DESIGN AND IMPLEMENT OF DATABASE STUDENT INFORMATION

MANAGEMENT SYSTEM IN

COLLEGE OF MEDICINE – UNIVERSITY OF DIYALA

A THESIS SUBMITTED TO

THE GRADUATE SCHOOL OF NATURAL AND APPLIED

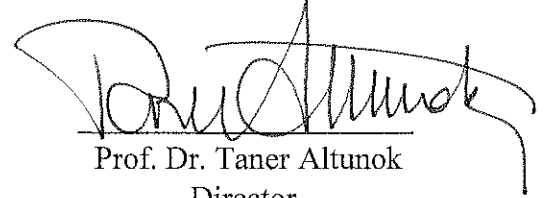**SCIENCES OF**

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IHSAN ALI HASSAN ALMEHMES

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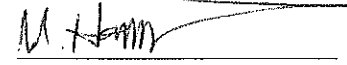Submitted By **IHSAN ALI HASSAN**

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I certify that this thesis satisfies all the requirements as a thesis for the degree of Master of Science.

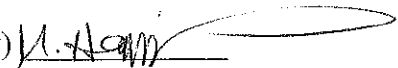Prof. Dr. Billur Kaymakçalan
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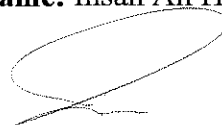
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ABSTRACT

DESIGN AND IMPLEMENT OF DATABASE STUDENT INFORMATION
MANAGEMENT SYSTEM IN
COLLEGE OF MEDICINE – UNIVERSITY OF DIYALA

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There were a number of problems associated with adopted manual methods to manage student information in the Department of Student Affairs in the College of Medicine – University of Diyala, these followed regulations caused delay in the delivery of services to students, inaccuracies in the completion of tasks and so on. A new system designed and implemented by using the tools of Microsoft Visual Studio 2010 (.Net Framework Environment) and Microsoft SQL Server 2008 R2 to solve most of the problems and obstacles resulting from the use of the old methods and techniques. The main work of the software design process included requirements

analysis, database description and logical structure design of the data. Database System test results show that the database system meets the requirements of each module with a graphical user interface and simple procedures. Student data can be updated by the administrator of the system efficiently, accurately in a short time and in a flexible manner. Finally concluded that adopted this new database student information management system helps to accomplish the tasks at high speed and accuracy, also helps the management of the college in speed of decision-making, which helps raise the level of performance of the college in general.

Keywords: Database Management System, Student Information System, Graphical User Interface, University of Diyala.

ÖZ

DİYALA ÜNİVERSİTESİ-TIP FAKÜLTESİNDE VERİ TABANI ÖĞRENCİ BİLGİLERİ YÖNETİM SİSTEMİNİN TASARIMI VE UYGULAMASI

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Diyala Üniversitesi-Tıp Fakültesi Öğrenci İşleri Departmanında öğrenci bilgileri yönetimi için kullanılan manuel yöntemlerle ilgili bir dizi problem bulunmaktaydı, izlenen bu düzenlemeler öğrencilere hizmet verilmesinde gecikmelere, görevlerin yerine getirilmesinde hatalara ve benzeri durumlara yol açmaktaydı. Eski yöntem ve tekniklerin kullanımından kaynaklanan problemlerin ve engellerin çoğunu çözüme kavuşturmak için Microsoft Visual Studio 2010 (Ağ Çatı Ortamı) ve Microsoft SQL Server 2008 R2 araçları kullanılarak yeni bir sistem tasarlandı ve uygulandı. Yazılım

tasarım sürecinin temel çalışması şartların analizi, veritabanı tanımlaması ve verilerin mantıksal yapı tasarımını içeriyordu. Veritabanı Sistemi test sonuçları veritabanı sisteminin grafik kullanıcı ara yüzü ve basit prosedürleri her modülün şartlarını karşıladığını gösterdi.Öğrenci verileri sistem yöneticisi tarafından kısa bir sürede esnek bir biçimde verimli ve doğru olarak güncellenebiliyordu. Nihayetinde şu sonuca varıldı ki; bu yeni veritabanı öğrenci bilgi yönetimi sisteminin kullanılması görevleri hızlı ve doğru yapmaya ve ayrıca fakültenin karar verme hızında yönetilmesine yardım etmektedir, bu da fakültede genel performans düzeyinin yükselmesine yardımcı olmaktadır.

Anahtar Kelimeler: Veritabanı Yönetim Sistemi, Öğrenci Bilgi Sistemi, Grafik Kullanıcı Ara Yüzü, Diyala Üniversitesi.

ACKNOWLEDGMENTS

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LIST OF ABBREVIATIONS

BI	Business Intelligence
CPU	Central Processing Unit
DB	Database
DBA	Database Management Administrator
DBMS	Database Management System
DBS	Database System
DBTG	Data Base Task Group
DDL	Data Definition Language
DML	Data Manipulation Language
DSA	Department of Student Affairs
DW	Data Warehouse
ERD	Entity Relationship Diagram
GB	Gigabyte
GUAM	Generalized Update Access Method
GUI	Graphical User Interface
HW	Hardware
IBM	International Business Machines
IDE	Integrated Development Environment
IDS	Integrated Data Store
IMS	Information Management System
IS	Information System
IT	Information Technology
MDS	Master Data Services
NAA	North American Aviation
ODBC	Open Database Connectivity
OS	Operating System
PL/SQL	Procedural Language/Structured Query Language
RAM	Random Access Memory

RBAC	Role-Based Access Control
RDBMS	Relational Database Management System
RPM	Revolutions Per Minute
SIMS	Student Information Management System
SIS	Student Information System
SQL	Structured Query Language
SSMS	SQL Server Management Studio
SW	Software
T-SQL	Transact-Structured Query Language
UML	Unified Modeling Language
VB	Visual Basic
VS	Visual Studio
XML	eXtensible Markup Language

CHAPTER 1

INTRODUCTION

Most businesses began, especially in developed countries, to store and save files on the computer since 1960, the experts of computing in the development of theories and methods of how to re-use of files that are stored in the computer, these files are called computerized, that expresses the uses of these files and methods were used to deal with these files. Store large files as a large base and containing all the recorded data, which can be used at a later time, this is called a database. Because of the databases are important and influential in all areas and main activities, so it is necessary to adopt a certain system to organize and manage the data stored, therefore this system is called Database Management System, this is a collection of programs that enable to enter, organize and select data in a database [1] and abbreviated as the DBMS.

Almost all universities and colleges have introduced educational computer systems designed to process their information [2], where the Universities are the main pillar in scientific research and education, and well as in the development and promotion of new talents. The Department of Student Affairs DSA is one of the important sections in college and is a measure of the level of management of the college. Some routine and burdensome works need accuracy and does not contain errors, such as basic information for students, course management, and degree management etc. Staff specialists in this department spend a long time and high efforts in case managing these actions manually. There are unmatched features through the use of computers to manage the information of the student, for instance the speed of the search, security, large memory space, long life, low cost, great reliability and find proper, which can improve the effectiveness of student information management.

The number of students in College of Medicine − University of Diyala increased from a few dozen in previous years to several hundred at the present time, this increase is urged to use modern means in order to manage student information, these

modern means and methods represented by using a database system, transforming the work from the traditional and manual ways to a computer-based system. Therefore, in this thesis will take "College of medicine - University of Diyala" one of the public universities in the Republic of Iraq to suggest using DBMS tools and applications to design and implement of student information management system in order to make the process of administration of the DSA much easier and reduce the time needed to carry out its orders in a short time and more efficient that help management of faculty in faster decision-making effectively and efficiently.

1.1. College of Medicine – University of Diyala:

College of Medicine - University of Diyala was founded in the 2002. It was the first college dealing with the health aspect in Diyala province, and has become one of the most important landmarks of the province. Began to accept the first batch of students for the academic year 2003 - 2004, where thirty students were accepted from the people of the province. The years rolled by and despite of difficult circumstances experienced by Iraq in general and in Diyala province particularly because of foreign occupation, this college is remained with efforts of the teaching staff and career, it also was able to celebrate the graduation of the first students in the 2009 [3].

Some of the main goals of this college that has established for [4]:

○ Graduation Doctors and scientists have backgrounds of scientific and medical research or clinical skills.

○ The quest for a degree of specialization in various medical specialties.

○ Contribute to the preparation of future leaders in the fields of health and education.

○ Use of modern teaching aids and advanced techniques in teaching methods, educational programs to prepare for college and employing information and communication technologies in the process of transferring, production of the knowledge and scientific research, and in the preparation of the approach of educational programs.

○ Activating the participation, coordination and integration between the college and the community through the establishment of seminars and conferences to discuss health issues and scientific for the country.

○ Establish relations, cultural exchange and bilateral agreements or collective with Arabic and global universities and professional organizations.

○ Work on the development of graduate studies in masters and Higher Diploma of scientific disciplines.

1.2. Department of Student Affairs (DSA):

The DSA is being the most important administrative departments in any college because of being involved in all regards to college students. Students are the basis of the educational process, so the advancement of student's affairs leads to the advancement of the whole college.

The Tasks Carried Out by the DSA:

❍ Registration of new students accepted to the college and organizes the files of their own.

❍ Follow-up student attendance or absence from the classroom.

❍ Announce of the final results grades for all academic levels.

❍ Saving dossier containing all information and archives for each student at the college [5].

❍ Working to provide services to the students of the college.

From the above, this department is like a data warehouse (DW) of all information that related to each student in the college.

Systems Used in the DSA:

The methods adopted for the management of this department are manual represented by records and files relating to the information of students, as in Figure (1.1). Where every student in the college has a dossier containing all the information and its own administrative orders, also contain his c.v from the moment of admission to the college "the courses he studied and his grades for these courses", also his details about attendance and absence and many other activities.

Figure 1.1 Dossiers of the students that used in the department

In addition, using some software programs such as Microsoft Word, as represented in the figure (1.2), for saving names and some information about students, also including some of the forms that are used periodically for students.
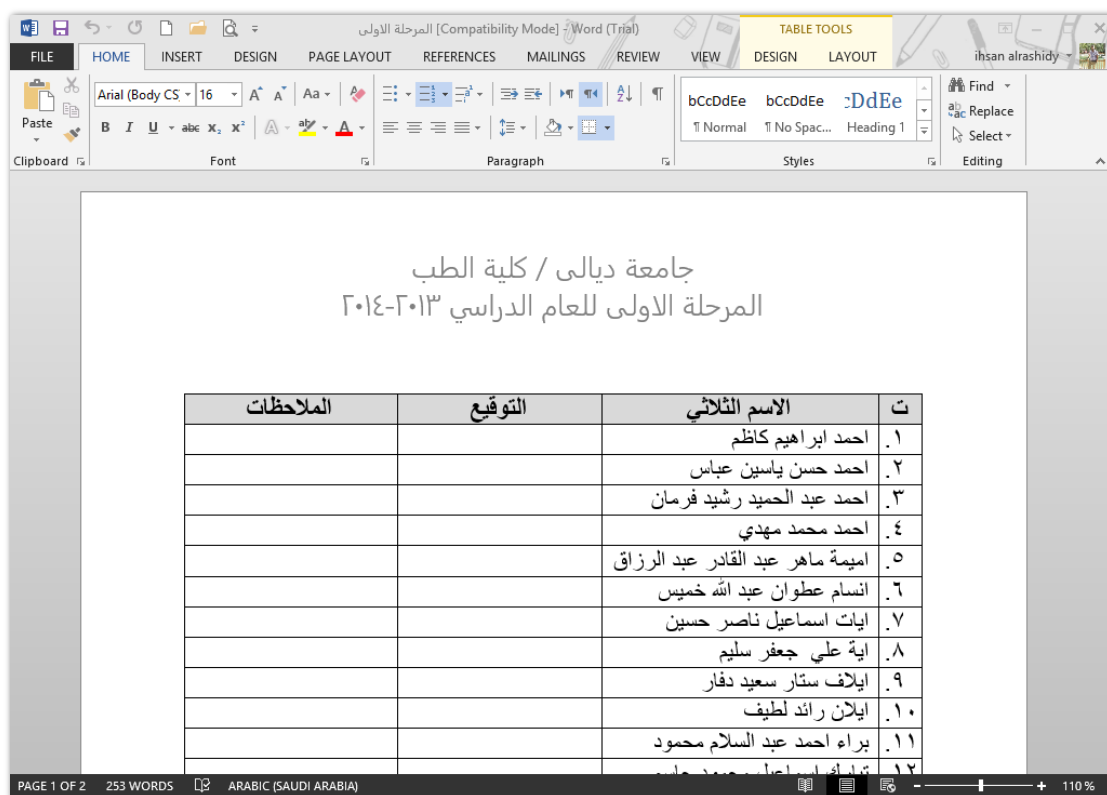
Figure 1.2 Program of microsoft word that used in the department

1.3. Problems with the Methods Used in the Management of the Department:

Several problems can be summarized because of using old and traditional methods:

❍ Delays in the delivery of services to students, because of the manual work.

❍ The department requires an adequate number of staff in order to make its administration, because of existing manual student information system.

❍ Information and data on students in several places, leading to delay and inaccuracies in the completion of tasks.

❍ There is no identification number for each student, making it difficult to manage student data.

❍ All these problems lead to a lack of help to the administration of the college to support them by the speed of decision-making.

1.4. The Purpose of the Study:

The main purpose from this study is to design database to construct student information management system in the department of student affairs – college of medicine, this system will solve most of the problems and obstacles resulting from the old methods and techniques that have been previously mentioned. Thus transform the work in this department from manually to a computer based-system, which leads to provide accuracy, efficiency, security and so on.

The questions that arising from the purpose are:

- How can reduce the errors and inaccuracies in the process of administration students' information.
- How can reduce the time and effort required to do routine operations of the DSA.
- How can support the administration of the college in the decision-making process.
- How can reduce the number of staff that required to implement the tasks of the DSA.

The benefit of this study is to achieve the following objectives:

- Raise the level of services provided to students.
- Making all information and data relating to students in one place.
- Speedin completing the tasks of the department.
- 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.
- All of these goals mentioned above lead to the upgrading of education at the college, which is the main objective of the thesis.

CHAPTER 2

BACKGROUND ANDLITERATURE REVIEW

2.1. Background:

A DB is a shared collection of logically related data and its description, designed to meet the information needs of an organization [6]. The database is a one, maybe a large warehouse of data that can be used concurrently by many departments and users. Rather than separate files with redundant data, is to integrate all the data elements with the smallest amount of duplicate. The database is no longer owned by a single department, but is a common resource. Database holds not only for the working organization, but also a description of these data. So, the database known as describes the collection of integrated records. While a Database System (DBS) is a set of interrelated elements, which allows the development and the deployment of a database application [7].

Database management system (DBMS) is a software system enables users to define, create, maintain and control access to the database. The DBMS is the software that interacts with the user's application programs and the database, which carries on the integrated management of the database resources and is responsible for all orders, send out by the users [8], as shown in the figure (2.1).
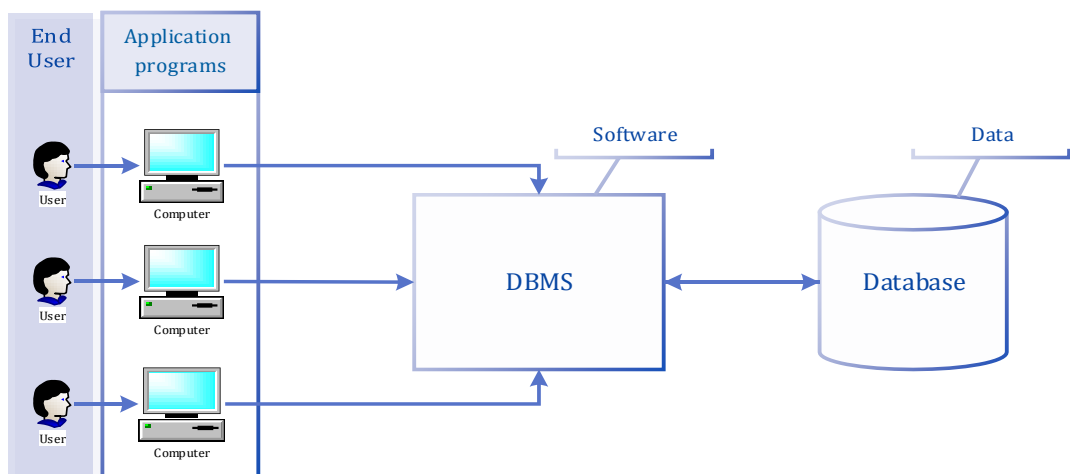
Figure 2.1 The DBMS

Student Information System (SIS) is a software application to manage the administrative processes of an educational institution [9].

2.2. Literature Review:

Literature reviews represent the art of locating substantive information which is unbiased and valid [10]. In the review of the scientific references, whether books or articles that specialized in design and implement of student information management system and database systems design, founded many of the studies and research, including the establishment of an information system for students and following is a summary of each study in terms of its goals and the conclusions reached by.

2.2.1. Ahmad, Khan, Abd Alla & Beg, 2010 [11]:

❍ Suggested to design a novel system for students, where alternative and essential solutions was given to solve various problems.

❍ Presented the design of the database for student information system, the computerization of the system means to change from manual to a computer-based system, to automate the work and provide precision, efficiency, timelessness, economy and security.

❍ Resulted after undertaking a detailed check of the Ayub Medical College's current manual student information system and analyzing its deficiencies, found it is necessary to remove its shortcomings and provide an appropriate solution to the problems encountered at the present time.

Conclusion of the Study:

❍ A comprehensive database (AMCSIS) for the students was introduced.

❍ The suggested algorithm can help the management to make a timely and effective decision.

❍ This system is able to store vast data of the student and generate the report according to the necessity.

❍ As well, this system enables to manage the information that carries the feature of easy to use and effective data control.

❍ The approach of this system enables the user to get access to data in a flexible way through a graphical user interface an easy to use.

2.2.2. Liu, Wang& Zan , 2010[12]**:**

❍ Mentioned that the achievement of student information management system, containing the establishment and maintenance of the database and the development of front-end application.

❍ This study demonstrates the functional and architecture design of the system, highlights the functionality of the system, database design and functional modules.

Conclusion of the Study:

❍ General functions and global variables. Could be stored in public module throughout projects in Visual Basic and it can be greatly improve the efficiency of the code by calling module functions, variables in the project.

❍ The system modules use varieties data in the database often it requires a public data manipulation function to achieve a variety of SQL statements.

❍ The study emphases on the description and analysis of the system function and access to the database through Open Database Connectivity (ODBC).

2.2.3. Eludire, 2011 [13]:

○ Explained some of problems that related to the management of academic records for students, these problems include faulty registry of the courses, the delay in the results of the students and a lack of precision because of the tedious and manual calculations.

○ usually in most cases the generated data that has been created by academic institutions in a non-delineated file is set to use by various departments within the institutions with the same data that appears on many of these files, this means that a simple change of address should be addressed in two and perhaps three or four places depending on the number of other files that show this data.

○ The development of the concept of databases is the solution to all these problems, where they are reducing the amount of redundant data, the possibility that the data contained in the file may be imprecise because it has not been updated.

Discussion of the Study:

○ Using Microsoft Access 2003 to design and implementation course management and a student registration.

○ The processes that relating of choosing the right model of database, system deployment and maintenance and design interface.

○ It also discusses the possibility of applying the system in academic institutions.

Conclusion of the Study:

○ This system can be of great help in solving some of the problems that have been identified in the management of student affairs and course registration in the academic institution of higher education.

○ The advanced system can be combines and improves to become a single block, thus can be deployed for commercial use. To achieve this, there is a

need to carry out activities such as user acceptance testing, test data, review and deployment of the system.

2.2.4. Norasiah & Norhayati, 2003 [14]**:**

◯ Aimed for designing the software for Management 'academic data of students such as status (Fail, Pass, Dismiss,' Cuti Khas') so that it can be generated GPA and CGPA. This information can help the students in the next semester in planning their academic performance.

◯ This system will also enable the academic advisors, head of the programs, in addition to other college management teams to simulate easily plan of study for students through menu-driven interface forms that easy to use.

◯ Using Microsoft Access program and Visual Basic programming in the process of designing this system.

Conclusion of the Study:

◯ This system is the solution of ineffective student's data and planning study at the faculty of electrical engineering.

◯ This technique will increase the effectiveness for the management of academic students in the faculty.

◯ In addition, to improve the current manual student's data management.

◯ For the academic advisors and head of the program, this system enables them to give a better advice to the students and save a lot of time in calculating the CGPA and PGA manually.

◯ It is hoped that this project will help the students give a consistent guideline and efficiency of academic performance to manage them for the duration of their studies in this faculty.

2.2.5. Yu-fang & Yong-sheng , 2009 [15]:

○ Proposed design and implementation of student information management system in School of Information Science & Engineering of Shandong Normal University.

○ Provides specific realization of each function module, design of database and main techniques used in this system,

○ Using ASP.NET technology, Java Script and Visual C# as programming language and these languages in the .NET environment.

○ This system using ADO.NET technology to get access to the database of Microsoft SQL Server 2005 and can be used by users with tight security following a mechanism to control access of RBAC (Role-Based Access Control) on Web services.

Conclusion of the Study:

○ Students can enter personal information on a database college student information management system in accurately and real-timely.

○ Enquire the personal information easily and timely.

○ Decreases the workload on administrators to enter information and enables them to focus on auditing and consulting information.

○ Achieves the digitization and networking of college students' information management.

○ Encourages to carry out the management of college students high efficiently.

2.2.6. Bharamagoudar, Geeta& Totad, 2013 [16]**:**

This study proposed to build student information management system, the following are some features of this system:

❍ Provides a simple interface for maintenance of student information.

❍ It can be used by educational institutes or colleges to maintain the records of students easily.

❍ Student information system deals with college details, batch details, academic related reports, and curriculum.

❍ It tracks all the details of a student from the first day to the last day of the course, which can used for tracking attendance, course progressing, completed semesters, curriculum details of coming semester, all-purpose reports, the details of the exam, project or any other details of the assignment, the result of the final exam and these activities will be available through a secure, online interface embedded in the college's website.

❍ It will also have faculty details, batch execution details, students' details in all aspects.

❍ It is also easy to explore the entire activities takes place in the college.

Purpose of the Study:

The purpose is to design a college website which contains up to date information about the college. That should improve efficiency of college record management.

Objective of the Study:

❍ Providing the online interface for students, faculty etc.

❍ Increasing the efficiency of college record management.

❍ Decrease time required to access and deliver student records.

❍ To make the system more secure by using user authenticate and display only the information required for the duties of the individual.

❍ Reduce the time spent on tasks that do not have great value.

Conclusion of the Study:

❍ This paper assists in automating the existing manual system.

❍ It can be monitored and controlled remotely.

❍ It reduces the manpower required.

❍ It provides accurate information always. Malpractice can be reduced.

❍ All years together gathered information can be saved and can be accessed at any time.

❍ The data which are stored in the repository helps in taking intelligent decisions by the management.

❍ All faculty and management and the stakeholders, can get the required information without delay.

2.3. Discussion:

For (Ahmad, Khan, Abd Alla& Beg, 2010) and (Liu, Wang& Zan , 2010), it can be agreed with them about what came on their studies of the design of an information system for students in all aspects of the study in terms of the identification and analysis of the problems and propose solutions on the other hand, with updated technologies and tools used in the construction and implementation of this system.

However with (Eludire, 2011) and (Norasiah & Norhayati, 2003), possible to accept of what came in these studies in relation of the analysis of the problem and propose their solutions, but it can be criticized in using "Microsoft Access", because this program specializes for built personal databases and is not the best solution to solve all the problems mentioned above in these studies.

In (Yu-fang & Yong-sheng , 2009), it can completely agree with what came in this study, as well as agreed with the tools used to create a student information management system, where adopted on the web tools that are more interactive in performing the tasks that set up for it.

The last study (Bharamagoudar, Geeta& Totad, 2013) considered the best of all previous studies in presenting the problem and find solutions to them, it is also the latest study on the establishment and management of student information system and

they are distinct from its predecessors the tools of modern technologies used in the creation of the information system. These tools can be summarized as follows:

- ❍ College staff is able to directly access all aspects of a student's academic progress through a secure, online interface embedded in the college's website.

- ❍ The system utilizes user authentication, displaying only information necessary for an individual's duties.

- ❍ Each sub-system has authentication, allowing authorized users to create or update information on that sub-system.

- ❍ In addition to a staff user interface, the system plans for the student user interface, allowing users to access information and submit requests online thus reducing processing time [16].

From all of the above, it is considered ideal in solving the problems facing the process of management of college information on both of staff and students. This is what we aspire to in the next step after the establishment of student information system in the College of Medicine - University of Diyala. However there are some potential problems of implementing this step, such as red tape and bureaucracy which managed most of the educational institutions in Iraq. However, the higher education in Iraq is in the process of development and on all sides, where both a college or university became has a website of its own on the Internet, as well as the ministry of higher education embarked in recent years to grant ten thousand a study mission for a Ph.D. in all scientific disciplines and from the finest universities in the world, thus raising the level of education in the universities and educational institutions.

CHAPTER 3

METHODOLOGY

Before starting the process of collecting data for the purpose of analysis and using it in the design of an information system based on the computer, it must first determine the objectives for which this system was found, also determine the necessary requirements in the design of the system. Thus there is a good analysis results in successful design meets with the requirements of the beneficiary body. After having a full awareness of the obstacles and problems facing the staff responsible for the administration of the Department of Student Affairs in the College of Medicine - University of Diyala, an effective system has been proposed for the College.

3.1. History of Database Management Systems:

It has been already seen that the ancestor to the DBMS was the file-based system. However, there was never a time when the database approach began and the file-based system stopped. In fact, the file-based system still exists in particular areas. It has been suggested that the DBMS had its roots in the 1960s Apollo moon-landing project, which was begun in response to President Kennedy's objective of landing a man on the Moon by the end of that decade. At that time, there was no system available that would be able to handle and manage the massive amounts of information that the project would create [6].

Consequently, North American Aviation, the prime contractor for the project, developed software known as GUAM (Generalized Update Access Method). GUAM was based on the concept that smaller components come together as parts of larger components and so on, until the last is collected. This structure, which adapts to an upturned tree, is also known as a hierarchical structure. In the mid-1960s, IBM combined NAA to develop GUAM into what is now known as IMS (Information Management System). The cause that IBM restricted IMS to the management of

hierarchies of records was to allow the use of serial storage devices, most especially magnetic tape, which was a market need at that time. This restriction was later dropped. Although one of the earliest commercial DBMSs, IMS is still the main hierarchical.

In the mid- 1960s, another important development was the appearance of IDS (or Integrated Data Store) from General Electric. This work was supervised by one of the early pioneers of database system, Charles Bachmann. This development led to a new type of database system known as the network DBMS, which had a deep effect on the information system of that generation. The network database was developed partly to meet the need to represent more complex data relationships than could be modeled with hierarchical structures and partly to enforce a database standard. To help set up such standards, the Conference on Data Systems Languages, comprising representatives of the U.S. government and the world of business and commerce, formed a List Processing Task Force in 1965, later renamed the Data Base Task Group (DBTG) in 1967. The terms of references for the DBTG were to define standard specifications for an environment that would allow database creation and data manipulation.

In 1970, E. F. Codd of the IBM Research Laboratory produced his greatly influential paper on the relational data model. This paper was very timely and addressed the disadvantages of the previous approaches. Many experimental relational DBMSs were implemented later, with the first commercial products appearing in the late 1970s and early 1980s.

In 1976, Chen presented the Entity-Relationship model, which is now a broadly accepted technique for database design. In 1979, Codd himself tried to treat some of the failings in his original work with an extended version of the relational model called RM/T (1979) and then RM/V2 (1990). The efforts to give a data model that represents the "real world" more closely have been loosely classified as semantic data modeling.

The 1990s saw the growth of the internet, the three-tier client-server architecture. The demand to allow corporate databases to be integrated with web applications. The late 1990s saw the development of XML (eXtensible Markup Language), which has

had a deep effect on many aspects of IT, including database integration, graphical interfaces, embedded systems, distributed system and the database systems.

3.2. Elements of the DBMS Environment:

It has been identified in the DBMS environment five major elements: people, procedures, data, software and hardware.

❑ **People:** The first component is the people involved with the system. There are four different types of people who are involved in the environment of a DBMS, application developers, database administrators, end-user and database designers.

❑ **Procedures:** This component refers to the rules and instructions which manages the design and use of the database. The staff and the user of the system who run the database need to document the procedures on how to use or operation of the system. This may be composed of instructions on how to:

   ❍ Use of a particular database management system or application program.

   ❍ Start and stop database management systems.

   ❍ Create backups of the database.

   ❍ Dealing with the failure of software and hardware.

   ❍ Highlight the database across multiple disks, change a table structure, store data to secondary storage and improve performance.

❑ **Data:** Maybe the most significant part of the DBMS environment is the data, where data is a collection of facts stored in the database**.**

❑ **Software:** Software element consists of database management system software and application software, in addition to the operating system and contains software network in the case that the DBMS used through the network.

❑ **Hardware:** The applications and the DBMS need the hardware to run. Hardware can range from a single personal computer to a single central or the network of computers. Hardware depends on the specific requirements of the organization and database management systems are used. In some DBMSs run only on specific operating systems or hardware, while others run on a variety of operating systems and hardware.

3.3. Advantages and Disadvantages of the DBMS:

The DBMS serves as an intermediary between the user and the database. The structure of the database itself is stored all application requests and translate them into the complex processes required to meet as a group of files and the only way to reach the data in those files through database management systems. The DBMS hides much of the database's complexity from the application programs and users [17]. Although the database management system is characterized by a number of properties, unfortunately it has several disadvantages. In the following, advantages and disadvantages are listed.

Advantages of the DBMS:

- ❍ Control the redundancy of the data.
- ❍ Stability of the data.
- ❍ Learn more about the same amount of data.
- ❍ Data exchange.
- ❍ Improving the integrity of the data.
- ❍ Improving the security.
- ❍ Implementation of standards.
- ❍ Scale economies.
- ❍ Improving access and response to the data.
- ❍ Increasing end-user productivity.
- ❍ Improving the maintenance through the independence of the data.
- ❍ Increased synchronization.
- ❍ Improving the services of backup and recovery.

Disadvantages of the DBMS:

- ❍ Difficulty.
- ❍ Size.
- ❍ The cost of a DBMS.
- ❍ The cost of additional hardware.
- ❍ The cost of conversion.
- ❍ Performance.

3.4. Requirements Analysis of the System:

After talking with the employee who responsible for the administration of the Department of Student Affairs at the college, it has been determined the required information in the system. This determination is according to the actual needs of the college, the information required for the student database information system are described as follows:

- ❍ Student main information.
- ❍ Student identity information.
- ❍ Student information about secondary (high) school.
- ❍ Course information.
- ❍ Other information.

Where, student main information includes, student's name (the name of a student consist of first name, father name, grandfather name and the tribe name, these are the components of the name of any citizen in Iraq), birthdate, gender, residence information, race (Iraq is composed of three major ethnic groups of Arab, Kurdish and Turkoman), nationality, religion and contact information (e-mail and phone number). For student identity information (any citizen in Iraq must have a four documents) include, document nationality Information, document certificate of nationality information, ration card information (this document is used for government food aid for citizens) and residence card information (this document is used in order to prove the permanent address of the citizen), it is worth mentioning that these documents are used only in Iraq. While student information of secondary school include, school name, exam number, attempt success and secondary certificate information. Course information includes, course name, course units, academic year, year (year is two semesters) and degree. Finally a picture of each student. These are shown on the figure (3.1).

Requirements List

- **Student main information:**
  - Student's name
  - Birthdate
  - Gender
  - Residence information
  - Race
  - Nationality
  - Religion
  - Contact information
- **Student identity information(Documents):**
  - Document nationality Information
  - Document certificate of nationality information
  - Ration card information
  - Residence card information
- **Student information of high school:**
  - School name
  - Exam number
  - Attempt success
  - Secondary certificate information
- **Course information:**
  - Course name
  - Course units
  - Academic year
  - Year
  - Degree
- **Other information:**
  - Picture

Figure 3.1 Requirements list

3.5. The System Administrator Roles:

As long as the student information management system is a windows application and not on the Internet, the system administrator (the system administrator is an employee of the DSA) holds all rights in the process of adding and modifying the information of the system. These amendments include, information adding, modifying and deleting on students' information, in addition making modifications on course management that including, adding, modifying and deleting courses information also. Figure (3.2) shows the UML use case diagram for the system administrator roles.
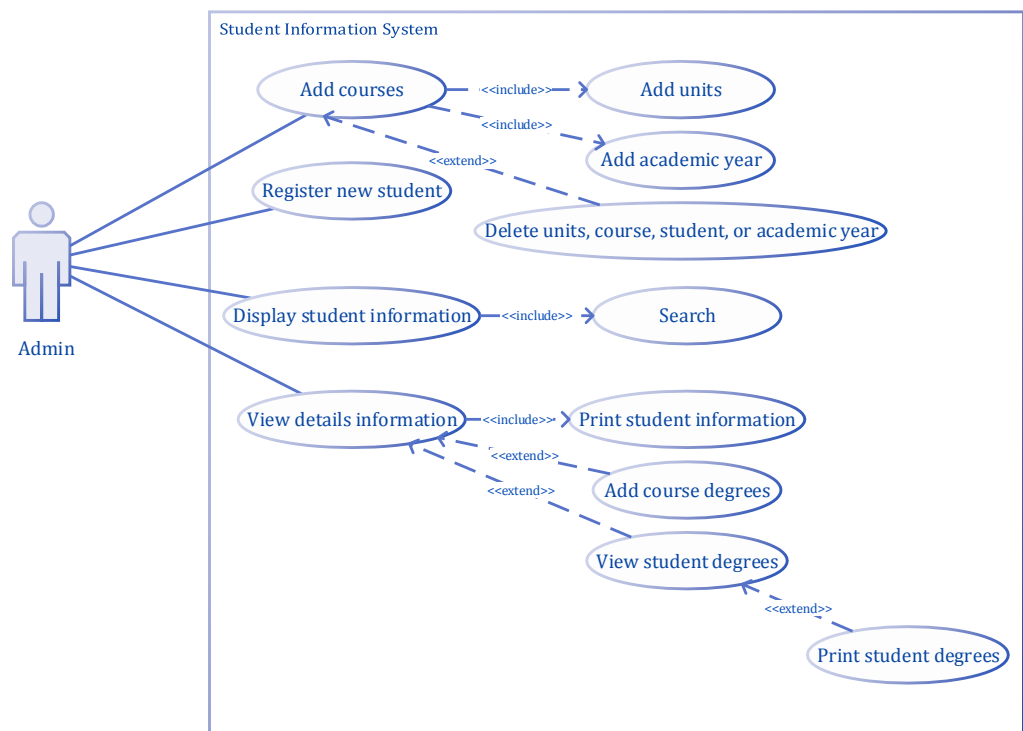
Figure 3.2 UML use case diagram for admin roles

3.6. Database Description:

According to identify the requirements of database student information system, a database of the system consists of four entities "student entity, high school entity, documents entity and course entity". Entities and their relationship must be designed to meet various types of student information and to design basis for the logical structure later. These entities include varied specific information and interaction each other as information flow. In the following figure (3.3) shows the ERD of the entities and their relationships.
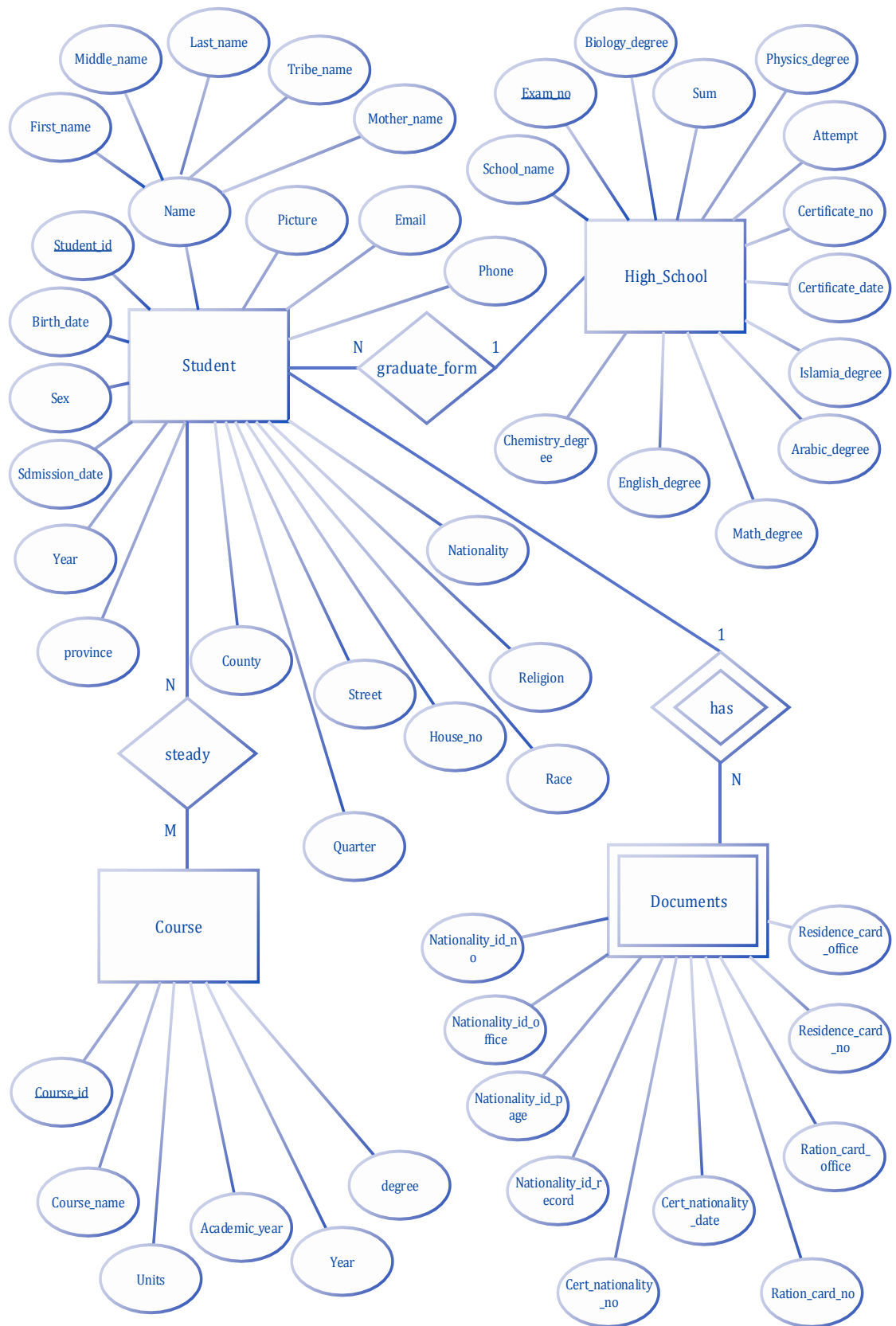
Figure 3.3 ER diagram

3.7. Logical Structure Design of the Data:

In the following tables show the logical construction of the data for the main tables "student basic information, student identity information, student information of secondary school, course, degree", student basic information table shown in table (3.1), student identity information table shown in table (3.2), student information of secondary school table shown in table (3.3) and course table show in table (3.4):

Table 3.1 Student Basic Information

Column name	Data type	Null or Not null	Description
student_id	numeric(18, 0)	not null	enrollment number (pk)
first_name	nchar(10)	not null	student first name
middle_name	nchar(10)	not null	student father's name
last_name	nchar(10)	not null	student grandfather's name
tribe_name	nchar(10)	null	student tribe name
mother_name	nchar(20)	not null	student mother's name
birthdate	date	not null	student's date of birth
sex	nchar(6)	not null	student's gender
admission_date	date	not null	date of registration
year	nchar(10)	not null	student's stage
province	nchar(10)	not null	name of governorate
county	nchar(10)	Null	name of county
quarter	nchar(10)	Null	name of quarter
street	nchar(10)	Null	name of street
house_no	numeric(18, 0)	Null	number of house
race	nchar(10)	Null	student's race
religion	nchar(10)	Null	student's religion
nationality	nchar(10)	not null	student's nationality
phone	nchar(20)	Null	student's phone number
email	nchar(20)	Null	student's email
picture	image	Null	student's picture

Table 3.2 Student Identity Information (Documents)

Column name	Data type	Null or Not null	Description
nationality_id_no	numeric(18, 0)	null	nationality document number
nationality_id_office	nchar(10)	null	nationality document office
nationality_id_page	nchar(10)	null	nationality document page
nationality_id_record	nchar(10)	null	nationality document record
cert_nationality_no	numeric(18, 0)	null	certificate nationality number
cert_nationality_date	nchar(10)	null	certificate nationality date
ration_card_no	numeric(18, 0)	null	ration card number
ration_card_office	nchar(10)	null	ration card office
residence_card_no	numeric(18, 0)	null	residence card number
residence_card_office	nchar(10)	null	residence card office

Table 3.3 Student Information of High School

Column name	Data type	Null or Not null	Description
school_name	nchar(30)	not null	student's school name
exam_no	numeric(18, 0)	not null	student's exam number (pk)
attempt	nchar(10)	not null	student's attempt success
certificate_no	numeric(18, 0)	not null	student's certificate number
certificate_date	Date	not null	student's certificate date
islamia_degree	numeric(3, 0)	not null	islamia course degree
arabic_degree	numeric(3, 0)	not null	arabic course degree
math_degree	numeric(3, 0)	not null	mathematics course degree
english_degree	numeric(3, 0)	not null	english course degree
chemistry_degree	numeric(3, 0)	not null	chemistry course degree
physics_degree	numeric(3, 0)	not null	physics course degree
biology_degree	numeric(3, 0)	not null	biology course degree
sum	numeric(3, 0)	not null	total average

Table 3.4 Courses

Column name	Data type	Null or Not null	Description
course_id	nchar(10)	not null	course number (pk)
course_name	nchar(10)	not null	course name
units	numeric(2, 0)	not null	number of units course
academic_year	nchar(10)	not null	academic year
year	nchar(10)	not null	course stage
degree	numeric(18, 0)	not null	course degree

CHAPTER 4

IMPLEMENTATION OF THE SYSTEM DESIGN

After setting goals and visions for which the SIS was designed, on this chapter will implementing the process of the system design to meet the needs of the college, where the system will processing data for students and taking them out in the form of useful information for the management of the college, thus help them in the management process for student affairs, speed completion of operations with high efficiency and low errors.

An information system (IS) can be defined as a set of interconnected components that collect, process, store and distribute information to support decision-making, organizing and control in an organization. Furthermore, information systems may also help managers and workers analyze problems, imagine complex subjects and create new products. The general model of an (IS) is in the form of a collection of semantic services [18].

Information systems contain information about important people, places and things within the organization or in the environment surrounding it. Information is a data that have been designed into a form that is meaningful and useful to human beings. Data, in contrast, are streams of raw facts representing events occurring in organizations or the physical environment before they have been organized into a form that people can understand and use [19]. As shown in the figure (4.1).

From the above, it can conclude that the primary function of information systems is to hold a series of operations on the data and turn it into information as possible to help decision-makers in the organization to take the proper decision as soon as possible.
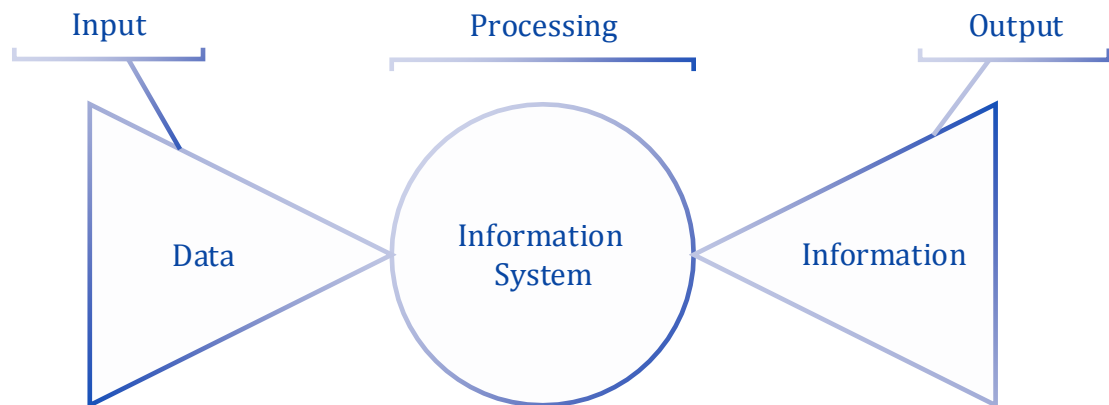
Figure 4.1 Information system

4.1. Technologies Chosen to Design and Develop the System:

To design a computer-based system, it must use some modern techniques of computer programs used for this purpose. In the following topics will illustrate these techniques and how to use them to build a student information management system.

4.1.1. Microsoft SQL Server 2008 R2:

Microsoft SQL Server 2008 R2 is the most advanced, trusted and scalable data platform released as argued by [20] as of 2010. Building on the success of the original SQL Server 2008 release, SQL Server 2008 R2 has made an impact on organizations worldwide with its innovative capabilities, empowering end users through self-service business intelligence (BI), bolstering efficiency and collaboration between database administrators (DBAs) and application developers and scaling to accommodate the most demanding data workloads. It is a powerful system used to create and manage Relational Database Management System or RDBMS, this system has a lot of features which make it one of the most powerful systems used to create and manage databases. In most relational databases such as SQL Server data is accessed using a query language SQL, or Structured Query Language, this language allows users to query data in addition to the ability to add, change and drop records databases [21]. In the figure (4.2) below shows the main interface of the SQL server 2008 r2 program.
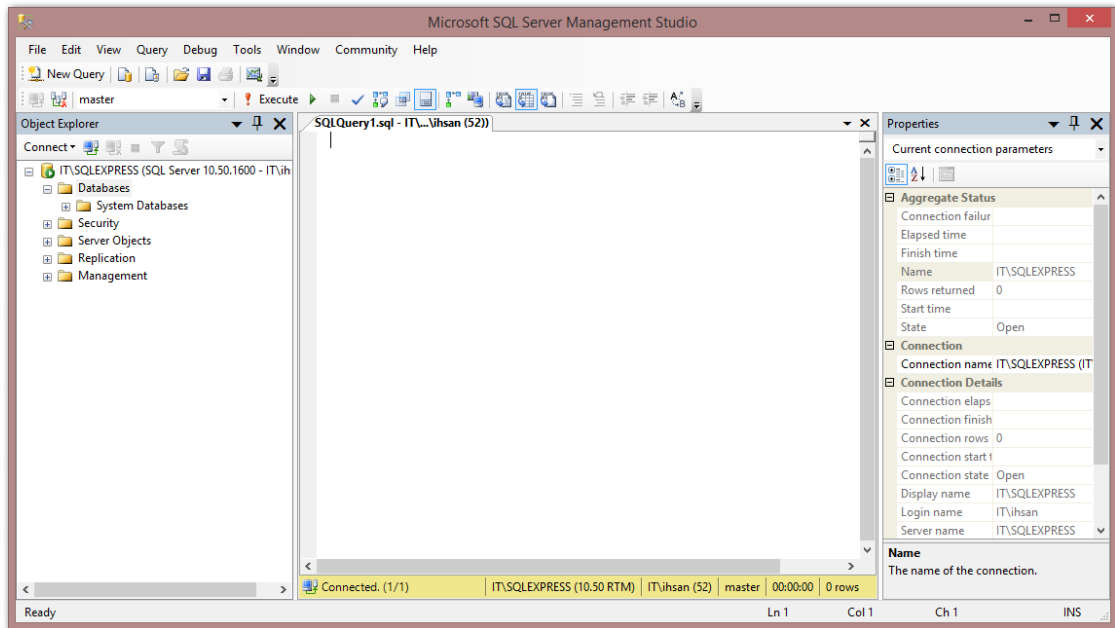
Figure 4.2 The main interface of the sql server 2008 r2 program

4.1.1.1. Structured Query Language (SQL):

SQL is Structured Query Language, which is a computer language for storing, manipulating and retrieving data stored in relational database. SQL is the standard language for Relation Database System. All relational database management systems like MySQL, MS Access, Oracle, Sybase, Informix, Postgres and SQL Server use SQL as a standard database language [22].

Also, they are using different dialects, such as:

- ❍ MS SQL Server using T-SQL
- ❍ Oracle using PL/SQL.
- ❍ MS Access version of SQL is called JET SQL (native format), etc.

Since the program that used in this study is, MS SQL Server, therefore the dialect of the language is T-SQL.

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4.1.1.2. Objectives of SQL Language:

A database language SQL allow user to:

❍ Access data in relational database management systems.

❍ Describe the data.

❍ Define the data in a database and manipulate that data.

❍ Embed within other languages using SQL modules, libraries and pre-compilers.

❍ Create and drop databases and tables.

❍ Create view, stored procedure, functions in a database.

❍ Set permissions on tables, procedures and views.

4.1.1.3. Components of SQL:

The ISO SQL standard has two major components:

❑ **Data Definition Language (DDL):** A language that allows the DBA or user to describe and name the entities, attributes and relationships required for the applications, together with any associated integrity and security constraints.

Data Definition Language statements let to do these tasks:

❍ Create, alter and drop schema objects.

❍ Grant and revoke privileges and roles.

❍ Analyze information on a table, index, or cluster.

❍ Establish auditing options.

❍ Add comments to the data dictionary [23].

❑ **Data Manipulation Language (DML):** A language that provides a set of operations to support the basic data manipulation operations on the data held in the database.

Data Manipulation operations usually include the following:

❍ Insertion of new data into the database.

❍ Modification of data stored in the database.

❍ Retrieval of data contained in the database.

❍ Deletion of data from the database.

4.1.1.4. Create Database Using SQL Server 2008 R2:

There are two different methods can be used to manage SQL Server, the GUI (Graphical User Interface) and the command line. Assuming that SQL Server program is already installed:

1. **Graphical User Interface (GUI):**
   - ❑ **GUI Step 1 - Create Database:** From the Windows Start Menu, select "Microsoft SQL Server" and then "SQL Server Management Studio". Once the Management Studio starts, right click the Databases folder and select new database. Enter a name in the "Database name" text box. As shown in the figure (4.3) below.
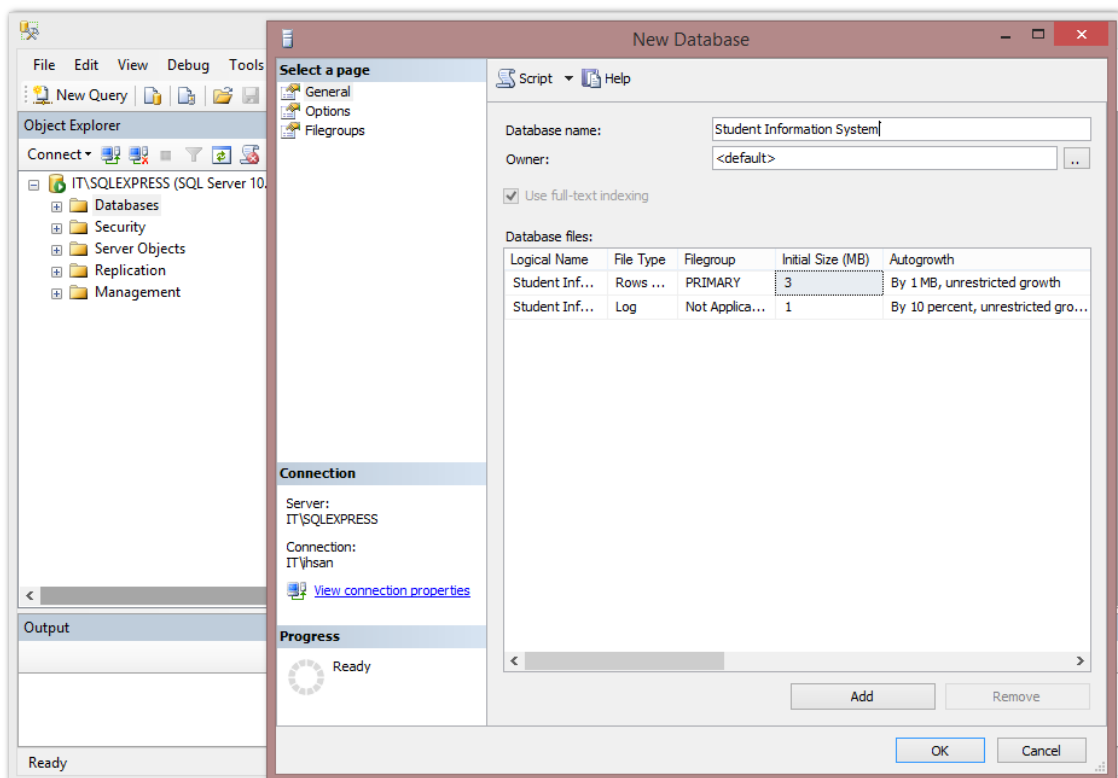
Figure 4.3 Create a database by using GUI

❑ **GUI Step 2 - Create a Table:** A structure to hold the actual data is needed. This structure is called a table, to create a table, expand the database folder and then expand the newly created "Student Information System" database as shown in figure (4.4).
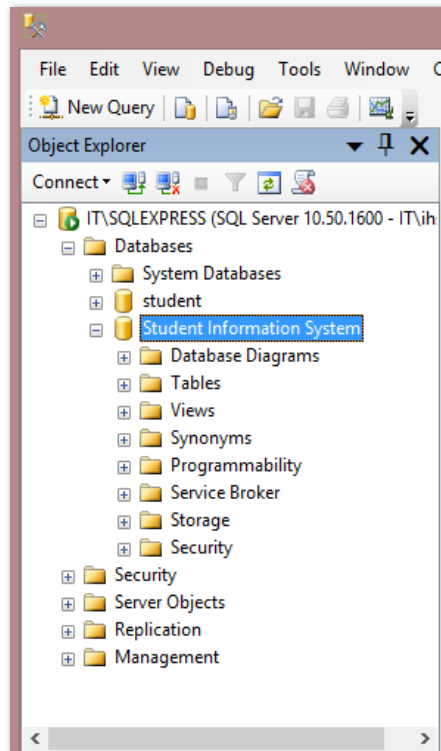
Figure 4.4 Expand "student information system" database folder

Now, right click on "Tables" and selecting "New Table". Will be prompted to fill in "Column Name" and "Data Type". Fill in "student_id" with a data type of "numeric(18, 0)". In the next row, will enter a Column Name of "first_name" with a data type of "nchar(10)" and so on, as shown in the figure (4.5) below.
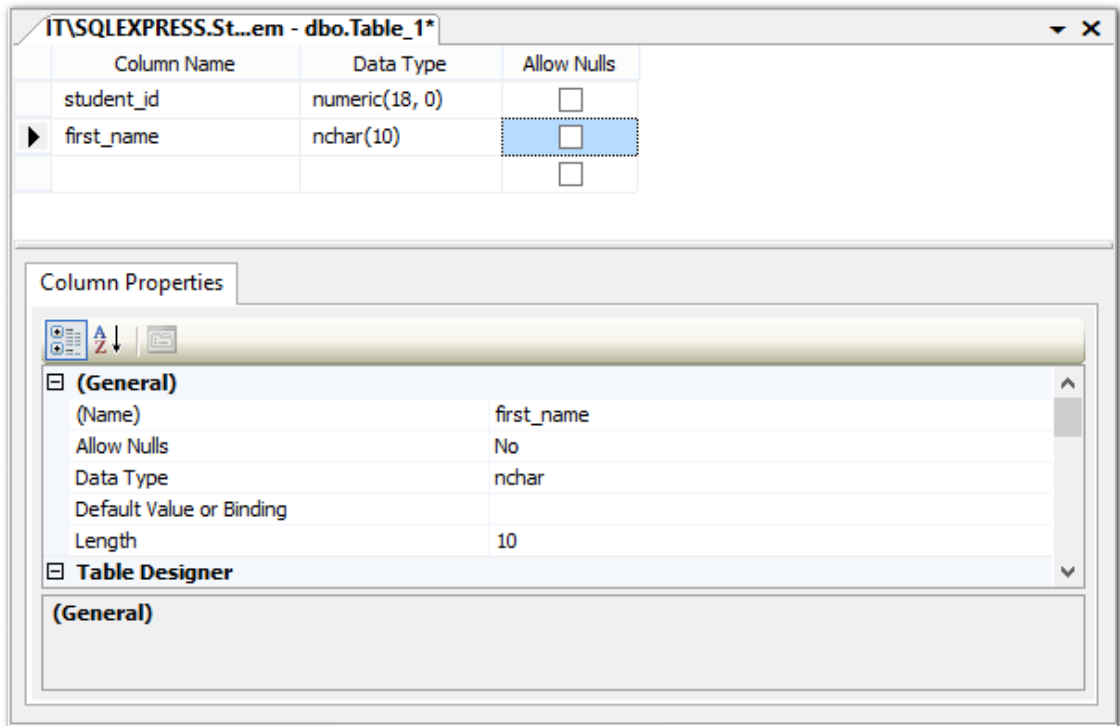
Figure 4.5 Create table by using GUI

Finally, save the table by clicking the Save icon from the top menu bar, then appear text box to choose a table name as in the figure (4.6) below. This table named as "student basic information".
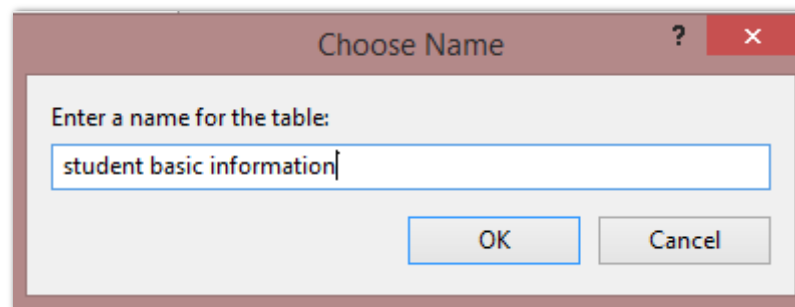
Figure 4.6 Choose name to the table

❑ **GUI Step 3 – Enter and View Data:** To enter data into the newly created "student basic info" table, expand the tables folder from the left menu as shown below (4.7):
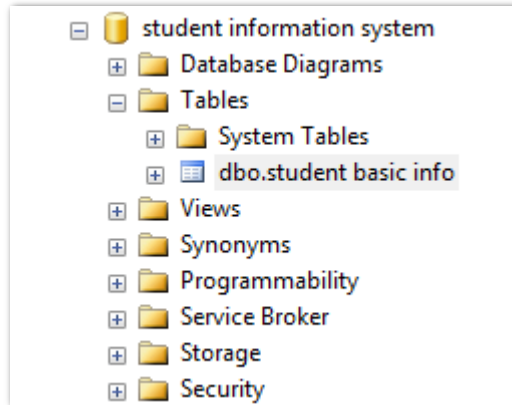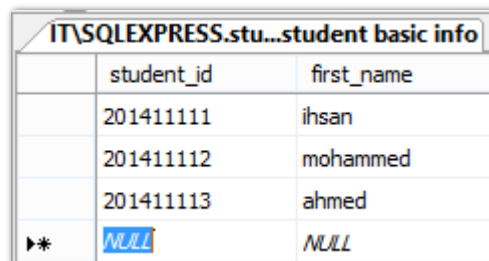
Figure 4.7 Expand tables from "student information system" database

The newly created "student basic info" table will be listed. Right click on it and select "Edit". A small grid will open. Enter a little data lines as shown below in the figure (4.8). Moving to a new line after entering data automatically saves.

Figure 4.8 Enter data into "student basic info" table

2. **Command Line:** In three steps using the SQL Server Management Studio (SSMS), created a database, a table and entered data and show the same three steps below using the command line (Query Window). To open a Query Window, select "New Query" from the top left menu in the SQL Server Management Studio as shown below in the figure (4.9).
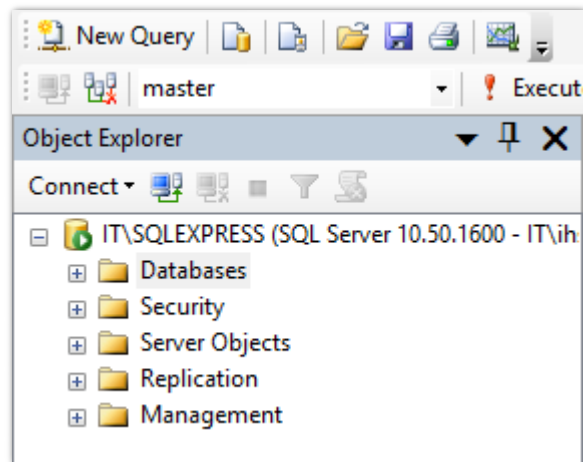
Figure 4.9 Open query window

❑ **TSQL Step 1 – Create Database:** Create a new database called "student_db" by entering the following TSQL then pressing the "Execute" button on the top menu.
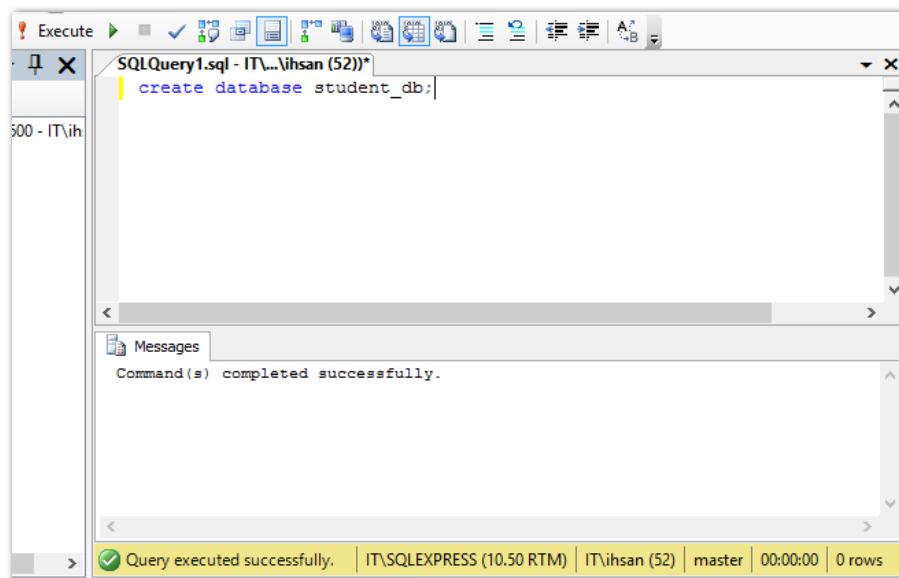
Figure 4.10 Create a database by using a command line

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❑ **TSQL Step 2- Use Database:** Write "use student_db;", then press execute. This tells the query window to run any future commands against the newly created "student_db" database rather than any other database.
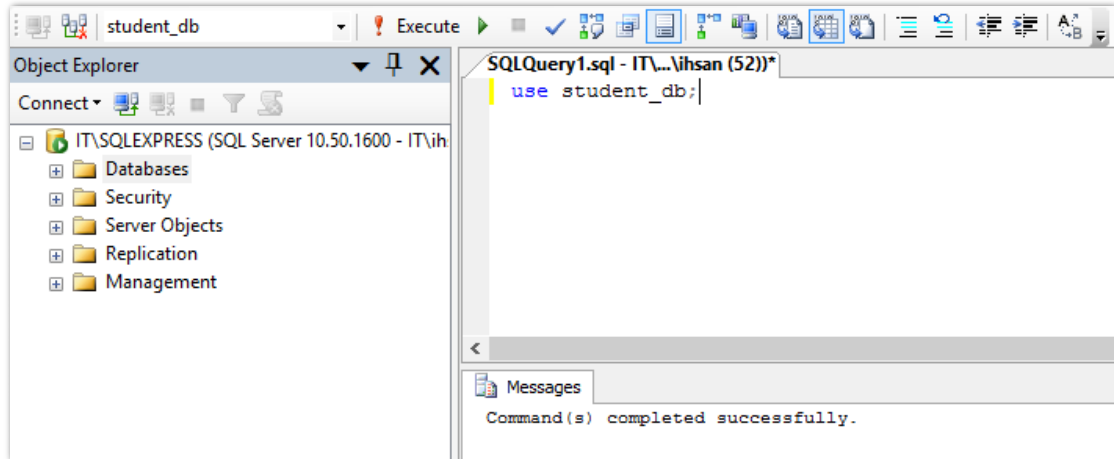
Figure 4.11 Using "use" command to select a database

❑ **TSQL Step 3 – Create Table:** Next, we'll create a "course" table to hold data. Delete any TSQL in the query window and execute create table commands as shown in the following figure (4.12), then press (F5) from keyboard to execute commands.
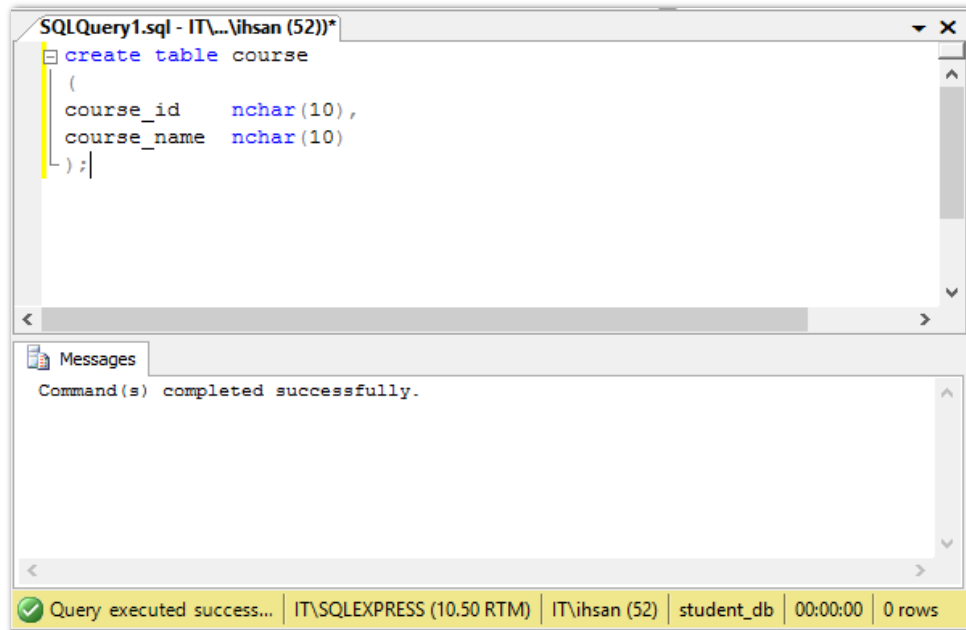
Figure 4.12 Create table by using command line

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❑ **TSQL Step 4 – Enter Data:** Execute the following statement shown in the figure (4.13) below to enter data into the newly created table "course".
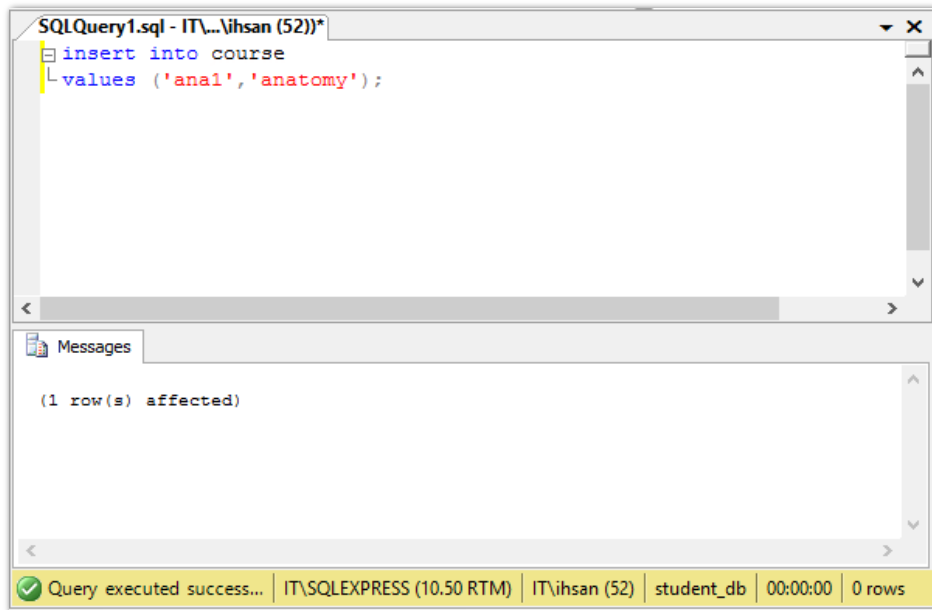
Figure 4.13 Insert data into "course" table by using command line

❑ **TSQL Step 5 – View Data:** This is the final step, to view the data just entered. Removing the previous statements and execute the following TSQL as in the following figure (4.14).
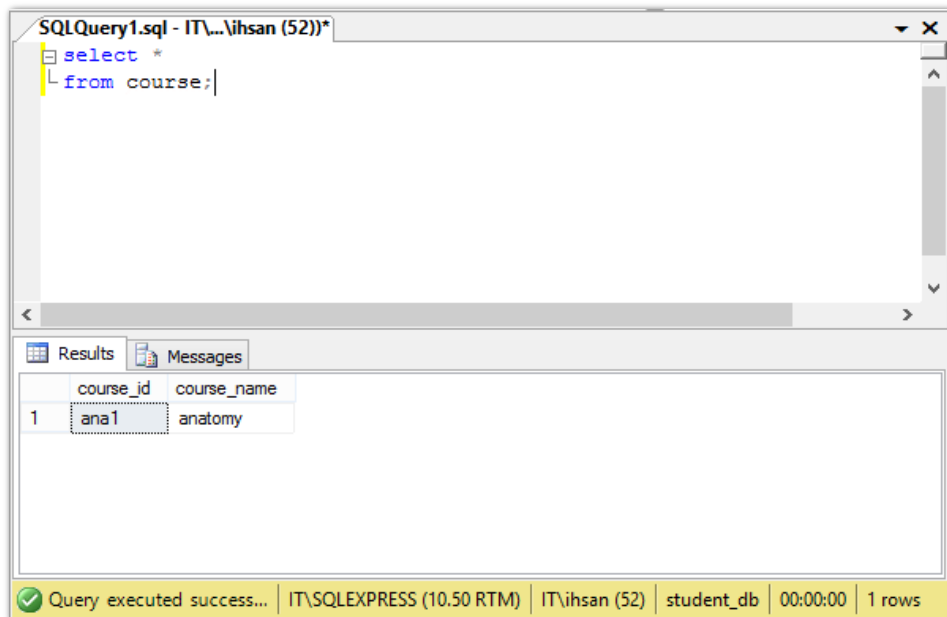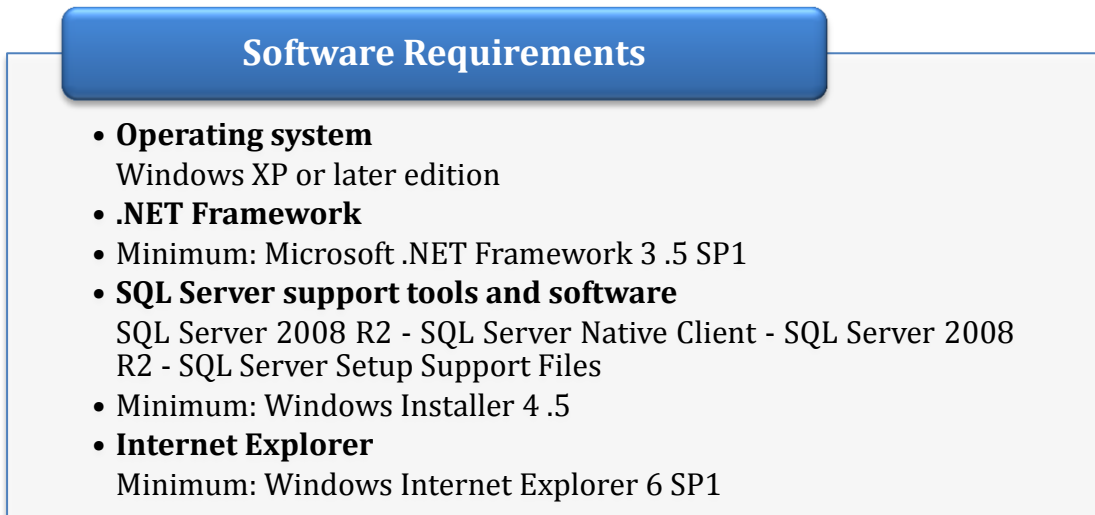
Figure 4.14 View data of "course" table by using command line

4.1.1.5. SQL Server 2008 R2 Hardware and Software Requirements:
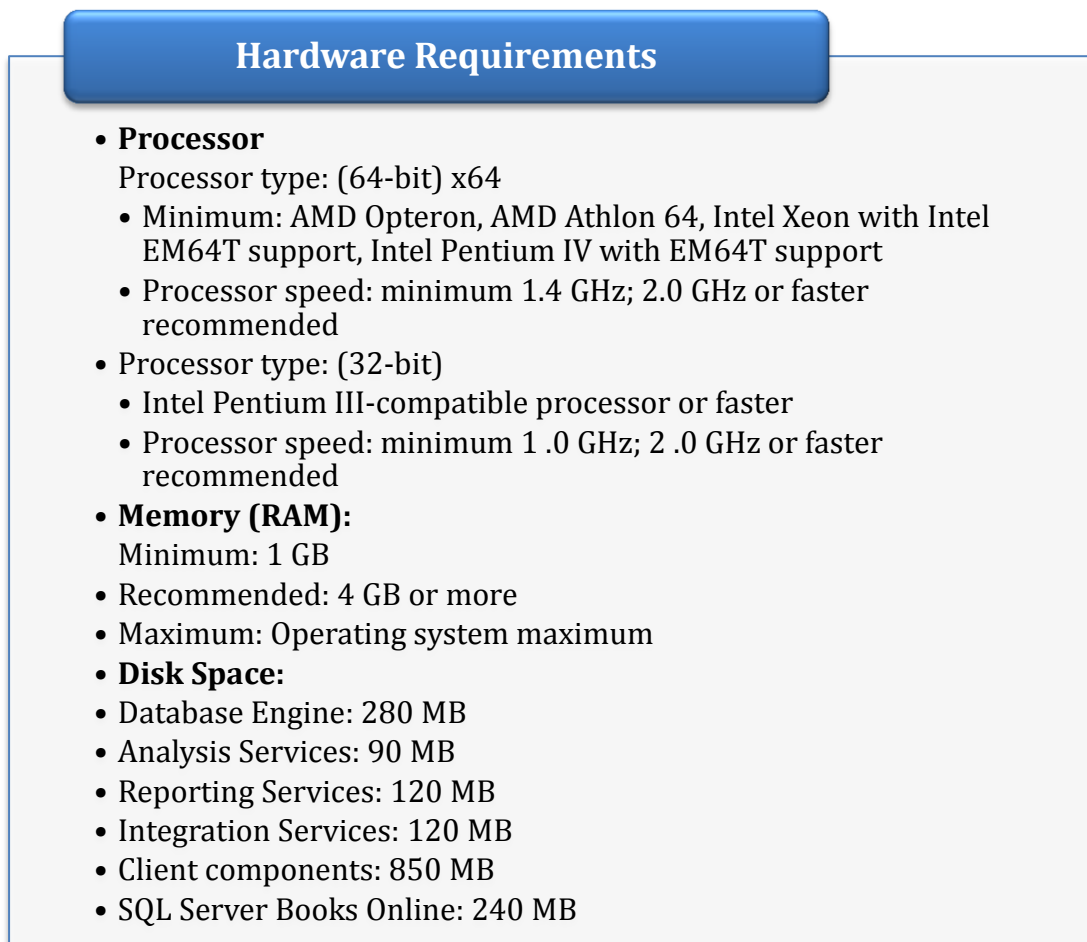
The following figures (4.15) and (4.16), showing the software and hardware requirements for SQL server 2008 R2:

Software Requirements

- **Operating system**
  Windows XP or later edition
- **.NET Framework**
- Minimum: Microsoft .NET Framework 3 .5 SP1
- **SQL Server support tools and software**
  SQL Server 2008 R2 - SQL Server Native Client - SQL Server 2008 R2 - SQL Server Setup Support Files
- Minimum: Windows Installer 4 .5
- **Internet Explorer**
  Minimum: Windows Internet Explorer 6 SP1

Figure 4.15 Software requirements of the sql server 2008 r2

Hardware Requirements

- **Processor**
  Processor type: (64-bit) x64
  - Minimum: AMD Opteron, AMD Athlon 64, Intel Xeon with Intel EM64T support, Intel Pentium IV with EM64T support
  - Processor speed: minimum 1.4 GHz; 2.0 GHz or faster recommended
- Processor type: (32-bit)
  - Intel Pentium III-compatible processor or faster
  - Processor speed: minimum 1 .0 GHz; 2 .0 GHz or faster recommended
- **Memory (RAM):**
  Minimum: 1 GB
- Recommended: 4 GB or more
- Maximum: Operating system maximum
- **Disk Space:**
- Database Engine: 280 MB
- Analysis Services: 90 MB
- Reporting Services: 120 MB
- Integration Services: 120 MB
- Client components: 850 MB
- SQL Server Books Online: 240 MB

Figure 4.16 Hardware requirements of the sql server 2008 r2

4.1.2. Microsoft Visual Studio 2010:

Microsoft Visual Studio 2010 (VS) is an integrated development environment (IDE), it is a set of tools in a single application that help to write programs [24]. Without VS, will be needed to open a text editor, write all of the code and then run a command-line compiler to create an executable application. The issue with the text editor and command-line compiler is that will lose a lot of productivity through manual processes. In the figure (4.17) below shows the main interface of Microsoft Visual Studio 2010.
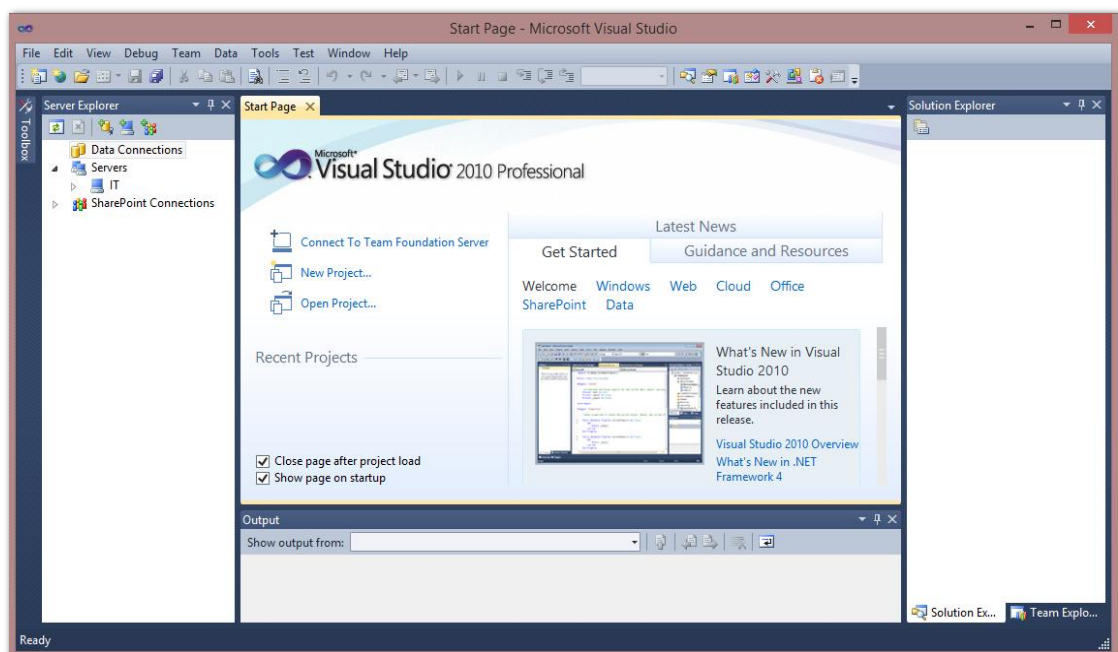
Figure 4.17 The main interface of Microsoft visual studio 2010

4.1.2.1. Create New Project in Microsoft Visual Studio 2010:

From the Windows Start Menu, select "Microsoft Visual Studio" and Microsoft Visual Studio will start, then left click on "File" and select "New project", new project dialog box will open as shown in figure (4.18). Student Information System project It was built under (.Net Framework) environment in visual basic (VB) language and select the first choice "Windows Forms Application", finally in name field write the name of this project as "student".
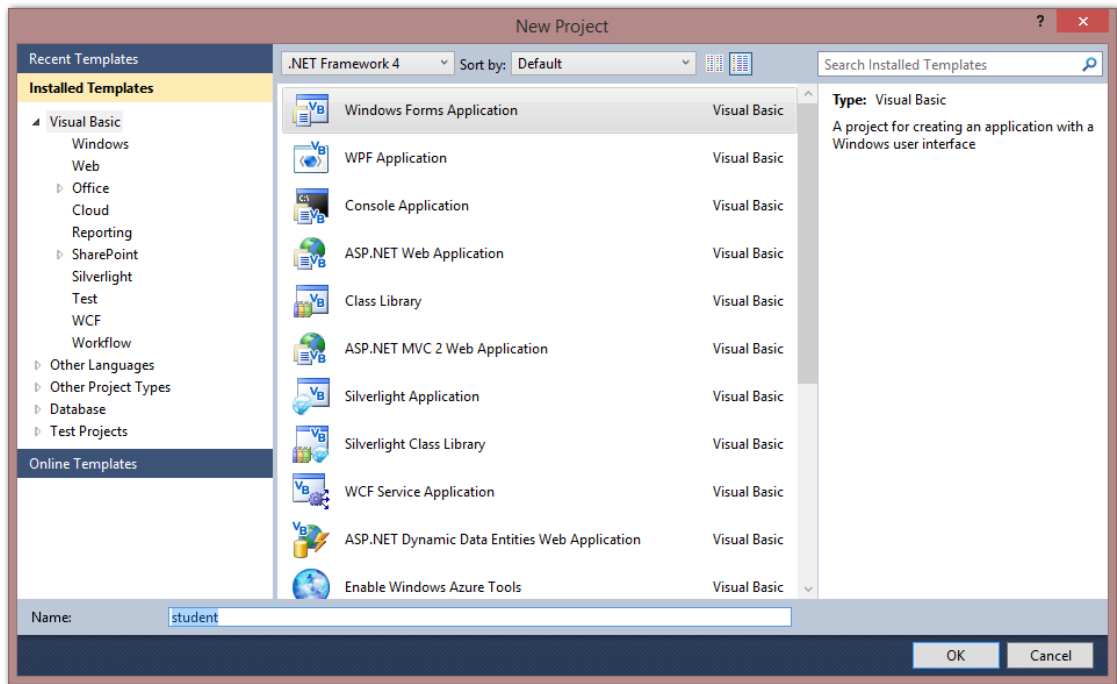
Figure 4.18 New project dialog box

4.1.2.2. Microsoft Visual Studio 2010 Software and Hardware Requirements:

In the following figure (4.19) illustrate the software and hardware requirements that needed to install Microsoft Visual Studio 2010 program.

Software Requirements: Recommended operating systems include Windows Vista (all versions except for Starter)Windows XP SP2 or later (all versions except for Starter), Windows 7 (only Ultimate at the time this chapter was written), Windows 2003 (SP1 or R2 or later), and Windows 2008 (SP1 or R2 or later)

Hardware Requirements: 32-bit x86 or 64-bit (x64) CPU; At least 1GB RAM; 5400 RPM hard disk drive; 3GB hard disk space; DVD-ROM; DirectX video at 1280 × 1024 resolution; 1.6 GHz processor

Figure 4.19 Software and hardware requirements of the visual studio 2010

4.2. Results:

In this part will design Graphical User Interface (GUI) to facilitate entering student data by the administrator of the system "The system administrator is an employee of the Department of Student Affairs in the college", also illustrate and design sub interfaces that regarding courses, grades and other student information including information about address, contact and so on.

4.2.1. Main Graphical User Interface:

GUI is a way to interact with a computer using pictures and other visual elements displayed on a computer screen [25].The graphical user interface is important to make the user an easy to understand what he need to do in order to use the program. To make the GUI functions work properly, must insert Microsoft Visual Studio coding of its elements. The main interface of the system contains all the sub-interfaces, sub-interfaces are three admin form, register new student and display student information. Figure (4.20) shows the main interface of the student information system.
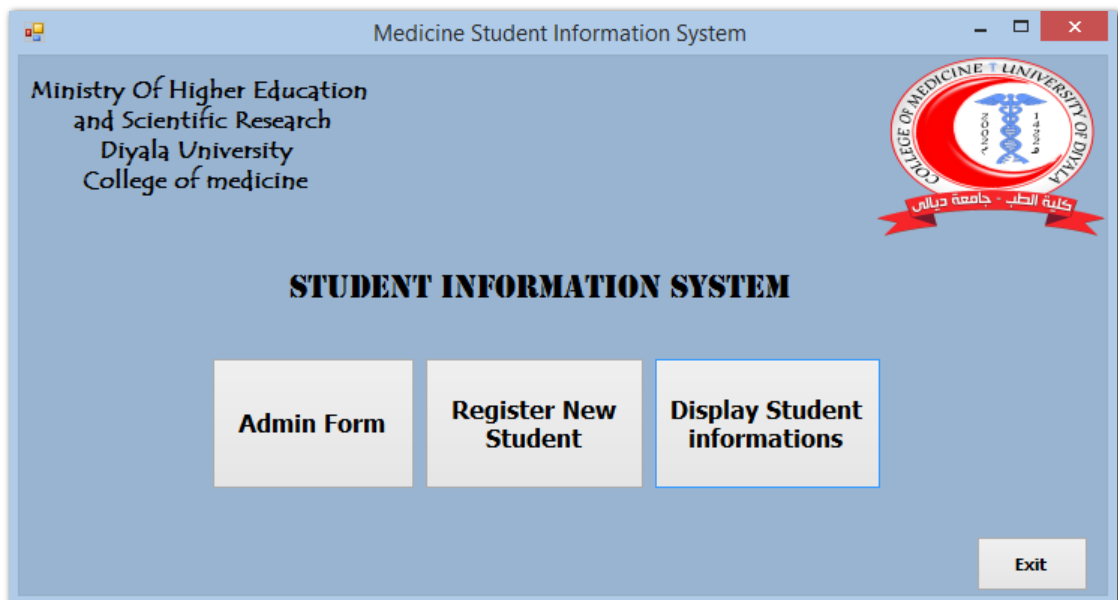
Figure 4.20 Main interface

4.2.2. Admin Form:

The sub-interface "Admin Form" consist of three tabs, first one named as "courses", this tab for adding courses for each stage and all academic years, also contains a button called "show all course" to show all the courses that has entered by an administrator ,the following figure (4.21) shows this tab.

Figure 4.21 Courses tab in the admin form

The following figure (4.22) illustrates the second tab of the Admin Form, this tab named as "Add years and units", its name indicates the functions carried out by it, these functions have been adding all the academic years since the beginning of the acceptance of the first batch of students at the college until the present day, also adding units for each course.
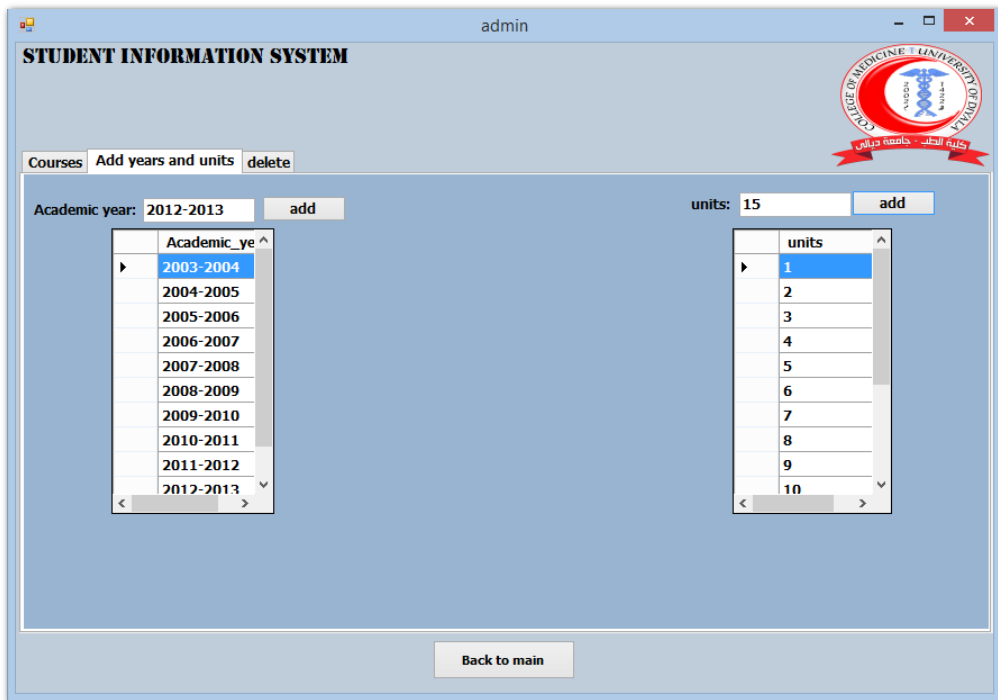
Figure 4.22 Add academic-years and units tab in the admin form

The last tab named as "delete", this tab is the most important destinations in the program and its importance comes through its work, where the amendment to the all information entered in the program. This information includes, units, academic years, courses and students. Figure (4.23) illustrates the work of this tab.
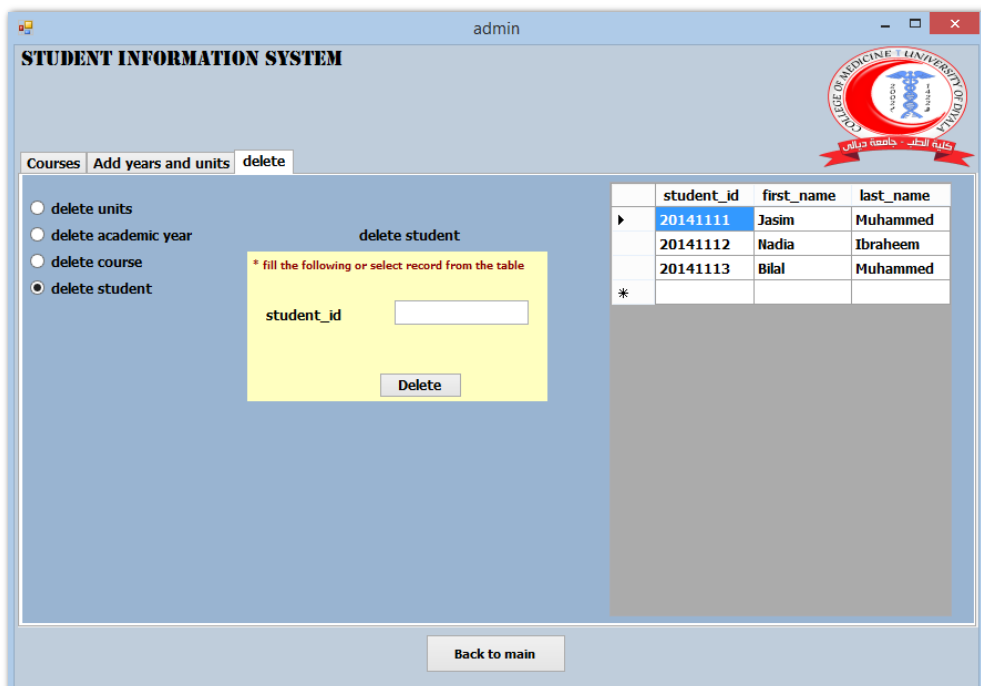
Figure 4.23 Delete tab in the admin form

4.2.3. Register New Student:

This sub-interface consists of several forms prepared to insert the new student information, these information includes:

- ❍ Student basic information.
- ❍ Identity and contact information.
- ❍ Previous school information.
- ❍ Picture of student.

The following figures (4.24), (4.25), (4.26) and (4.27) show the four forms that mentioned above respectively:

Figure 4.24 Student basic information form

Figure 4.25 Student identity information form

Figure 4.26 Previous school information form
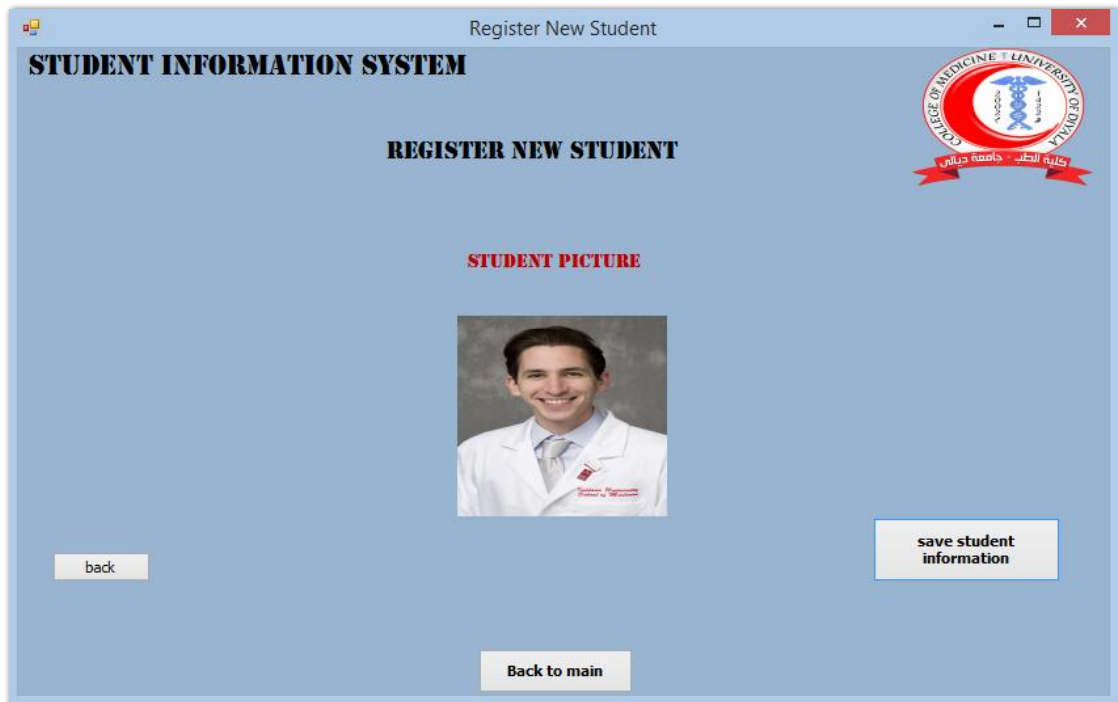
Figure 4.27 Adding student picture form

4.2.4. Display Student Information:

The last sub-interface of the system is for displaying and printing student information, in addition to enter some information related to the student degrees in the courses that he studied. Figure (4.28) shows a list of all students, besides to the possibility of the search for any student in the system. This search is done by student ID or by the name of the student, with the addition of another way to search named as filtering, these filtering through student stage and admission date for the student.

Figure 4.28 List of all students

In case we want to display the details of the student information, that include student basic information, identity and contact information and previous school information that has been inserted previously, press on a student ID to open those details for student information as shown as in the figure (4.29).

Figure 4.29 Student details information

Student details information form contains three tabs, first one shown in the figure (4.29) above, consist of student basic information and student identity information. The second tab is named "previous school information" contains information on the junior high school in addition to high school grades that qualify the student for admission to the college, this tab is illustrated in the following figure (4.30).

Figure 4.30 Previous school information tab

The last tab is "Add course degrees" its name demonstrate the function carried out by it, adding final grades of student at the end of the course as shown as in the following figure (4.31).

Figure 4.31 Adding course degree tab

In the figure above for all the tabs observe in the upper right four buttons, first one to display all students list named as "list all students", for second to show student degrees in his courses, this button has been named as "view student degrees" when it is clicked, student degrees will appear in all stages as shown as in the figure (4.32) below. The last tab, "Back to main" its utility to return to the main program interface (figure 4.20).

student degrees details Print

student id: 20141111   sex: male   addmission date: 15/09/2003
Student name: Jasim Fadhil Muhammed Ala   graduation date: graduate at 4/7/2014

first year

2003-2004 course name	first units	attempt degree
Biology	7	76
Chemistry	8	78
Physics	7	76
Anatomy	8	56
Computer	4	87
Arabic	2	67
Human Rights	2	67
Terminology	2	76
avarage		73

Second year

2004-2005 course name	first units	attempt degree
Anatomy	10	60
Histology	7	87
Embrilogy	2	76
Physiology	15	65
Chemistry	8	55
Computer	2	52
Human Rights	2	60
English	2	54
average		65

Third year

2005-2006 course name	second units	attemp degree
pharmacology	9	60
Biology	7	54
Parasites	6	53
Medicine	5	60
Surgery	2	54
Community	4	56
Pathalogy	6	57
Immunology	4	51
average		56

Fourth year

2006-2007 course name	second units	attemp degree
Community	10	66
Forensic	6	87
Medicine	11	63
Surgery	9	55
Obestetrics	6	53
Pathology	6	64
Gynecology	4	76
Pediatrics	4	66
average		65

Fifth year

2007-2008 course name	first units	attempt degree
Medicine	8	55
Surgery	10	77
Gynecology	4	89
Pediatrics	7	65
Psychology	4	54
Dermatology	4	87
ENT	4	89
Ophthalmology	5	65
average		71

Sixth year

2008-2009 course name	first units	attempt degree
Medicine T	8	67
Medicine P	7	60
Surgery T	8	56
Surgery P	7	54
Gynecology T	5	53
Gynecology P	4	83
Pediatrics T	5	77
Pediatrics P	4	55
average		62

GPA 65.3333

Figure 4.32 Student degrees

CHAPTER 5

CONCLUSION

In this thesis we have introduced a database management system for students in College of Medicine - University of Diyala. The main objective to design and carry out this system is to collect 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 objective as well as the functions for which they were designed this system has been achieved. 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 can promote the management of college to carry out its tasks high efficiently.

Student Information System can reduce time and effort required in the process of management students' information, also the need for a large number of staff to carry out the functions of the DSA, where the management of this system needs to only one employee, furthermore it will help the administration of the college to speed decision-making, where this system has made it possible for the administration of the college to use real-time data when making decisions, which flows into the benefit of the college. The characteristics of this system are the answer for all the questions raised from the purpose of this study.

For further recommendations, linking Student Information Management System (SIMS) with the college's website enable the student to directly access all aspects of his academic study through the online interface embedded on the college website. This online system can use a user authentication, where every student has a username and password to display his information and give requests online thus reducing time processing. Additionally, students can be involved in operations of updating and modifying his information, which leads to faster order fulfillment.

The work presented in this thesis has the following limitations:

❍ The system has not been tested.

❍ The budget is not discussed.

❍ Organizational transition and staff education is excluded.

❍ While the current system is getting replaced by the proposed system both systems need to be in service for the transition phase. This requires planning on both executive staff and management.

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