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Online Information System for Examination Department: Conceptual Model

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Abstract. Examination Department is one of the core parts of any higher educational organizations which provides essential service to the students and academic staff members of the organizations such as providing semester exam applications, scanned certified copy of certificates & transcript of students, and time table, result updates whenever they need and wherever they are, etc. The existing methods have many drawbacks such as time-consuming, onsite working staff service, can't provide immediate service to the students, and much more since the majority of the works are done by using MS Excel, MS words, and onsite work force. Any online system can be developed such as a web application or mobile application to overcome these issues through easy user interfaces via the internet connection using various web and mobile technologies such as web programming, database technologies, scripting languages, and user interface designing tools. Furthermore, an online system can be designed to assist both department's works, and administrative tasks from anywhere and anytime like a virtual office; which can help incorporate staff and students via real-time chat to reduce crowed inside office and swift update to the registered students and staff through the system's SMS service. System security can be increased with the help of user authentication using encryption methods.

Keywords: Web Development, online Information System, encryption, examination, Programming, Database.

1 Introduction

Education is the key aspect of any country which play major role in the country's development; and the quality of the education mainly depend on the examination system which is one of the main responsibility of the educational organizations which is organized by the examination department, indeed it is not only the main scope of the examination department but also providing certificate & transcript to the students, receiving examination marks from Academic staff, GPA calculation, student status, and so on.

The world runs toward technological development such as Internet of Things, Smart Concepts, Artificial Intelligence, and other forms of computerized systems where this technological improvement makes less human effort, time-consuming, and reducing manual methods. Any computerized software information system can be based on Artificial

Intelligence or automated system to collect facts, measure accomplishment, and assess teachers' and students' work [1]. But the majority of the Examination department in higher educational institutes maintain examination processes manually such as using papers, MS Excel and MS word. Researchers and Web developers suggested many solutions to overcome these issues by not only implementing Secure login, question management, results in view, results upload to the Examination department, and announcement via online platform to reduce all the manual paper works [2] but also, introducing SMS communication way to reach the announcement, live conversation between Exam branch staff & its users scanned copy of the certificate, transcript, and result sheet for students. A computerized system helps the administrators, it is providing the list of participants for a particular subject related to their results can summarize, analyze, and send to students personally to their Email but there is a chance for cheating [3].
Any web-based or mobile web information applications can be developed using various programming languages, such as PHP, ASP.net, JSP, and Java, scripting program, database technologies like Access, MySQL, SQL Server, and Oracle, and development tools [4]. Therefore, as a researcher, I'm going to propose a concept to remove the barrier between the users of the examination department and existing manual methods and reduce security issues, user friendly accessible & time-consuming system which can be developed using above technologies with the above mentioned functional requirements as well as nonfunctional requirements. Furthermore, this article discusses both the positive and the negative side of proposing web-based system and selection criteria of previously mention development technologies.

2 Proposed system

Requirement collection and Requirement analysis be conducted before any system development, which can be done using various techniques, it can be either an Interview or Group discussion, ~~or~~ workshop or any other recommended techniques by the experts. Therefore, following functional and nonfunctional requirements could help a web designer to develop a system that increases user-friendly, high secure, and reduce time consuming, and error-free documentation for the examination department.

Functional Requirements:

- New Student reservation
- Apply exam online
- Secure login
- Semester results
- Online results view
- Communication between department staff and other register users
- SMS Notification
- Report Generation

Non-functional requirements:

- Reliable & Robust
- Encryption login
- Less paper work
- User friendly
- Less graphics to reduce page load

- Work good for medium internet connectivity
- Device compatibility

Figure 1. Functional requirements of proposed system.

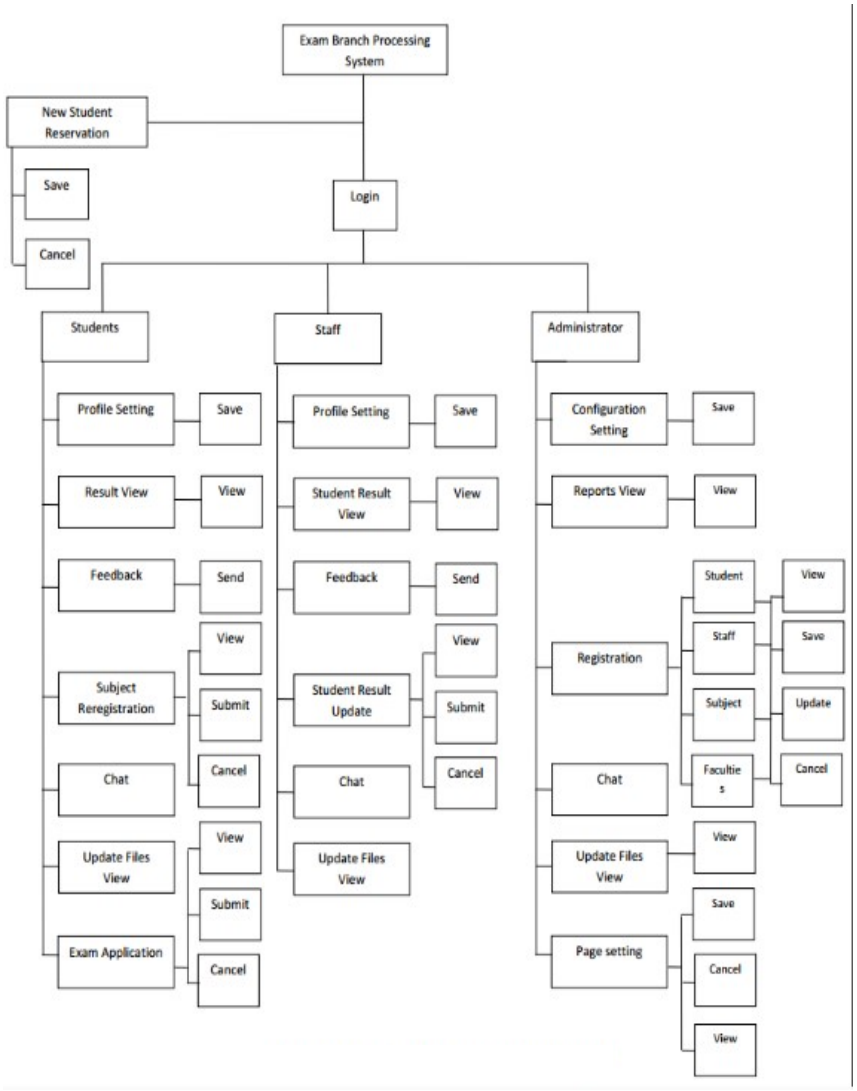

Table 2. Comparison of Wed Languages

Language	Cost	Speed	Support libraries	Security	Mobile web
Python	High	High	High	Medium	Low

PHP	Medium	Medium	High	Medium	Medium
Java	High	Slow	Medium	Medium	High
C-sharp	Medium	Medium	Low	Medium	Medium

Furthermore, other than the above backend languages, either JavaScript, or React, or Angular, or VueJS can be used as a frontend web language.

Table 2. Comparison of Database Technologies

Database	Performance	Compatibility	Operational	Cost	Stability
Access	Low	Low	Simple	Low	Low
MySQL	Good	Good	Simple	Low	Good
SQL Server	Good	Good	Simple	Medium	Good
Oracle	Good	Good	Complex	High	Good

According to the above tables, both frontend, and backend sites can be developed using any types of selected language and database technologies; also, bootstrap and other CSS libraries can be used to design web page layouts while search engine optimization, page load, cross-browser compatibility and animations can be made by query languages either Jquery, or Datalog, or AQL, or GraphQL, or any other suggested query language suggested by web design experts.
Also, the following software tools collection suggested to develop and implement this web-based application which are available free of charge and can be used with any kind of operating system.

Table 2. Require software tools

Types	Recommended Tools
Operating System	Windows, iOS, Linux
Editor	ATOM, Sublime
Server	Apache server, Microsoft IIS
Browser	Chrome, Firefox, Safari, Tor
PDF Reader	Adobe PDF Reader
Database Interface	phpmyadmin
Graphic Designing	Adobe Photoshop

Database which will store all the examination related information such as user details, subject details, examination information, and scanned copy of certificates & transcripts can be developed. These databases can be created using any of the above suggested database technologies in table 2. Furthermore, any information Search by registered users can be generated by PDF generators such as TCPDF, or FPDF, mPDF or DOM PDF, or Snappy where these PDF generators can be used with the help of PDF PHP libraries.
Furthermore, examination department announcements can be sent to the registered users via SMS notifications with the help of Ozeki NG SMS Gateway via database connection.

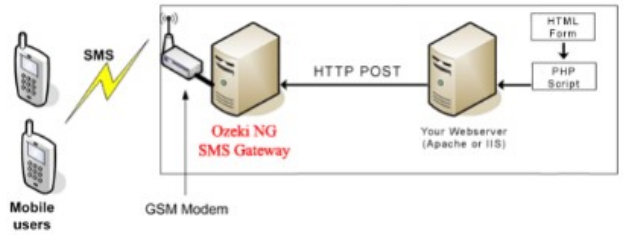

Figure 3. Sending SMS from system

Finally, the Quality and integrity of the system can be measured by conducting tests using static, dynamic, black box, white box, unit, requirement, and unit testing techniques. These tests have to be done via both localhost and after live hosting.

3 Existing System

Any computerized Information system works based on Artificial Intelligence to collect, measure information, and evaluate staff's & students' work which can be employed to support decision making and control in an organization. Furthermore, it can help analyze problems, visualize subjects, and develop new technologies. Also, required information can be produced by three activities such as input, processing, and output [1]. A computerized examination processing system can be developed using N-Tier architecture and it is called three-tier architecture mode which support either browser/ server (B/ S) or client/ server (C/ S) or both modes lead to the main advantage that the zero client maintenance, where these model-based systems can be developed using Windows 2003 + IIS6.0 and the development language is ASP.NET; background database is SQL Server Version 2000 [4].
Computerized systems can secure and control access level by providing a different kind of access level such as administrative login, teacher login, and student login, and this system contains front end, back end, and database server which were developed using JavaScript, Ajax, CSS, and MySQL [5]. Department management system has increased the speed the workflow by 84.3% and manual work speed was 47.8% while error rate was 0.01% and 12% accordingly, where the system has developed using Microsoft visual studio for C#, Microsoft SQL server 2005, Transact-SQL, SQL Query analyzer, Crystal report 9.0, and Macromedia Dream viewer MX [6]. Manipal University Jaipur has developed an Online Faculty Information System (MUJ-OFIS) using Laravel Framework with MVC architecture and HTML, CSS, JavaScript, JQuery, and Ajax for the Front end, and PHP and MySQL for backend, where this system is maintaining research, publications, teaching, award, and

service activities with high accuracy and more than 40x efficiency compared to manual methods [7].
The University of Benin implemented a computerized results system using Java and MySQL, based on windows operating system, which allows lecturers to upload examination results directly and students' results will then be calculated from which the raw mark and the senate format can be made [8]. A case study in a private university in Malaysia confirmed that the successful deployment of any Management Information System depends on accountability, budget, and staffing [9]. Strategic management is a widely used Management Information System (MIS) which requires organized and controlled information technology architecture; further, extracted data transformed into consistent and recognizable form, and then loaded into a data warehouse which is providing an integrated database to expedite the technical infrastructure of management [10].

4 Results & Discussion

The above proposed online examination department management system can assist to avoid the majority of the paperwork and turn into the automatic system which reduces the human effort to provide service to the registered members of that system such as a certified scanned copy of students' result sheet, transcript, certificate, letter request upon students and lecturers and can view students' individual as well as subject wise results. Furthermore, this system can help reduce paper works and quick access to submit students' results to the department from the subject lecturers as the system provides an interface to submit student results to the department which cannot be seen by others till the relevant authorities approve as final grade.
Furthermore, the proposed system included report generation by PDF format only which can help provide staff, students, department staff profiles, students' results and subject-wise results. But developers can use different formats of report generation such as word, CSV, MHTML, and TIFF. Apart from this, we proposed an SMS notification system with the system to publish the department related announcements to the students and staff's mobile phone, which help reduce human efforts and swift information reach to the department audiences.
It is really important the Backup plan of this system and data protection. It can be done either daily basis, weekly basis, or monthly basis in local drive or cloud storage in case of an accidental deletion, machine failure, and virus attack and only one day's work will be lost at most. Backup can be done either with manual methods or automatic backup using storage devices and third-party applications such as Cobian backup, Goodsync, FBackup, and Backup4all.
This system can be used to any higher educational institute as it is a common solution based on examination department process and customizable in terms of user interfaces, and backend process. Further, the proposed system only focused on a web-based application, but the mobile app for this system can be developed following the same above but the development technologies can vary based on available mobile development the platform, but still the proposed online system can work well for mobile web interfaces too since the system's layout is purely based on CSS 3.

5 Conclusion

Any computerized system can help transform any manual methods into an automatic system which provides paperless work and quick response to their customers. In that sense, we proposed a system that will provide online assistance to the examination department users such as students, staff, and lecturers related user details, scanned copy of certificates, transcript, and examination marks via web browsers in any kind of displays such as laptops, tablets, and smartphones. Further, this system will provide reports in PDF formats, and examination department announcements via SMS notifications.
Furthermore, the proposed system can be used by any higher educational institute's examination department and it can be customized accordingly. And this system can be developed with any programming, database technologies, and scripting languages described in this article above.

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