		
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ABSTRACT

THE ROLE OF INFORMATION SYSTEMS IN APPLICATION OF

HUMAN RESOURCES MANAGEMENT SYSTEM IN

PRESIDENCY OF DIYALA UNIVERSITY

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M.Sc. Department of Mathematics and Computer Science

Information Technology Program

Supervisor: Prof. Dr. Mahir NAKİP

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Human Resources Management Systems (HRMS) plays an important role for any organisation to effectively manage its human resources. In university domain, HRMS is particularly crucial as the organisation comprises a large number of personnel and administrative units.

In Iraq, some universities are still using the manual administration in management of human resources which has disadvantages including: spending a large amount of papers, stores need for archive save and using paper records for save institution data as well. The main purpose of this study is designing an electronic system to manage human resources in presidency of Diyala University. A HRMS at an abstract level has been designed to address the problems of traditional management.

Methodology of the study is based on building database by using (Microsoft SQL Server 2008) and designing interfaces for database by using (Microsoft Visual Studio

2010). The finding of this study is the application enables to presidency of Diyala university facilitate administrative procedures in HRM through collecting the employees information in one place is database and conducting different processes on it such as, insert, update, delete and print according to the need of the end user, hence saving of time in the search process and reducing administrative effort. It is also used to recover damaged data and information and converting the traditional management to an electronic one. In addition, university support in speed of decision making.

Keywords: Information Systems, Human Resources Management System, Presidency of Diyala University.

ÖZ

DİYALA ÜNİVERSİTESİ REKTÖRLÜĞÜNDE İNSAN KAYNAKLARI YÖNETİMİ SİSTEMİNİN UYGULANMASINDA BİLGİ SİSTEMLERİNİN ROLÜ

ALAZZAWI, Ahmed Adnan Mohammed

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İnsan Kaynakları Yönetim Sistemleri (HRMS), insan kaynaklarının etkili biçimde yönetilmesi için organizasyonda önemli bir rol oynar. Üniversite alanında HRMS, özellikle çok sayıda personel ve idari birimlerden oluşan organizasyon olarak çok önemlidir.

Irak'ta bazı üniversiteler, aşağıdaki dezavantajları olan insan kaynakları yönetiminde hala elle idareyi kullanmaktadırlar: çok fazla kağıt israfı, arşivleri saklamak için gerekli depolar ve aynı zamanda kurumsal bilgileri saklamak için kağıt kayıtların kullanılması. Bu çalışmanın ana amacı, Diyala Üniversitesi rektörlüğünde insan kaynakları yönetimi için elektronik sistemin tasarlanmasıdır. Soyut seviyede HRMS, geleneksel yönetimin sorunlarına yönelik olarak tasarlanmıştır.

Çalışma metodolojisi, (Microsoft Visual Studio 2010) kullanılarak veri tabanı için arayüzlerin tasarlanması ve (Microsoft SQL Server 2008) kullanılarak veritabanının

oluşturulması temelindedir. Bu çalışmanın bulguları, Diyala üniversitesi rektörlüğünün HRM'de idari işlemlerini çalışan bilgilerinin toplanmasıyla bir yerde veri tabanıyla ve farklı süreçleri uygulayarak bir yerde son kullanıcının ihtiyacına göre girmesini, güncellemesini, silmesini ve yazdırmasını kolaylaştırmayı sağlayan, böylece araştırma sürecinde zaman kazandıran ve idari çabaları azaltan bir uygulamadır. Aynı zamanda hasar gören verileri düzeltmek ve geleneksel yönetimi elektronik yönetime dönüştürmek için de kullanılır. Ayrıca üniversite karar verme hızını desteklemektedir.

Anahtar kelimeler: Bilgi Sistemleri, İnsan Kaynakları Yönetimi Sistemi, Diyala Üniversitesi Rektörlüğü.

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LIST OF ABBREVIATIONS

DB	Database
DBMS	Database Management System
DCL	Data Control Language
DDL	Data Definition Language
DML	Data Manipulation Language
EG	Electronic Government
EM	Electronic Management
ER	Entity Relationship
GUI	Graphical User Interface
HR	Human Resources
HRIS	Human Resources Information System
HRM	Human Resources Management
HRMS	Human Resources Management System
HW	Hardware
ICT	Information and Communication Technology
IS	Information System
IT	Information Technology
LAN	Local Area Network
MUI	Main User Interface
OS	Operating System
PDF	Portable Document Format
RAM	Random Access Memory
SQL	Structured Query Language
SW	Software
URL	Uniform Resource Locator
VB	Visual Basic
VS	Visual Studio

CHAPTER 1

INTRODUCTION

Resulted the modern technology use to bring a change in administrative structures and working methods of the government and private institutions. Since the mid-eighties institutions also are using information and communications technology along with business re-engineering as a means to reform the administrative work, including getting rid of bureaucracy [1]. Further, it leads to increase coordination between institutions and providing services in ways easier in terms of space and time.

Convergence of the methods of work in many government institutions leads to achieve readiness management and integration required for linking institutions across regimes in the applications such as, E-Management and E-Government. The models mentioned are as indicators for the establishment of computer systems in management practices and the abolition of traditional practices in the field of labor-intensive and accumulation of paperwork.

A human resources management system refers to the systems and processes at the intersection between HRM and information technology. It merges HRM as a discipline and in particular those are basic human resources (HR) activities and processes with the IT field [2].

There are features through the use of computers to manage the human resources, for instance the speed of the search, security, large memory space, long life, low cost, which can improve the effectiveness of HRM.

1.1 Scope of the Study

University presidency in Iraq is the basic supervisor on university work (administratively and scientifically), since it contains group of departments and units that monitors and manages the university faculties. This study has taken Diyala university as a model of work. Diyala university is one of Iraqi universities located in Diyala province east of Iraq. It established in 1999 containing 14 faculties in different fields [3]. The study in Diyala University contains three programs: bachelor, master and doctorate. Presidency of Diyala University has organization structure that includes four basic levels. First level "Rector" is general supervisor to university. Second level "Assistant of Rector" there are two vice chancellors in the university; the first one is for supervision of administrative departments and the second one is for supervision of scientific departments. Third level is "Departments and Units". Fourth level is "Employees" the persons who work in the departments and units as an administrative employees and academics, as shown in figure (1).
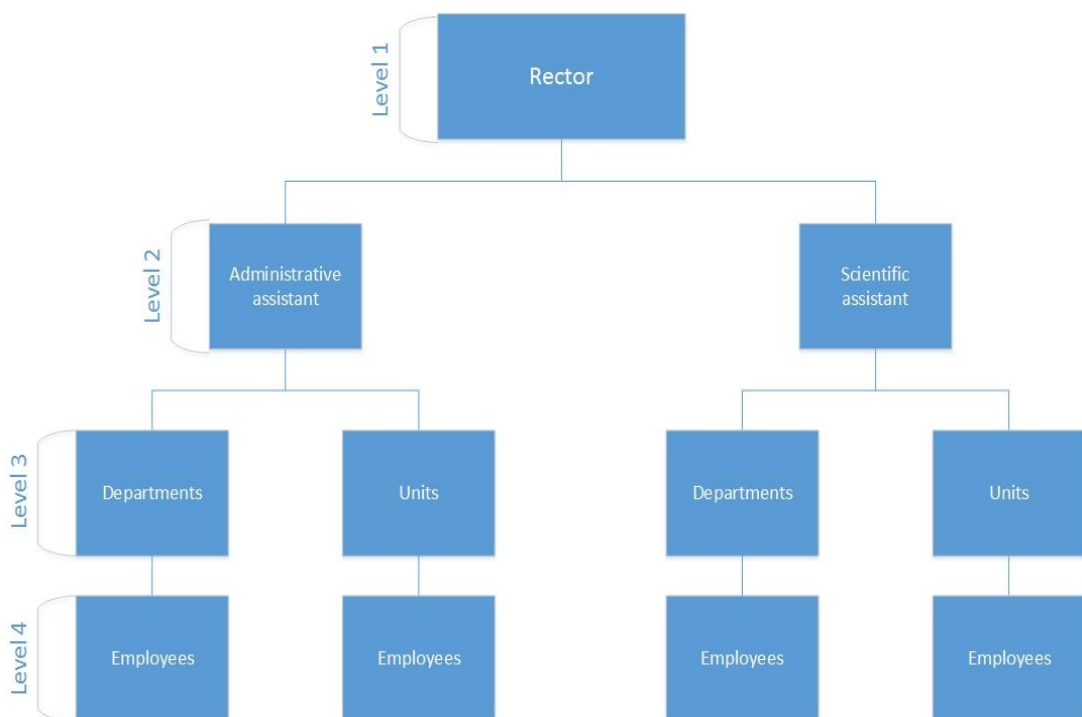
Figure 1 University levels

Diyala University has a lot of aims to achieve, such as [4]:

- The preparation of highly qualified academically and professionally rehabilitation high in the areas of science and literature and the arts to perform their duties in the service of the country and promote.

- Great and afforded opportunities for outstanding students and qualified students to complete their higher evaluation and curriculum development to keep pace with scientific and technical development in the world.

- Follow –up evaluation and curriculum development to keep pace with scientific and technical development in the world.

- Develop strategies of scientific research and the tools and conditions for the advancement in the arts and sciences and inventions to meet the requirements of the evolving life.

- Employment research centres of the University for the advancement of the movement of scientific research and authorship, translation and publishing all forms of science to serve the community.

- Follow –up training and development of teaching staffs, technical and administrative, enabling them to achieve the goals of the university the development of her for the better.

- Openness and regional communication and scientifically through the missions and the establishment of scientific conferences and scientific symposium within the country and participate in it outside the country.

- Provide technical consultation only to serve the university and the public sector, private and mixed.

- Improve and develop the performance off the university and raise the level of competencies in line with the scientific renaissance and technology using computer and communications.

- Interest in the development of infrastructure and communications service and a culture of moderation; and to learns in accordance in with principles of religion and calls for moderation and dialogue and ostracize violence and extremism.

1.2 Problem of the Study

The development that has been occurred concerning information technology through using electronic methods in institutions management, aims at simplifying procedures and routine reduce, replacement the paper documents to be an electronic system. The reason why traditional management is unable to respond for changes and requirements of the age is because the disadvantages in this administrative system for example, it needs many employees, spending a large amount of paper, needs for stores as an archive save, a lot of money and more time. There are technical problems while using the limited programs in the management of university for example using Microsoft Excel spreadsheet in designing of DB, which can be used only for building personal DB. Furthermore, there are other problems in using such of these systems such as stockpiling the information in one table that causes the data redundancy, as shown in figure (2).

Figure 2 A screenshot of spreadsheet that hold current database of employees

1.3 The Purpose of the Study

The main purpose of the study is designing and applying HRMS in presidency of Diyala University. The proposed system contains database that leads to save data and retrieve when it is needed which eventually lead to save time in search process. Additionally, there are other purposes such as:

- Based on the proposed system, we can change paper information for employees in presidency of Diyala University to electronic information that can be updated easily.
- Maintaining the information from damage or loss through building database for compilation the information and data.
- University support in decision making.
- Avoiding administrative mistakes by an electronic system to hold accurate data.

1.4 Importance of the Study

Application of successfully HRMS in presidency of Diyala university leads to application of electronic management in other institutions and accordingly it can access to the application of electronic government for providing services to people, business and other government institutions through developing the proposed system to be more comprehensive. For example, HRMS uses at the ministry level to include all Iraqi universities. The importance of the study can be summarized as follows:

- Transparency of administrative work because the proposed system depends on clear steps (data input, processing and output), and does not allow changing workflow.
- Simplifying the administrative work and procedures in the university is based on providing information at computer and reducing manual work by using database and interfaces.
- Help the top management of organization in making decisions in a timely manner that because of the availability of accurate data and necessary in the system database which can access to them when needed, as well as the supply

of feeding for the inverse of all activities and requirements, through the use of complex system which depends on components of IS.

- Increasing data accuracy to provide possibilities to get required information after it has been processed, hence the trust in the correctness of exchanged data which have been reused will be high and worry about the inaccuracy of the information and resulted mistakes by the handy insert will be vanished.

1.5 Advantages and Challenges of the HRMS

Advantages:

- Time saving, where can get information in one click by executive buttons which are unavailable in the current system or spreadsheet that used in university.
- Easy access to the data through collected in one place is a relational database that prevents data redundancy while is possible with the current system because collecting data in one table without coordination as a database.
- Reduced manual work by adopting the computerized processes to HRM.
- Ensure the protection and security of information by using a protection window to the proposed system and converting paper information to electronic one.

Challenges:

- Need to programmers who have experiences in designing and implementing.
- The cost of conversion from previous system to HRMS.
- The challenges of resistance to change, and the continuation of senior management in the intellectual shortcomings are unable to absorb the information systems to manage.

1.6 Contribution to the Field

The contribution of the study is building database for storing information in presidency of Diyala University by using "SQL Server 2008". The system includes interfaces designed by using "Visual Studio 2010" for dealing with database through

insert, update and retrieval the data. There are many departments and employees in presidency of Diyala University. The database shows of organization structure as tables through relationships. Also, this study will contribute to the Diyala University in many ways such as easy and effective controlling.

The questions that arising from the purpose are:

- How can reduce the errors and inaccuracies in the process of human resources management?
- How can protect data and information from damage or loss?
- How can reduce the time and effort required to manage human resources in presidency of Diyala University?
- How can support presidency of Diyala University in the decision-making process?

CHAPTER 2

BACKGROUND AND LITERATURE REVIEW

2.1 Background

Information systems (IS) can be defined as a set of interrelated components that collect process, store and distribute information to support decision making, coordination and control in an organization. In addition to supporting decision making, coordination, and control, information systems may also help managers and workers analyse problems, visualize complex subjects, and create new products [5]. Components of information systems are shown in figure (3).

Figure 3 Components of information system

Electronic management (EM) is administrative strategy in age of the information for achieving best services to the people and institutions by using information resources and reducing time, cost and effort [6]. It means also the conversion the paperwork to the electronic work through automating the institutions work and building system based on single window principle.

Human resources management system (HRMS) is application based on information systems and it has been designed for supporting the human resources in the university. Figure (4) shows simple steps in the system work. At the beginning, it is conversion paper information to electronic information in the database then viewing information when it is needed through interfaces.

Figure 4 Steps of system work

The data are series of facts that can be got through search, registration or other ways. In general, the data is a group of letters, words, numbers, symbols and pictures that has relation with a particular subject such as data of employees which are names, ID number, job and picture [7].

The database (DB) is a collection of related data with each other by mathematical relationship. It contains to one table or more, each table has more than one record, the record contain group of fields [8].

Database management system (DBMS) is a collection of software for control of storing, management and retrieval the data of database [7]. There are other functions of (DBMS) such as establishment, maintenance, protection and update the database.

2.2 Literature Review

In this part, the focus will be on the scientific references that specialized in design and implement of electronic management system, database systems design and human resources information systems. There are many studies in this field; some of these studies are for universities and the other studies for institutions. The following is a summary of each study in terms of its goals, importance and the conclusions.

2.2.1 Literature review which have relation with database build

A database build process not comes easily to meet needs of university and end-user. It is also need to the technologies which uses in database design to get a relational database which can be compatibles with the proposed system. However, we can know methodology to build database through what come in the literature review [9], [10], [13], [16] and [17].

The main aim of the study [9] is designing DB for employees in Baghdad University to store their information and to manage the information and data in high efficiency. Also, designing interface to this system with four buttons which are input, report, search and exit. Importance of the study is ending problems of the paper documents that have been used in storing employees data.

Conclusions of this study are users can select the required information easily by using the main interface and the executive buttons. The system can warn the user by message when there is a wrong in implementation. The user can get the reports by using different keys. The system can be used by people who have simple information about computer.

The aim of the other study [10], raise the level of services provided to students through preparing of documents and results by electronic system. Making all information and data relating to students in one place is database. Speed in completing the tasks of the department through retrieving data and processing by using the system interfaces. Give each student identification number which facilitates the process of administration of information. Support the administration of college the ability to speed decision-making. This system provides a kind of protection to the

data by preventing unauthorized users from accessing to the data stored in the system. Since the department suffers from a lack of staff, the adoption of this system does not require a large number of employees.

Conclusions of this study are collection of students data in one place and making various transactions and modifications on it, and retrieve this data according to the need of generating the report. This system will transfer the work in this department from the manual to the computer-based system, and is able to store huge data of the students, also enables the user to get access to data through a user-friendly interface. In addition, this system promotes the management of college to carry out its tasks high efficiently. Student information system reduces the time and effort required in the process of management students' information, also reduce the need for a large number of staff to carry out the functions of the department of student affairs, where the management of this system needs to only one employee, furthermore it will help the administration of the college to speed decision-making which flows into the benefit of the college.

The aim of the study [13] is design and build of a database management system for students in the department of computer science. Through DB, it is possible to store the information and data typical manner. This data will be connected to each other by a reciprocal relationship.

Results of the study are using the "ER-Model" then "Relational Model" strengthens DB and detects errors from the beginning. Applying steps "Normalization" to find the best standard formulas at least "3NF" for "Relational Model" to overcome the problems which is facing DB for example data redundancy. According to "Relational Model", it can establish an integrated DB for students in the department of computer science in line with the descriptive tables. The system does not need "Denormalization" because there is no problem in final tables. Access time and data processing through entering, retrieval, update and delete is almost negligible. Using "Embedded SQL" within an application "Microsoft Visual FoxPro" can be a good way to data retrieval and also to view reports. Student ID number is useful in search, reports and queries because it is a primary key in the database.

Conclusions of the study are good analysis for the system from the early stages makes DB strong. "Relational Model", which is based on mathematics basis can configure an integrated DB. Storing the attributes in a sequence way within table

does not affect content of the table and the user can store the attributes in random sequence.

The study [16] is aiming to build electronic documentation system by using (Oracle) and designing distributed database for management unit of the postgraduate studies and connects it with administrative units and academic departments in the university. Importance of this study are facilitating the work in the units and departments within college and organizing it by using distributed database. Time saving, by using the electronic mail system in dealing among administrative units in the college. Prevent unauthorized persons from access to the system by protection gate. Insert electronic pictures documents and directory of graduate studies within database tables.
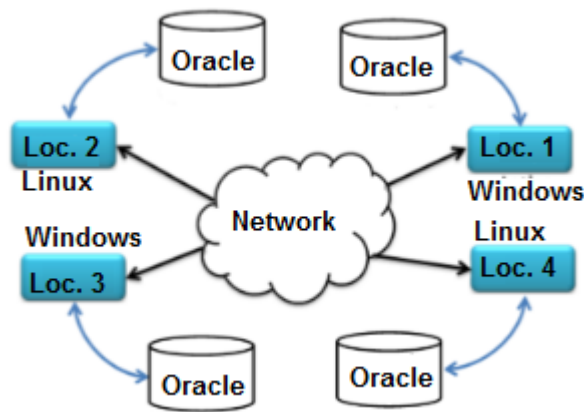
Figure 5 Distributed database [16]

Conclusions of the study are the user can access to the system from any computer at network because linking database in LAN network with all users. The system can process the technical problems facing data by using tools within DBMS "Oracle". Easiness in dealing with images and PDF by using multimedia databases in designing database. Using horizontal retail depending on (issued code, incoming) will lead to retrieve the data easily because the mentioned codes will be the keys to deal with data. The system provides transmission easily among the windows and provides reports print, search and view the electronic documents.

The aim of the study [17] is automating of administrative work by using information and communication technology to reduce time and effort in preparation of the reports. Building a system to provide students database and store the documents, information and reduce number of employees in the administrative units.

Advantages of this study are reducing the administrative effort in obtaining the information and the number of the employees because the one employee can handle with the proposed system. Accuracy in the work because the proposed system can provide accurate data and information to user through storing them in the database. Easiness in system development, where can add a new relationships to ER diagram and DBMS change from Microsoft Access which used in the proposed system to another one for example Microsoft SQL Server, Oracle. The system depends on an automatic coding to facilitate process data input through DBMS which is used in designing the proposed system where provides this technique.

Conclusions of the study are the system provides database to save information the students, hence making the modification and query on this information easily. Reducing administrative effort through dealing with digital information and the computerized processes without searching in the paper documents. Reducing the number of the staff because the proposed system can handle with one employee. Getting reports in less time by using the executive buttons to retrieve and printing information.

2.2.2 Literature review which have relation with web applications

In this part there are three studies [14], [18] and [19] which deal with web applications. The first study [14] is aiming to provide flexibility in exploring suggested projects and displaying full details for each specific project to make reservation decision easier.

Conclusions of this study are flexible interactive windows that help to reserve projects online. A faster reservation procedure, because of saving time of searching for the professors to ask about project details and requirements. Saving all completed projects in electronic archive, hence it will be easy to retrieve them in the future.

The aim of the study [18] is access to information for the customers easily after system application based on network. The system maintains the information and data from loss or damage through storing them in database. There is no process of repeat while collecting and processing the data because database design according to logical steps for example, ER diagram and relational model.

Conclusions of this study are the system provides database contains information to each employee in the institute for retrieving this information and updating it easily.

The customer can access to the information easily from different administrative units through LAN network. The system provides speed; accuracy and reliability in inserting and updating the data. The system contains interfaces that characterized in the easiness of use and uncomplicated ones. Searching in the system through the name of the employee, gives speed in getting the information by using employee name as a primary key in database.

The aim of the study [19] is demonstrating the importance of using relational database management system in working with web applications. The author chose MySQL technology such representative relational database management system because has: portability, scalability, speed, is easy to use, is open source, is widely used by web developers and provides good security.

Conclusions of the study are high performance because MySQL can run on a variety of operating systems such as, Linux, Windows, Mac OS X and Solaris. Meanwhile, it can work with millions of transactions. Easy to use because MySQL is easy to configure and administered. Scalability, MySQL is open source and it can be easily adapted by the user for his own requirements. It also manages very large databases. Good security because MySQL provides increased security through the implementation of encrypted passwords and ensure data protection through specific mechanisms.

2.2.3 Other studies

There are also different studies [11], [12] and [15] about applying EG and EM. The aim of the study [11] is recognizing the electronic management as a description of modern administrative, and what are the elements and requirements to apply electronic management.

Conclusions of the study, electronic management is comprehensive transformation in concepts, theories, methods, procedures and legislations that is depended by the traditional management. It is complex process, integrated system of technical components, Informatics, finance and human.

In the study [12] which is aiming to design and implement an e-government workflow that acts as a software platform to connect the government agencies together. The application enables the employees of different ministries to exchange electronic mails between each other in very secure and flexible way, it enables a user

to create a text message using a very sophisticated text editor (WYSIWYG), and also the user can attach a file to the message with a maximum size of 10Mb, then send that message to the specified receivers according to the government hierarchy (Ministry, Office, Department, Employee).

The EG Workflow contains an administrative console which contains web pages that enable the administrator to create new users, add or edit ministry, office, department and official positions. For test purposes the designed application is deployed to a web server http://www.mobiiraq.com/egov, where many users have been registered to the application and tried it.

Conclusions of the study are using the developed e-government workflow system in this thesis, it will provide an advantage to the government in minimizing the waiting time of sending and receiving official messages between the employees of different ministries in the government.

Also e-government workflow provides an easy and effective way to store the messages sent and received as an archive. Security in the e-government workflow is an important issue, hence the proposed design in this thesis takes that into consideration:

1. The managers of the system add their employees, hence there is no auto registration, all the employees are trusted people and known by the managers which makes the application   more secure.

2. When a user type the URL of the application on the browser that user is automatically to a login page that contains a login box only without any controls to hide the details of the application for unauthorized users, and when that user is logged in successfully is redirected to the required page.

3. The use of ASP.NET 2.0 gives the system more security, because the data membership of the system built using stored procedures which prevents the SQL injection attack.
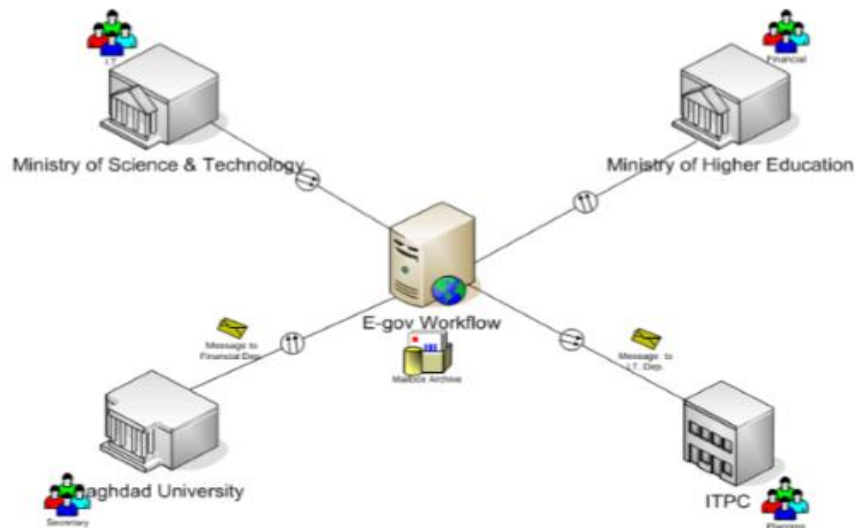
Figure 6 E-government workflow description [12]

The study [15] which is aiming to apply and implementing of EG, through the scientific literature in this field and analyse main issues for transformation from public administration to modern management.

Conclusions of the study are ICT and particularly internet-technologies are increasingly shifting into the multidimensional citizen society sector, requiring new forms of researches, administration and education. Provision of alternatives to e-governance is an expensive, (it does not provide the expected savings in expenses) and was not fully accepted by citizens and generally did not improve the inclusions, innovations or participation of citizens in key decision-making. Based on world experience, we can affirm that many developing countries do not possess the infrastructure for provision of e-government services on their entire territory. Developing countries must include the development of ICT- infrastructure in the e-government development strategy, developing new approaches to solution of the access problem. Analysing the current condition of the e-government in the world, it can be noted that, the growing technical gap between countries more developed in the informational field and the developing countries, is still an actual problem.

2.3 Discussion

It is normal to be agreed with [10], [13], [16] and [18] about what came in the studies of designing the databases, electronic management system, human resources information system (HRIS) with technologies and tools used in building and implementing of these systems.

Resources of [9], [14] and [17], can be accepted from in regard with problem analysis and putting steps for achieving the aim. On the other hand, using simple programs such as "Microsoft Access" is to build personal databases and it is not the best solution to all the problems mentioned above in these studies.

The study [12] achieved all required aims through using the components (hardware and software) and modern tools. Additionally, the study depends on the problem analysis by algorithm which is divided into three levels that gives strength in building the system.

In sources [15] and [11] depended on theoretical aspect in electronic management application and facing the constraints that prevent the conversion of the traditional management to electronic management. These studies can be useful before applying the practical aspect to remove the obstacles that face it.

The study [19] is depended on MySQL technology in building database because this technology is easy to be used, speed and provides increased security. This study is useful in web applications since it gives security for data existed in network.

Through what have been mentioned in the previous studies, it can be said that system building and the analysis of the study problem by using appropriate tools and the components (hardware and software) to access the required aims in applying human resources management system in presidency of Diyala University. However, there are some constrains that may face the application of this system for example, organizational, technical, financial and human obstacles. By training courses for the employees about electronic management and computer use, these constraints can be overcome. The government or ministry can provide university with requirements to apply this system.

CHAPTER 3

METHODOLOGY

In this study we will use information systems in HRM to apply a new system which is called HRMS. This system needs three steps to be designed and implemented. In each step, tools or particular software to complete the system was used. The first step is analysing and building DB, the second step is designing the interfaces and the third step is linking database with interfaces. After that, the proposed system can be prepared for implementing.

To design a computer-based system, it must use some modern techniques of computer programs used for this purpose. In the proposed system we will use two technologies, the first one is "Microsoft SQL Server" to build database, which is supported by SQL language. The second one is "Microsoft Visual Studio" to design interfaces by using VB language. In the following topics will illustrate these steps, techniques and how to use them to design a HRMS.

3.1 Analysing and Building the Database

The important issue in building of the database is in meeting needs the university and the end-user. However, the researcher works as an employee in presidency of Diyala university, hence he can selects the basic needs. Also, we can analyse and building of database through what came in the previous studies which were mentioned in chapter two. These studies depend on analysing and designing a group of logical systems. Firstly, building of conceptual model to database is based on ER diagram. Secondly, converting conceptual model to relational model. Third, selection appropriate DBMS to work with the proposed system. Fourth, programming and applying to use programming language in building DB.

3.1.1 ER diagram

To get good database without a redundancy, the process must be analysed accurately. Through the study, the project model is presidency of Diyala University that has two major entities which are "Employee" and "Department". The entities are specific objects or things in the mini-world that are represented in the database [8]. There are properties used to describe entities which are called attributes. The figure (7) is showing the entity and attributes.
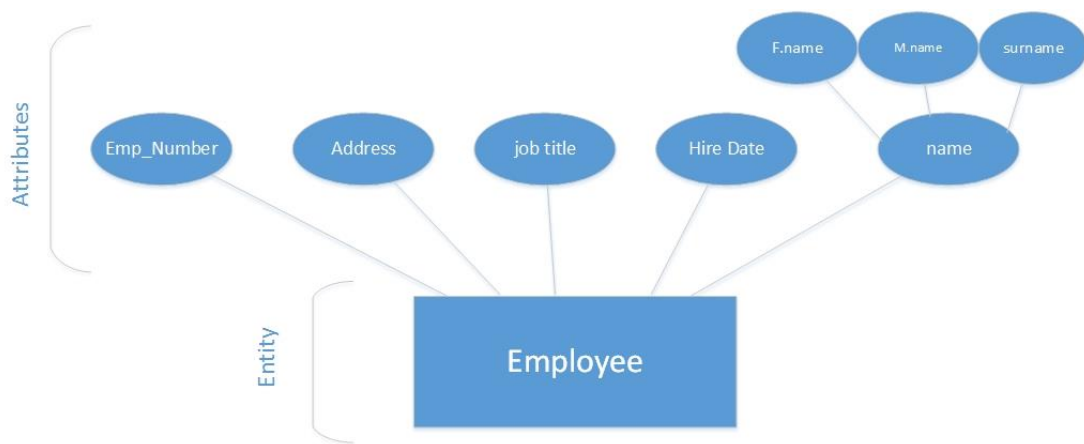

Figure 7 The employee entity and attributes

There is more than one type of the attributes and each one has particular properties. Simple attribute is any attribute that has a single value; composite attribute may be composed of several components and multi-valued attribute may have multiple values [7]. Each entity is representing as a table in database and each attribute is representing title of field for that table. There are two types of entities, the normal entity with a key attribute and the weak entity without key attribute. The advantage of key attribute is lies in connecting the entity or table with another table through relationships between the entities.

Presidency of Diyala University has two entities which connect with each other by relationships. Each relationship has a particular name in the diagram for representing the relationship name in the database. There are several types of relationships that connect between the entities. Relationship one to many (1:N) means one record in

the major data table corresponds more than record in other table and this type is the most used one. Relationship one to one (1:1) and relationship many to many (N:M). One of important step to build the database is description through diagram and this process is called entities relationships (ER). It is a model used to describe a database and the relation among the databases [7]. This model shows the links between entities via points or keys, as shown in figure (8).
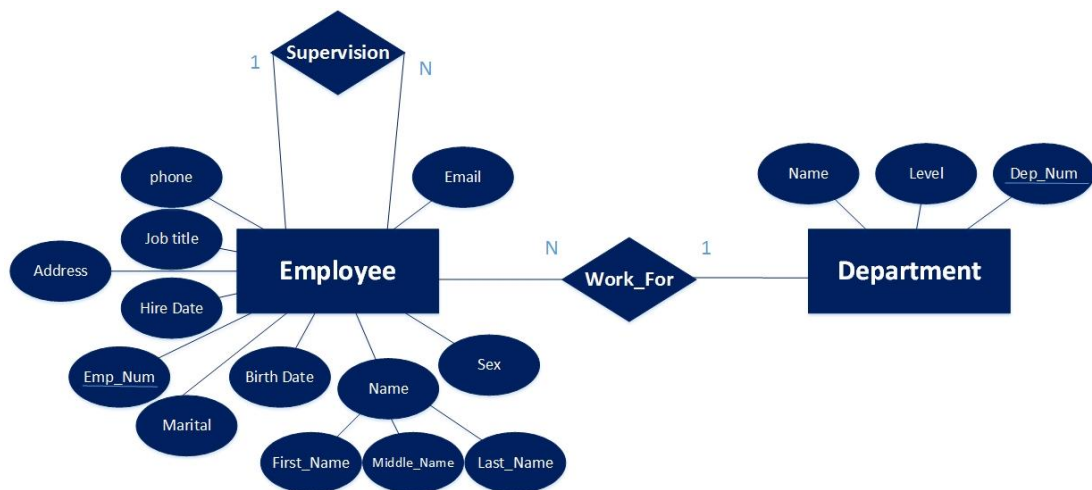
Figure 8 ER diagram

3.1.2 Relational mapping

Relational mapping is based on ER diagram to establish new diagram which shows the connection among entities through keys. Relational mapping algorithm contains seven basic steps [7]. The first step is mapping of regular entity types, the second step is mapping of weak entity types, the third step is mapping of binary 1:1 relation types, the fourth step is mapping of binary 1:N relationship types, the fifth step is mapping of binary N:M relationship types, the sixth step is mapping of multivalued attributes and the seventh step is mapping of N_ary relationship types, as shown in figure (9).
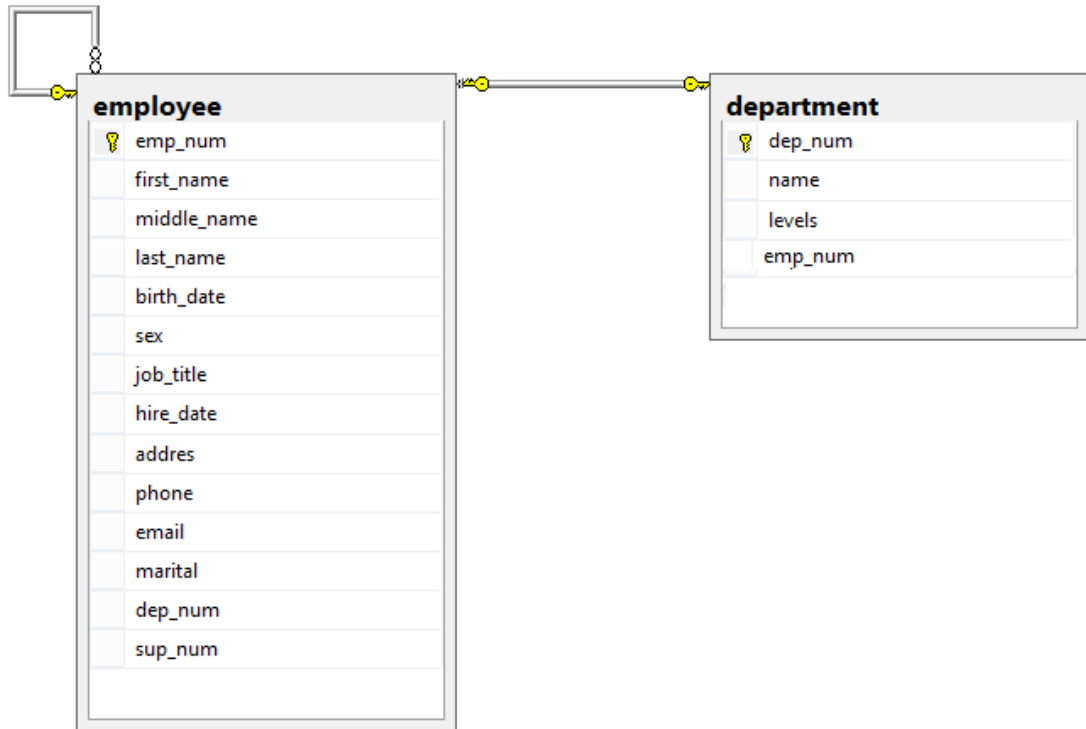
Figure 9 Relational mapping

3.1.3 Normalization

Normalization is process of division the data into groups of relationships that characterized by homogeneity and without redundancy [21]. Normalization rules are collection of standards for designing the databases and segmentation the relationships (tables) to smaller relationships.

3.1.3.1 Advantages and disadvantages of normalization

Normalization process leads to reduce redundancy of the data and heterogeneity between data. It also leads to cost reduce update and processing the data, conversion relationship M:N to relationship 1:N. At the same time normalization contains disadvantages such as complexity of processing that is caused by indexes use and reduces the efficiency of the system commands.

3.1.3.2 Normalization rules

There are set of rules for applying the normalization process [21]:

- First normal form (1NF)
- Second normal form (2NF)
- Third normal form (3NF)
- Boyce-codd normal form (BCNF)
- Fourth normal form (4NF)
- Fifth normal form (5NF)

After it has been normalized, the process will be logical and without disadvantages and it will be at least in third normal form (3NF).

3.1.4 Database programming

In most relational databases is accessed using a query language SQL, this language allows users to query data in addition to the ability to add, change and drop records databases. Also, the most of the previous studies which were mentioned in chapter two achieved the aims by using SQL.

What is SQL?

SQL, which is a computer language for storing, manipulating and retrieving data stored in relational database. It is the standard language for relation database system. Relational database management systems such as MySQL, MS Access, Oracle, Sybase, Informix, Postgres and SQL Server use SQL as standard database language [22]. SQL is consisted of three major groups and each group contains saved words that perform a particular function.

1. Data definition language (DDL) is the commands used in managing the database, for example CREATE, ALTER, DROP and RENAME.
2. Data manipulation language (DML) is a group of commands for dealing with data inside the database, such as SELECT, DELETE, UPDATE and INSERT.

3. Data control language (DCL) gives a particular authorization to users, such as GRANT and REVOKE [22].

Why use SQL?

- Allows users to access data in relational database management systems.
- Allows users to describe the data.
- Allows users to define the data in database and manipulate that data.
- Allows to embed within other languages using SQL modules, libraries and pre-compilers [22].
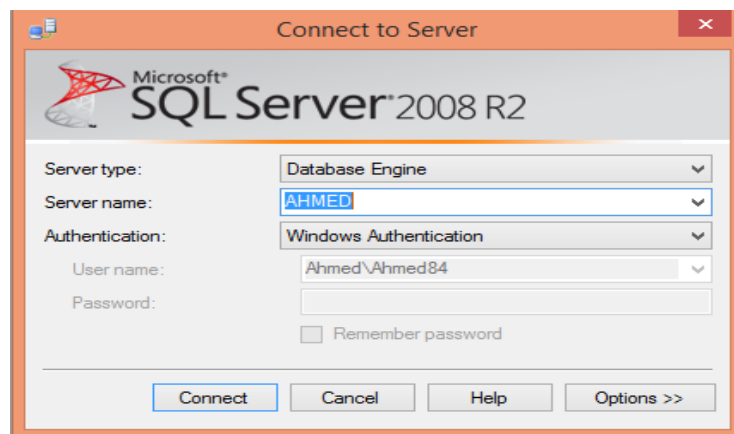
3.1.4.1 Microsoft SQL Server 2008

Microsoft SQL Server is one of the Microsoft Company products. The system contains many tools [23] for example; management studio that used in providing user interface to design database, as shown in figure (10).
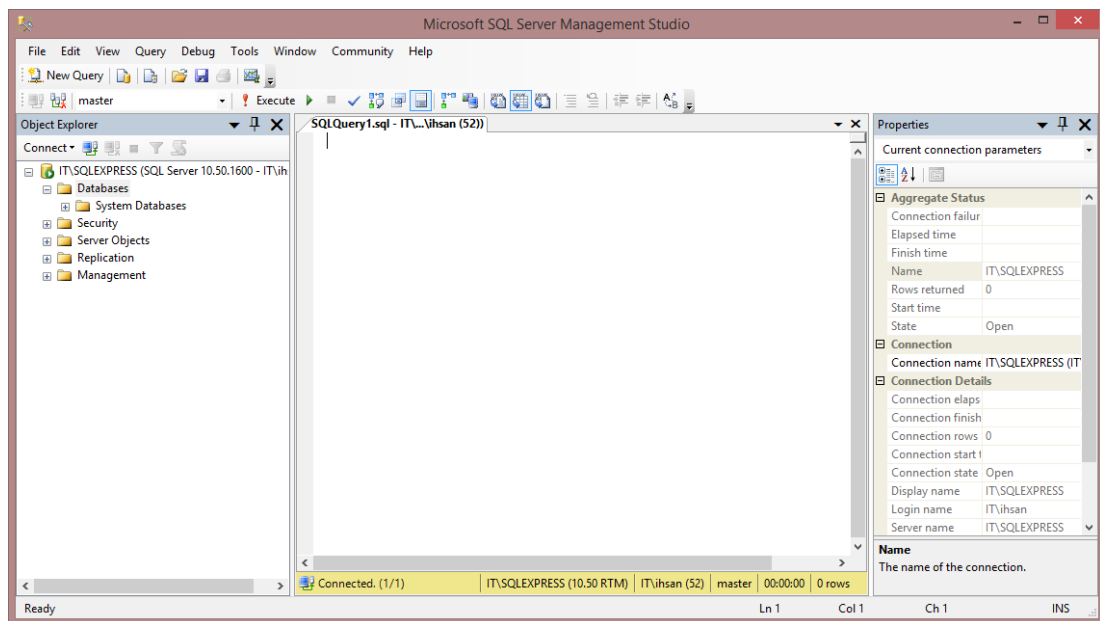

Figure 10 Microsoft SQL Server Management Studio

There are two methods for designing the database through Microsoft SQL Server. The first method is filling the data in a table while the second one is typing the commands through the query. Before start designing the database, we must achieve the connection condition between the system and the server. The server is a personal computer, where the connection condition can be achieved through entering the server name, as shown in figure (11).


Figure 11 Connection to server

To establish a new database by using a graphical user interface through Microsoft SQL Server Management Studio, we have to right click the database folder and select a new database then a new window will be shown, as shown in figure (12).
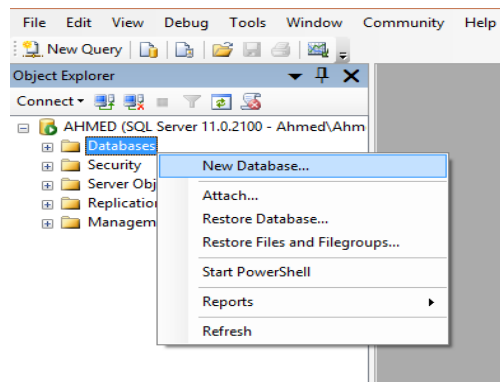

Figure 12 Establishing new database

After that, new database window will be shown and we can write the database name in text box for example "university" and click ok, as shown in figure (13).
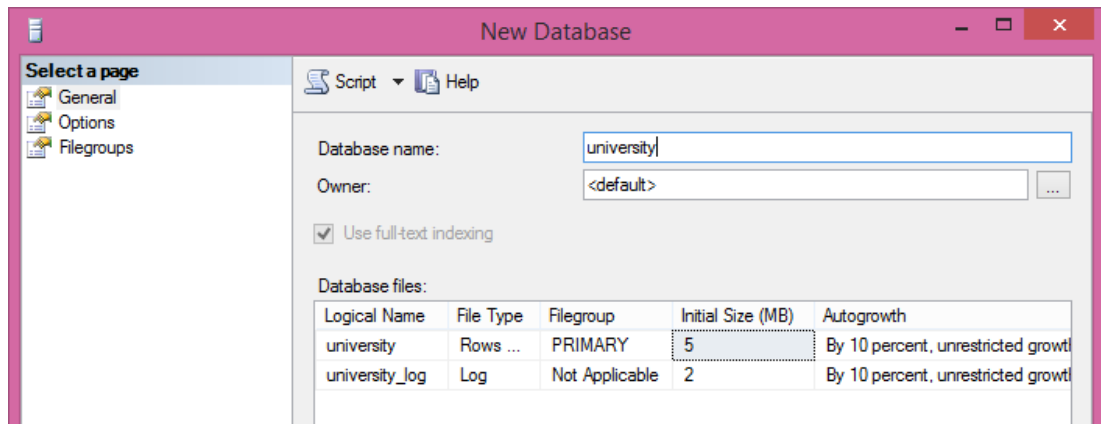

Figure 13 Database new name

Here, it can be started to create the tables inside database through two ways. Firstly, we expand the database, right click the table and select new table, as shown in figure (14).
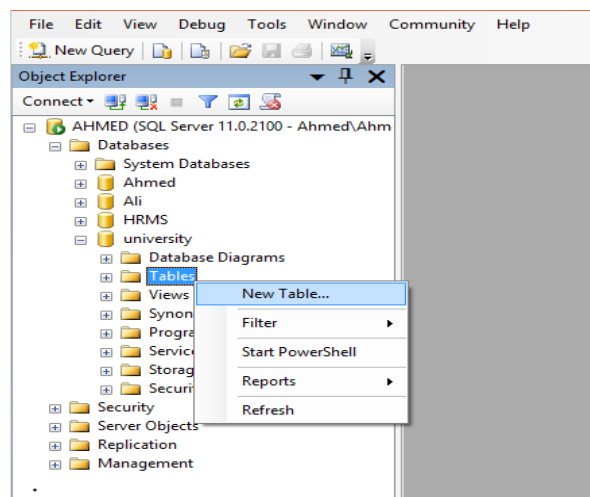
**Figure 14** Creation of a new table

Then, the name of the table and data type will be entered. After that, there is field allowing for the column to be null or not. The name "emp_num" can be filed for the

first column name and data type for this column will be "numeric", while the second column name will be filed with "first_name" and data type for this column will be "nchar" etc. As shown in figure (15).
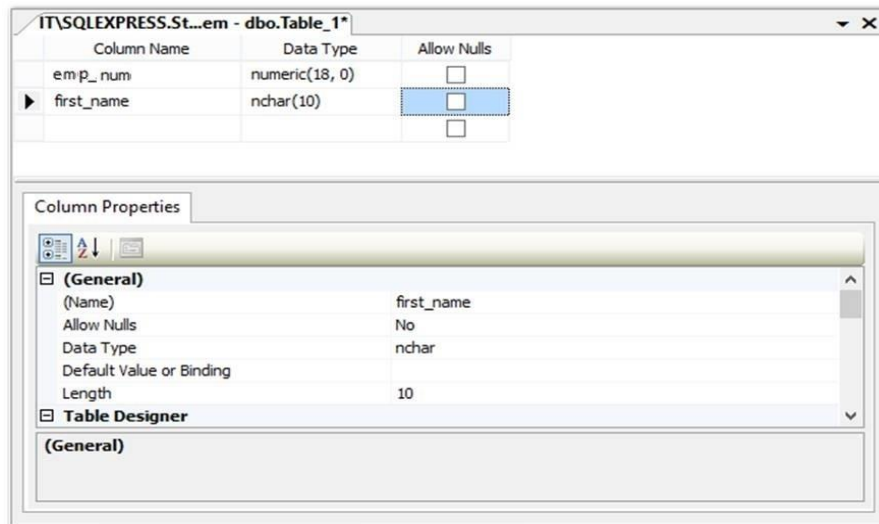

Figure 15 Filling a new table

After we finish filling the table, the database can be saved by a particular name. For example, when we exit from a previous window in figure (15), text box will be shown and we can write a table name inside it by the name of "employee" then click "ok", as shown in figure (16).
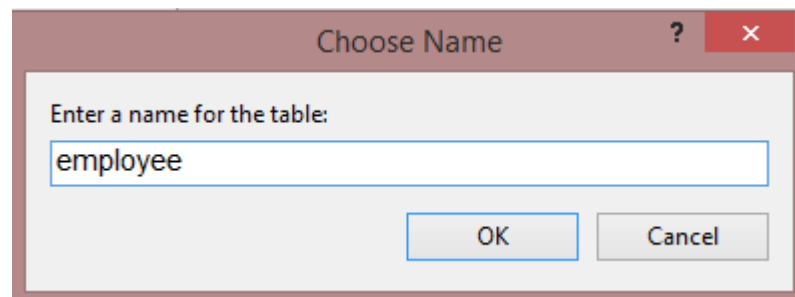

Figure 16 Table name

Secondly, we establish a database by using structured query language SQL. To build the database, we have to click "new query" from the top left menu in Microsoft SQL Management Studio. Then, SQL window will be shown and we can write the command to create a new database in this window by the name of "university". After that, we can save the database when we press "Execute" and message "Command(s) completed successfully" will be appeared, as shown in figure (17).
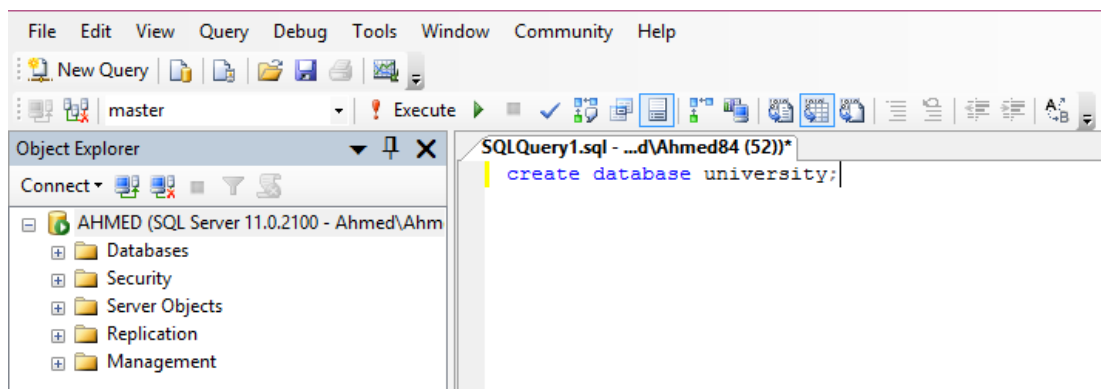

Figure 17 Creation database by using SQL

After the database is created, we can create the tables inside the database, through previous window in figure (17). Then we delete the previous command, write "use university" and press "Execute", as shown in figure (18).
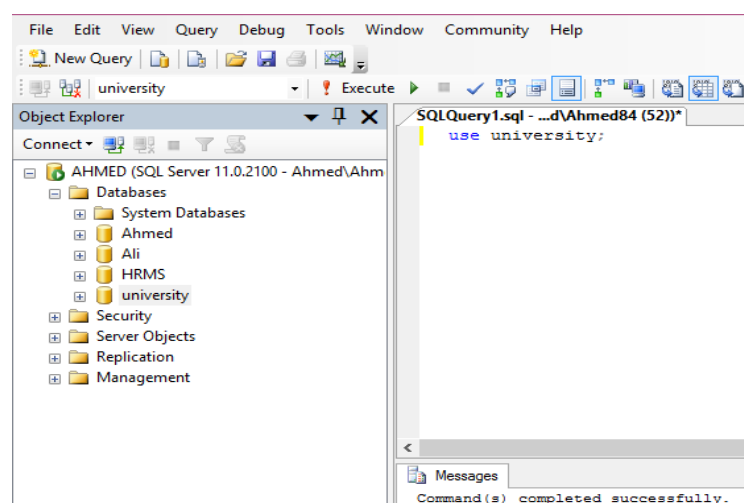

Figure 18 Database selection for use

Here, a new table in database "university" through the same window typing "create table employee" can be created then we write a column name and data type, as shown in figure (19).
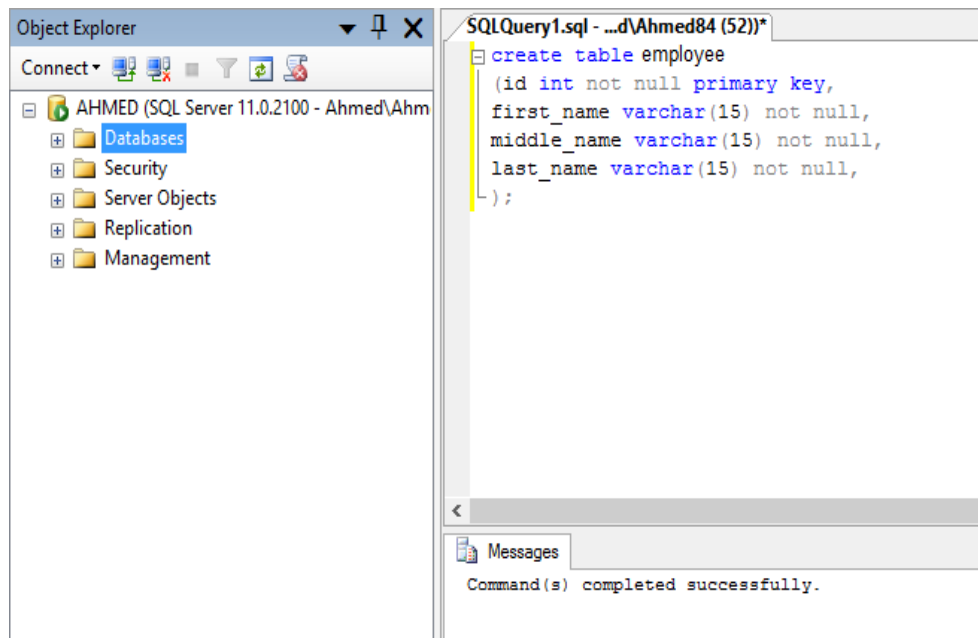
Figure 19 Table creation by using SQL

We enter the data to table fields by using SQL through typing command "insert into employee" and the data is "2014" for first column and "Ali" for second column etc, as shown in figure (20).
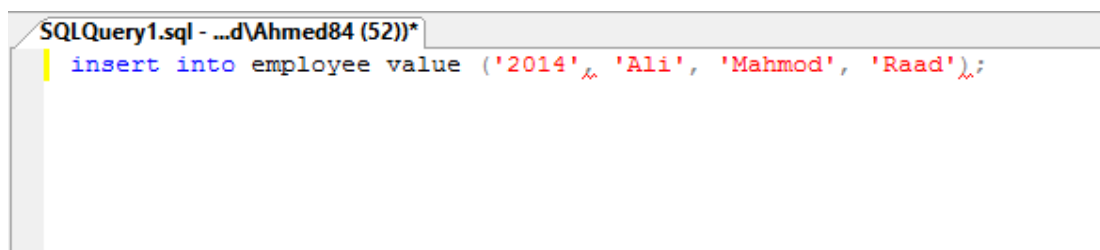
Figure 20 Data insert to table

3.1.5 Database result

The final result to build the database get the following tables, "Employee information" and "Department information" are shown in tables (1) and (2).

Column name	Data type	Null or Not Null	Description
emp_num	numeric(15,0)	Not Null	employee number (pk)
first_name	nchar(15)	Not Null	first name
middle_name	nchar(15)	Not Null	father's name
last_name	nchar(15)	Not Null	grandfather's name
birth_date	date	Not Null	date of birth
sex	nchar(8)	Not Null	Gender
job_title	nchar(10)	Not Null	job title
hire_date	date	Not Null	date of hire
address	nchare(10)	Null	constant address
phone	nchare(10)	Null	phone number
email	nchare(10)	Null	electronic mail
marital	nchar(10)	Not Null	marital status

Table 1 Employee Information

| Column name	Data type	Null or Not Null	Description
dep_num	numeric(15,0)	Not Null	department number (pk)
name	nchar(15)	Not Null	department name
level	nchar(15)	Not Null	department or unit

Table 2 Department Information

3.2 Designing the Interfaces

After the database is build, we design the interfaces by using Microsoft Visual Studio 2010 which is an integrated development environment from Microsoft Company provided with a graphical user interface (GUI), textual programs and web applications [24]. Visual Studio contains editor of codes, a compiler to detect the errors and a designer for building GUI, as shown in figure (21).
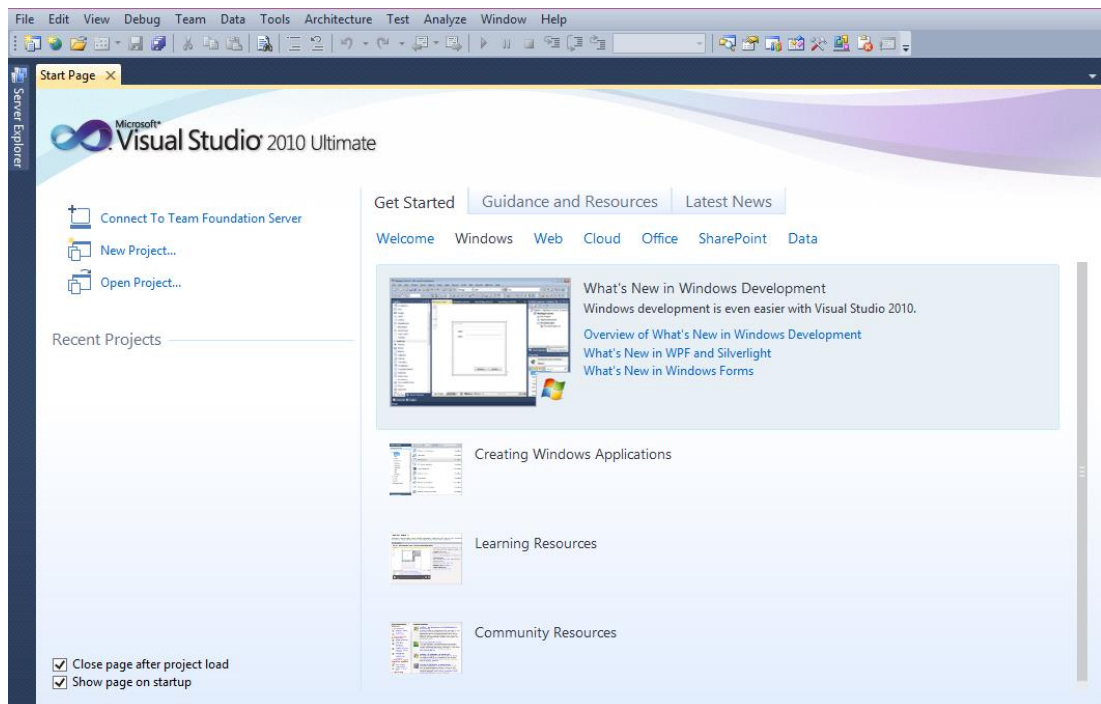

Figure 21 The main interface of Visual Studio 2010

There are many steps for establishing GUI and connect it with database, through the previous window (21). From the menu bar we click "File" and select new project or through clicking "New Project" from the left of the previous figure, as shown in figure (22).
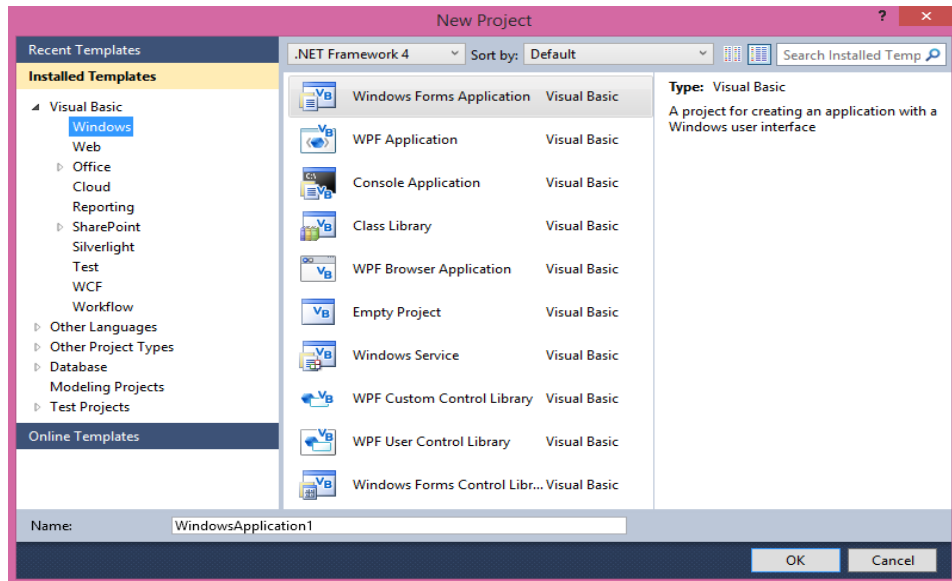
Figure 22 New project

After that, we can select the work environment for the new project. In this study, the work environment will be "Windows Form Application" and it can be reached through the first selection in the previous window. Then we select "Windows" and click "Windows Form Application". Finally, the work window will be shown, as shown in figure (23).
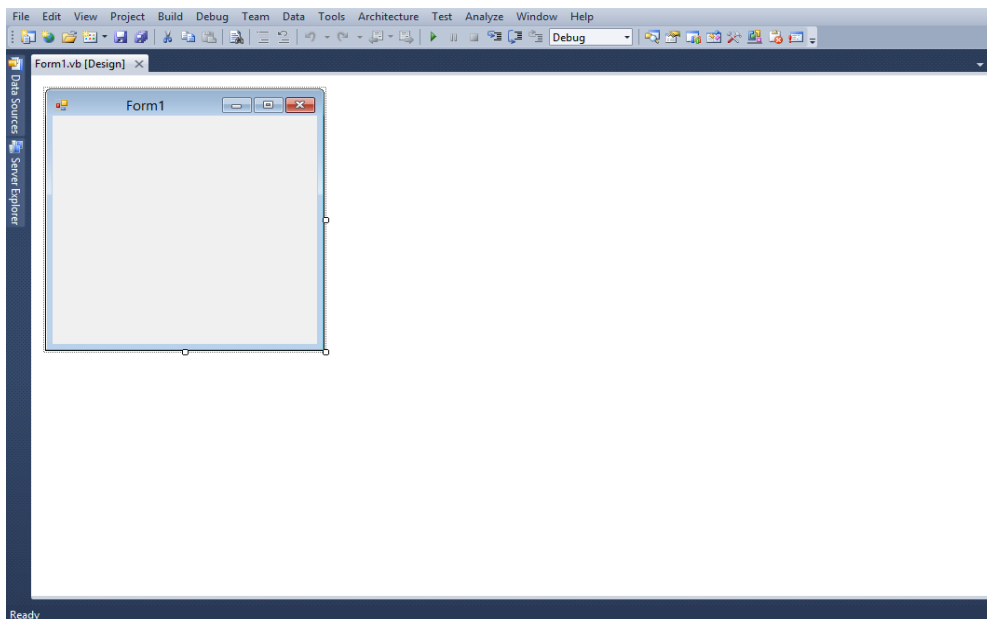
Figure 23 The work environment

The work environment contains a collection of the tools and windows. The first one is the project window which is called "Form" or "Design" and it is shown when we open a new project, as shown in figure (24).
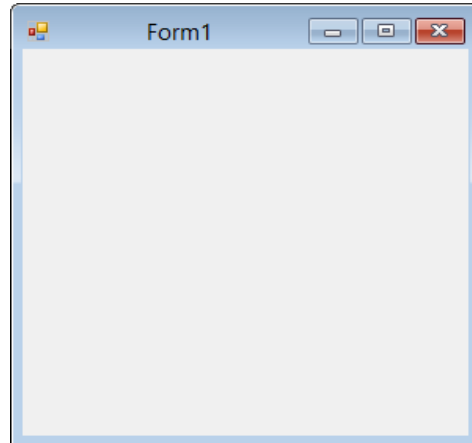
Figure 24 Form

The second one is the toolbox that contains a group of tools for design. We can access to toolbox through menu bar and click "View" then select "Toolbox", as shown in figure (25).
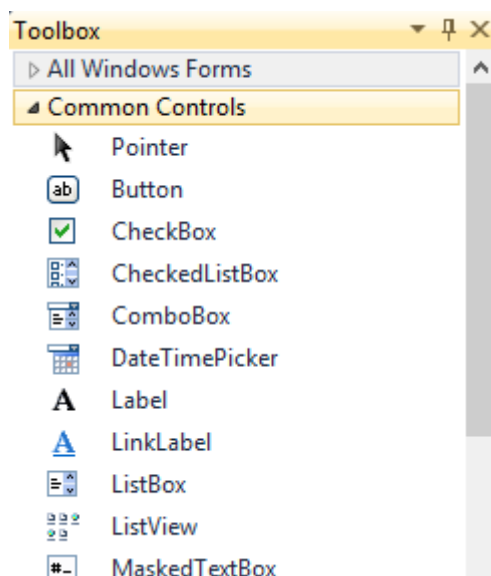
Figure 25 Toolbox

The third one is the properties window that shows the properties of the specific tools. For example, name, font type, size and colour, as shown in figure (26).
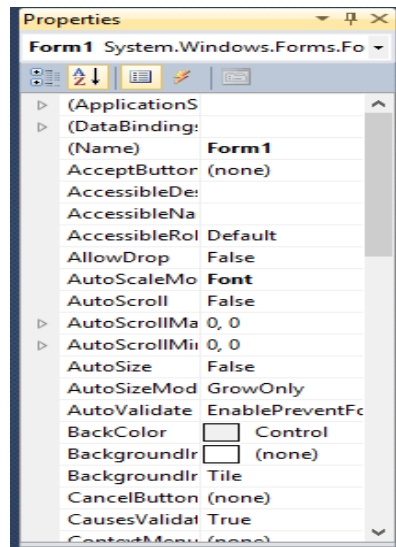
Figure 26 Properties window

After we view the work environment of Microsoft Visual Studio 2010, we can start to design GUI. Then, we establish the main interface containing "Form" that represents the window which has buttons to enter it to database fields. After that, we can change the name of "Form" to human resources management system through the properties window and insert logo of Diyala University, as shown in figure (27).

Figure 27 Creating main interface

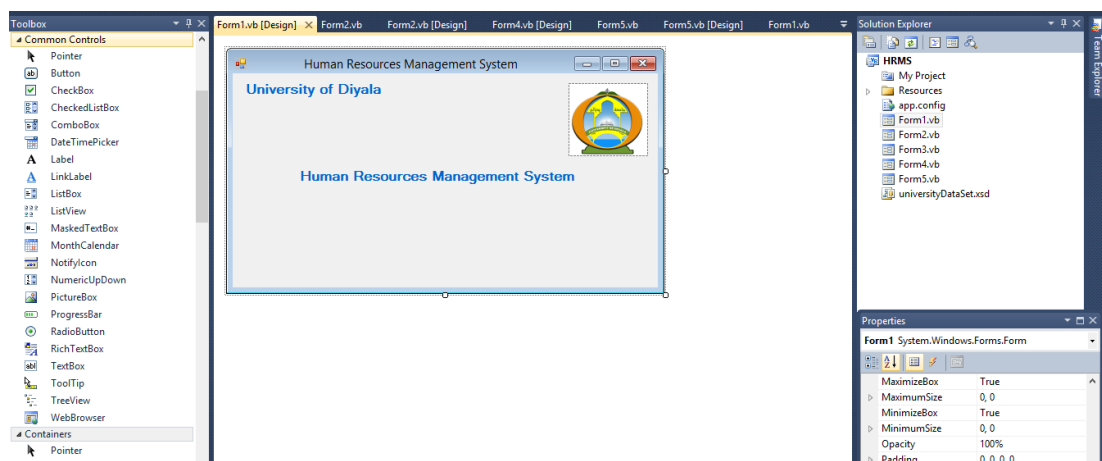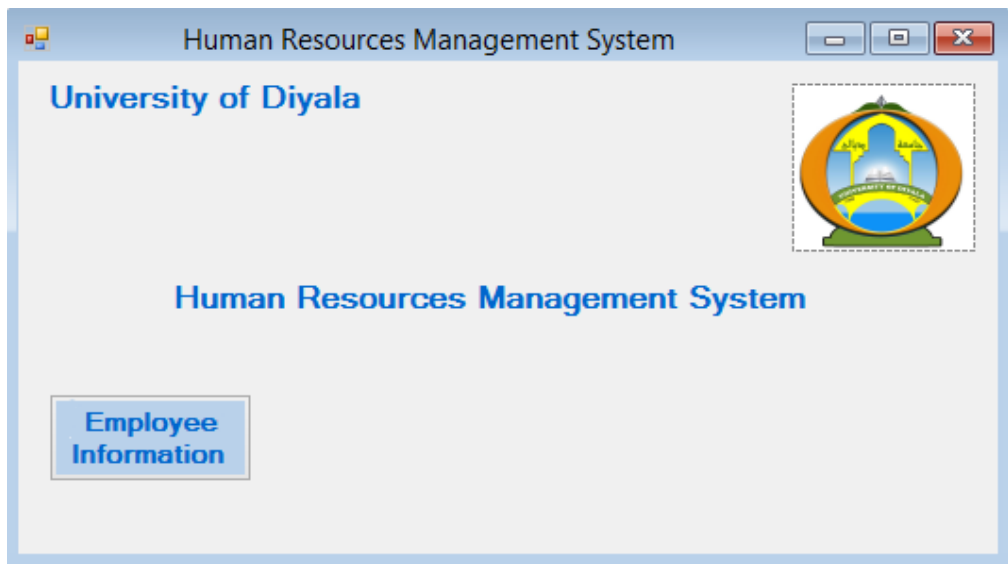Finally, we can add buttons to the window from toolbox select "Button" and drag it to the window. These buttons will be an entrance to sub-interface in the system, as shown in figure (28).

Figure 28 Buttons addition to the interface

3.3 Connecting the Interfaces with Database

The interface does not represent anything without content, which is database that must be connected with the interface. The requirements that are needed in this step contain the following: The first requirement is to achieve the connection condition between "Microsoft Visual Studio 2010" and the server to invoke the database. We click "Tools" of menu bar then select "Connect to Database".

In the connection window, there is a text box named as "Data source" where we can enter "Microsoft SQL Server" in this field and the other text box named as "Server name" then we can enter personal computer name is "AHMED" after that, we choose the database which is "university" and click ok, as shown in figure (29).
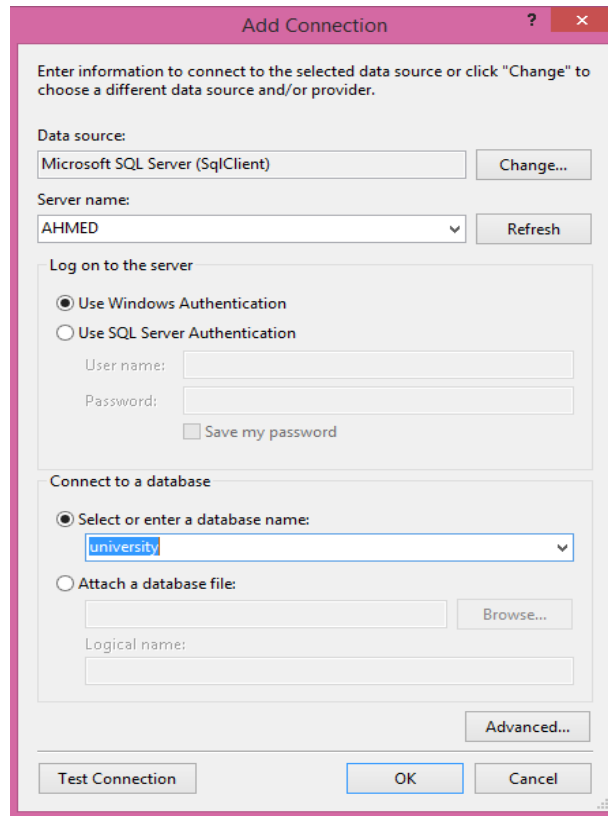
Figure 29 Connecting window

The second requirement is the programming language that it is needed to connect interfaces and database. Visual Studio contains programming language Visual Basic (VB) which is a programming language and software development environment [20]. Visual Basic contains many of commands and it is characterized by ease application. For accessing to VB window in Microsoft Visual Studio 2010, we double click on the "Form" or "Button" that we want to connect with the database and window for typing the code in visual basic language will be appeared, as shown in figure (30).
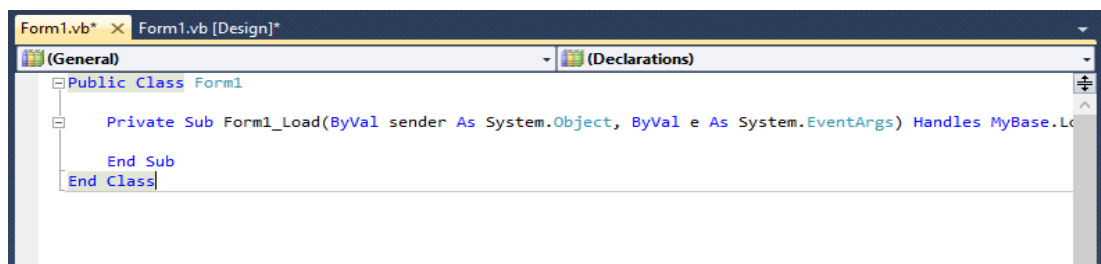
Figure 30 Visual basic window

35

To add sub-interface to the main interface from "Solution Explorer", we right click on the project name "HRMS", select "Add", click "New Item", select "Windows Form" and click button "Add", as shown in figure (31).
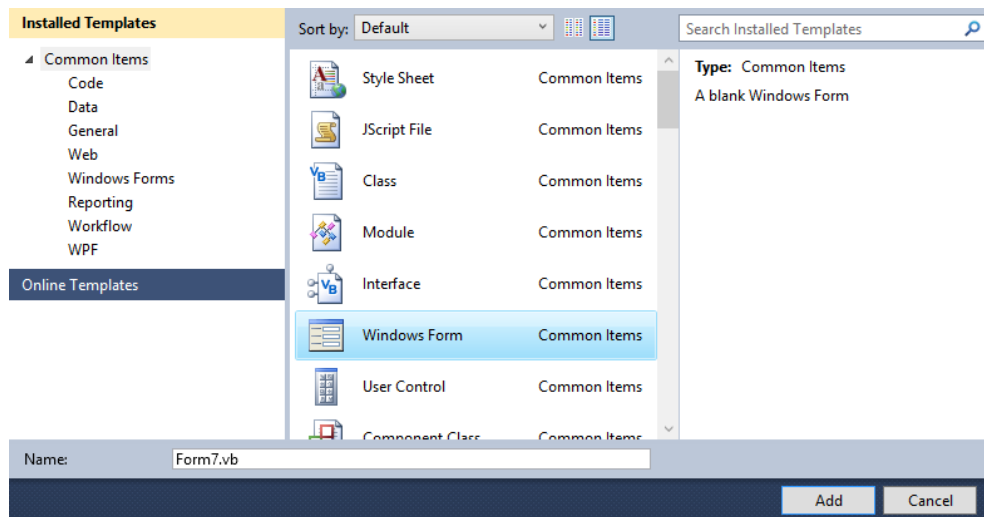
Figure 31 New form addition

3.3.1 Connecting the form with the database

There are a lot of functions or libraries within VS for dealing with the database. To connect the "Form" with the database, we double click on blank space in "Form" and window for typing the code will be shown. The first line of this code will be the library which contains set of commands for dealing with database type such as Microsoft Access, Oracle or SQL Server. The name of library for dealing with SQL Server is called "sqlclient", as shown in figure (32).
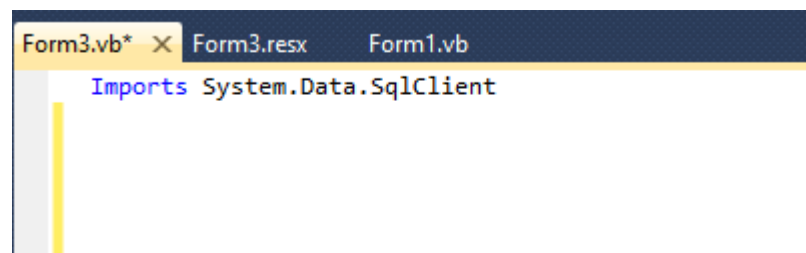
Figure 32 Function to deal with SQL Server

The second step is to define a variable connection. We can select any name for variable such as "emp" abbreviated "employee". After that, we invoke the database through typing the database source within code for "Form", as shown in figure (33).

```vb
Imports System.Data.SqlClient

Public Class Form3
    Dim emp As New SqlConnection
    Private Sub Form3_Load(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles MyBase.Load
        emp.ConnectionString = "Data Source=AHMED;Initial Catalog=university;Integrated Security=True"
    End Sub
```

Figure 33 Connection between "Employee Information" window and database

3.3.2 Programming of executive buttons

After we completed the connection process between "Form" and database, the connection between buttons and the tables in database comes later. In this step we can use commands of the SQL query language inside VB code. There is specific command for each button in the window. Programming the buttons depends on defining the variable that represents the connecting between the interfaces and the database and connecting this variable with SQL commands for example, when programming button "Addition", it is required to use the command "Insert" and with other buttons as well.

3.4 Implementation

This part exhibits designing result HRMS through viewing the interfaces and what are the benefits of applying the system in presidency of Diyala University. Interfaces use to insert, update, search and delete the data leads to simplify the process of interaction between the user and the system. GUI is a way to interact with a computer using pictures and other visual elements displayed on a computer screen [25]. With the absence of the interfaces, it is required to use programming in every time for a particular procedure on the data and this process needs more time for

achieving the aims. The system design in accordance with principle single window contains a set of buttons to login on the sub-interfaces. When we enter to the sub-interfaces we can conduct operations on data through textboxes and the executive buttons, these interfaces are linked with the database by VB programming language.

3.4.1 System protection

Security is an important issue in any application, where the paper information is prone to the damage or penetration easily. One of the aims of this study is to protect the data and the information from damages or loss and prevent unauthorized of accessing the data. Data and information stored electronically within the database and eventually it will be stored in the hard disc. There is many ways to make a backup copy of information and data by using compact disk, flash-RAM or external hard disk. HRMS contains a security window which works when the system is being operated through entering user name and password, as shown in figure (34).

Figure 34 Log in to the system

3.4.2 Results

Results of implementing the HRMS are to view the main user interface and the sub-interfaces. There is a specific function for each interface and buttons that supports the system in the executive procedures such as moving among windows and reports printing. Also, the system provides textboxes that help in insert, update and delete the data.

3.4.2.1 Main user interface

Main user interface (MUI) or system interface is a window that is shown after log in to the system. It contains a set of the buttons and each one has particular function, as following:

Employee information: it is an executive button to enter to the employee information window.

Department information: it contains department information for updating it.

Exit: this button is used to exit from the system, as shown in figure (35).
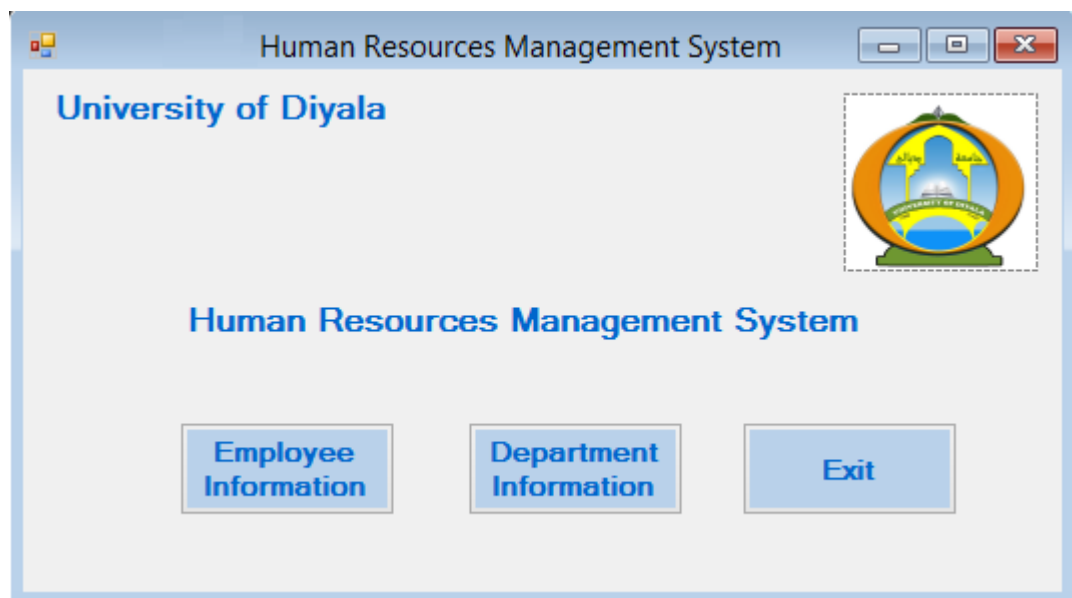

Figure 35 Main user interface
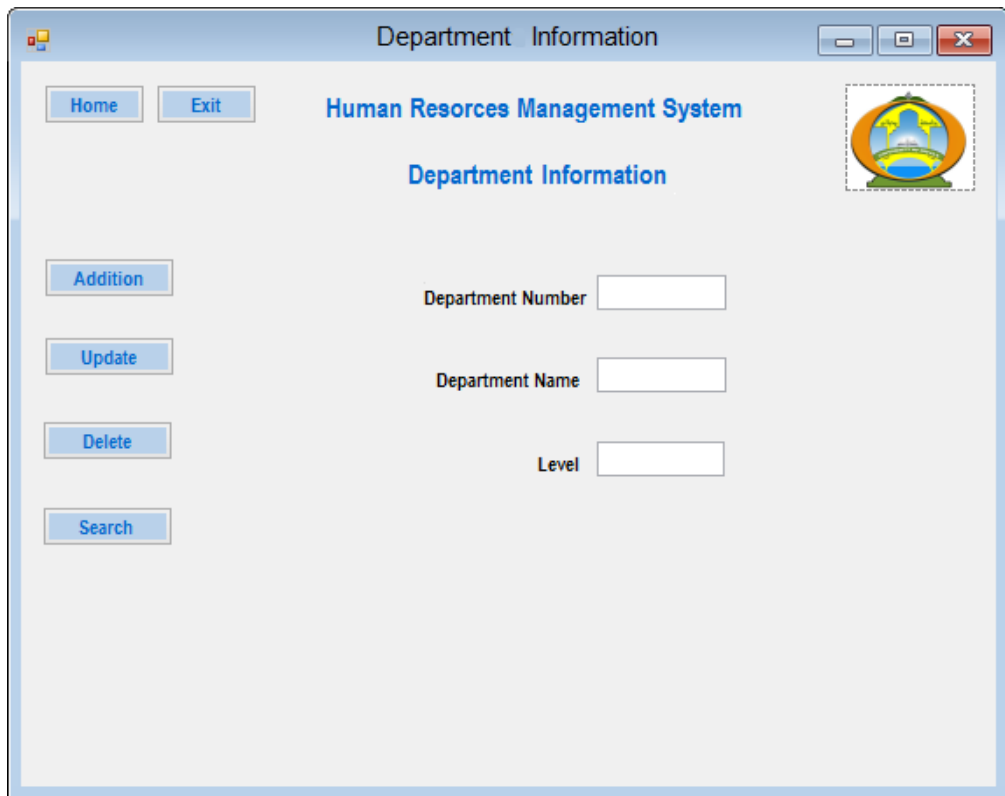
3.4.2.2 Interface of employee information

Interface of employee information is a sub-interface which consists of five executive buttons. The first one is "Addition". This button is used to add a new record which includes employee information. The second button is "Delete" which is used to delete the information from the employee table in the database when the employee leaves the job. This button is designed to delete the primary key for the field and eventually we delete all information from the field. The third button is "Update" which is used to modify and update the data. The fourth button is "Print" which is used to print information or reports. The last button is "Search" is important to retrieve the data and searching in the database through primary key or employee number or through any other field since there is more than one employee. Additionally, interface of employee information contains other buttons such as "Home" to go back to main interface and "Exit" to exit from the system, as shown in figure (36).

Figure 36 Interface of employee information

3.4.2.3 Interface of department information

It is sub-interface for dealing with the department table. This interface contains a collection of buttons to add, update, search and delete the data stored in the mentioned table, as shown in figure (37).

Figure 37 Interface of department information

CHAPTER 4

CONCLUSION

4.1 Finding

Findings that have been achieved through this study include the following:

- HRMS can provide a relational database containing information to each employee in presidency of Diyala University, hence easiness the search process about information and getting it.

- HRMS contains GUI that characterized in the easiness of use where retrieval data can through any field in the database for example, getting information by "Employee Number" or "Last Name".

- There is protection window to prevent unauthorized persons from accessing the system database.

- The user can return the output as input according of principle "Feedback", the purpose of this process: improve performance and getting accurate information.

4.2 Limitations

The work presented in this thesis has the following limitations:

- HRMS is designed to work in presidency of Diyala university and does not support other faculties in university.

- HRMS works within an environment "Windows Applications" which leads to reduce role of employee in updating information.

- Risks difficult to maintain the confidentiality of information and secure.

- Strategy immediate replacement from previous system to the proposed system without test and evaluating.

- The researcher work in presidency of Diyala university - administrative affairs department gives some requirements which university need and the end-user, for example, HRMS does not provide details about using the executive buttons or transition between windows to end-user. Also, the proposed system does not contain payroll system for employees.

4.3 Future Studies

To enhance the performance of the proposed system, some future studies are recommended:

- Designing database to each college in Diyala university and linking it by using the distributed database.

- Linking the HRMS with website of Diyala university to enable the employee to see the information and participating in updating them through designing a page containing the employee information which can be reached by user name and password to each employee.

- Building database by using DBMS which gives increased security to data for example MySQL.

- Using of strategy gradual replacement to the proposed system.

- Adding a new window "help" contains information about dealing with the proposed system.

- There is available space in ER diagram to add a new relationships and entities for example, adding the payroll entity.

4.4 Conclusion

In this study we have introduced human resources management system in presidency of Diyala university. The proposed design is done by using the information systems components such as HW, SW and data. HRMS is flexible; it uses the model of two layers which isolates the user interface in a layer and the database in another layer,

hence any change in one layer does not effect to another layer. For example to change the DBMS from SQL Server to Oracle does not require any code change or development just a minor change in the configuration file of the application, which makes the maintenance and upgrading process easy.

The system proposed achieved the purpose of this study. For example, applying an electronic system to HRM, this system contains database for storing the human resources information to presidency of Diyala university, it provides access easily to data through GUI which contains many of keys to conduct different processes on data, such as modification and query. HRMS allows just for authorized users from accessing the system through protection window.

Also, the proposed system leads to convert the paper information to electronic information and saved it in the database. Protecting the information electronically, which were in previous as a paper documents prone to damage.

The researcher can evaluate the proposed system through his work in university and seeing the current system which is used in university. For example, using are fields of database in retrieval the data through the system interfaces is faster in search process. The system speed to insert, update and retrieval the data, provides time and effort. Finally, university support in decision making through data accuracy, speed and realism that represents information about ability of real university without exaggerating in the estimates.

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