Automated registration for postgraduate students via multimedia

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Abstract:

With the development of modern technology and the expansion and spread of modern networking and communications methods and technologies, the fields and applications of human resources management and the organization of various data have multiplied to facilitate statistical operations and organizational and financial management in the state's various educational and service institutions. The effective design of data management for the student registration platform based on multimedia applications has become a necessary and important requirement in universities and educational institutions because of the important services they provide in organizing and managing this data, saving time and human effort for these institutions, and contributing to organizing work in an efficient and easy manner. Since the using of a paper-based system to manage this information has become hard mission because the information might be redundant, inaccurate, ineffective, inconsistent, difficult to access, and insecure. Therefore, for effective and error-free management of this information, In this thesis, a mechanism and techniques will be proposed, which are supposed to mean how graduate students register (automatically) for the subjects assigned to them and choose the professor (the subject teacher) and the subject that the student wants to study in this course, as well as choosing the appropriate lecture time, and the study begins at Tikrit University. It will be proposed to use JavaScript and SQL Server to implement the requirements of this study.

Keywords: (Data Manegments and Administration, Student Registration Platform, Multimedia Applications, JavaScript and SQL Server, React).

1.1 Introduction

With the continuous advancement of modern technology and the increase in the number of schools, colleges, and universities around the world, student information has multiplied more and more. Colleges and universities are faced with a large amount of information, and it is becoming difficult to manage this information manually [1]. Using a paper-based system to manage this information has become difficult because the information may be redundant, inaccurate, ineffective, inconsistent, difficult to access, and insecure. [2] [1] Therefore, for effective and error-free management of this information, a Student Information Management System has been developed. The concept of the database model was adopted to enhance the efficiency of keeping student information records in universities in an organized manner [3].

However, the information stored in the database will be vulnerable to a number of hacks which include; Reducing data duplication and update errors (inaccuracies), increase data consistency and integrity, facilitate easy access to information, and improve data security. The data management system is beneficial for the collection and for both students, lecturers and college authorities. SIS can also be divided into Student Information Management System (SIMS), Student Management System (SMS) or Student Records System (SRS) and are all created to help maintain records digitally [4].

Background of the Study

Programs for student data and registration are described as the one of the core organizational programs for educational institutions, crucial for the provision of the important service environment for the management of the institution [8].

Many services and facilities are present in this for teachers, employees, and students to view them and to input and get data regarding study and students. These programs and systems have grown and evolved greatly as they are utilized to index books and retain records that are pertinent to information concerning the students who have been enrolled alongside the working employees [9].

Standard educational institutions employed the manual system in capturing the office and student records gotten from the registration portal [10].. Since actual requests made by other employees could also be addressed to the administrative center, this creates a rather cumbersome manual system that is time-consuming and can be prone to mathematical errors [11].

Database

A database is an organized collection of structured information, or data, typically stored electronically in a computer system. A database is usually controlled by a database management system (DBMS).

Databases often store information about people, such as customers or users. For example, social media platforms use databases to store user information, such as names, email addresses and user behavior. That data is used to recommend content to users and improve the user experience.

Relational Databases

Relational databases are based on the relational model, which organizes data into tables with rows and columns. These databases have been the standard choice for many applications due to their robust consistency, support for complex queries, and adherence to ACID properties (Atomicity, Consistency, Isolation, Durability). Key features and benefits of relational databases include:

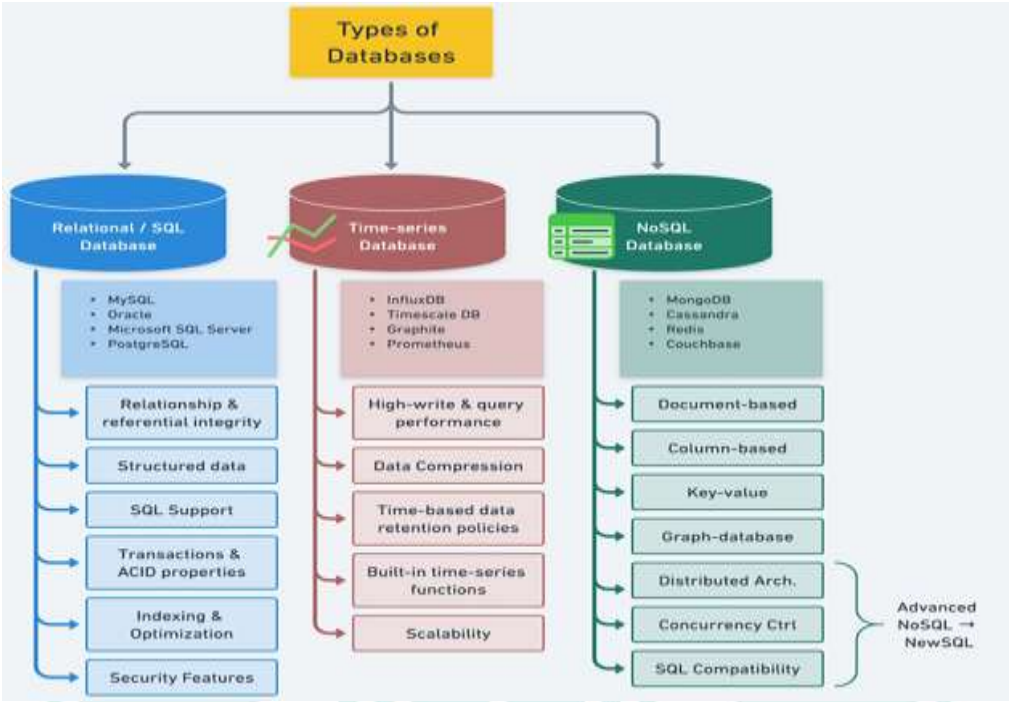
- **Structured data organization:** Data in relational databases is stored in tables with a predefined schema, enforcing a consistent structure throughout the database.
- **Relationships and referential integrity:** The relationships between tables in a relational database are defined by primary and foreign keys, ensuring referential integrity. This feature allows for efficient querying of related data and supports complex data relationships.
- **SQL support:** Relational databases use Structured Query Language (SQL) for querying, manipulating, and managing data.
- **Transactions and ACID properties:** Relational databases support transactions, which are sets of related operations that either succeed

or fail as a whole. This feature ensures the ACID properties – Atomicity, Consistency, Isolation, and Durability – are maintained, guaranteeing data consistency and integrity.

- **Indexing and optimization:** Relational databases offer various indexing techniques and query optimization strategies, which help improve query performance and reduce resource consumption.

Database Types

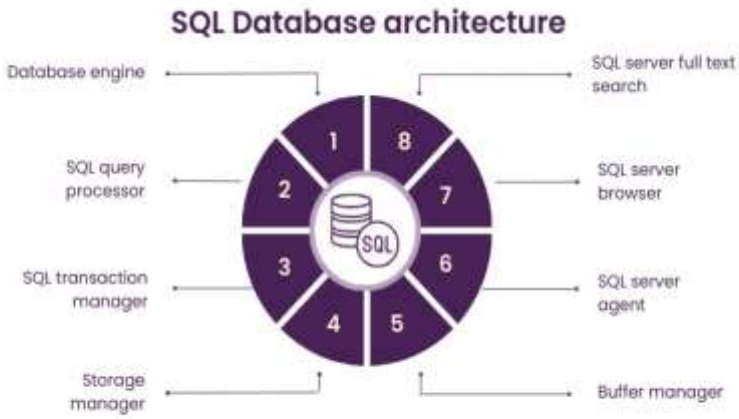
To make the best decision for our projects, it is essential to understand the various types of databases available in the market. In this section, we explore the key characteristics of different database types, including popular options for each, and compare their use cases. The types of database shown in figure below :



The success of a software application often hinges on the choice of the right databases. As developers, we're faced with a vast array of database options. It is crucial for us to understand the differences between these options and how to select the ones that best align with our project's requirements. A complex application usually uses several different databases, each catering to a specific aspect of the application's needs.

SQL Database

SQL Database is a fundamental component of Data Management. It offers several advantages to individuals, including increased efficiency, flexibility, consistency and better performance. Read this blog to learn what a SQL Database is, its key features, advantages, components, structure, essential commands, and more[12] .



Problem Statement

The proposed new system framework based on the web programming language takes into account addressing the problems of the paper-based administration and registration system in educational institutions. This section will discuss the problems of implementing the electronic registration system, the problems of filling out the form, and verifying the management system. To reduce errors in student registration and prepare the classroom/department and administration to manage student information and fill out the exam form related to all operations. In addition, problems with the student's form-filling record will be clarified to save it for a long time in the database, making it easier for the administrator to access the database, as well as, it could quickly generate any query result for a student in a short time [9]. Student information records can be securely stored in the database, free from any manual system damage. On the other hand, the problems of the proposed system will be identified, which will provide a user-friendly and more dynamic interface, which will help guide every user to use it properly [13]. Furthermore, considering the

bottlenecks in order for our system to be able to handle a large number of records in a short time. Additionally, it enables the administrator to grant the specific user permission to access the database log to analyze it for further use. To understand what are the common problems in the learning management systems with the following constraints:

1) The user interface. A complicated user interface might make it more challenging for student management software to be acknowledged among school staff [14].

2) Absence of good internet offices. The fact that needs to be addressed makes extraordinary internet association one more significant issue.

3) Common problems with learning management systems include poor usability, inadequate user support, lack of scalability, and lack of access to high-quality content. In addition, many learning management systems suffer from security and data privacy issues[15].

Study Objectives and Aims

In this thesis, we can summarize the most important requirements, desired goals, and objectives of the study in the following points:

1. Build a non-relational database management system using cloud computer networking systems that will store student information in a document-oriented structure [١٦].
2. Design the user interface for the proposed system using front-end technologies such as HTML (for creating web pages), Java (for designing web pages), JAVASCRIPT (for interactive web pages), and (for responsive web pages).
3. Write some business logic for the application using the appropriate programming language.
4. To build a cloud SQL server running on localhost to create the system design using UML (Unified Modeling Language).

RESEARCH METHODOLOGY

The main objective for this study is to identify a suitable conceptual framework for the Student Registration in a way that can be equal to the traditional classroom and thus it can be applied to the Iraqi students in the universities. By doing so, the objectives of this study will be fulfilled. This chapter presents the details of the adopted research methodology through mix-methods in five phases. The first phase focuses on the quantitative data collection while the second phase describes on the qualitative data collection and the third phase include Demonstrate and analysis, the phase four about the development for the framework in addition to the final phase concerns the methods of data collection and data analysis.

Research Design

Methods and strategies employed by a researcher at different phases of the investigation are reflected in research methodology. Developed by Vaishnavi and Kuechler (2019), the general research design technique was employed in this study. Awareness of a problem, Suggestion, Development, Testing, Evaluation, and Conclusion are its five stages. Subsections that follow provide a detailed explanation of each step.

- **AWARE OF A PROBLEM**

The suggested system framework, which is based on web programming languages, intends to modernize the administration of educational institutions by substituting electronic registration and management systems for paper-based operations. It aims to lower errors and streamline procedures by addressing issues including form completion, verification, and record-keeping. An intuitive user interface, the flexibility to scale to accommodate massive data quantities, and administrator access control are important aspects. In order to guarantee effective and secure management of student information, it addresses typical problems such challenging user interfaces, inadequate internet access, usability, scalability, and security concerns.

- **SUGGESTION (SOLUTION):** At this stage and after identifying the problem, the stage of proposing solutions to this problem begins. This stage is considered one of the important stages, especially since it is considered a treatment for the disease, as the success or failure of the system is based (depends) on this stage. The solution proposer must take into account the strengths and weaknesses of this (proposed) treatment.

- **Development:** The field of data organization and human resources management has experienced significant transformations in educational and service institutions due to the advancement of contemporary technology and the growing reach of networking and communications. Numerous creative methods have been developed in the domains of organizational and financial management, as well as statistical operations, to make these tasks easier. Effective data management system design is one such area of concentration for student registration platforms, which depend more and more on multimedia apps to satisfy the demands of higher education institutions. The challenges and limitations that are inherent in the old-fashioned tools have paved way to the transfer from paper based systems to computer based systems. Some of the issues with paper-based systems are issues to do with duplication of work, inefficiencies, inappropriateness, irregularity, and high levels of seclusion together with security threats. Hence there is a need to apply modern methods and techniques that will ensure effectiveness and accuracy of the students' data management. From the needs of the population of the graduate students of tikrit university specifically, this thesis presents an overview of the method and measures to cope with the barriers faced in student registration. With IEPs of the given format, the registration procedure can be fully mechanized, and students will be able to register for their prescribed

subjects by deploying the said approach. Also, via the website, students will be able to choose their teachers, courses, and the times of lectures. Concerning the specifications for implementing the above solution, the two main languages that can be used are JavaScript and SQL Server. JavaScript makes the interactive part possible making the registration more comfortable and clear. On the other hand, when it comes to the storing and retrieving the data SQL server has a solid base of handling the data and making it secure, easily accessible and manageable. The solution proposed for increasing the effectiveness of student registration procedures aims to incorporate these technologies. Another advantage of multimedia application integration will be improvements in user experience since it will further contribute to the platforms' easy-to-use nature.

- **Testing:** Such measures are taken to ensure that it is dependable, secure, and performs optimally and to accomplish these, several tests shall be conducted. Now during this phase of testing, the testing methodologies that are going to be used are unit, integration, system and security testing. Where integration testing examines operations from the integrated system's perspective, unit testing examines the functionality of each unit. Integration testing will extrapolate on whether or not the system works well in an integrated environment while system testing will look into the ability of the system to perform under real life circumstances. Also, security testing will

identify vulnerabilities that will be corrected to ensure the prevention of leakage or unauthorized entry on the student data. As a result, all the problems or limitations with the given system can be uncovered and resolved before it is used on a business level. It will also try to implement the solution from the grounds up to match the expectations of tikrit university and the positive aspect of having a fresh and reliable student registration and information storage platform.

- **Evaluation :**Thus, it is necessary to consider means and ways of the suggested system considering its perspectives, effectiveness, and applicability for the requirements of tikrit university.

Experimental Results and Evaluation

This chapter provides the results obtained from the suggested system application (Effective Design of Data Administration for Student Registration Platform Based on the Multimedia Applications). This system (postgraduate student registration platform) was designed using the JavaScript language, specifically one of the JavaScript language libraries, which is the React library, which is a declarative, efficient, and flexible JavaScript library for building reusable UI components. It is an open-source, component-based front-end library responsible only for the view layer of the application. It was created by Jordan Walke, who was a software engineer at Facebook. It was initially developed and maintained by Facebook and was later used in its products like WhatsApp & Instagram. Facebook developed ReactJS in 2011 in its newsfeed section, but it was released to the public in the month of May 2013.

Methodology Implementation Results

The suggested system includes four main components and each component performs a specific function to make the proposed system work correctly. These components are interconnected and compatible with each other and complement each other. One of the components in this system cannot be dispensed with. The four components are:

Home Component: This component is specific to the home page, and the following tools are used to programming this component:

- **react-router-dom**: Link is imported to create a link to navigate between pages.
- **Navbar**: Import navigation bar component.
- **CSS**: Import the home.css file to style the page.

Brief explanation: The component contains a section that displays an overview of the platform and an option to go to the registration page using a Link.

Subjects Page Component: This component is concerned with presenting the academic subjects and the number of units for each subject. There are several tools used in this component (part), and these tools are:

- **useState, useEffect**: To manage different states (such as selected subjects, current course, modules, registered student) and execute side instructions.
- **useNavigate**, useLocation: To navigate between pages.
- **sweetalert2**: To display sweet alerts.
- **Context**: To manage student status across components.

- **localStorage, sessionStorage**: To store and retrieve student data, selected materials, and modules.

Professor Page Component: This part (component) is concerned with choosing a teacher for the academic subject from among a group of teachers and the appropriate time and day that suits the student

- **useState, useEffect, useMemo**: To manage different states (such as selected professors, selected subjects, and schedule) and improve performance.
- **useNavigate, useLocation**: To navigate between pages.
- **sweetalert2**: To display sweet alerts.
- **Context**: To manage student status across components.
- l**ocalStorage**: To store and retrieve data of selected professors.

Print Page Component: This part (component) is concerned with sending the student's information that he chose within the previous pages to the admin page, as well as printing a PDF copy, and uses the following tools for this purpose:

- **useState, useEffect**: To manage various states (such as student information, timetable) and execute side instructions.
- **useNavigate, useLocation**: To navigate between pages.
- **sweetalert2**: To display sweet alerts.

- **jsPDF, jspdf-autotable**: To create PDF files containing the timeline for importing fonts and images for use in PDF files

The bottom line is this ,Many tools and libraries are used in these components to create an interactive and flexible user interface, while handling various problems such as login verification, loading and saving data, checking for conflicts, and creating PDF files. These tools include React, react-router-dom, sweetalert2, jsPDF, and others .

The system interface

the beginning designs the main interface which contains a brief explanation of the platform for registering graduate students in the College of Computer Science and Mathematics at Tikrit university. It also contains a button to enter the platform, as shown in figure below:

main interface for platform

When you press the button to enter the system the following window will appear

entering to subjects form

The student enters the user name and password given by the college, then enters the window for choosing the study subjects for the two courses and the number of units, Since the College of Computer Science and Mathematics at tikrit university consists of two departments, the Computer Science Department and the Mathematical Sciences Department, there are special usernames and passwords for each department, meaning that students of the Computer Science Department have their own usernames through which they can access the study material platform of the Computer Science Department. Likewise, the students of the Mathematics Sciences Department have their own usernames and passwords through which they

can access the study materials of the Mathematics Sciences Department, as shown in Figures below:

computer science subject's form

mathematic subject form

These windows at the top contains several elements, including the student's photo, the student's name, the department, the names of the academic subjects and their number of units, the number of units for each course and the number of total units. It also contains two buttons, one for

the next window and the other for logging out. In this window, the student must choose six subjects and balance the subject units. The student must choose the subjects and their number of units equally between the two courses. There are also subjects that are required to be taught in the first or second course, as required by the department. If six subjects are not selected or there is an imbalance in the number of units for the two courses, a warning message will appear according to the reason , If the student does not choose six subjects and clicks the Next button, the warning message appears as shown in the figure below :

warning massage1

However, if the student in the first course chooses subjects with units that are not equal to the subjects in the second course, the following warning message will appear:

warning massage2

We note in that warning message that the number of units must be 13. Here we mean the number of units for the course must be 13 because the total number of units for the two courses is 26, and as we mentioned previously, the number of units must be equally divided between the two courses. If the student's choice of the number of subjects and the number of units is correct, then when he clicks the Next button, the professors' selection window will appear, as shown in the figure below:

Professor selection form

The window above (the professor selection window) contains the academic subjects and the professors who teach each subject, as there is more than one professor for one subject, and each professor has his own time and day to teach that subject. Here the student has the right to choose the professor from among several professors who he wishes to teach that subject, and he also has the right to The student can return to the previous window and modify his choice of subjects using the Previous button. He can also, after selecting the professors, go to the next window (the window for the selected subjects, teachers, and appointment schedule) via the next button. We also notice in this form that some professors teach more than one subject, and therefore you should not interrupt during lecture times, and this is what was taken into consideration in this system.

After choosing the professors (after the student chooses the appropriate professors for him) and clicking on the Next button, the next window appears, shown in the figure below:

The final form for the student's choice

This window contains the student's name, department, course, and total number of units for the course. It also contains a table consisting of five columns that include the name of the subject, the number of its units, the teacher of that subject, Lecture day and Lecture time it was taught. It also contains two buttons, one of which is for printing (printing the selection file in PDF format) as shown in figure (4.10) and sending the file to the system administrator page and the other button to return to the previous page and modify the selection.

اسم الطالب: حسن عمر عدنان
الكلية: علوم الحاسوب والرياضيات
القسم: null
الكورس: الأول
الوحدات الكلية: 13

اسم المادة	الوحدات	التدريسي	اليوم	الوقت
أنظمة حواسب متقدمة	3	د. وليد غازي	الإثنين	من 11:30
شبكات الحواسيب	3	د. مشاري	[illegible]	م 12:30
تقنيات الذكاء الاصطناعي	3	د. محمد الكلو	الأحد	من 9:00
برمجة متوازية	3	د. سوزي	[illegible]	من 9:00
علم البيانات	3	د. سوزي	الأحد	من 11:30
المنة الأخلاقية	2	د. أبي حسن	الإثنين	من 9:00

PDF format for the student's final selection

Conclusions

In summary, human resources management and data organization have undergone tremendous change in educational and service institutions due to the development of contemporary technology and the widespread effect of sophisticated networking and communication techniques. Nowadays, universities and other educational institutions throughout the world are in dire need of effective data management systems for student registration platforms—especially those that make use of multimedia technologies. With the numerous drawbacks of these outdated approaches—such as duplication, imprecision, inefficiency, inconsistent results, restricted accessibility, and security flaws—it is vital that paper-based systems be replaced. In this thesis we introduces a complete registration system and policies that support the automation of graduate student regisstraion in

collage of computer science &mathematics university of tikrit university to get over these problems ,keep students ID differentiate, storing final information about student safely as will presented. This proposed solution involves increasing productivity and ease of use by facilitating the immediate enrolling of students in particular subjects, professor selection, course scheduling & lecture time management. In this case, schools can improve their registration process and make it faster while saving time for them which makes the institution more organized but how because they are utilizing technologies such as JavaScript also SQL Server greatly from reducing financial costs (time-labor). By implementing this advanced technology and techniques educational institutions like tikrit university can improve their data management procedures to provide more efficient &safe environment for all students. The use of these recommended processes and procedures is a significant step toward papers to sign up for college utilizing improved student registration systems, along with other potential benefits like multimedia applications in school administration.

When push comes to shove, keeping pace with the shifting requirements of educational establishments and ensuring smooth-running processes in an increasingly digitized landscape largely relies on how well-designed and effectively implemented their student registration systems are.

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