

Online Registration System

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Abstract

Problem Statement: Enrolling students into the General Associate-Degree Examinations is a very difficult, critical, and important process. Students are required to pass this exam in Jordan to be given the Associate Degree in the field of study they studied for 2 years. The exam is held 3 times per annum; annually, more than 15,000 students from different colleges all over the country apply to the exam. Managing all exam activities is a very complex and sophisticated process. In the old, conventional method, i.e. the manual registration system, communication between different parties working with exam activities is very difficult. Lack of technologies used in exam activities obstructs dealing with it in a modern and simplified way. **Approach:** The main outcome is to computerize everything related to the General Associate-Degree Examination. To do so, the Waterfall Model is to be used to study the new system requirements, analyze it, design, implement, and finally test and deploy it. **Results:** After the deployment of the new system and working with it, all the problems referred to were solved; this is done by adopting the Online Registration System which helped a lot in reducing the errors resulted in different ways and which in turn afferent the correctness of the exam itself. **Conclusion/Recommendation:** In conclusion a web-based tool was developed to computerize the required steps already expected by the system. As a further work, some features might be added, such as adding SMS support, adding AJAX functionality to the website to increase response time, and to create a bulletin board system, that might enable different parties working with the system to interact and communicate with each other easily.

Keywords: Software Engineering, Web Development, Online Registration, Computerization, Corporate Web Portal, In-house Development.

1. INTRODUCTION

In Jordan some students are enrolled in 2-year academic programs called the Associate-Degree Programs. To qualify for the associate degree, student should study the required curriculum relevant to each specialization; they must then apply for what so called the General Associate-Degree Examination (GADE), informally known as the Comprehensive Exam. Only students who pass the exam, i.e. GADE, are granted the Associate Degree in the specialization they studied for 2 years.

50 intermediate colleges, informally known as community colleges, work under the supervision of Al-Balqa' Applied University (BAU), this is according to the statistics of the Unit of Evaluation and General Examinations at BAU. Colleges are classified into the following types:

1. University colleges.
2. Public colleges.
3. Private colleges.
4. Military colleges.

Table 1 lists the number of colleges according to their types.

| College Type | Colleges |
|--------------|----------|
| University | 14 |
| Public | 5 |
| Military | 6 |
| Private | 25 |

TABLE 1: Colleges in Jordan classified by type

Colleges are grouped into moderates according to their geographical location. Currently, there are 13 moderates spread all around Jordan Table 2, lists all moderates and the number of colleges in colleges in each moderate.

| No. | Moderate Name | Colleges |
|-----|-----------------------|----------|
| 1 | Amman 1 st | 6 |
| 2 | Amman 2 nd | 8 |
| 3 | Amman 3 rd | 9 |
| 4 | Irbid 1 st | 6 |
| 5 | Irbid 2 nd | 4 |
| 6 | Ajloun | 1 |
| 7 | Salt | 2 |
| 8 | Zerka | 8 |
| 9 | Kerak | 1 |
| 10 | Tafila | 1 |
| 11 | Ma'an | 2 |
| 12 | Aqaba | 1 |
| 13 | Granada | 1 |

TABLE 2: List of moderates and number of colleges in each moderate

1.1 Problem Identification

For the exam to take place, the unit of Evaluation and General Examination (UEGE), this is the unit responsible of running and administering the exam all over the kingdom in its different stages, must identify the following factors:

1. Total number of students who will attend the exam.
2. Number of student in each specialization.
3. Number of colleges whose students will attend the exam.
4. What papers the students will have exams on, so UEGE can start preparing the necessary questions of each paper.
5. The specific information about each student wishes to apply for the exam. This is to be verified and audited by UEGE to make sure all students are eligible to exam according to exam rules, regulations, legislations, and instruction.
6. Exam retakers can electively retake the exam in the papers they didn't already pass during previous exam sessions. However, they keep their marks in the last exam session in which they didn't pass the exam. This should also be audited by UEGE.

As long moderates, and thus colleges, are distributed in different geographical locations across the country, its very hard, maybe it's impossible, to collect an updated version of each of the previous factors at the time they are needed.

Auditing and verifying exam-retaker mars prior to the start of the exam is very crucial. This requires a lot of time and effort by the Computer Staff at UEGE. Delivering this piece of data to UEGE by colleges in a late time may obstruct the running of the exam.

The old, yet conventional method used to obtain the required data is to collect the statistics either by phone, fax, or e-mail. A UEGE's employee is named to the colleges as a coordinator; one of his/her responsibilities is to contact colleges and moderates to get the required statistics once they needed.

The higher committee of General Examinations (HCGE) at BAU is responsible of issuing all the legislations to run the exam, which is held 3 times annually, they are the: Winter, Spring, and Summer sessions. HCGE is also responsible of specifying exam appointments either for the paper-based

section or the practical one. Accordingly, the HCGE specifies the registration duration which allows students to apply for the exam.

At the end of registration duration, UEGE start its final activities such as managing student seating in exam halls. Each student is given a Seat Number, which is a unique number, and it's used to identify the student on the coming exam activities.

After the expiry of registration duration, college registrars are required to correct any errors that may appear during the registration phase. Thus, they make the necessary updates on their records, and send them in an MS-Excel file with a predetermined format to UEGE via one of the following methods:

1. E-mail.
2. Floppy Diskettes.
3. CD-ROMs.
4. Flash Memories.
5. Papers (Hard Copies)

Finally, a unified MS-Excel file is complete, and it's named the **Students' Base File**. It contains detailed data about the students who will actually attend the exam; and it serves as the exam's database.

To summarize, the conventional manual system suffers the following problems:

1. It's a hard method to communicate between UEGE and the colleges.
2. Inaccurate statistical data gathered from time to time due to its dependent on the time in which it's ordered.
3. Not all the colleges fill their students' data correctly or properly in the Excel files; neither they comply to the predetermined file format.
4. The method of data exchange between college registrars and UEGE is unsafe, in that storage media might be susceptible to corruption at any time.

1.2 The Proposed System

The key solution to avoiding all the problems mentioned previously is to find a unified way to solve the problems mentioned earlier. The only unified way is by computerization.

First, registrars should find a better way to communicate with UEGE; this could only be achieved by an Online Registration System. Since the whole country is connected to the Internet, it's very easy to make use of that feature to facilitate the way in which UEGE can monitor what's going on there in the colleges and detect errors during the registration process once they are entered to the system. Hence, there's no need to wait until the end of the registration duration to start auditing.

Not only will the system be a registration system. In fact, Online Registration is a subsystem of the whole system.

The system is a Web Portal. By definition, a Web Portal is a system that presents information from diverse sources in a unified way^[1]. Contents of a portal may include reports, announcements, e-mail, searches, etc^[2].

This portal is classified into a Corporate Web Portal, that is, it allows internal and external access to information specific to GADE.

1.3 Online-Registration Systems

Several registrations systems are used in the Jordanian universities and colleges, some of them support the online registration features and some do not. Some of these systems were purchased by local or international software companies, and some are developed internally by the software development teams in the computer centers each in the relevant university or college.

What makes this registration system almost distinguished when compared to others, is that it's a Special-Purpose Registration System. First of all, the system is explicitly used to enroll students to exams, the General-Associate-Degree Examination (GADE); here, courses are grouped into collections called Exam Papers.

An Exam Paper is a set of courses each with a definite number of questions, each question has a weight; courses of each specialty are grouped into papers each with a definite mark, when all-paper marks are added to each other final exam mark can be calculated.

Secondly, this system is designated to examinations; no other system all over Jordan is used to enroll student for such a general examination. Purchasing a Ready-Made Application to manage GADE Activities will be impossible since GADE is the only examination in Jordan held for the Associate-Degree Students.

Finally, this system is to be used by college registrars themselves not the students; most online registration systems in the market and the other that are applied in the other universities and colleges are used by the students themselves.

2. MATERIALS AND METHODS

The proposed system is a 3-Tier web-based. 3-Tier Architecture is a Client/Server Architecture in which the user interface, functional process logic (business rules), computer data storage, and data access are developed and maintained as independent modules, most often in different platforms^[3]. Fig. 1 shows a 3-Tier Architecture design.

2.1 The Database Layer

The proposed system's database will be implemented using Microsoft SQL Server 2005. This layer provides high connectivity and availability, plus, it provides system developers with the ability to manage and administer their databases easily, especially using the Graphical User Interface (GUI) of its Management Studio. In addition to enabling developers to create their own stored procedures or use built-in system ones.

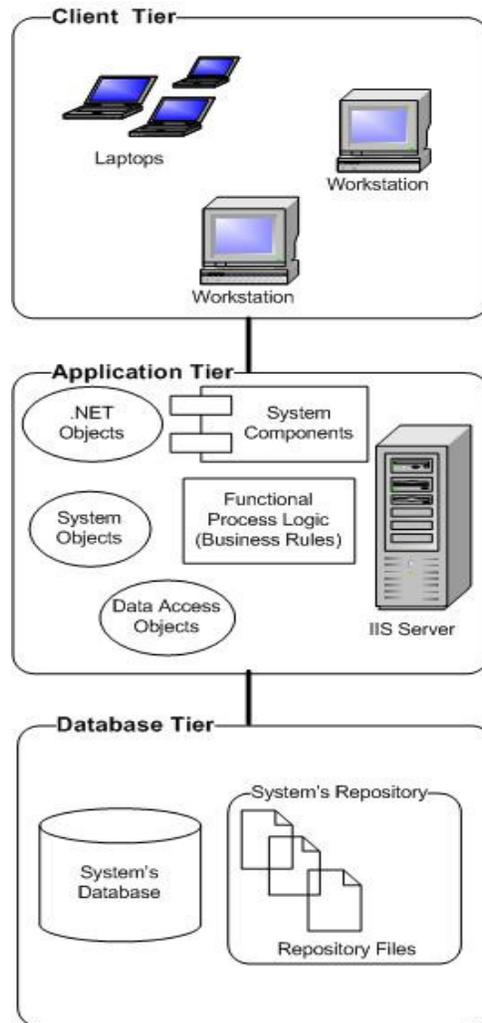


FIGURE 1: 3-Tier Architecture

Using MS-SQL Server 2005 as a Relational Database Management System (RDBMS) of the entire solution gives the user the ability to create Server-Side Cursors to iterate programmatically through different table records and manipulate them row by row. At development time, developers may need to process resulting records at the server without the need to use another programming language, i.e. by means of the built-in functionality of the RDBMS.

Never forgetting the use of triggers to perform actions on data upon insertion, deletion, or updating.

All of the previously mentioned features make MS-SQL Server 2005 a good environment to host the system's database.

2.2 The Application Layer

As shown in Fig. 1, the Application Layer contains the User Interface (UI), Business Rules, and the Data-Access Components. In this system, .Net 2.0 framework is used to provide data access to the MS-SQL Server 2005 by the use of ADO.NET.

All the accessing data code and business rules implementation was developed using Microsoft Visual Basic .NET; the code was written in files, each contains a class or more to handle the operations of web forms designed using ASP.NET.

Internet Information Services (IIS) version 5.0 or later must run on the Application Server to enable the use of ASP.NET across it.

2.3 The Client Layer

The simplest client must have a PC, preferably running Windows XP as an operating system, with Internet Explorer (IE) installed to enable the users to browse the website over the Internet.

As a web-based application, all processing is done on behalf of the users' computers on the server hosting the system. So, other operating systems such as Linux, UNIX, Mac OS, etc. might be acceptable as client machines.

2.4 Process Model

The Software Development Process used in this system is the **Waterfall Model** shown in Fig. 2. The Waterfall Model was chosen because of the fact that system requirements are well understood and won't change during system development^[4].

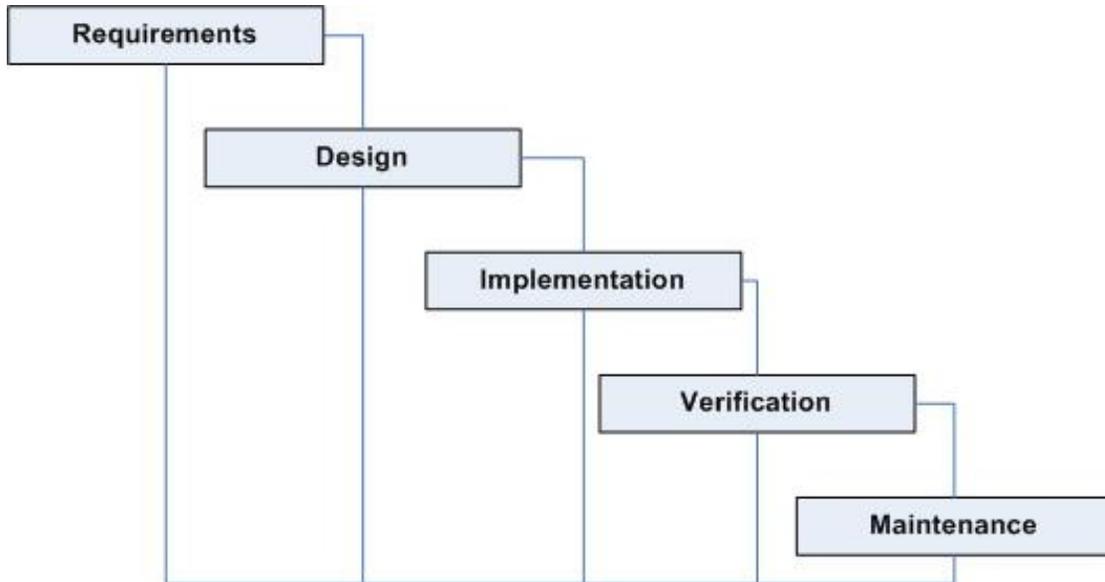


FIGURE 2: The Waterfall Model.

Actually, this system is designed, developed, and implemented by the Computer Staff at UEGE, so all requirements are made by UEGE itself, which are already clear by 95% prior to starting.

2.5 System Overview

Fig. 3 shows the context diagram of the proposed system.

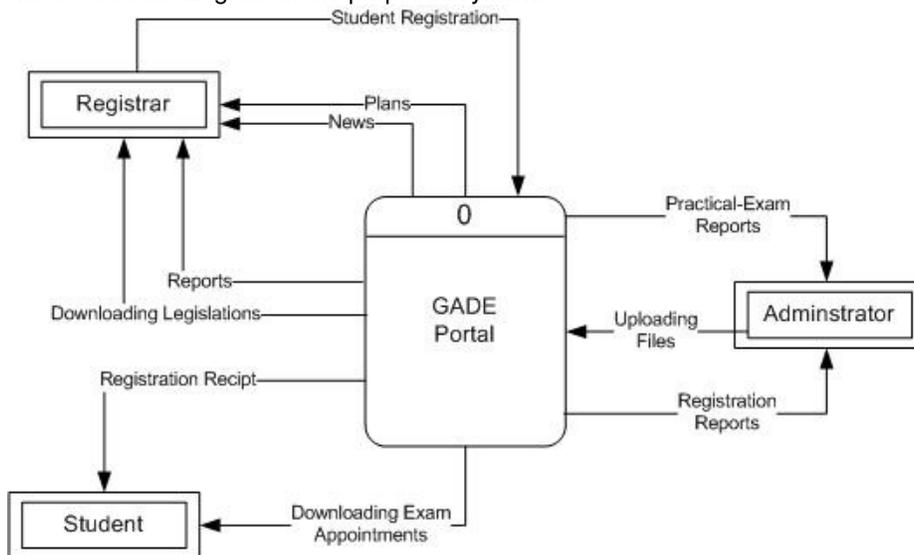


FIGURE 3: System's Context Diagram

The Context Diagram is an overview of the system that shows its basic inputs/outputs^[5].

2.6 System Use Case Diagram

Use Case Diagram is a graphical representation that describes how users will interact with the proposed system^[6]. Fig. 4 shows the Use Case Diagram of the proposed system.



FIGURE 4: Use Case Diagram of the Proposed System.

3. RESULTS

This system comprises a number of subsystems (smaller systems) that integrate together to form the overall system requirements and functionality.

3.1 Registration Subsystem

This is the main and the most important subsystem of the web portal which is depicted in Fig. 5. The main reason led to think in a computerized system to manage GADE's activities was to solve the registration problems, improve communication methods between college registrars and UEGE, and to monitor what's going on there in the colleges during the registration duration trying to catch any exceptional cases.

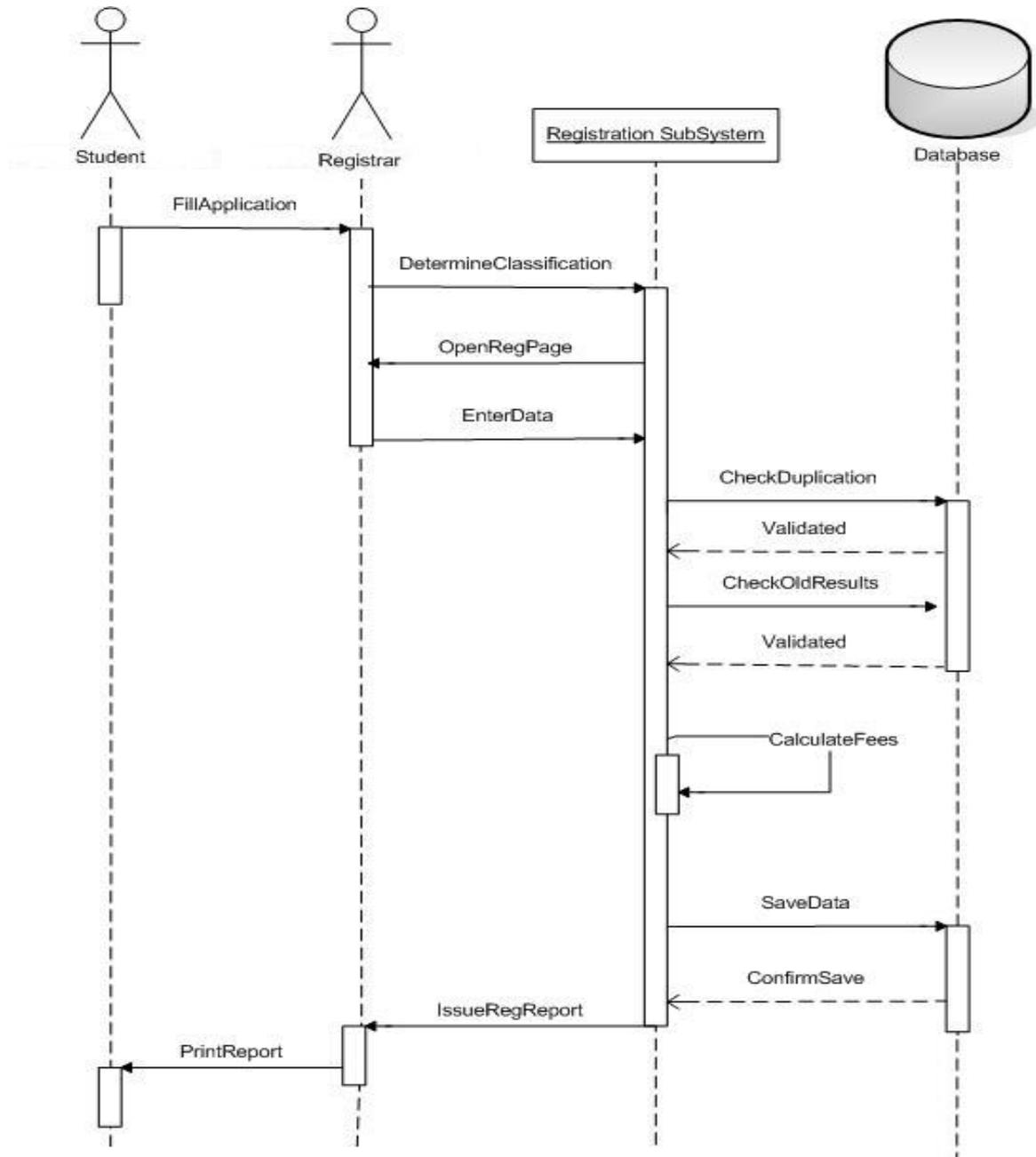


FIGURE 5: Online-Registration's Sequence Diagram.

Students wishing to apply to GADE must visit the college's registrar to fill an application form with the required data.

The registrar must enter student's data, as filled by the student, into the system's database, by means of the data-entry screen designed for this purpose.

After completing the data entry process by the registrar, the system issues a registration receipt; this has to be passed to the student as a proof of registration. The student signs on the two copies of the receipt, hence, it's used from now on as a statement from the student that the data entered to the system by the registrar was correct, in addition to the first reason mentioned earlier.

Actually, the registration process is not that easy, on the contrary, it's a very vital and crucial component of the system, despite the fact that it's transparent to the end user (registrar).

The user enters the student data to the system, and gets two things as a feedback, they are a confirmation from the system to assure that the student was enrolled into the exam, and an exam receipt to be passed to the student as mentioned earlier.

But, what goes inside is a complex, yet critical set of operations depicted in Fig. 5, which shows the **Sequence Diagram** of the Online-Registration Process. The Sequence Diagram shows system objects and how they interact with each other and the order in which these interactions occur^[7].

3.2 Reporting Subsystem

Another important aspect of the system is that it provides a reporting subsystem for three different parties dealing with the system, they are:

1. College Registrars.
2. Moderate Exam Coordinators.
3. UEGE Administration.

Now, it's easy for each college registrar to know how many students applied for the exam, the fees required from each student, and the papers in which the student will have the exam in.

For Moderate Exam Coordinators it's now clear to them how many students will apply for the exam in their moderates, so they can make the necessary calculations regarding each college's fees. Plus, they are now able to know how many halls they will have in the moderate to manage student seating in them, how many labs are needed to be reserved for the purposes of the practical exam, and they'll be able to know what specializations student will have exams in.

3.3 Repository Subsystem

By looking to the System's Use Case shown in Fig. 4, it's clear that there are three means of communication between system users and UEGE.

The first communication method is by using the reporting subsystem which issues different types of reports as demanded. Another method is by the news updates done by system's administrator, and viewed by registrars.

The last method, and it's the most important communication method, is by using the System Repository (Repository Subsystem). Repository Subsystem and System Repository will be used interchangeably henceforth.

System Repository is a tool that enables users to download files necessary for managing GADE activities.

Such files include the study plans for different Associate-Degree programs and specialties. They also include course-to-paper mapping for each specialty, which acts as a guide to let examinees know how courses they studied are distributed among exam papers, and the weight of each paper (paper full mark and minimum passing mark). Also, they include the files that describe what skills are required for the student to have to be eligible to the practical exam in his/her specialty.

As depicted in the Use Case shown in Fig. 4, users of the system may also link to the latest regulations and legislations issued by HCGE, plus they can also download exam appointments, whether for the paper-based or the practical exam.

Files are uploaded to the website by a user with administrative privileges, the System Administrator. The website refers to them as links in the various menus as will be shown later.

Files uploaded to the system have different formats, such as:

1. Portal Document Format (**PDF**), this is the most widely used format in this website since it's been read the same by different operating systems.
2. MS-Word Documents (**DOC**).

3. MS-Excel Spreadsheets (XLS).
4. Images (JPG, BMP, GIF, TIFF).

3.4 Database Design

Fig. 6 shows the Entity-Relationship Diagram (ERD) of the system.

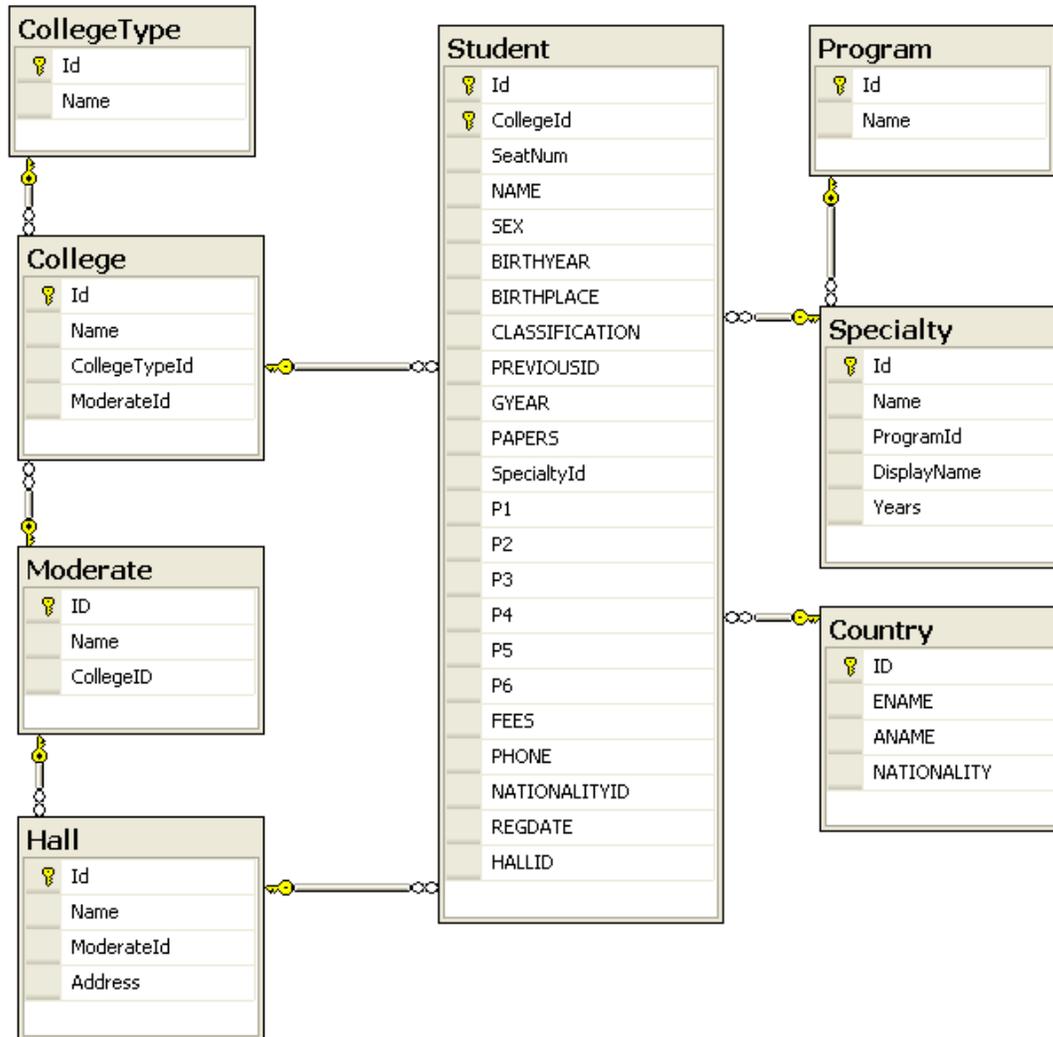


FIGURE 6: System's ERD.

3.5 System Features

The system utilizes Microsoft .NET 2.0 framework which provides it with the necessary components to build system components and objects, plus providing the system with the required data access components.

This system was implemented using ASP.NET as the webpage design tool in combination with VB.NET as the technology that provides the necessary coding behind the ASP.NET pages.

The application connects to a Microsoft SQL Server 2005 database, which plays the role of the RDBMS associated with the application.

Users of the system, whether they are registrars or UEGE employees, can run the application through their Internet browser, such as Microsoft Internet Explorer (IE) version 6.0 or later. To do this, the application is hosted on a Windows 2000 Server machine with Internet Information Services (IIS) 5.0 or later installed.

3.6 Implementation

The system was developed and implemented successfully resulting in the following set of web pages; noting that what's listed below is a brief of the entire solution, in the same time they provide full functionality of the overall system.

3.6.1 Login Screen: Fig. 7 shows the login screen. As shown in the figure, the user must enter a valid User Name and a Password; once they are matched the user can enter the system.



FIGURE 7: The Login Screen.

3.6.2 The Main Menu: Fig. 8 shows the menu items that enable the user to makes choices for using which subsystem of the overall system.

الكلية: مدير الدائرة الفنية وتكنولوجيا المعلومات رمزها: 111
منطقة الامتحان: وحدة التقييم والامتحانات العامة



FIGURE 8: System's Main Menu.

3.6.3 Online Registration Subsystem: Fig. 9 shows the webpage that lets a registrar choose the classification of the student desired to enter the system.



FIGURE 9: Student-Classification-Selection Screen.

Fig. 10 shows one of the registration pages, using this page a registrar can enroll a student of Classification-R (Regular Student) to the system.



FIGURE 10: Online Registration Screen.

After registration completes, the Registration Receipt show in Fig. 11 is how and printed out to be passed to the student.



FIGURE 11: Registration Receipt.

3.6.4 Reporting Subsystem: Different types of reports are implemented in the system. They are briefly shown below.

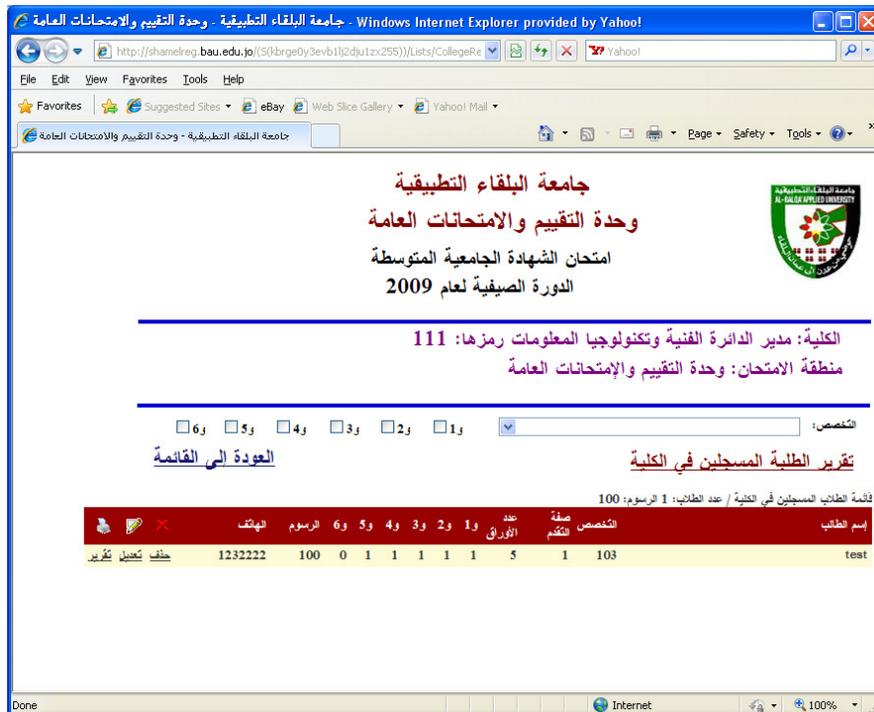


FIGURE 12: College Registration Report.

The page shown in Fig. 12 displays to the college registrar a list of the students enrolled into the exam in his/her college. At the top of the page there is a combo box that enables the user to iterate through different specialties to filter his/her selection. Also, at the top-left of the page there are a

number of six check boxes that enable the user to filter student selection by paper requesting to apply for.

Fig. 13 displays Exam Moderate's Report. It's also contains the specialty combo box, and the six-paper check boxes. Plus, it also includes a combo box with a list of colleges working in the exam moderate of the college currently logged in.



FIGURE 13: Moderate Registration Report.

The report shown in Fig. 13 is only shown if user of the system is identified as a moderate coordinator.

3.6.5 System Repository: The System Repository lists the files required. Fig. 14 shows a listing of Course-to-Paper Mapping.

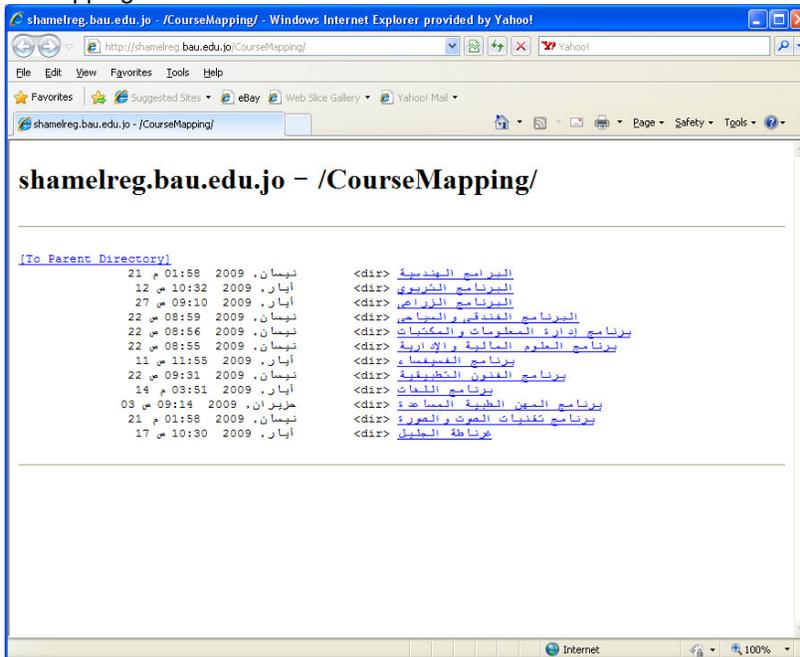


FIGURE 14: Course-to-Paper Mapping from the Systems' Repository.

4. DISCUSSION

By using the system, most problems used to be faced by the UEGE's administration and college registrars were now eliminated. This is done by the means of the Online Registration Subsystem, which allows students to enter to the system immediately once they fill the required application form. Now, there's no need to the coordinator to make long calls to get the number of students currently enrolled into the exam. Plus, by monitoring the instantaneous insert/update/delete operations done by the system, UEGE's administration can detect any type of errors that may enter the database immediately once they occur.

Also, there's no need now for other activities to wait the end of the registration duration, since the Reporting Subsystem give the administration the necessary let them predict approximate student numbers, specializations, and colleges they came from.

Finally, using paper and fax correspondence have been deducted by 100%. Thanks for the Repository Subsystem which allows System Administrator to upload the necessary files immediately to the system and announce their upload to the users by the news bar associated with this application.

5. CONCLUSION

A web-based application was designed, developed, and implemented as a web portal that enables different parties working with Associate-Degree General Examination to benefit from.

As a proposed future work on this system, the following points should be taken into consideration:

1. Short Messaging Service (SMS): this is a very important service the system must include. Briefly, student cell-phone numbers are currently stored into the system's database. This predetermined feature allows us to build on, to come out with a subsystem that enables the system to send news to students, such as their Seat Numbers, exam appointments, new regulations and legislations, and probably their results.

2. Online Student Registration: to make it much easier for the college registrars, students might have been given an access to the website wherever they are; they are requesting to be enrolled into the exam, the request status stays pending until verified and audited by the registrar.

3. Upgrading the system to support AJAX (Asynchronous JavaScript and XML): this reduces the load time of each page, and thus makes interacting with the system much easier and faster.

4. Customized Reports: as a further future work, colleges might be granted some administrative privileges on the system to allow them to manage the reports they need, so that the system never controls the way and format in which reports are displayed, but each college or moderate can customize a set of reports as they are seen appropriate to their usage.

5. Bulletin Board: instead of using a the news bar at the main page of the website, a bulletin board might be built as a bidirectional communication method between system users and UEGE.

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