

Palestine Polytechnic University
College of Administrative Science and Informatics
Information Technology Department



Resource Allocation System

In Higher Education Institution

Applied to Palestine Polytechnic University

Prepared by:

Fadi Fannoun

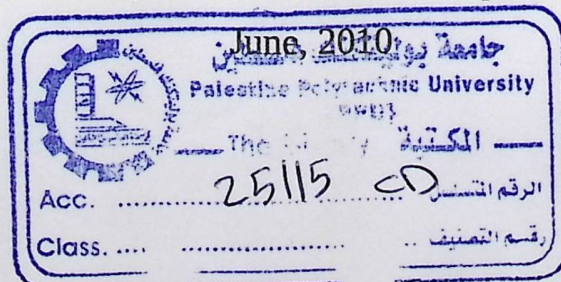
Hadeel Ayyad

Rabab Dwaik

Supervised by:

Dr. Ismail AL-Roumi

This project was submitted in partial fulfillment of the requirements for the degree B.Sc.



Dedication

To who lit the light in my road and made the sun in the darkness, to best woman in the world **my mother**. To who gave me hope to be myself, for you dear **my father**. To the spike of Grains and the fruits of the olive: Our **Home Palestine**

Acknowledgment

We would like to thank our supervisor **Dr. Ismael AL-Roumi** who taught us the way of creative thinking, as he was step by step watching. Also, we would like to thank **Mr. Saed AL-Shella** and **Mr. Khaldoun Halawani** for helping us along the way. Thanks to everyone who help.

ملخص المشروع

في ضوء حاجة المؤسسات الملحة لتوظيف تكنولوجيا المعلومات في شتى مجالات ونظم المؤسسة تنبع فكرة مشروع نظام توزيع المصادر. ينقسم مشروع نظام توزيع المصادر إلى جانبين، يتمثل الجانب الأول وهو الجانب البحثي في فصل الدراسات السابقة، حيث قام فريق المشروع بعمل دراسة تلقي نظرة عامة على موضوع نظام تخطيط موارد المؤسسة تم في هذا الفصل الاطلاع على آخر الدراسات والإنجازات البحثية والتطبيقية في مجال تخطيط موارد المؤسسة. فائدة هذه الدراسة بأنها تعطي فكرة أوضح وأعمق لفريق المشروع عن كيفية ومنهجية حوسبة أنظمة المؤسسة ونقلها من الطرق التقليدية إلى التكنولوجيا في التعامل مع مصادرها ومواردها. وبما أن نظام تخطيط موارد المؤسسة هو عنوان شامل يتعامل مع كل جزئيات المؤسسة ويتفرع إلى عدة أنظمة إلكترونية يمكن تطبيق كل نظام منها بشكل منفصل ومن ثم تجميع كل هذه الأنظمة في بوتقة واحدة، قرر فريق المشروع تطبيق نظام يندرج وينطوي تحت مظلة نظام تخطيط موارد المؤسسة ألا وهو نظام توزيع المصادر.

أما الجانب الآخر فهو الجانب التطبيقي وفيه تم نقل النتائج البحثية إلى حيز التنفيذ والتطبيق. فتم برمجة وبناء نظام توزيع المصادر المشتق من النظام الأشمل نظام تخطيط موارد المؤسسة. يقوم نظام المشروع على إيجاد حل لمشكلة توزيع المصادر داخل المؤسسات الجامعية وتم تطبيقه على وجه التحديد في جامعة بوليتكنك فلسطين مطبقاً على دائرة تكنولوجيا المعلومات التابعة لكلية العلوم الإدارية ونظم المعلومات. هذه المشكلة تعترض طريق المشرف الأكاديمي بالدرجة الأولى مع بداية كل فصل دراسي حيث تتمثل في كيفية التعامل مع عناصر الدائرة الرئيسية (طلاب، مواد، أساتذة، ومصادر فيزيائية) فتوزيع هذه العناصر بصورة تقليدية يشكل عبئاً لا يمكن تجاهله يقع على عاتق المشرف الأكاديمي.

يوفر نظام توزيع المصادر سلاسة في توزيع المصادر الرئيسية كل مصدر حسب العوامل التي يعتمد عليها. فيتم توزيع الطلاب على الخطة الأكاديمية حسب سنة الخطة لكل مجموعة من الطلاب. ومن ثم توزيع وعرض المواد اللازمة لكل مجموعة ناتجة من عملية التوزيع الأولى. يلي ذلك توزيع حمل الفصل الكلي بين أساتذة الدائرة كل حسب درجته العلمية. وأخيراً توزيع المصادر الفيزيائية من قاعات تدريسية ومختبرات على نتائج التوزيع للطلاب والمواد والأساتذة. ولتحقيق هذه السلاسة يعتمد نظام توزيع المصادر أسلوب التكامل بين الدائرة المطبق عليها هذا النظام مع دوائر أخرى لازمة لتزويد النظام بالمعلومات اللازمة كدائرتي التسجيل والمواد البشرية.

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Abstract

Computerized systems provides the university with information technology solutions for many problems facing the university. Thus, we have introduced in our project a literature review about a system that can move universities towards electronic technologies and transform all organization's systems into computerized systems. This system is Enterprise Resource Planning (ERP). ERP is a larg and enterprise-wide system that consists of wide range of operations and can handle millions of business processes. We have decided to limit our scope to a sub-system and a part of ERP that is called Resource Allocation System.

1.1 Introduction

Resource Allocation System (RAS) main object is to integrate IT Department with other departments, specifically Registration Department and Human Resources Department in Palestine Polytechnic University. Through creating a web-based application we have achieved the integration among three departments. This integration eliminate the traditional way of exchanging data and information from Registration Department and HR Department and enable the Academic Administrator of the IT Department of doing his/her work easily and save much time and effort this could lead to a faster decision making.

1.2 Preliminary study

RAS can handle four main functions that is usually done by the academic administrator: 1) distribute students to the academic plan 2) present courses to distributed students 3) distribute load on instructor 4) and distribute physical resources. These four functions need integration between the IT department and Registration Department which will provide the IT Dept with students information.

Chapter 2: Literature Review

2.1 Introduction

2.2 ERP Definition

2.2.1 Educational ERP

2.3 Reasons to Implement ERP System

2.4 Benefits and Obstacles

2.4.1 Benefits

2.4.2 Obstacles

2.5 Conclusion

Chapter 3: Requirements Analysis

3.1 Introduction

3.2 Project Scope

3.3 General View to Palestine Polytechnic University

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1.1 Introduction

Technological revolution is the most recent era that came after industrial revolution. The technological and technical progress contribute to remove the barriers between the state and its people, and the expansion of using computerized systems contribute in solving some problems in the organization, and to find new ways of communication, though this age is still far from the previous era with respect of exchange ideas and convey information throughout the world, which has been diminished in a small village.

Chapter 1

Introduction

The world becomes a small village depending on the speed and accuracy of conveying and sending information that is due to the importance of the information in all walks of the life: scientific, cultural, economic... So, it's necessary to develop service that a university can provide it and enhance the way it provided by using modern information-communication methods.

1.1 Introduction

Qadisiyah University is one of the most important technological universities in Iraq. As a result of this fact, the working team decided to build

1.2 Study Problem

the university of Qadisiyah Polytechnic especially Information Technology Department (IT) in order to allocate from and share information

1.3 Objectives

and Human Resource Department according to a single database to perform all of the data allocation related functions.

1.4 Importance of Project

1.5 Feasibility Study

1.6 Gantt Chart

Qadisiyah University (QU) is kind of large organization that has a number of departments and each department has a number of majors which each has a number of courses, students, and instructors. The architecture of QU requires a system to perform kind of hard functions and tasks which are correlated with dealing with main component of each faculty which are Courses, Students, Instructors, and Rooms. Conducting such functions and tasks in traditional ways are time and effort consuming. These functions and tasks could be distributed faculty's students in a specific Academic Plan, presenting courses to those students and other related activities. Most of these exhausting tasks are a responsibility of the Academic Supervisor in each department which means an increased burden on the Academic Supervisor. According to mentioned problems some questions take place:

1. Who can access the database in order to perform the previously mentioned functions?
2. If the administrator or supervisor doesn't have enough time to do that?
3. How will the supervisor do his or her job in case of growth of each faculty?
4. How can the IT Department obtain the needed database to perform its own tasks from other departments?
5. What benefits can be achieved if an application can allocate the resources and do activities electronically instead of traditional paper-based approach?

1.1 Introduction

Technological revolution is the most recent one that came after industrial revolution. The technological and technique process contribute to remove the barriers between the state and its people, and the expansion of using computerized systems contribute in solving some problems to the organization, and to find new ways of communication, though this age is great different from the previous one with respect of exchange ideas and convey information with high speed throughout the world, which has been diminished to a small village.

After this development the world becomes a small village depending on the speed and accuracy of receiving and sending information that is due to the importance of the information in all walls of the life: scientific, cultural, economic,. So, it's necessary to develop service that a university can provide it and enhance the way it provided by using modern telecommunication methods.

Given that the Palestine Polytechnic University is one of the most important technological education institution in Palestine. As a result of this fact, the working team decided to build a web-based application that helps the university of Palestine Polytechnic especially Information Technology Department (IT) in order to allocate from and share information with Registration Department and Human Resource Department according to a single database, to perform a set of usual data-allocation related functions.

1.2 Study Problem

Because Palestine Polytechnic University (PPU) is kind of large organization that has a number of faculties and each has a number of departments and each department has a number of majors which each has a number of courses, students, and instructors, the architecture of PPU requires a system to perform kind of hard functions and tasks which are correlated with dealing with main components of each faculty which are Courses, Students, Instructors, and Rooms. Conducting such functions and tasks in traditional ways are time and effort consuming. These functions and tasks could be: distributing faculty's students to a specific Academic Plan, presenting courses to those students and other related activities. Most of these exhausting tasks are a responsibility of the Academic Supervisor in each department which means an increased burden on the Academic Supervisor. According to mentioned problems some questions take place:

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1.3 Objectives

The system aims to achieve a set of objectives. These can be summarized as follows:

1. To create a web-based application capable of performing activities of allocating Information Technology Department's resources.
2. To facilitate tasks of the Academic Supervisor and eliminate traditional way of dealing with resource allocation.
3. To make an integrated system within the Information Technology department that integrate specific processes of its own with the Registration Department and Human Resources Department which will provide the system with specific data.
4. To generate and provide Academic Administrator with reports.

1.4 Importance of the Project

Importance of Resource Allocation System project in IT Department could be noticed within two aspects:

1.4.1 Academic

Resource Allocation is considered to be a part of Enterprise Resource Planning (ERP) and a humble component of Enterprise-Wide Operations. As a result of this fact we needed to review papers and other references to study the subject of ERP. Our Project provide a general view, through (Chapter 4: Literature Review), about ERP systems and highlight recently paper, works, and last achievements of people and organizations who are interested in ERP Systems. This chapter also may introduce fashion approaches of academic businesses to be adapted enterprise-wide through the whole university.

1.4.2 Practical

Applying an instance of ERP Systems which is Resource Allocation System could lead the IT Department to the best of its performance.

1.5 Feasibility study

This section discuss and study the required resources to build and complete Resource Allocation System.

1.5.1 Workers

To accomplish the Resource Allocation System three system developers were needed.

1.5.2 Physical Resources

Table 1.1:Hardware Resources

Item	Quantity	Price	Total Cost
Personal Computer	1	349\$	349\$
Printer	1	179\$	197\$
			528\$

Source ([http:// www.amazon.com](http://www.amazon.com), December 2009) (<http://reviews.pricegrabber.com>, December 2009)

1.5.3 Software Resources

Table 1.2: Software Resources

Item	Quantity	Price \$	Total Cost
Microsoft Windows XP SP2	1	109.95\$	109.95\$
Microsoft Office 2003	1	69.99\$	69.99\$
Microsoft Visual Studio 2005 Shipped with My SQL Server	1	250\$	250\$
			429.94\$

Source (<http://www.amazon.com>, December 2009)

The following shows the minimum requirements for system development.

Table 1.3: Personal Computer Specifications

Item	Specification
Personal Computer	- Pentium 4 - 512 mb of RAM - 40 GB

Source: (<http://www.hp.com>)

1.5.4 Total Cost

Table 1.4: Overall Cost

Human Resource	Hardware	Software	Total Cost
600\$	528\$	429.94\$	\$1,557.94

2.1 Introduction

This chapter attempts to present the latest research work in the field of Enterprise Resource Planning Systems (ERP), especially in the field of higher education. Through this chapter, which is divided into several sections, common points and outlines are discussed. These are handled by most of references which are used, books, papers, and articles. In order to achieve the purpose of this work and summary is divided into modules to show main ideas which make an overview apply to ERP system through explaining reasons for its implementation and drawbacks follow implementing and

Chapter 2

Literature Review

A main challenge to any organization is to integrate its all environment and systems, and create a safe, less cost way for achieving this. An approach was developed to serve this purpose; it is the Enterprise Resource Planning. This term was coined in the early 1990s (Crawford & Ogden, 2000). In its basic definition, ERP is an enterprise-wide information system that integrates all business processes in the entire organization (Al-Fawar, 2008). A brief history look to ERP history, ERP construction process, ERP architecture, Database Management system. And go on to discuss the ERP system like Legacy Systems (Zykov).

2.1 Introduction

2.2 ERP Definitions

2.3 Reasons of Implementation

2.4 Benefits and Drawbacks

2.5 Conclusion

2.2 ERP Definitions

ERP in its pure expression is a term for computer and software, with multi-function purposes. ERP integrates and automates major – sometimes all – enterprise processes and functions. It's like merging or mixing all internal systems within an organization into one single system which would make it easier to these different systems to communicate and share data and exchange information, creating a database and warehouse (Al-Fawar, Al-Sali and Eidahi, 2008).

According to Nati and Lap (2001) ERP is "a packaged business software system that enables a company to manage the efficient and effective use of resources (materials, human resources, finance, etc.) by providing a total, integrated solution for the organization's information processing needs" (Al-Fawar, Al-Sali and Eidahi, 2008).

2.1 Introduction

This chapter attempts to present the recent research work in the field of Enterprise Resource Planning Systems (ERP), especially in the field of higher education. Through this chapter, which is divided into several sections, common points and outlines are discussed. These are handled by most of references which are used; books, papers, and articles. In order to achieve a useful review work and summary is divided into subtitles to show main ideas; ERP definitions, what make universities apply an ERP system through explaining reasons that would lead universities to do so, what benefits and drawbacks follow implementing and using this system.

A main challenge to any organization is to integrate its all environment and systems, and create a safe, less cost way for achieving this. An approach was developed to serve this purpose; it is the Enterprise Resource Planning. This term was coined in the early 1990s. (Swartz & Orgill, 2001) In its basic definition, ERP is an enterprise-wide information system that integrates and controls all business processes in the entire organization. (Al-Fawaz, Al-Salti and Eldabi, 2008). A brief fleeting look to ERP history, ERP construction procedures are based on data model, architecture, Database Management System. And go through several development approaches like Legacy Systems. (Zykov).

In the past, ERP systems were used in larger more industrials types of organization. However, the use of ERP has been changed and is extremely comprehensive. Today the term can refer to any type of organization, no matter what industry it falls in, and are used in most types of organizations, large or small. (<http://www.technet.net>, November 2009).

2.2 ERP Definitions

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Table (2-1): A Literature Review of ERP Definitions

Definition	Source
ERP vanquishes the old standalone computer systems in finance, HR, manufacturing and the warehouse, and replaces them with a single unified software program divided into software modules that roughly approximate the old standalone systems	Thomas Wailgum, 2007
ERP systems are software packages that integrate information across the entire organization. This integration removes inconsistencies and enables the organization to attain consolidated reports.	Shakir, 2000
ERP systems, a form of Enterprise-Wide Information System (EWIS), represent sets of business applications that allow for an organization -wide management of operations. ERP systems are seen as optimization and integration tools of business processes across the supply chain (within and beyond organizational boundaries) implemented through modern information management systems	Al-Mashari, 2000
Enterprise Resource Planning software systems (ERP) encompass a wide range of software products supporting day-to-day business operations and decision-making	Ashim Raj Singla, 2008
ERP is a term for computer and software systems, which integrate and automate major enterprise processes	David F. Rico, 2003
(ERP) is the new solution to the business systems and provides comprehensive business functionality using Information Technology. The existence and use of ERP systems have a significant impact on the Information Systems (IS) in a business	Dana K. McCann, Deborah Grey, 2009
Enterprise Resource Planning (ERP) is an approach that most businesses use to enhance their performance and productivity. This systematic approach makes it easier for organizations to plan for and allocate their resources in the most effective way	http://www.zaheerspeaks.com , November 2009
Enterprise accounting systems for automating the general ledger, accounts payable, accounts receivable, payroll, inventory, job/project costing, fixed assets, order entry, and budgeting	http://accountingsoftwareadvisor.com , November 2009

Source (Literature review).

2.2.1 Educational ERP

Within a university, David Rico (2003) has described ERP as an information technology solution that integrates and automates recruitment, admissions, financial aid, student records, and most academic and administrative services. Typical administrative functions may include human resources, accounting, payroll, and billing. Academic functions include recruitment, admissions, registration, and all aspects of student records. (Rico, 2003)

Such integrated functions and operations across the universities could be expanded to be conducting with external sources. By using an ERP system universities now can connect its

internal environment with external one, achieving by this a competitive advantage. Thus, as an ERP system facilitates the information flow across all universities processes and services internally and externally (Al-Fawaz, Al-Salti & Eldabi, 2008).

ERP can meet the current space and wide range of functions, and collecting them in one data base, such as personal areas (McCann & Grey 2009) Human Resource Management (HRM), manage the resource chain Supply Chain Management (SCM) (Forslund, 2007), Finance Resource Management (FRM), to connect the market and needs of customer with the sales and purchasing transactions (Vuksic and Spremic 2002) (CRM) Customer Relationship Management, and to schedule and release manufacturing work orders and purchase orders (Vuksic and Spremic 2002) (MRP) manufacturing resource Planning. ERP can be shown with the main component in (Figure2.1) below, as integrated system:

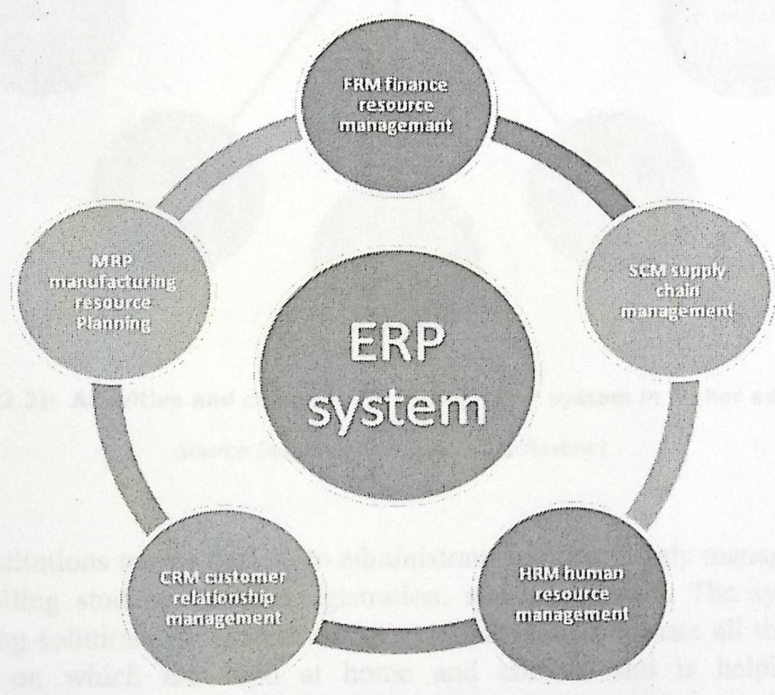


Figure (2.1): Information integration through ERP system

Source: Adapted from (Literature Review)

ERP objectives target and mainly focus on large facility planning to use it in an integrated way, and facilities that the firm have and could provide the resources, as elements of this system. Procurement and purchasing (Swartz and Orgill, 2001) and sales and Financial Accounting (McCann & Grey 2009) (Goldstein 2005), and internal elements for production projects and many, external elements as restaurants, hospitals ... etc. (Figure 2.2) below shows the activities in ERP system in education

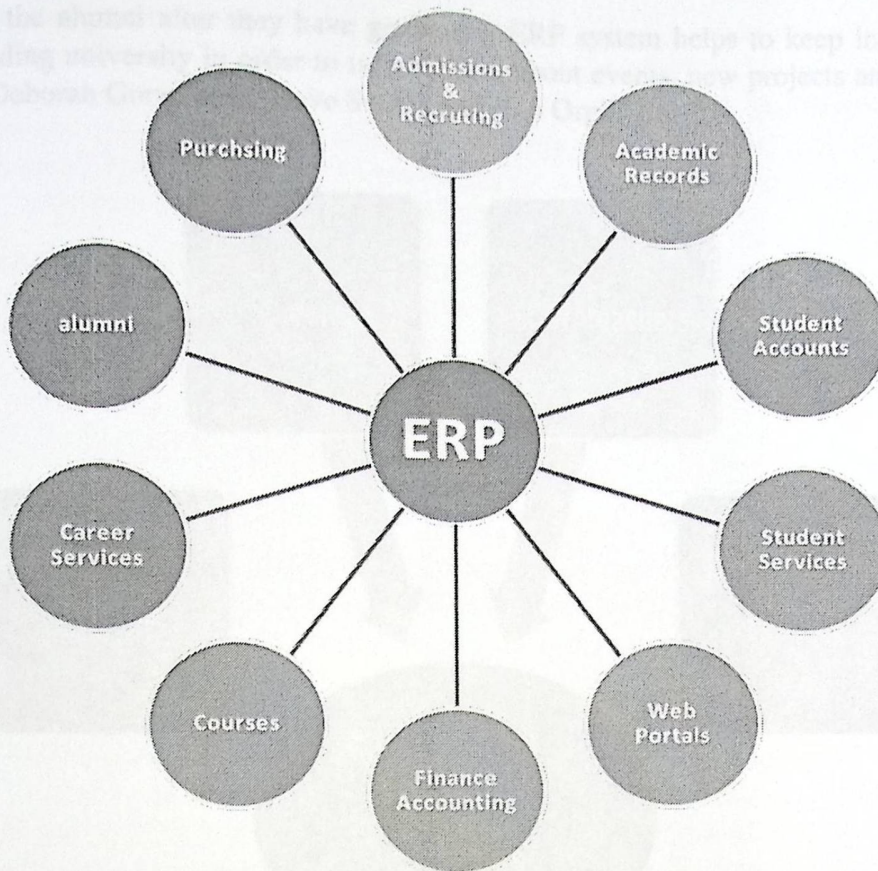


Figure (2.2): Activities and components through ERP system in higher education

Source (Adapted from Literature Review)

Educational institutions need a system to administrate and completely manage all operations such as controlling student records, registration, and recruitment. The system must also provide planning solutions for the university's resources, to automate all the processes and issues related on which are used at home and abroad, and is helping to improve communication between parents, teachers, administration, students and graduates of universities and colleges that are still located in the deep gap that increase the complexity (Tarn, Razi and Chen, 2009)

Educational ERP system also covers the administrative aspects, dealing with a wide variety of domestic activities such as admission, financial management, administration offices and many other operations. As parent what the needs to get management timely updates about their children from academic and non- academic side, and care about the schools and institutions, events... etc. As a student, the main goal is to avoid consuming the query for much transaction he or she must do. (David F. Rico 2003) (Philip and Judith Borreson Caruso 2004). As a teacher, publishing and receiving information, materials and reports available. These operations could be targeted to virtual or real students. Also tracking teacher's tasks by the responsible person is enabled. (Swartz and Ken Orgill 2001) (Swartz 2000)

Regarding the alumni after they have graduated, ERP system helps to keep in touch with their preceding university in order to inform them about events, new projects and so on (K. McCann, Deborah Grey 2009) (Dave Swartz and Ken Orgill 2001)

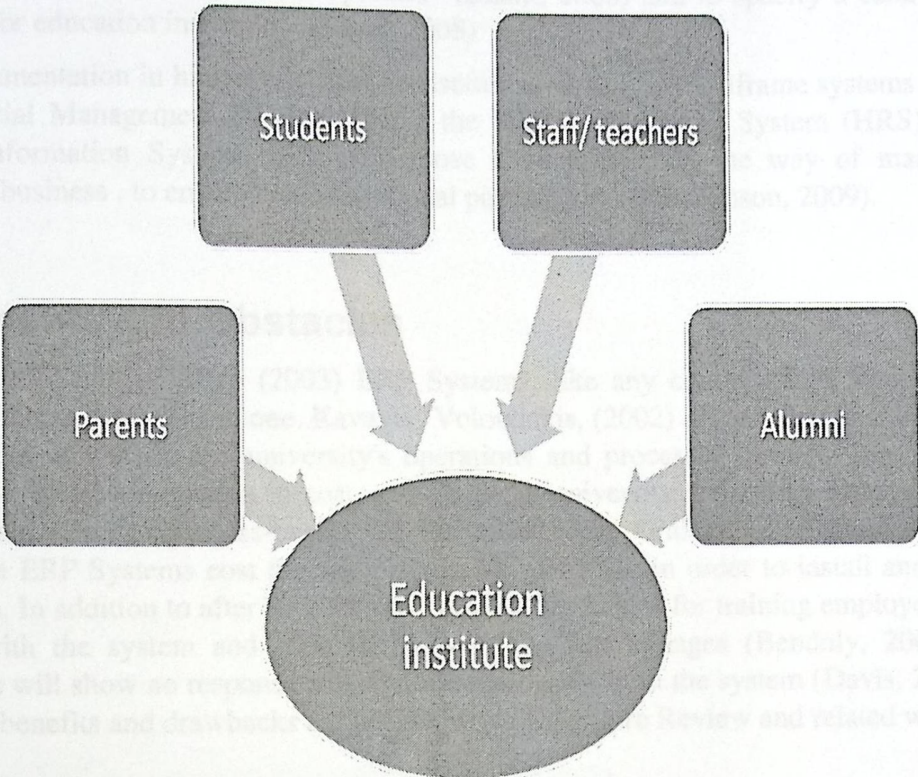


Figure (2.3): ERP Effects

Source: (Adapted from Literature Review)

2.3 Reasons to Implement ERP System

The top reasons that made universities adopt ERP solutions are to transform enterprise process, modernize computer systems and increase operating efficiency (King, Kvavik, & Voloudakis, 2002). Other is to integrate function across the enterprise in a single system that supports the institution financial, human resource, and student service, etc.." (Christopher Koch, 2002). Other universities use ERP system to increase the efficiency, keep institution competitive, replace legacy system, improve service to customer, and provide better management tool, accountability and other" (Christopher Koch, 2002)

The most important reason for implementing ERP in higher education or in any institution is to keep up with development that occurs to institution like change in the organization structure, organization culture, and norms, and also trying to keep up with technology (Siau & Mesersmith, 2003). "Although many reasons exist for the growth in ERP systems, the main emphasis on ERP implementation focuses primarily on processes of re-engineering, business. Process analysis, best practice analysis, and utilization of transaction processing systems"(Hutchinson, 2009). That can be used to create theories more appropriate for the

development of the institution and to make methodologies that available to use from any institution (Hutchinson, 2009). Another reason to implement ERP in higher education is to better understand of dynamic process that occurs in educational institution in specific contexts (Hutchinson, 2009). With ERP implementation" institution can makes certain assumptions about how a business operates" (Bhatti, 2008) and to specify a clear goal and objective for education institution (Bhatti, 2008)

ERP implementation in higher education is useful for replacing mainframe systems including the Financial Management System (FMS), the Human Resources System (HRS), and the Student Information System (SIS), and those have impact on the way of managing the university business , to ensure cross-functional participation (Hutchinson, 2009).

2.4 Benefits and Obstacles

According to David F. Rico (2003) ERP Systems, like any computerized system, have a positive effect and a negative one. Kavavik, Voloudakis, (2002) discuss that installation of an ERP System will affect the university's operations and processes through improving their efficiencies, make a reduction in cost, and carry the university from fragmented functional-based organization to process-based. On the other hand, Graham and Hutchinson (2009) clarify that ERP Systems cost the university a lot of money in order to install and maintain the system. In addition to after installation costs, we have costs for training employees to well interact with the system and make it fit with business changes (Bendoly, 2005). Also, employees will show no response and a good relationship with the system (Davis, 2007). The following benefits and drawbacks are adapted from Literature Review and related work.

2.4.1 Benefits

- Improved access to accurate time and information.
- Enhances work flow increases efficiency and reduce reliance on papers.
- Provide user friendly web based interfaces.
- Easier replacement of old and fragmented legacy systems.
- Add new services for students faculty and staff.
- Increase institutional account ability.
- Increase efficiency in business processes.
- Increase coordination and cooperation between departments and sections of the educational institutions.
- Increase the competitive advantage between the universities and educational institutions.
- Increased efficiency through the redesign of business processes in educational institutions.

2.4.2 Obstacles

- Start up high cost.
- Wrong understanding of the critical success factors.
- Weak and slow response to the system, because of traditional business.
- ERP system tends to create changes on much business process.
- Putting ERP in place requires new procedures, employee training, and both managerial and technical support. (Shang and Seddon, 2002)
- Limited time and materials: ERP systems are huge and complicated systems, and implementing such a system needs enormous time.
- Failure to rely on best practices of the ERP system.
- Lack of preparation for the organizational and cultural transformation and change that comes up with ERP implementation.
- Training cost: after installing ERP system the university needs to train its employees and provides a good trainer to do that.
- Difficulty of changing, modifying, and maintaining an ERP system.
- Limited of vendors and providers of ERP systems.
- The suppliers and vendors implement and conduct without understanding the core of the system.
- The ERP implementation complexity and largeness.
- Poor communication and background.
- Unfamiliarity with the system needs and the previous experience.

2.5 Conclusion

Recently, ERP represents an urgent need for higher educational institutions, due to its importance in keeping universities up-to-date in the world of information technology. These systems are first to transform universities into a full sharing environment among all participants using one database and one logic with keeping on securing this database and critical information. From this Literature Review, a set of Functional Requirements could be extracted and defined in the fields of the core functionality. From the previous studies and research that were reviewed, an ERP system is expected to perform the following functions:

Curriculum : Supporting Student Information System (SIS), Course Management System (CMS) and Library Automation System (LAS). *Financial Accounting:* concerning data for university's organizational structure.

Controlling: Controlling operating areas for purpose of cost and profitability analysis, cost and sales data, overhead, labor rates, and actual costs.

Human Resources: Covering a wide range of functions in HR like personnel areas, employee groups, personnel master records, payroll, and benefits administration.

Project Management: The primary challenge of project management is to achieve the whole goals of project, taking into concentration time and cost.

Supply Chain Management: Including inventory, SCM management, resource scheduling ... etc.

Quality Management and Assurance: Controlling quality of functions performance.

Warehouse Management and Business Information Warehouse: As information is a valuable resource which connects various organizations' sectors, functions and processes, it needs to be managed efficiently and effectively.

Material Managements: Such as managing purchasing departments.

This project Resource Allocation is a part of an ERP System, with a limited scope; we have defined and determined our scope in (chapter 3.3) to include only allocating resources in specific environment of IT Department. These resources include:

- Students
- Courses
- Instructors and Load
- Facilities

3.1 Introduction

This chapter is an analysis for system requirements including functional and non-functional requirements. It contains a description for each requirement, the project scope and an introduction about FPU, IT Department and. The analysis phase includes the creation of a logical system design. The logical design specifies conceptual data model, inputs, processes, and expected output requirements. System design tools: Data Flow Diagram (DFD) and

Chapter 3

Requirements Analysis

3.2 Project Scope

Project scope is limited to one of most important software under any ERP package that is Resource Allocation System. Project aims to achieve allocation and integration for resources within the IT Department with Registration Department and Human Resources Department.

3.1 Introduction

3.2 Scope

3.3 General View to Palestine Polytechnic University

3.3 Functional Requirements

3.4 Non-Functional Requirements

3.5 Hardware and Software Requirements

3.1 Introduction

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1. Students.
2. Courses.
3. Instructors and Load.
4. Resources and Rooms.

3.3 General View to Palestine Polytechnic University

Palestine Polytechnic University is a high educational institution located at Hebron city, (PPU) is one of the strongest and best universities in the technical field education and applied sciences in Palestine. It was founded in 1978 by the Universities Graduate Union (UGU) in Hebron and the University is currently headed by Dr. Ibrahim AL Masree, committed to the general laws of the Palestinian Ministry of Education and Higher Education.

Palestine Polytechnic University was launched at the beginning with a three-year Diploma program in the disciplines of electrical engineering, mechanical engineering, civil engineering and architecture. In 1982, these plans have been changed for these two diploma programs have been highlighted in the scientific aspects of these plans to meet the needs of the community and the Arab market. In 1990 the event was the second where he was raised five-year undergraduate programs in mechanical engineering and engineering computer systems in the years following the opening of a new undergraduate programs in multiple disciplines: engineering industrial automation, medical devices within the Engineering Department of Electrical Engineering and specialized engineering, engineering buildings and the space within geomatics Engineering civil architectural, specialized information systems and applied mathematics. In 1999, Palestine Polytechnic University is now officially a member of the Conference of Heads of Palestinian universities and later a member of the Federation of Arab Universities as well as a member of the Islamic universities. The university currently has four faculties which are:

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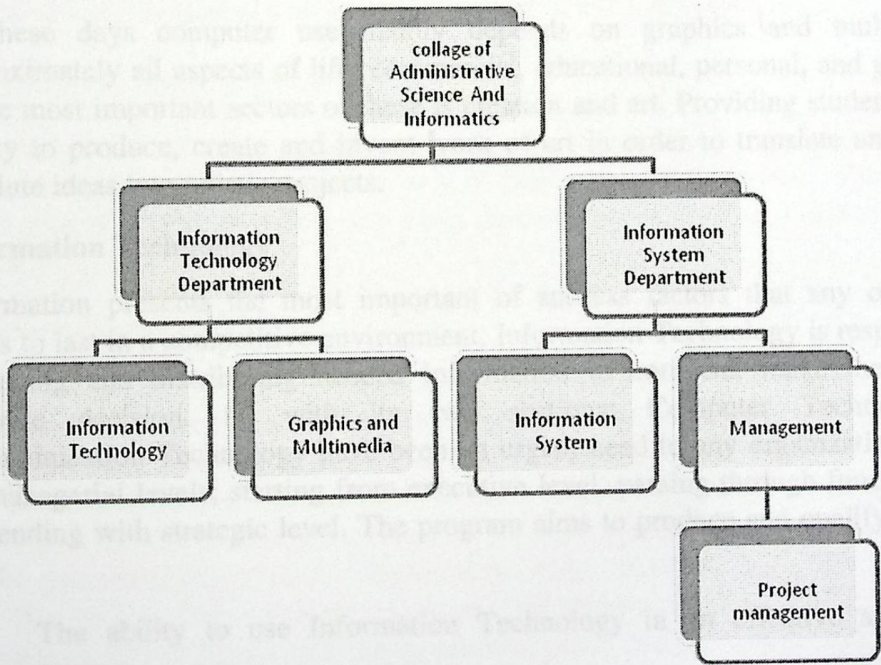
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Faculty of Engineering and Technology: grants bachelor degree with five years in the disciplines: computer systems and industrial automation and medical devices, mechanical engineering, mechatronics engineering, refrigeration and air conditioning, buildings, engineering and space engineering Algiomatsk architecture and building is located in AL-Harria Valley.

Faculty of Management and Information Systems: grants a bachelor degree with four years in the disciplines: information systems, business management and contemporary graphics, multimedia, and waiting for the adoption of the university and the Ministry of Higher Education for specialized e-marketing, project management. Buildings are located in Jabal Abu-Rumman.

Faculty of Applied Sciences: Bachelor degree is granted in the disciplines: Applied Mathematics, Applied Electronics, Computer Science and Applied Physics. Buildings are located in AL-Harria Valley.

Faculty of Applied Profession: Associate degree is granted in about twenty specialized in engineering and technical areas: electrical engineering, mechanical engineering, civil engineering, architecture, applied arts, management, and computer and. Buildings are located in the Abu-Ktailah Valley.



3.2.1 Administrative Science and Informatics Faculty

The College of Administrative Science and Informatics is located at Abu-Rumman Building. The college aims to provide distinct programs, contributes in economic growth, and contributes in developing Human Resources in Palestine by providing the community with well-qualified graduates in different fields of activities. Information is very important at this time because they play an crucial role in this competitive world.

3.2.1.1 Programs

Information System Department

- **Management**

Because the traditional management skills are not more effective than new modern technologies, the college administration decided to provide the college with modern skills that lead the college management to establish the business management major that must reflect the mission of the University.

- **Information System**

This program is considered to be the first and most distinct one in the homeland and the neighboring Arab countries. The aim is to qualify students to be familiar with computer systems and management aspects. This mixture between the two aspects leads to create a generation of graduates who are capable to manage computer departments in an effective administrative and technical manner.

Information Technology Department

- **Graphics and Multimedia**

At these days computer use mainly depends on graphics and multimedia in approximately all aspects of life: commercial, educational, personal, and games. One of the most important sectors of these is creation and art. Providing students with the ability to produce, create and invent work of art in order to translate and transport absolute ideas into artistic projects.

- **Information Technology**

Information presents the most important of success factors that any organization needs to last in a competitive environment. Information Technology is responsible for producing and distributing needed information to compete, make the right and accurate decision. IT with its two sections: Computer Technology and Communication Technology have been an urgent need to any organization along its all managerial levels; starting from executive level, passing through functional level and ending with strategic level. The program aims to produce and qualify specialists with:

- The ability to use Information Technology in an effective and efficient manner.
- The technical ability of producing and developing software, networks, internet websites and applications.
- The ability of following-up informatics and technical rapid-growth

To achieve these as well as a wide range of different goals, the program has a plan which guarantees the achievement consisting 139 studying hours concentrating on four main tracks:

Table (3.1) Main Tracks at IT Program

Ranges	Track
Programming Language, Data Structure, Multimedia, Computer Graphic, Artificial Intelligence.	Programming Development.
Software Engineering, programming and management and design Database.	Software Engineering and Databases.
Operating system, Computer Networking, Programming and Design Internet Application and Networking.	Internet and Networking.
Management, Accounting, Economic, Information System, Business Comm., Mathematics.	Acknowledgments supporting for major.
All study planning is depended to develop a cooperating , creative and high moral person.	Moral and Personality.

3.4 System Requirements

Resource Allocation system includes a set of requirements which are divided into functional and non-functional requirements, this will be described in the following points.

3.4.1 Functional Requirements

The system includes a set of functional requirements that could be divided into special requirements for Academic Administrator and Building Administrator. The academic administrator should be able to do the following functions through input Academic Plan and Strategic Plan.

3.4.1.1 Student Distribution

Each group of student has its special year-related plan, so for every new student, he/she will be signed in the newest plan. This project will consider 2007 plan as a base plan to work with. The plan is divided into 8 semesters with 134 credit hours. So the system should be able to distribute students into their plan relative to their level. For each group of students, the level due to semesters will be determined in order to make a suitable presentation of courses. At each new semester, the system allocate data about students from the Registration Department. The system then calculate the number of students at each level including new registered students. Then the system can generate reports. Statistics also will provide the system with the numbers of current regular students with their levels, to decide at which semester plan they belong. The system also provides statistics about dismissed and late students.

3.4.1.2 Courses Distribution

Courses should be presented to students depending on the result of first function. The data comes from the database that contains the academic plan specify courses at each level. For new registered students, The system should accurately reports available courses, with expectation of how many sections for each course and the facilities that needed if the course need data show or lab or anything else. This rely on the nature of the course and to which level of the plan it belongs. Each section is correlated with the course and its subsequences. For example, one section of course with a laboratory, must not exceed 30 students for each section, then the information is stored in the database.

3.4.1.3 Load Distribution

After presenting and offering courses to students, we can determine the overall academic load to the semester which has to be distributed among instructors depending on each one degree. The data comes from database and shows in crystal report includes the distributed information then stored in database. The following table shows the rules that determine the academic load for each instructor.

Table (3.2) The Academic Load is degree-dependent

Degree/Rank/Position	Load (in hours)
Dean	6
Head of the Department	9
PhD	12
Master	14
Bachelor	16

As shown in the above table, each instructor and depending on his degree will take over number of hours until the overall load is covered by instructors. If it is not, a contingency plan is needed to activate in this case and other cases like this. The contingency plan should be able to provide the interested people, Head of the Department for example, with more choices and alternatives. After distributing the academic load, two potential results are expected: the first indicates an excess in the available load and the second indicates a lack or insufficient instructors to cover the load. In the first case, the excess could be exported to another college in the university, or in the same collage. In the second case, the department has to demand additional instructor(s) from the university or outside it (as full-time or part-time employee). This depends on the case, situation and the nature of the load (courses). The system should provide a detailed report showing all these cases, taking in consideration all potential situations.

Building administrator should be able to performe the following function:

3.4.1.4 Facilities Distribution

This function is determined by the previous functions. Elements still missed to complete the combination which represent the real semester are the physical aspects. The system should provide: how many Hall / Lab / Office needed for covering the entire academic load. Such reports should provide available and expected needed physical resources such as Lab and

course equipments (Personal Computers, Data show) each space has a capacity and containment limitation for students' numbers. This aspect should be considered when distributing students on courses' sections. Many questions need to be answered for the responsible person, and the system should answer: How many sections for each course? How much each section can hold? What resources and equipments each space (Hall, Lab) need?

3.4.2 Description of Functional Requirements

Table (3.3) Functional Requirements to Distribute Students

Function	Distribute students into their Academic Plan
Description	Determines level for each student group
Input	Excel file from registration department
Output	Students Distribution
Source	Academic administrator
Condition before implementation	The academic administrator should be registered
Condition after implementation	The administrator should be recognized by authentication and authorization policies
Definition	Academic administrator obtains students information (statistics of new and regular students) from registration department. Then distribute each group of students into the plan depending on their levels.

Table (3.4) Functional Requirements to Distribute Courses

Function	Distribute courses on semester.
Description	Courses are offered depending on the first distributing step which determine students groups' level
Input	Academic Plan (Course and Levels)
Source	Academic Administrator
Output	Courses Distribution
Condition before implementation	The academic administrator should be registered
Condition after implementation	The administrator should be recognized by authentication and authorization policies
Definition	Level of student determines what courses should take, so a list of courses will be shown to students including level, course number, course name.

Table (3.5) Functional requirements to Distribute Load

Function	Distributing academic load among instructors
Description	The system can get the stuffs the requested load.
Input	Excel file from Human Resource Department
Source	Academic administrator
Output	Load Distribution
Condition before implementation	The academic administrator should be registered

Condition after implementation	The administrator should be recognized by authentication and authorization policies
Definition	Determine list of courses for each instructors covering his/her maximum academic load

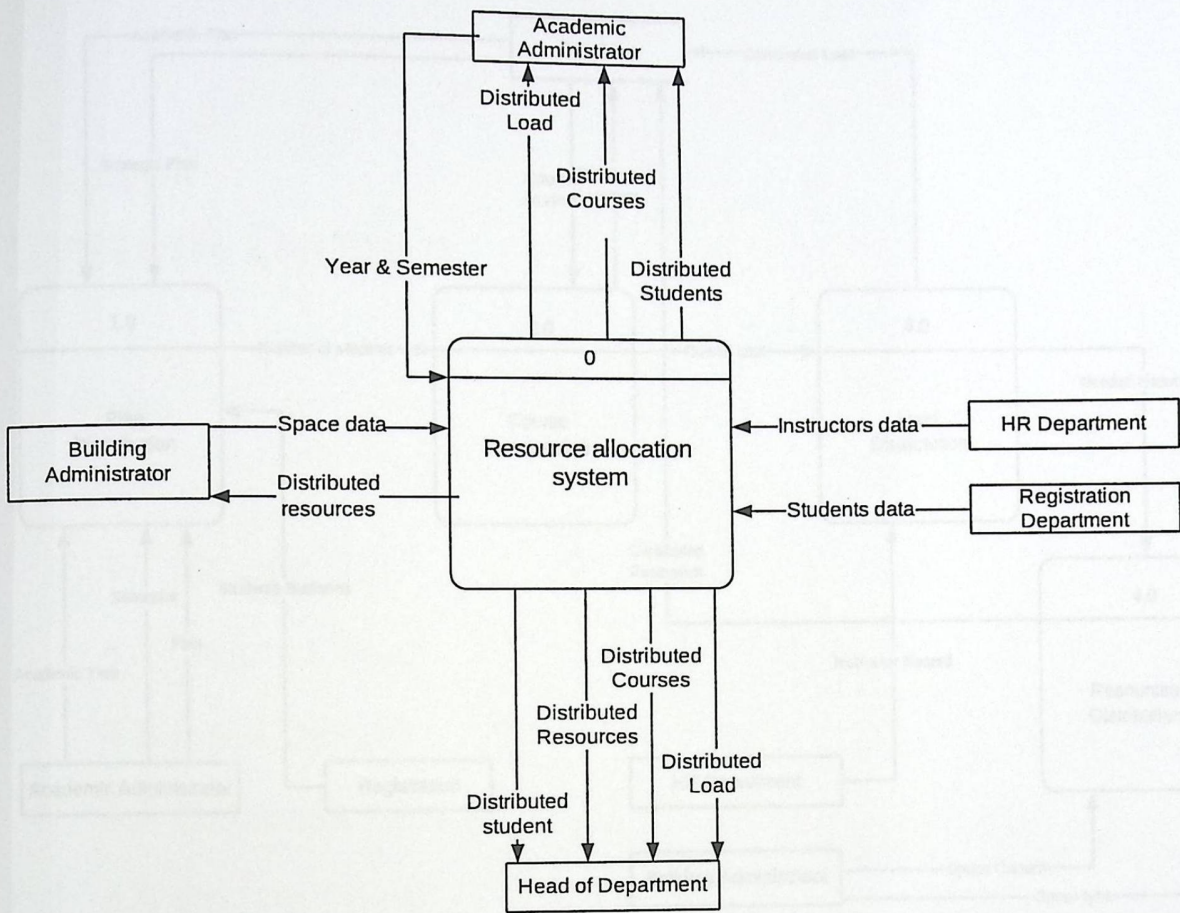
Table (3.6) Functional Requirements to Distribute Rooms

Function	Distributing physical resources
Description	Distribute instructors and students on facilities (rooms)
Input	Building Excel sheet from building administrator
Source	Building a administrator
Output	Rooms Distribution
Condition before implementation	The building administrator should be registered
Condition after implementation	The building administrator should be recognized by authentication and authorization policies
Definition	Specification/No.4

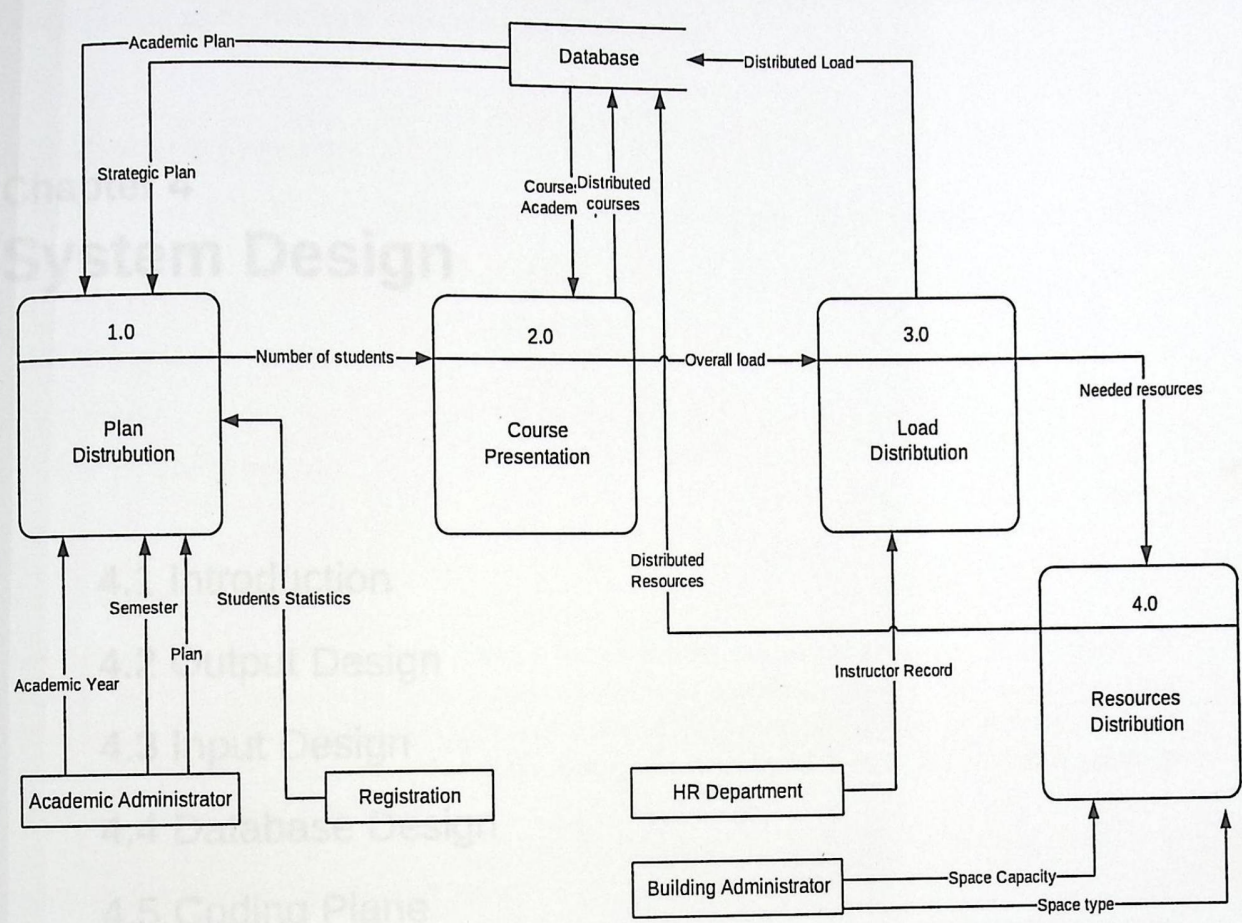
3.4.3 Non-Functional Requirements

- The System should be easy to use.
- Have a quick response, especially for users who have access outside the university.
- Flexible and have the opportunities for being developed in the future.
- The ability of protecting data from being lost when any problem occurs in the system.
- The system should authenticate and authorize the users who will access the system.
- The ability to make periodically backup and should be able to support recovery.

3.4.3 Context Diagram



3.4.4 Data Flow Diagram



4.1 Introduction

This chapter describes the design level of the project, which includes the output design, input design, coding plane, database design, and process design.

4.2 Output Design

Chapter 4 will be both hardcopy and softcopy reports. Reports will consist of the

Chapter 4
System Design

- 1. Courses
- 2. Load
- 3. Physical Resources

4.1 Introduction

4.2 Output Design

4.3 Input Design

4.4 Database Design

4.5 Coding Plane

4.6 Process Design

Table 4.1: Student Information		
Student Name		
Student-ID	Number	University Identity Number
Student Level	Number	Student Level according to the Academic Plan

4.2.2 Courses

The following screen (Figure 4.3) shows a button where it becomes able to operate only after the function has been performed. When the user clicks this button, it will provide the user with the reports that display the distribution of the courses on each student's group and level. Then, the system saves the output in the database because the output for this function is an input for the next function.

4.1 Introduction

This chapter describes the design level of the project which includes the output design, input design coding plane, database design, and process design.

4.2 Output Design

System output will be both hardcopy and softcopy reports. Reports will consist of the following:

1. Course Plan
2. Courses
3. Load
4. Physical Resources

4.2.1 Course Plan

The following screen (figure 4.1) shows a button which the user presses on. The system will allocate the data needed from different data sources to distribute students into their academic plan. The result will be presented in a report which contains the number of students in each level of IT program, then the system saves the result in the database because this result is important for the next functions.

Table (4-1) Courses Plan Output Items

Items	Type	Description
Student-Name	Text	Student Name
Student-ID	Numeric	University Identity Number
Student-Level	Numeric	Student Level regarding to the Academic Plan

4.2.2 Courses

The following screen (figure 4.3) shows a button where it becomes able to operate only after the first function has been performed. When the user clicks this button, it will provide the user with the reports that display the distribution of the courses on each student's group and level, then the system saves the output in the database ,because the output for this function is an input for the next function.

Table (4-2) Courses Distribution output items

Items	Type	Description
Course-name	Text	The report will shows the courses distributed according to semester
Course -ID	Numeric	The ID will determine the Id for each course to determine for which group year.
Course -Type	Text	The type of the courses if it's specialization course or pre-college, pre-department.
Course Prerequisite	Text	The Prerequisite for the registered listed courses in the selected semester.
Course-credit	Numeric	The number of hours for each course as they are in the academic plan.
Course-level	Text	Where to show this course in the academic plan as level.

Resource Allocation

PPU IT dept.

HomeStdudentsCoursesLoadResources

Please click the button bellow to show the result of the Student Distribution.
A summary will be displayed, for detailed information press Detailed Report

distribute students on plan

Detailed Report

Welcome

Welcome Omar Ahmad. You are
logged in as admin, Date 6/8/2010

Options

Admin Control Panel

User Page

Sign Out

Links

PPU Home

E-Learning

Registration

Figure (4-1): Student Distribution Screen

Table (4-2) Courses Distribution output items

Items	Type	Description
Course-name	Text	The report will shows the courses distributed according to semester
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Resource Allocation

PPU IT dept.

Home Stdudents Courses Load Resources

Please click the button bellow to show the result of the Student Distribution.
A summary will be displayed, for detailed information press Detailed Report

distribute students on plan

Detailed Report

Welcome

Welcome Omar Ahmad. You are logged in as admin, Date 6/8/2010

Options

Admin Control Panel

User Page

Sign Out

Links

PPU Home

E-Learning

Registration

Figure (4-1): Student Distribution Screen

26

Table (4-2) Courses Distribution output items

Items	Type	Description
Course-name	Text	The report will shows the courses distributed according to semester
Course -ID	Numeric	The ID will determine the Id for each course to determine for which group year.
Course -Type	Text	The type of the courses if it's specialization course or pre-college, pre-department.
Course Prerequisite	Text	The Prerequisite for the registered listed courses in the selected semester.
Course-credit	Numeric	The number of hours for each course as they are in the academic plan.
Course-level	Text	Where to show this course in the academic plan as level.

Resource Allocation

PPU IT dept.

Home Stdudents Courses Load Resources

Please click the button bellow to show the result of the Student Distribution.
A summary will be displayed, for detailed information press Detailed Report

distribute students on plan

Detailed Report

Welcome

Welcome Omar Ahmad. You are logged in as admin, Date 6/8/2010

Options

[Admin Control Panel](#)

[User Page](#)

[Sign Out](#)

Links

[PPU Home](#)

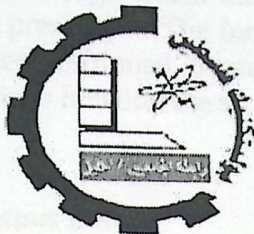
[E-Learning](#)

[Registration](#)

Figure (4-1): Student Distribution Screen

26

PALESTINE POLYTECHNIC UNIVERSITY
COLLEGE OF ADMINISTRATIVE TECHNOLOGY AND INFORMATICS
INFORMATION TECHNOLOGY DEPARTMENT



Academic Year Semester Academic Plan 2007 Report Date 6/7/2010

Students Distribution Report

Student Number Student Name
Level# 1

Figure (4-2) : Student Distribution Report

Resource Allocation

PPU IT dept.

Home Stdudents Courses Load Resources

please press the following button to distribute students in courses, depending on each student's group and level

distribute courses to students
Detailed Courses Report

Welcome

Welcome Omar Ahmad. You are logged in as admin, Date 6/8/2010

Options

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User Page
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Figure (4-3): Courses Distribution Screen

4.2.3 Load

Screen (figure 4.4) shows a button through which the user can view how the overall load distribution on instructors through pressing it. The button also button becomes enable only when the previous function has been performed, because the output for previous step is the input of the next step, like the previous function the system saves the result in the database to be used later in the last function.

Table (4-3) Loads Distribution Output Items

Items	Type	Description
Instructor-Name	Text	Instructor Name
Instructor -ID	Numeric	Instructor Identity
Instructor -Degree	Text	Instructor Degree
Instructor-load	Numeric	Instructor Final Load

4.2.4 Resources

Screen at (figure 4.4) shows a button that distributes the facility racecourses by depending on the all previous functions, we meant by facilities all classes, laboratories, and instructor rooms. The button is enabled when the previous functions or previous output had been performed, because the input of this function depends on the output for the previous function.

Table (4-4) Resources Distribution Output Items

Items	Type	Description
Course-Name	Text	Course-Name
Room-Number	Numeric	The ID for each facility.
Room-Type	Text	Room-Type (Class, Lab,...)
Room-Capacity	Numeric	How much facility can accommodate

PALESTINE POLYTECHNIC UNIVERSITY
COLLEGE OF ADMINISTRATIVE TECHNOLOGY AND INFORMATICS
INFORMATION TECHNOLOGY DEPARTMENT



Academic Year Semester Academic Plan Report Date

Course Distribution Report

Student Number Student Name CourseNumber Course Name

Figure (4-4): Courses Distribution Report

Resource Allocation

PPU IT dept.

Home Students Courses Load Resources

Please press Distribute Load on Instructors to view each instructor load, or you can view each course with instructors who are capable to teach it.

Distribute Load On Teachers

View By Course

Welcome

Welcome Omar Ahmad. You are logged in as admin, Date 6/8/2010

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Figure (4-5): Load Distribution Screen

4.3 Input Design

Two main sources for data. Input can be divided into screen input which depends on user key stroke and the last is file input.

1. User Credentials
2. Initial Attributes
3. Registration Excel Sheet
4. Human Resources Excel Sheet
5. Rooms Excel Sheet
6. Results of Previous Inputs

4.3.1 User Credentials (Log in)

The login page shown in figure (4.5) this is the main page for the system where the user can enter his name and his password to enter into the system, so after that he become have permutation to perform the task in the system.

Table (4-5) Login screen data dictionary items.

Item	Type	Size	source	Note
Username	Text	20	User	Should be unique among all users
Password	Text	20	User	Must have complexity constraints

4.3.2 Initial Attributes

After the system authenticate and enable the user to have a legitimate access to the system, the user is asked to provide the system with initial attributes which are used as a base to the allocation process. These attributes are academic year, semester, and academic plan. After entry of these values the system become able to allocate data relative to provided data.

Table (4-6) years and semester items

Item	Type	source	Note
Academic Year	Numeric	User	Current Academic Year
Semester	Numeric	User	One of two values first or second semester
Academic Plan	Numeric	User	Academic Plan as a base of allocation

Resource Allocation

Home Stdudents Courses Load Resources

Login Page!

Log In

User Name:

Password:

☐ Remember me next time.

Log In

Figure (4-6): Login screen

Resource Allocation

PPU IT dept.

Home Stdudents Courses Load Resources

Please enter year, semester, and academic plan for which you want to allocate resources, then press allocate data to allocate resources upon your request!

year

semester

Base Plan

choose ▼
choose ▼

Allocate Data

Welcome

Welcome Omar Ahmad. You are logged in as admin, Date 6/7/2010

Options

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[Registration](#)

Figure (4-7): Academic year and semester screen

The Allocate Data button will perform some functions that transform other departments files into readable type for the system. It will import excel sheets that other departments had provide, and then insert it into the system database.

4.3.3 Registration Excel Sheet

The system empower a registration user to log in with his own credentials with limited access to the system, to provide the system with an excel sheet contains students data. Figure (4.6) shows the screen through which a registration user is authorized to access the web application.

Table (4-7) Registration Excel Sheet Items

Item	Type	Note
Student Number	Numeric	Student Identity number in university
Student Name	Text	Student Name
Student Level	Numeric	Student level (1,2,3...)
Student Plan	Numeric	Plan to which student belongs

4.3.4 Human Resources Excel Sheet

Users from Human Resources Department also are enabled with limited accounts which allow them to provide or upload to the system an excel sheet containing instructors information. Figure (4.6) shows the screen which through user is authorized to do so.

Table (4-8) HR Department Excel Sheet

Item	Type	Note
Instructor number	Numeric	Instructor Number in the university
Instructor name	Text	Instructor Name
Instructor degree	Numeric	Instructor degree will determine load

4.3.5 Rooms Excel Sheet

Building Administrator is able to log in too with limited access and provide the system with the needed information about building's rooms including classes, labs, and instructor rooms. Figure (4.6) shows the screen which through building administrator can do so.

Table (4-9) Rooms Excel Sheet

Item	Type	Note
Room-Number	Numeric	Room Number

Room-Name	Text	Room name if exist
Room-Type	Numeric	Room Type (Class, Lab ...)
Room-Capacity	Numeric	Room Maximum Capacity

Resource Allocation

PPU IT dept.

Home Sign Out

Please click brows and choose your Excel File wich contains Students Information. please check Excel File Specification and Constraint below

Please take into consideration the following criterias:

Upload an Excel File Only

The file should have the follwoing coloumn name (id, name, major, level, plan.

Note: You Can Download an Empty Excel File with the Right Syntax and Fill it clicking on [Download Template Excel Sheet](#)

[Upload File](#)
[Download Template Excel Sheet](#)

Welcome majd hash. You are logged in as majd, Date 6/8/2010

Welcome to PPU Resource Allocatio. Through this page you can upload an Excel File which will provide the IT department with the needed information.

Figure (4-10): Upload screen: through this page other departments can provide files.

4.4 Database Design

Database Description

- **Student Table**

StdNo which is a numeric value indicates the uniquely identifier for each student, this integer is the student university identity number. *StdName* is student name . *LevelNo* indicates the level in which the student currently exist, this value is related to the Academic Plan that contains courses and levels. *MajorNo* indicates student's major. *PlanYear* is the base plan to which a group of students belong.

- **StudentCourse Table**

StudentCourse table contains the result of allocation process for courses, courses which the system expect the student is going to have it. *StdNo* is a foreign key point to *StdNo* in *Student* table, *CourseNo* indicates course number, *CourseNo* is a foreign key point to *CourseNo* in *Course* table. Primary Key of this relation is (*StdNo* and *CourseNo*) together.

- **StudentMajor Table**

In this relation students are identified by their major to which they belong to. *MajorNo* identify majors, *MajorName* is the major name such as (Information Technology), *DeptNo* point to table *Department*, this attribute indicate to which department a specific major belong.

- **Plan Table**

Indicate each academic plan with its courses. *Year* is the plan number and *CourseNo* point to *CourseNo* in *Course* table which is the course number. Both *Year* and *CourseNo* together are the primary key.

- **Course Table**

Consist of attributes that describe each course. *Cno* is the course unique number, *Cname* is the course name, *Ctype* indicate the type of the course as courses could be categorized into types relative to its Academic Plan, course type could be University Requirement, College Requirement, Department Requirement, or Major Requirement. *Ccredit* is the credit hours for a course. *Clevel* indicate that a specific course should be given to a specific student at a specific level. *Capacity* is the maximum number of students can a specific course handle, *DataShow* is a boolean value indicate if a specific course need a Data Show, *Lab* is a boolean value indicate if a specific course require a Laboratory, *OHPProjector* is a boolean value indicate if a specific course need an Over Head Projector.

- **Department Table**

DpetNo is the unique department number, *DeptName* is the department name.

- **Instructor Table**

This relation's attributes describe the Instructor entity. *InstNo* is the unique identifier of the instructor, *InstName* is the instructor name, *InstDegree* indicates the instructor academic degree, this degree will determine the load value for each instructor, *DeptNo* is the department to which a specific instructor belong, *DeptNo* is a foreign key point to *DeptNo* in *Department* table.

- **InstructorCapability Table**

This relation describes which courses can a specific instructor teach, it is like a history record for instructors. *InstNo* is the instructor number point at *InstNo* in *Instructor* table, *Cno* is the course which can be given by a specific instructor and it point at *Cno* in *course* relation.

- **InstCourses Table**

The courses of a specific instructor in a specific semester. *InstNo* is the instructor number point at *InstNo* in *Instructor* table, *Cno* is the course which can be given by a specific instructor and it point at *Cno* in *course* relation.

- **Room Table**

Describes Room Entity, *RoomNo* is the uniquely identify rooms in the building. *RoomName* is the room name if exist. *RoomType* indicate the type of the room whether if it is a class, lab, or an instructor room.

- **User Table**

Is the table that stores users credentials in order to authenticate and authorize them when they attempt to log in to the system. *Username* indicate a unique name for each user in the system and it is the primary key. *Password* is the secret word that a user create and maintain to be recognized through it besides the username. *Password* is kept encrypted using MD5 Hash Function which is a one way encryption algorithm. *UserType* indicate the type of user, the system has to recognize who is attempting to log in and how much he can grant? *UserType* assure this by distinguishing users. *Name* is the real name of the user. *RegDate* is the date in which the user had been registered in the system.

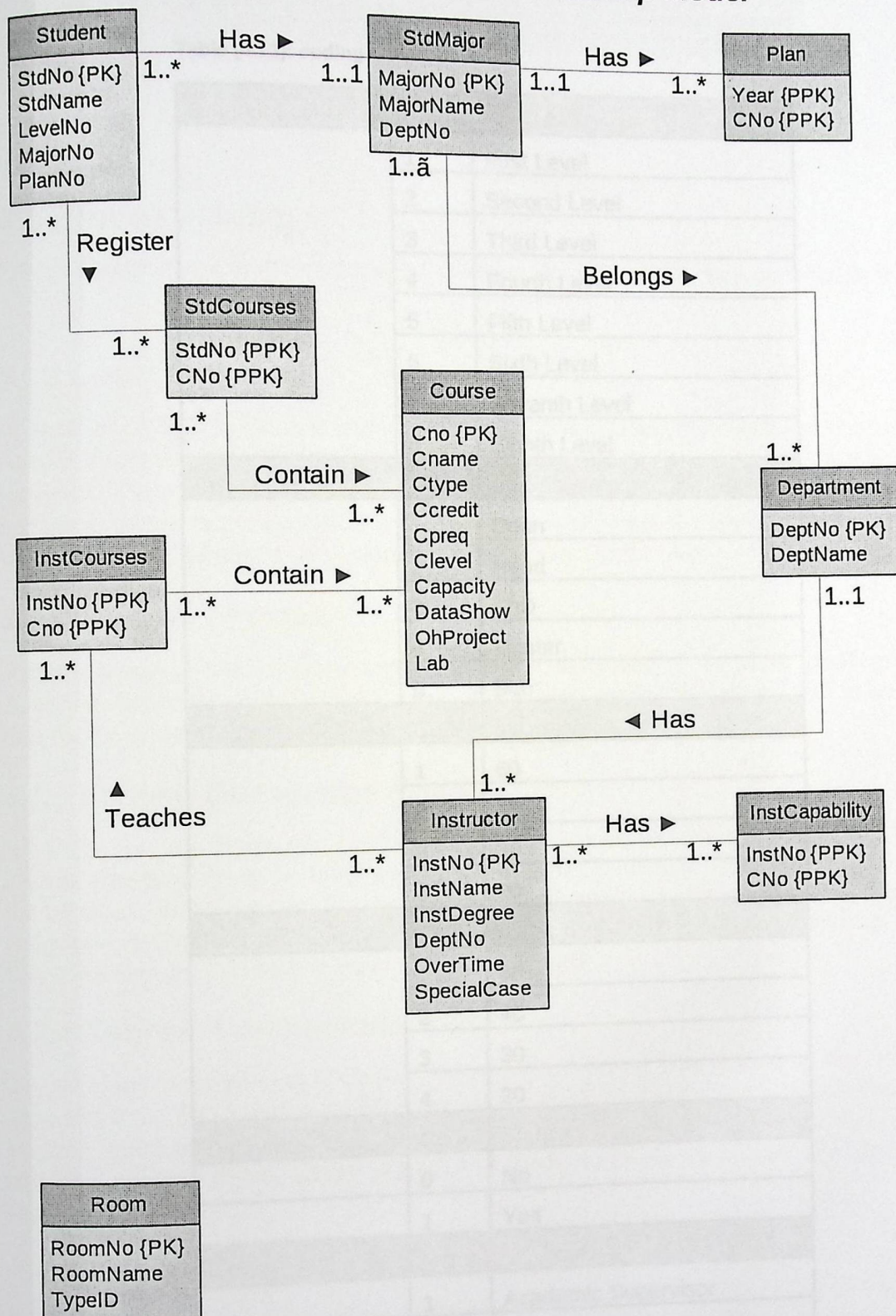
Table (4-9) Database Data Dictionary

Student Table						
Attribute	Type	Size	Key	Constraint	Null?	Description
StdNo	Int	6	PK		No	Student ID
StdName	Varchar	100			No	Student Name
LevelNo	Int	1		<=8	No	Student Level
MajorNo	Int	1	FK		No	Student Major
PlanYear	Int	4		Year	No	Student Plan Year
StudentCourse Table						
Attribute	Type	Size	Key	Constraint	Null?	Description
StdNo	Int	6	PK, FK		No	Student Number
CourseNo	Int	4	PK, FK		No	Course Number
StudentMajor Table						
Attribute	Type	Size	Key	Constraint	Null?	Description
MajorNo	Int	1	PK		No	Major Number
MajorNam	Varchar	50			No	Major Name
DeptNo	Int	1	FK		No	Department Number
Plan Table						
Attribute	Type	Size	Key	Constraint	Null?	Description
Year	Int	4	PK	year		Year of the plan
CNo	Int	4	PK, FK			Course number
Course Table						

Attribute	Type	Size	Key	Constraint	Null?	Description
Cno	Int	4	PK		No	Course number
Cname	Varchar	100			No	Course name
Ctype	Int	1	FK		No	Course type
Ccredit	Int	1			No	Credit hours
Cpreq	Int	1	FK	Course no	No	Perquisites
Clevel	Int	1		<=8	No	Level
Capacity	Int	3			No	Room Capacity
DataShow	Boolean	1				DataShow required
Lab	Boolean	1				Lab required
OHP projector	Boolean	1				Overhead projector
Department Table						
Attribute	Type	Size	Key	Constraint	Null?	Description
DeptNo	Int	1	PK		No	Department Number
DeptName	Varcher	50			No	Department Name
Instructor Table						
Attribute	Type	Size	Key	Constraint	Null?	Description
InstNo	Int	4	PK		No	Instructor ID
InstName	Varchar	100			No	Instructor Name
InstDegree	Int	1			No	Instructor Degree
DeptNo	Int	1	FK		No	Department Number
InstructorCourses Table						
Attribute	Type	Size	Key	Constraint	Null?	Description
InstNo	Int	4	PK,FK		No	Instructor Number
CNo	Int	4	PK,FK		No	Course Number
InstCapability Table						
Attribute	Type	Size	Key	Constraint	Null?	Description
InstNo	Int	4	PK, FK			Instructor Number
CNo	Int	4	PK, FK			Course Number
InstOptions Table						
Attribute	Type	Size	Key	Constraint	Null?	Description
InstNo	Int	4				Insructor Number
Overtime	Boolean	1				Overtime Load
SpecialCase	Boolean	1				Special Cases
Room Table						
Attribute	Type	Size	Key	Constraint	Null?	Description

roomNo	Int	2	PK		No	Room Number
roomName	Varchar	20				Room Name
roomType	Int	1			No	Room Type
User Table						
Attribute	Type	Size	Key	Constraint	Null?	Description
Username	Varchar	20	PK		No	Username
Password	Varchar	60			No	Password
Name	Varchar	60			No	Name of User
UserType	Int	1			No	User Type
RegDate	Date	8			No	Registration Date

4.5.1 Conceptual Models – Entity Relationship Model



4.5 Coding Plan

Table (4.13): coding table

Student Level	Code	Level
	1	First Level
	2	Second Level
	3	Third Level
	4	Fourth Level
	5	Fifth Level
	6	Sixth Level
	7	Seventh Level
	8	Eighth Level
Instructor Degree	Code	Degree
	1	Dean
	2	Head
	3	PhD
	4	Master
	5	Bch
Course Type	Code	max
	1	60
	2	40
	3	30
	4	20
Facility Capacity	Code	capacity
	1	60
	2	40
	3	30
	4	20
Data show	Code	Status
	0	No
	1	Yes
Users	Code	Description
	1	Academic Supervisor
	2	Registration Users
	3	Human Resources Users

	4	Building Administrator
Semester	Code	Semester
	1	First
	2	Second

4.6 Process Design

Process design phase describes through flowcharts the steps and sequences for each function.

3.6.1 Login Process

In login process, after the user enter his/her own username and password, the system checks entered information by checking users table in the database, if username exists and the password is entered correctly the system authenticate the user and allow him/her to have a legitimate access to the system. After authentication succeed, the system check which roles the user can play through this account and what to grant to the user.

3.6.2 Start-up process

Start-up process enables the system to allocate data relative to given Academic Year, Academic Semester, and Academic Plan. These three parameters considered to be a basic data for the system.

4.6.3 Student Distribution Process

After the user has finish the start-up process and has provided the primary parameters he became able to perform the four functional requirements starting with student distribution as the first step. In this process the system process imported data from registration excel sheet and export results of distributed students on the academic plan. This step determines the other functions. Student distribution report will be generated.

4.6.4 Course Presentation Process

Second function or process is Course Presentation Process. This process as was mentioned, depends on the first function. In this stage the academic administrator could distribute courses for each group of students. Each group of student could be recognized from its plan number and level number. Result of this process will be shown in reports consist of students names and their courses.

4.6.5 Load Distribution Process

Third function is to distribute load on instructors this load is resulted from all courses that was presented for students. So at this stage distributing load is allowed and it is able to function. The final of load distribution is shown withing its reports that consist of instructors names and their courses.

4.6.6 Rooms and Resources Distribution

The final process is rooms and physical resources distribution. Now the system has the result of students, courses, and load distribution and at this stage the system is asked to distribute rooms and physical resources for resulted students, courses and load. Reports will be generated showing the distribution final results.

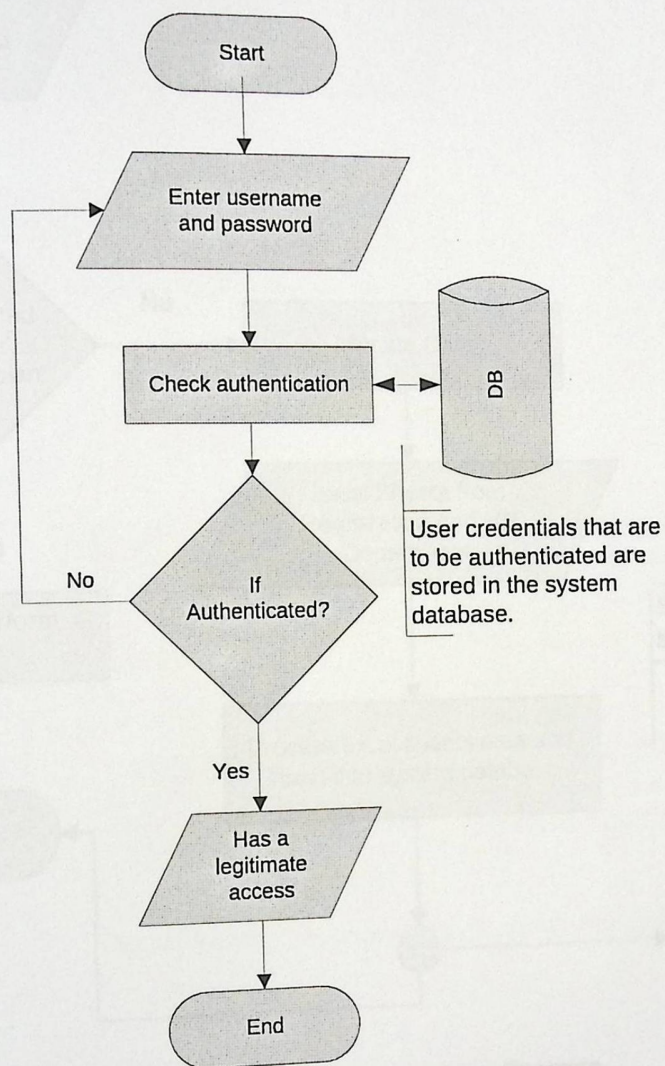


Figure (4-11): Login process

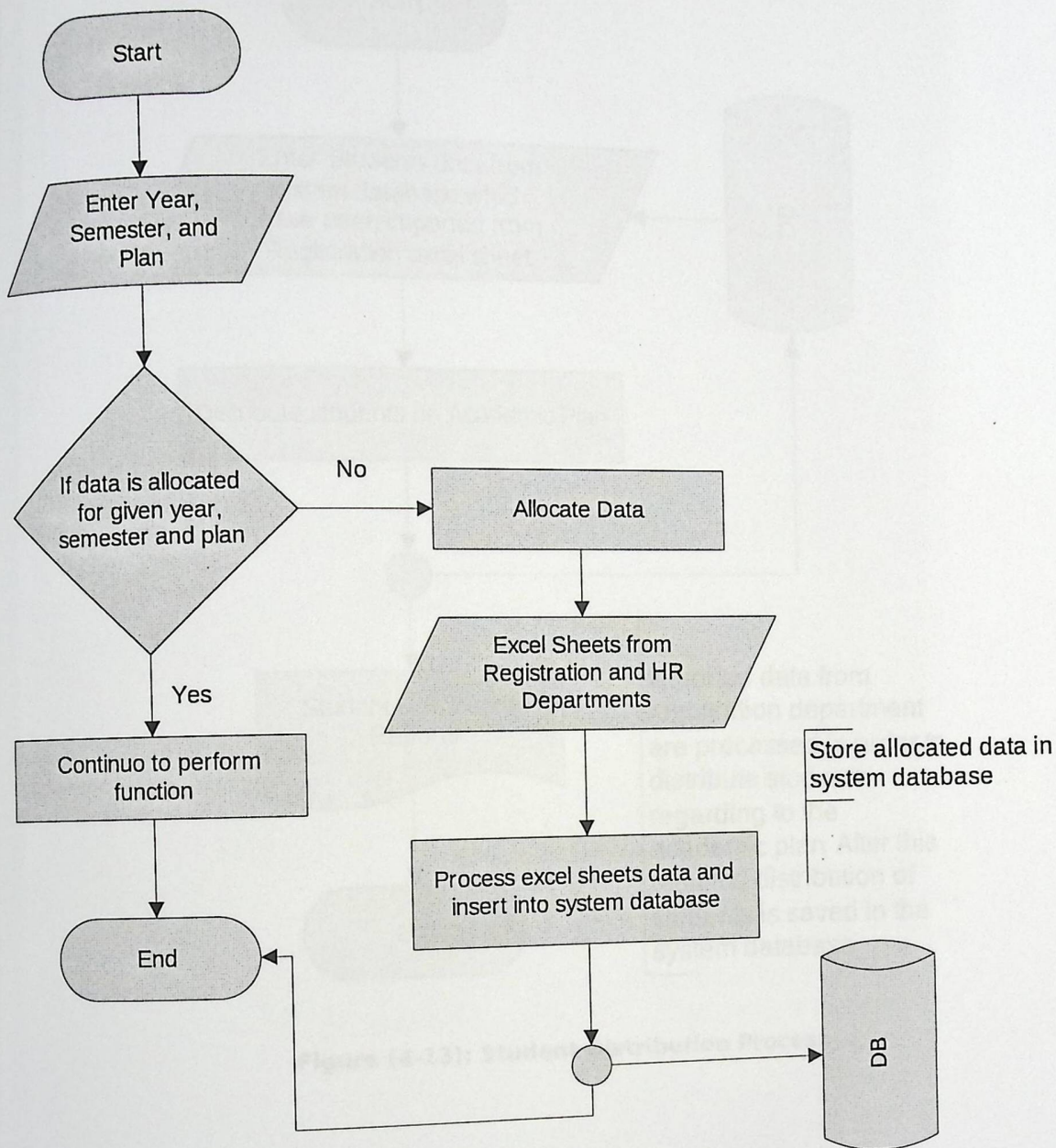


Figure (4-12): Start-up Process

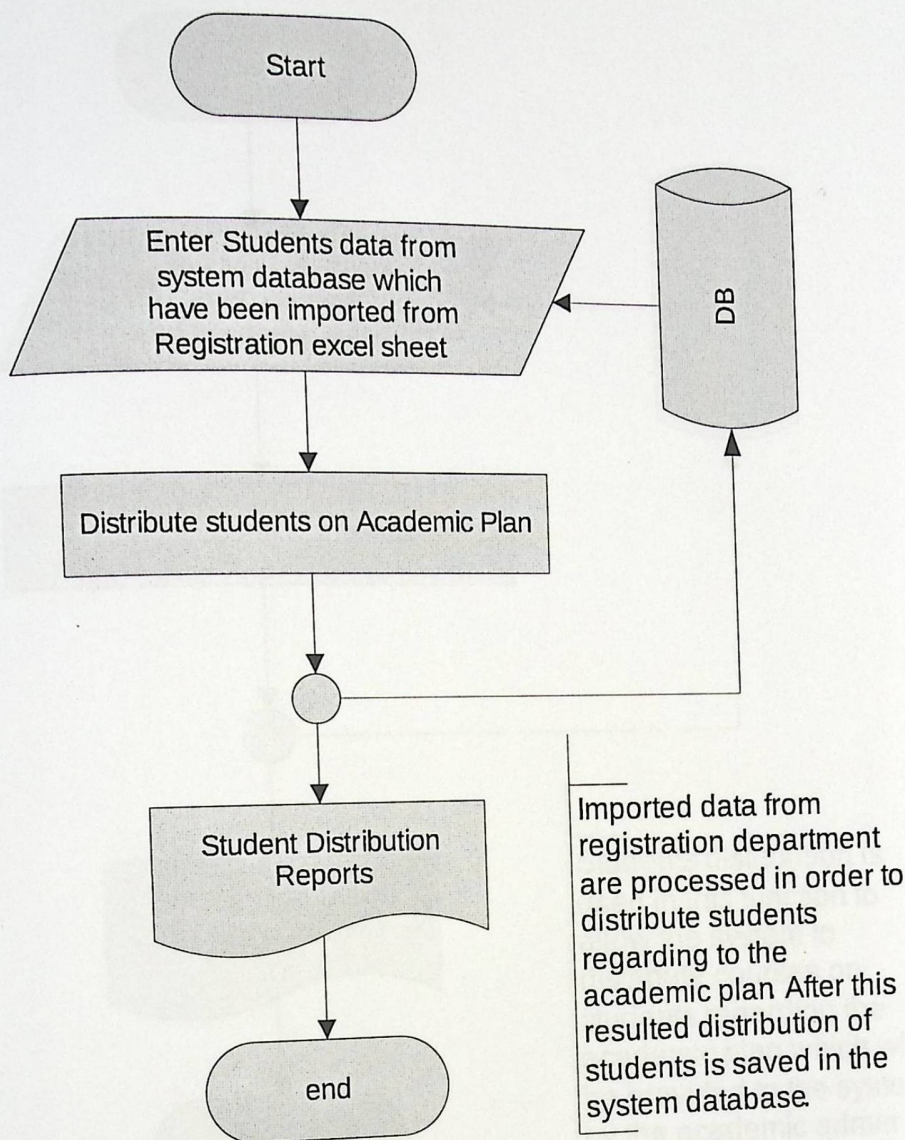


Figure (4-13): Student Distribution Process

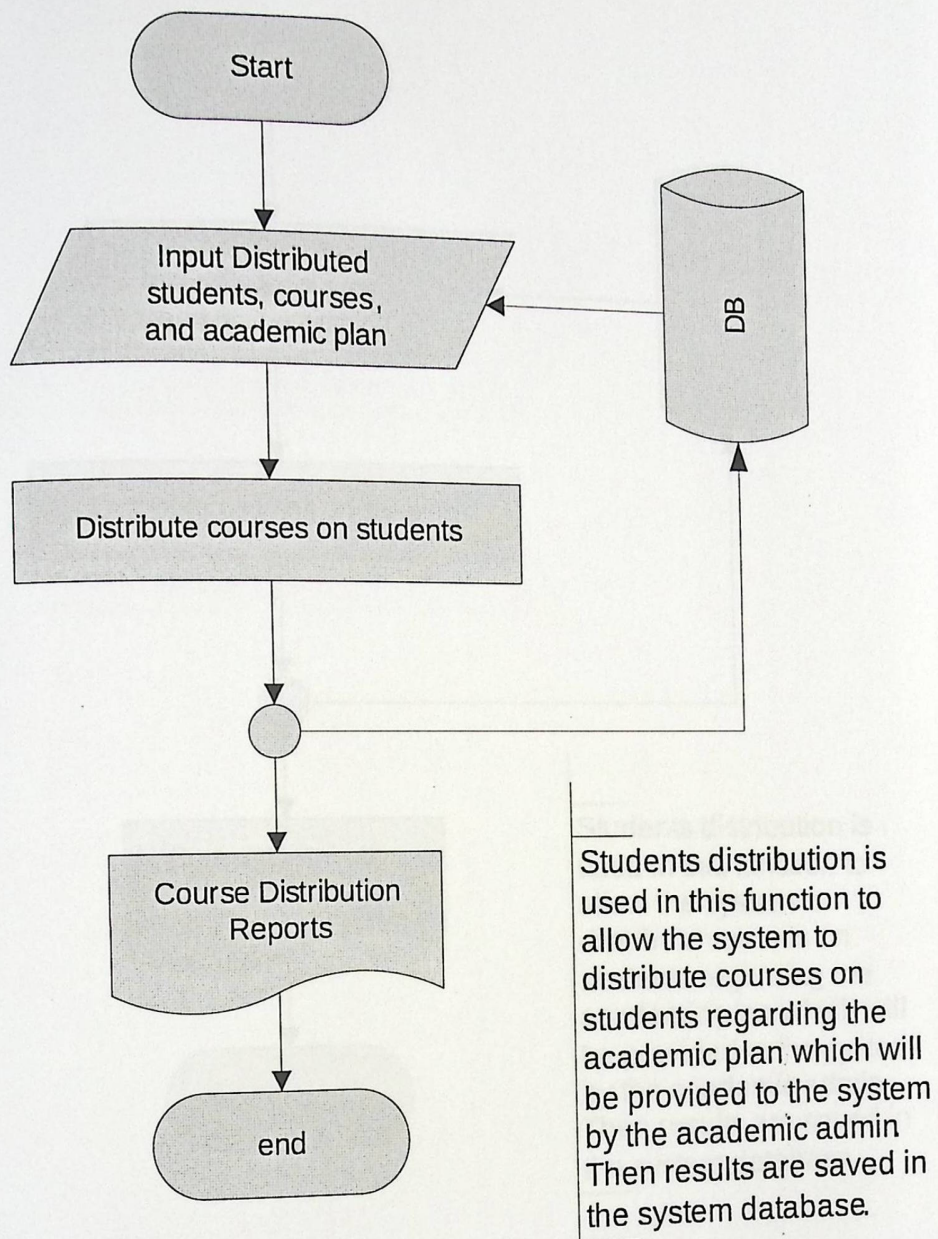


Figure (4-14): Course Distribution Process

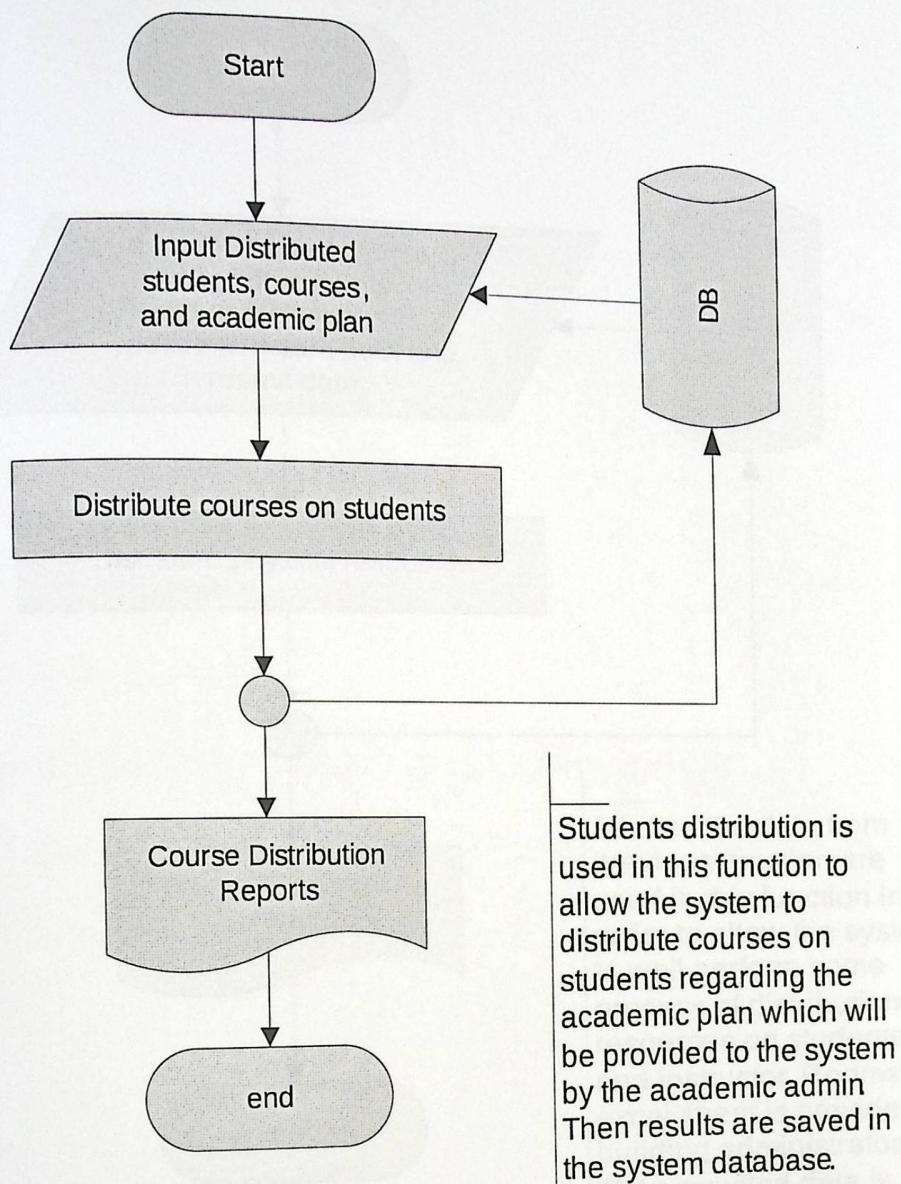


Figure (4-15): Load Distribution Process

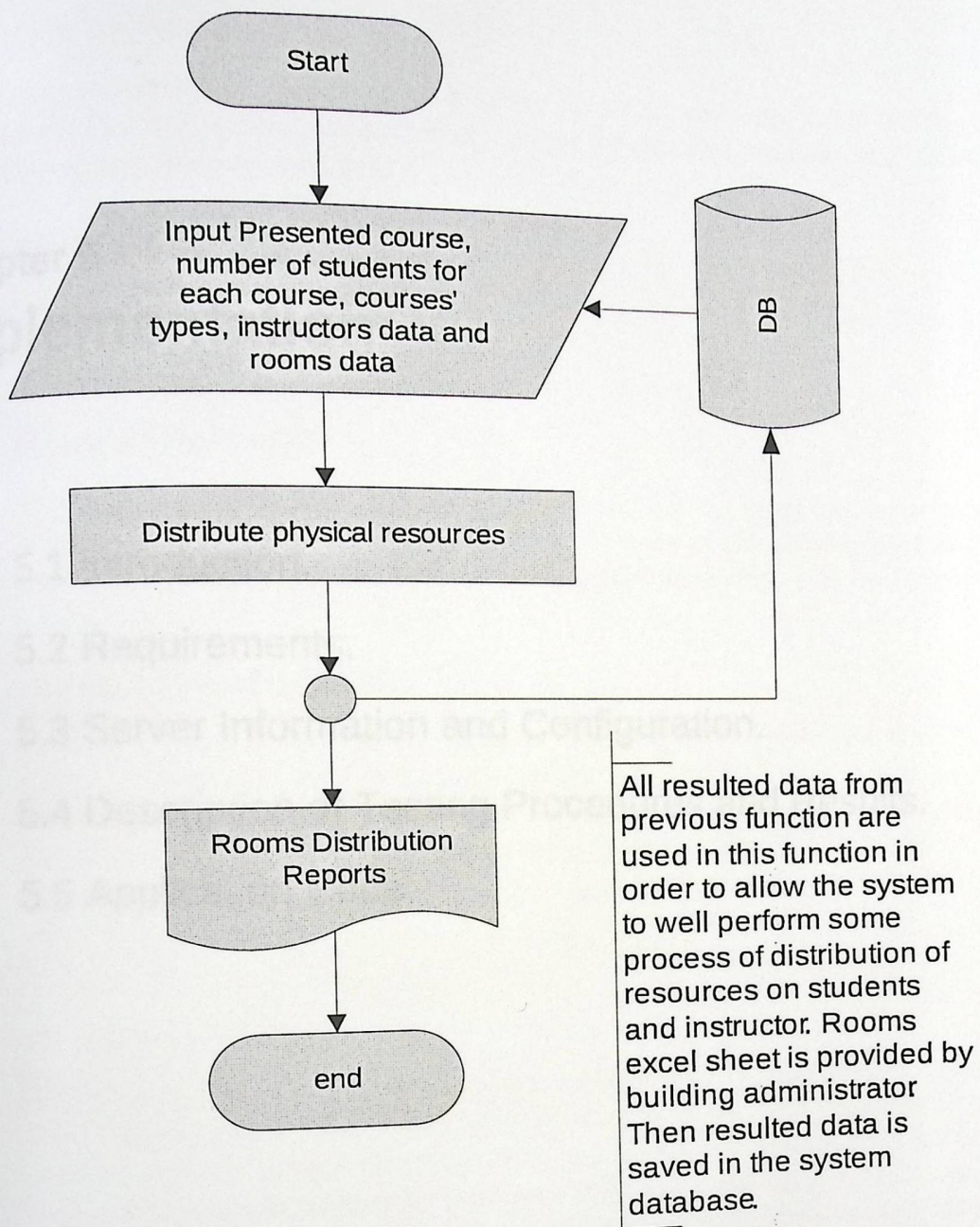


Figure (4-16): Resources Distribution Process

Chapter 5

Implementation

5.1 Introduction.

5.2 Requirements.

5.3 Server Information and Configuration.

5.4 Description of Testing Procedures and Results.

5.5 Application Code.

5.1 Introduction

This chapter discusses the implementation phase at which more technical details of this project, tools, physical equipments, and environments for essential programs that are required for developing and implementing the system.

5.2 Requirements

For completing the project a collection of software and equipments were used. These include the following:

1. Microsoft Windows XP

Windows XP is most famous and used now that is support many requirements needed in this project. As Microsoft Visual Studio is used as the developing tool for the project, a supporting platform must be used, and Windows XP is the best choice.

2. Microsoft Visual Studio 2005

Microsoft Visual Studio is an Integrated Development Environment (IDE) from Microsoft. It can be used to develop console and graphical user, and is a complete development environment, the work of the design, development, find out where the mistakes are and correct them, and activation of applications and the Web. Net. It also supports a variety of programming languages used to develop both desktop and web .Net applications.

3. Microsoft ASP.NET

ASP.NET is a set of Web development tools offered by Microsoft. Programs like Visual Studio .NET and Visual Web Developer allow Web developers to create dynamic websites using a visual interface, and it lets the programmers write their own code and scripts and incorporate them into ASP.NET websites as well. It requires the installation of .Net Framework on the machine used to develop and operate the system. As they provide an easy method to build dynamic Web sites where it can be considered a web page user and he can see through the use of a web browser, and it is characterized by several features that make them better than others.

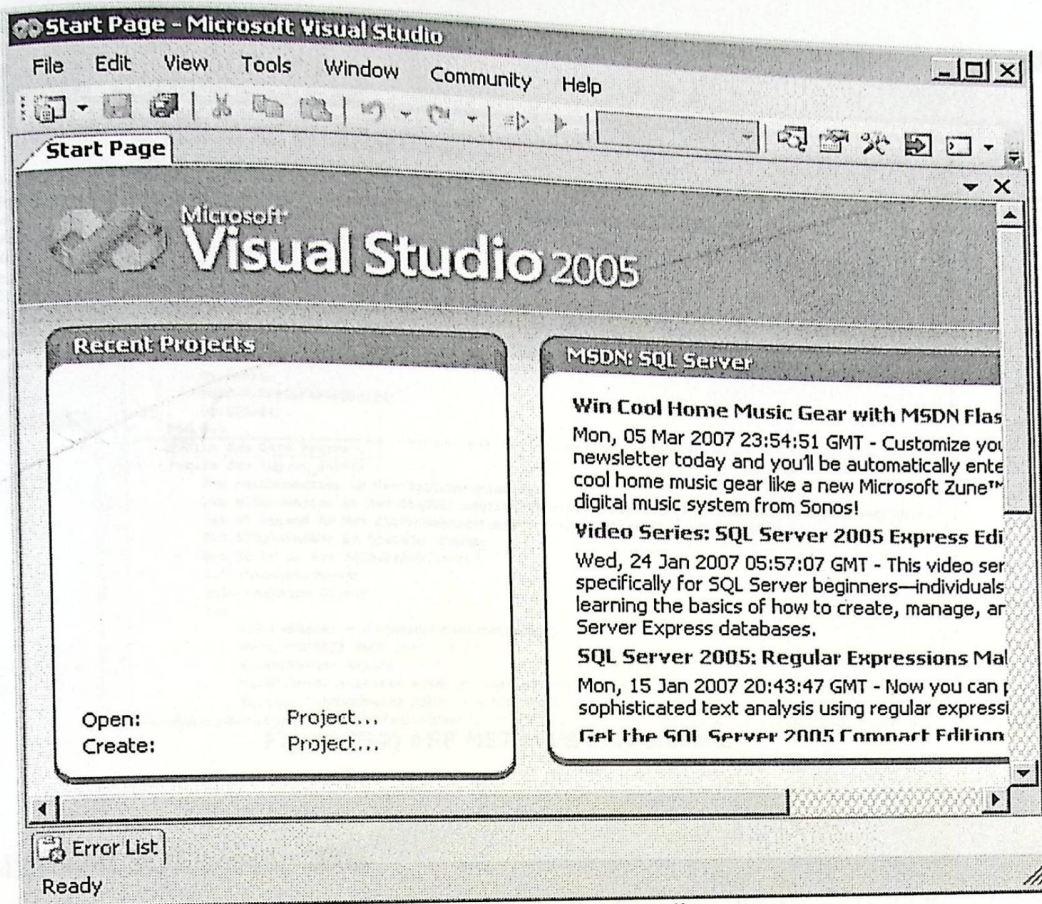


Figure (5-1) Microsoft visual studio.

ASP.NET Installation Requirements:

- Microsoft Operating System, Windows XP or later.
- Internet Information Service (IIS).
- Internet browser (ASP.NET is browser independent).
- Microsoft SQL server 2005.



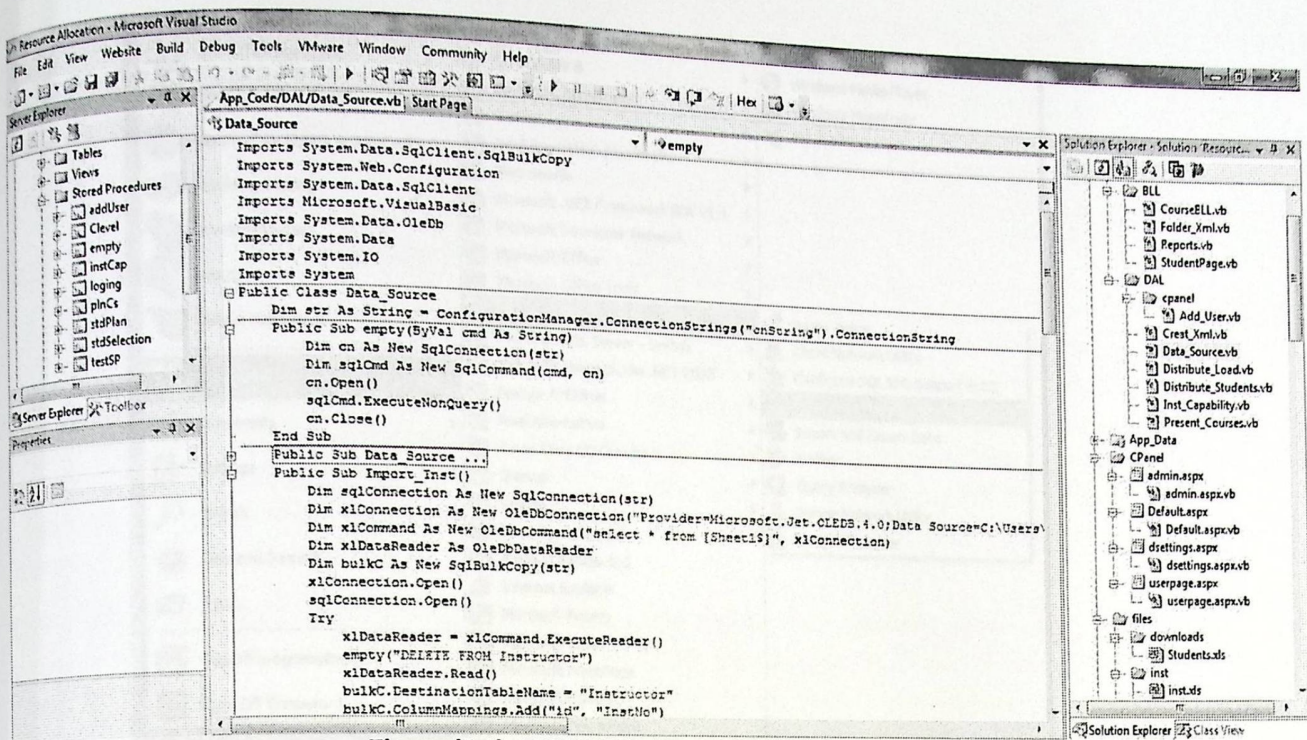


Figure (5-2) ASP.NET in VS environment.

4. Microsoft SQL server 2005

SQL Server provide a complete and easy platform for databases including database creation, management, and controlling. With high and variety security choices as it supports three types of authentication: Windows Authentication, SQL Server Authentication, and Mixed mode which uses both Windows and SQL Server authentication. SQL Server provide an easy interaction platform through its Graphical User Interface through which the database administrator can easily create, modify, and delete database objects. SQL Server is integrated with other Microsoft Products especially with Microsoft Visual Studio in an effective mannar.

The SQL Server feature:

- Support stored procedure: which works as mediator between the database and program page, the main advantage of the stored procedure is that it can build and examine it for one time and use it for many time and at any time.
- Default value: it is the most SQL Server simple constant, where can establish a number of a default value and then link them with the fields.
- The rules: the rule is identified and link with a specific field, then the field no accept any values out of the rule.
- Support a large number of users at the same time.

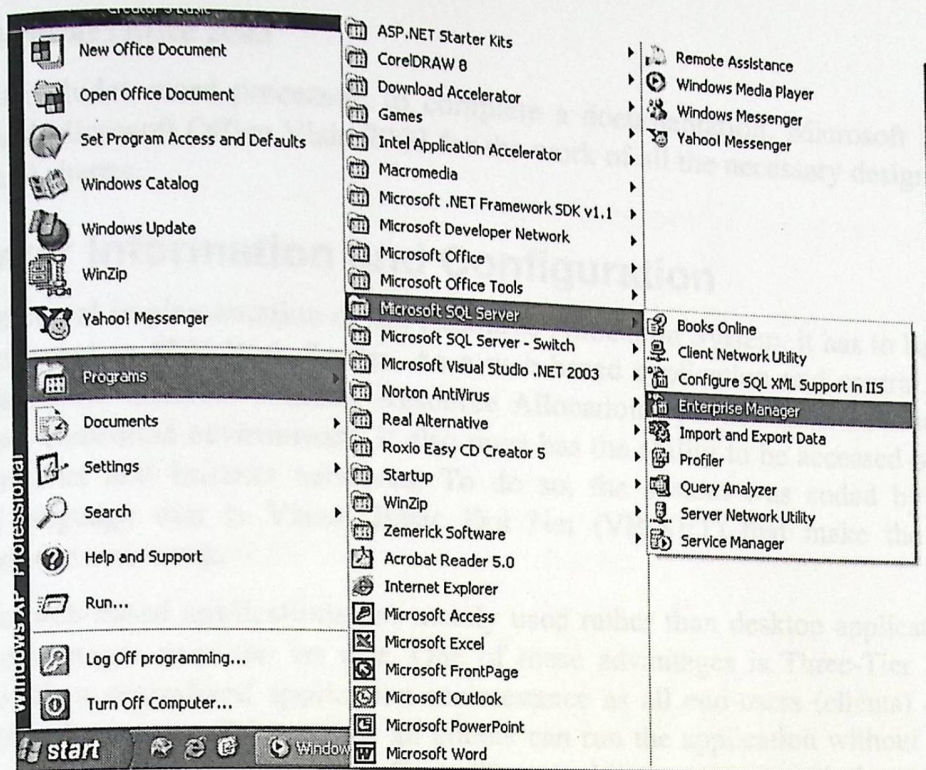


Figure (5-3) create database using SQL server with enterprise manager.

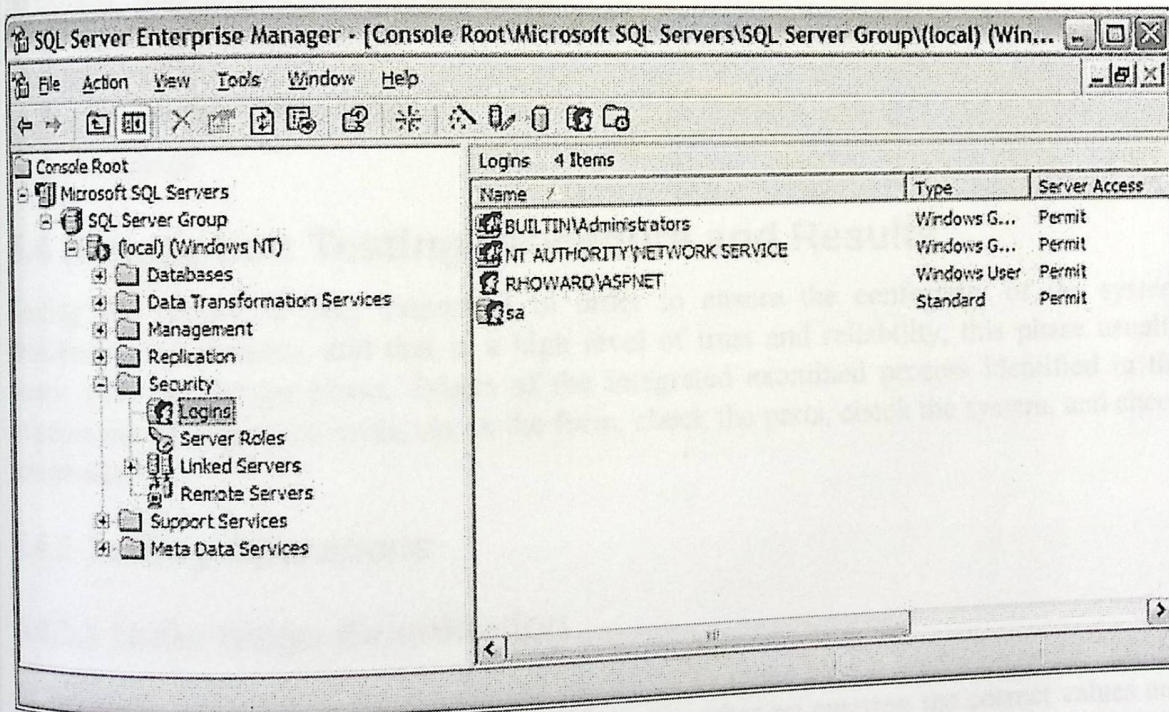


Figure (5-4) SQL enterprise manager.

• Microsoft Office 2003

It includes word processor, to complete a documentation, Microsoft PowerPoint, and Microsoft Office Visio 2003 for the work of all the necessary designs, drawings and shapes.

5.3 Server Information and Configuration

To perform a real implementation of the Resource Allocation System, it has to be configured and implemented in PPU Web Server. As a web-based application and central system that collects data from different sources, Resource Allocation System has to be reachable from any browser-controlled environment, it also must have the ability to be accessed over network such as Internet and Intranet networks. To do so, the system was coded by a browser-supported language that is Visual Basic Dot Net (VB.NET) that make the application executable over a network.

Nowadays, web-based applications are mostly used rather than desktop application because of many advantages over the last one. One of these advantages is Three-Tier Architecture which provides a centralized application maintenance as all end-users (clients) deal with a single application server. That means all clients can run the application without the need for installing the application locally. Three-Tier Architecture proposed three layers, each potentially running on a different platform:

1. The user interface layer
2. The business logic layer
3. A DBMS

5.4 Description Testing Procedure and Results

Testing the system is very important in order to ensure the conformity of the system functional requirements, and that is a high level of trust and reliability, this phase usually comes after the design phase. Stages of the integrated examined process identified in the examination of individual units, check the form, check the parts, check the system, and check acceptance.

5.4.1 Testing Operations

5.4.1.1 Units Stage Examination

At this stage, functions of the system are examined to make sure it works properly, all the processes must be examined independently from the other by entering the correct values and the other wrong, and examine the results.

5.4.1.2 Form Stage Examination

At this stage, collected interrelated components with each other in the system are examined as a whole through the introduction of the values of each console, then forms are checked completely.

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5.4.1.3 Parts Examination

At this stage, a set of functions related with each other this system consists of posts deification as:

1. The distribution of students on academic plans with the distribution of their courses to the semesters
2. And distribute the courses with the distribution of instructor's loads and their facilities needs.

5.4.1.4 System Examination

Here where to collect all parts of the system with some of the work of examination of the entire system, to examine the interaction between the components of the system and components and system interface. For example, after the system has distributed the students their academic plans and distributed the courses offered in the semester that was selected in the home page should have to distribute the loads on the academic stuffs in the same way so that the distribution of courses for each of them by degree, and finally distribute the facilities as needed from previous functions where each course what need of the facilities and stuffs with their needed of facilities.

5.4.1.5 Acceptance Examination

After building the system, it should be examined to achieve the desired requirements. The team proposed a number of problems that could face the users when using the system as illustrated as follows:

Table (5-1) Login test.

Case	Entered value	Expected Result	Actual Outcome	Comments
Login	Correct username, wrong password	Error Message	Error Message	Agree
Login	Wrong user name, wrong password	Error Message	Error Message	Agree
Login	Wrong user name, correct password	Error Message	Error Message	Agree
Login	Correct username, correct password	Have a legitimate access to the system	Have a legitimate access to the system	Agree

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Login	Wrong user name, wrong password	Error Message	Error Message	Agree
Login	Wrong user name, correct password	Error Message	Error Message	Agree
Login	Correct username, correct password	Have a legitimate access to the system	Have a legitimate access to the system	Agree

Resource Allocation

PPU IT dept.

Home Students Courses Load Resources

Log In

User Name:

Password:

☐ Remember me next time.

Log In

Welcome to PPU Resource Allocation,
Please Sign In with Your Username
and Password!

Otherwise, if you do not have an
account, or you have forgetton you
account credentials please contact
your Web Administration

This is a private website!

©2010 PPU. All Rights Reserved

Figure (5-5) login page

Resource Allocation

PPU IT dept.

Home Students Courses Load Resources

Log In

User Name:

Password:

☐ Remember me next time.

Log In

Welcome to PPU Resource Allocatio,
Please Sign In with Your Username
and Password!

Otherwise, if you do not have an
accoun, or you have forgetton you
account credentials please contact
your Web Administration

This is a private website!

©2010 PPU. All Rights Reserved

Figure (5-6) login with null values

Resource Allocation

PPU IT dept.

Home Stdudents Courses Load Resources

Log In

User Name:

Password:

☐ Remember me next time.

Your login attempt was not successful. Please try again.

Welcome to PPU Resource Allocatio,
Please Sign In with Your Username
and Password!

Otherwise, if you do not have an
accoun, or you have forgetton you
account credentials please contact
your Web Administration

This is a private website!

©2010 PPU. All Rights Reserved

Figure (5-7) login wrong user name or password.

Resource Allocation

PPU IT dept.

Home Stdudents Courses Load Resources

Please enter year, semester, and academic plan for which you want to
allocate resources, then press allocate data to allocate resources upon your
request!

year

semester

Base Plan

Welcome

Welcome Omar Ahmad. You are
logged in as admin, Date 6/7/2010

Options

[Admin Control Panel](#)

[User Page](#)

[Sign Out](#)

Links

[PPU Home](#)

[E-Learning](#)

[Registration](#)

Figure (5-8) Legitimate Access for Academic Administrator

Resource Allocation

PPU IT dept.

Home Stdudents Courses Load Resources

Please enter year, semester, and academic plan for which you want to allocate resources, then press allocate data to allocate resources upon your request!

year +
semester choose v +
Base Plan choose v +

Allocate Data

Year Field Is Required
Please Choose Semester
Please Choose Plan

Welcome

Welcome Omar Ahmad. You are logged in as admin, Date 6/7/2010

Options

[Admin Control Panel](#)

[User Page](#)

[Sign Out](#)

Links

[PPU Home](#)

[E-Learning](#)

[Registration](#)

Figure (5-9): Allocating data with empty attributes

Resource Allocation

PPU IT dept.

Home Stdudents Courses Load Resources

Data Allocation Success for Year: 2010, Semester: 1, and Plan: 2007

Re-Allocate

Proceed

Welcome

Welcome Omar Ahmad. You are logged in as admin, Date 6/7/2010

Options

[Admin Control Panel](#)

[User Page](#)

[Sign Out](#)

Links

[PPU Home](#)

[E-Learning](#)

[Registration](#)

Figure (5-10): Success in Data Allocation

5.5 Application Code

The application was coded using VB.NET programming language and ASP.NET programming model. System and source code are included in the disk which could be found stacked at the back cover.

Chapter 6

Maintenance

6.1 Introduction.

6.2 Relay the system.

6.3 System maintenance.

6.4 Backup.

6.5 Upgrade.

6.6 Preventive measures.

6.7 .NET Framework Maintenance.

6.8 The Internet Information Server Maintenance.

6.9 The SQL Server 2005 Maintenance.

Chapter 6

Maintenance

6.1 Introduction.

6.2 Relay the system.

6.3 System maintenance.

6.4 Backup.

6.5 Upgrade.

6.6 Preventive measures.

6.7 .NET Framework Maintenance.

6.8 The Internet Information Server Maintenance.

6.9 The SQL Server 2005 Maintenance.

6.1 Introduction

After the completion of development and testing the system, it becomes eligible to take a place in the work in real environment. As known, the user does not have the experience and adequate information about a new introduced program or software. Developer and programmers must provide users with needed steps information and guidance for deployment and maintaining the system. This chapter clarifies necessary operations to relay and maintain the system.

6.2 Relay the System

To operate the system efficiently and effectively, we should take several steps before the adoption of the new system. Defining the system environment and preparing full and correct description. Follow that, PPU has to make a decision of adoption the new system taking into account all the constraints and operational risks of the system. The process of relaying the system must pass through the following stages:

5. Build and prepare the environment of the system: must provide the PPU, the minimum operational requirement to adoption the system.
6. Make the decision to adopt the new system: decision-making process of the adoption of the new system, are the responsibilities of senior management, which decides to adopt it after answering the following questions:
 - Are the functional requirements of new system covers functional requirements of the IT-department?
 - Dose the IT-department have minimum requirements to run the system and adopt it?
 - What are the steps that must be followed to run the system?

6.3 System Maintenance

while the system has been running, there is always the possibility of system failure or the occurrence of certain errors, problems that should be avoided. So this section attempts to view the proposed plan for system maintenance, which includes the following:

6.3.1 Backup

The system must have backup copies of the full system and its database. When there is backup of the system through the reproduction of the system, and stored on media outside of the device that is developing the system was also done Backup the database and using tools provide the manufacturer of the DBMS is SQL Server 2005 used in our system. It provides many options for doing the Backup, according to the same database, This must be the work of these backups on a regular basis to ensure there is a loss or not.

6.3.2 Upgrade

Replacement of a product with a newer version of the same product, and this is done by having the latest versions of the software used, such as SQL Server 2008, and Visual Studio 2008 or 2010 so as to obtain the best performance of the system.

6.3.3 Preventive Measures when Building the System.

5. Use of validation control to prevent users from entering wrong values.
6. Use of the Data set to prevent direct contact with the database.
7. Use of the Stored Procedure in order to prevent direct contact with the database.
8. Use of the n-Tier architecture as a coding technique in order to create the flexible and reusable application.
9. Use of MD5 for enhancing security.

6.3.4 .NET Framework Maintenance

Using the Visual Studio and .NET Framework can amend to the rules at any time and make improvements to design user interfaces in the application to increase the performance and effectiveness. Through the screen in the solution explorer visual studio can see all the pages and select the page that needs an amendment.

6.3.5 IIS Maintenance

IIS is the basic approach to the process of deploying applications on the internet so that the successful deployment of applications, efficiency and effectiveness required. It depends primarily on the basic accuracy, confidentiality and stability enjoyed by the IIS. In order to maintain the confidentiality and security in the form required the user must choose the appropriate value for the option of confidentiality for the security.

6.3.6 The SQL Server 2005 Maintenance

In SQL Server 2005, database maintenance plans are almost entirely created by using SQL Server 2005 Integration Services. The main part needed is the database of the IT Department which is collected by PPU with IT-department. This contains the tables and the stored procedures that are used in the system and every data contained in the SQL server.

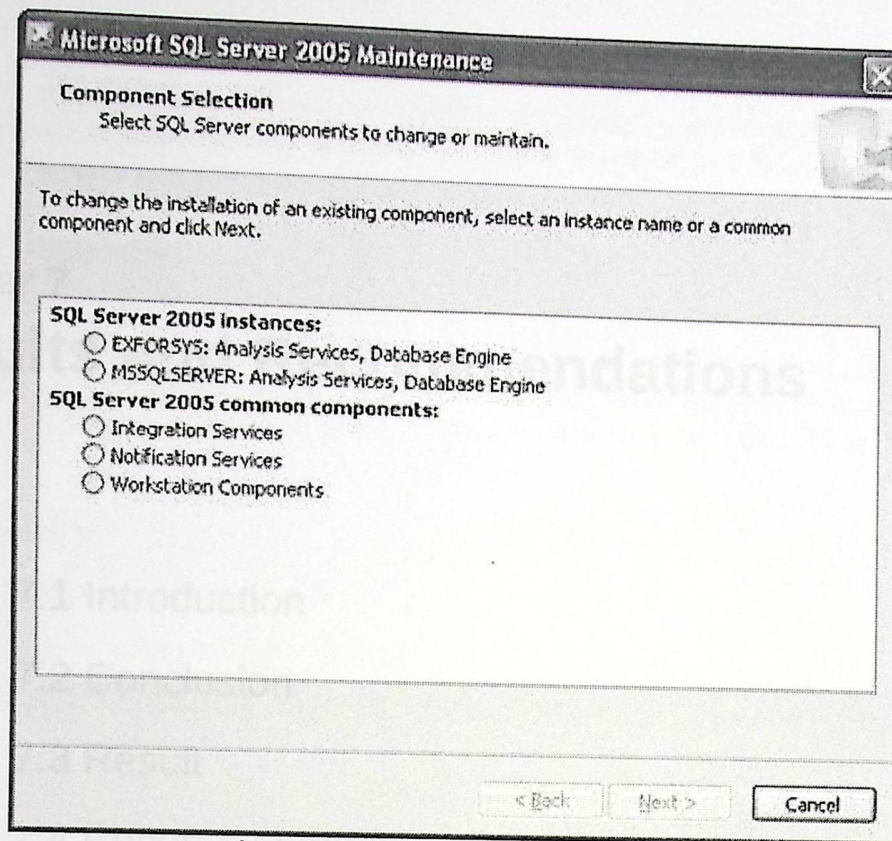


Figure (6-1) SQL server 2005 maintenance

7.1 Introduction

After the team work finish the last level of the system, much some of the result is which has been explained in this chapter, and there are some of recommendations which is aim to improve the system in the future.

7.2 conclusion

Chapter 7

Results and Recommendations

7.3 Results

7.1 Introduction

7.2 Conclusion

7.3 Result

7.4 Recommendations

7.1 Introduction

After the team work finish the last level of the system, reach some of the result in which has been explained in this chapter, and there are some of recommendations which is aim to improve the system in the future.

7.2 conclusion

This web application has been build to achieve the objective of the project, this web application enable the academic supervisor to access it during his name and password to perform his work electronically during the function that the system has been provide to him, and also can provide a signal shared database allocated on the server from several department..

7.3 Results

1. We-based application was built.
2. Functions are working and desired reports are generated.
3. Integration between IT, Registration, and HR Department was achieved.

7.4 Recommendations

Resource Allocation System is an opening step toward fully integerated Enterprise Resource Planning System that could be applied to PPU. Working toward such a system and adopting it will lead the university to the best of its performance and put it in a higher place.

Appendix A

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Abbreviations

- CMS:** Course Management System
- CRM:** Customer Relationship Management
- ERP:** Enterprise Resource Planning
- FMS:** Financial Management System
- FRM:** Finance Resource Management
- HRM:** Human Resource Management
- HRS:** Human Resources System
- IS:** Information System
- IT:** Information Technology
- LAS:** Library Automation System
- MRP:** manufacturing resource Planning
- PPU:** Palestine Polytechnic University
- RAS:** Resource Allocation System
- SIS:** Student Information System
- DFD:** Data Flow Diagram

Appendix B

Interviews

Interview (1) Outline	
Interviewee Head of the IT Department	Interviewers Group
Location College of Administrative Science and Informatics	Appointment Date: Sun 20/12/2009 Start Time: 10:00 am End Time : 10:50 am
Objectives Understanding the idea in genera for the work flow in the IT department. Understanding and having acknowledgment how the IT dep. Deals with each semester. Collecting data and information about the architecture and who architect	
Agenda Introduction Background on Project Topics to be Covered Summary of Major Points Questions from Interviewee Closing	Approximate Time 1 minute 2 minutes 37 minute 5 minutes 4 minutes 1 minut
Questions	Answers
7. What are the major human resources in the department?	- head of the department - full-time instructors - part-time instructors - Secretary
8. How do you distribute the overall academic load?	We divide the academic load (credit hours of all courses to be offer at each semester) on the department instructors depending on each instructors major and degree
9. Depend on what?	The load is degree-dependent that mean: - Dean must have maximum 6 credit hours - Head of the Department 9 hours - PhD instructors 12 hours - Master instructors 14 hours

	- BA instructors 16 hours Till all instructors cover all credit hours at the semester.
10. If any instructor still have free hours?	he may have academic load at another college
11. If insufficient?	We may require part-time or new full-time instructor.
12. Do you have a contingency plan for any sudden event?	Sure we have, if any instructor has to suddenly travel, absence or anything we quickly find an alternative.
13. Please explain in short, the daily process of the IT department?	We manage everything in the department from putting a new academic plan in action to exporting marks to the registration department. Passing through all stages we talked about.
14. What do you depend on in offering courses each semester?	Depending on the academic plan, and statistics from the registration department.

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