Design and Implementation of Structural Webpage for Online Education System

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Abstract - **Technology is a way of improvising things to a level which people couldn't have imagined in earlier decades, this is followed in the field of education even. Putting a glance in recent times, the online mode of education was the only safe and available mode left open for the pupils during the raging pandemic days which locked everyone inside. During this period, online education has proved to people that it can also be an alternative in the decades to come and provides the pupils as well as their instructors a closed yet common medium to connect and continue the process of knowledge exchange. This paper is all about a detailed feature that a website of an institution imparting education should possess to handle and operate an educational portal. The website must comprise of a simple structure containing every detail that a new visitor might be interested while the education portal must be minimalistic to impart hassle-free education and to make it function properly. It must be well divided among pupils, instructors, and the admin itself and should be having an evenly connected and abled database to allow uniform in and out dataflow within the system, which will be maintained and upgraded from time to time by a designated administrator of the institution. The whole system is made keeping in mind the security features that will prevent an unauthorized user from getting access to the system.**

Index Terms - **Web Portal, Portlets, Responsive Webpage, Dynamic Dataflow, Database, Minimalistic Approach, User Access, Dynamic Platform.**

I.INTRODUCTION

A.BASIC INTRODUCTION

During the pandemic era, the continuation of the offline mode of education seemed to be impossible. It prevented people from any gathering due to the fear of mass spreading. The two options which were available during this period were either to halt the offline mode of education during the pandemic period or to find out an alternate way to continue the education that must not have any risk of putting the teachers or student life in danger. The most appropriate method available at that point was to migrate to an online mode of education. In the beginning, one major drawback that came to light was the absence of any proper education portal as most of the institutions were not ready for such a challenge. In this paper, the need for a proper educational portal is discussed in detail, and the essential features that the portal must possess to maintain the server of the system and provide a safe and secure platform for online education [4].

B.RELATED WORKS

A portal in simple words can be defined as a platform that compiles specific information from the database present and provides the merged data to a user under a single source. We can also define the database as the information hub of the webpage as well as that of the portal, implementing various functions like keeping storage of all the data of the portal as well as the maintenance of it [4], because, in absence of a portal, the institution has to maintain several different applications at the same time to perform one particular task [1]. In the case of a portal, it's divided into various portlets. Portlets produce fragments of markup code that can be aggregated into a portal [8]. Each portal is specified with a particular task that compiles together to perform a single complete task [3]. Glancing through the earlier works, it can be noticed that most of the works were related to a single platform which can be said as a common platform for the instructors to impart sound education on the pupils and how they can be used in form of overlapping portlet windows to complete the necessary tasks of the institution, since it's a form of plugged interfaces and can be

manipulated according to the use of the portal. Similar examples of some of these existing portals are news portals, portals belonging to the online discussion forum, etc.

C.CONTRIBUTION

In this paper, our main discussion will mainly be aimed at the importance of an online education portal, and the benefits that it would bring upon education with the betterment of technology. We will also throw light upon the important features that an education portal must contain as it's mandatory in making a proper atmosphere for learning [5]. In the portal, all the data related to the students and teachers are stockpiled in the respective database which is controlled and updated from time to time by the admin [1]. In this case, the portal is classified into four categories respectively for teachers, students, admins, and mentors as each have very different yet important functions in creating a successful online campus covering more or less, all the facilities that each student is entitled to receive in their institute's campus. Also, the security of the portal is kept in mind to prevent an unwanted user from entering and disrupting the atmosphere of education, in other words, it can also be said that a portal must be capable enough to impart the same amount of knowledge and maintain the standard of learning similar to that of the closed-door classrooms.

II.PLATFORM ARCHITECTURE AND ITS WORKING

A.STRUCTURE

The website of an institution must have all information that people new to the webpage might be interested or they are looking for the details which are referred to in Fig.1. On searching about the institution, a person would be reaching the official website of the institution with the home page filled with information thoroughly pilled about the institution and gives a detailed idea about the institution to the user. This includes all the amenities provided by the institution among them like courses offered, library (library infrastructure, working hours, books and journal present), laboratory facilities and hostel facilities for the students, a piece of detailed information about the teaching staff with their respective skills and achievements is provided including a handbook

containing the details of the institution and a list of the events as well as the achievements of the institution. An institution has to portray its objectives and goals to help the newcomers to build their careers here. Hence, a separate about us section has been added which is directly connected to the home page via hyperlinks connected to the homepage of the institution. In the about us section, the history of the institute, the aim and mission, and details of the accreditations along with the approvals are the essentials that are provided. The message of the chairman, the principal, and detailed information of the board members governing the institute is presented. In the case of an educational institute, the department offered, and what the departmental head has to convey have even been provided to have a glance upon. A portal is incomplete without a proper representation of the campus and its facilities in either form of a portrait or clips as it gives a clear visualization of the campus to the viewer. The information filled website may be enough to many but those having additional doubts or queries may get them answered in the contact us section of the portal which will ask the user some of the person's basic contact information along with the doubts or question the person is demanding an answer for and will directly forward it to the admin under the admin login and if the questions are worth answering the admin may contact the person later with the necessary information and gets all doubts covered. Separately the contact details (phone number, mail id) and the pinpoint location of the institution are also provided in the footer section if the person feels necessary to approach the institution directly.

Fig.1 Entire website structure

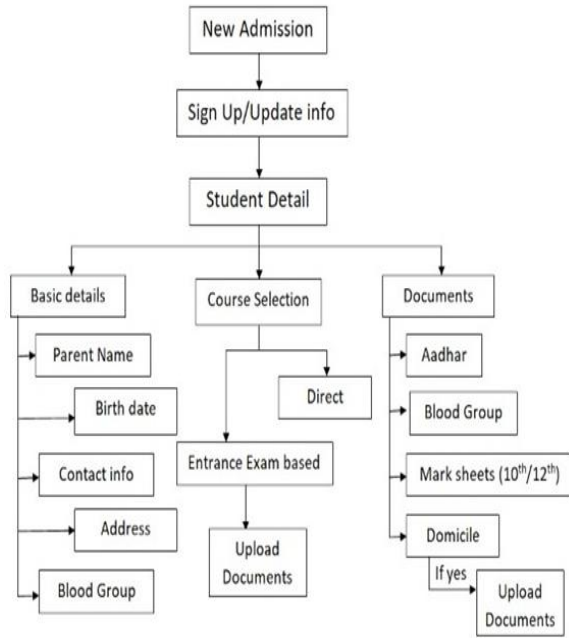Now let's shift our attention to the portal [5] from the website.

Fig.2 A diagrammatic view of the new student registration

Every institute must have a detailed fees structure for every course that it offers and a dedicated admission portal for direct online admission for the interested.

For the process to be successful, there should be an authentication check as well as a guide to the entire process (starting from online verification and admission form fill up to fees payment) the entire process is presented in the diagrammatic format in Fig.2.The admission process is successfully done via the portal once all the mentioned steps are completed. As the academic session begins for a new student, the student at first will have to register to the institutional portal under the new registration option with all the compulsory details that would be required to access the portal and also have to provide the payslip that was provided during admission. A diagrammatic view of this work is shown in Fig.3. The use of payslip is used here as a security feature preventing an unwanted user from applying in the registration, even there is a system where the user has to select a security question from the given options and they can select a self-desired answer thus preventing the chances of unwanted access to the classrooms which would eventually end the chaos that was created in the initial days of online classes. Once the registration request has been submitted, the admin will receive a verification notification, and once it's verified and cleared by the admin, the account of the student will

be created and the student will get access to use the portal under the student's login. The students can attend classes thereafter and if the person feels that their security is compromised then they are bound to change their credentials (only once in a month), if the limit is exceeded, they can contact their respective mentor to get their problems related to the portal fixed.
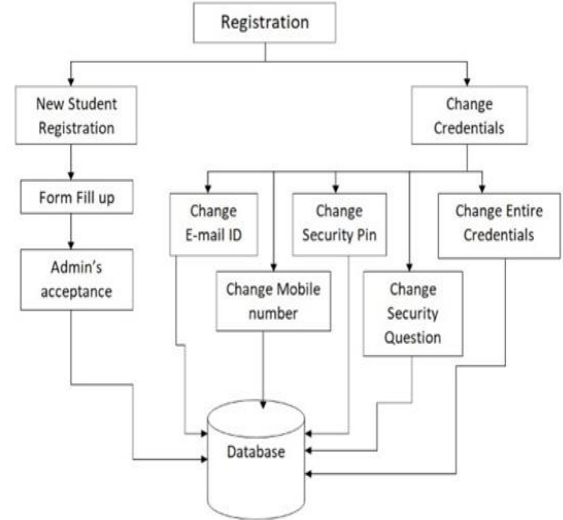

Fig.3 Registration Section of the Portal

Now let's shift our attention to the structure and the working of the portal. The educational portal is subdivided into four respective sections each for students, teachers, mentors, and admin [3]. The diagrammatic view along with the division of features are shown in Fig.4. The students pursuing different courses are entitled to use the student's login section. The student is entitled to log in with the required credentials (email id as user id and password along with security question with its answer with the unique student id provided by the institute), and once the authentication of the credential is done, the home page of the student's login section opens with the biodata and image of the student. The student can use the portal to attend classes and laboratory work, clear doubts, check attendance (monthly and semi-annually) gather notes and suggestions. The online system of assessment (unit tests, semester exams) is directly linked here because the students will be under the vigilance of the examiner, they will get their respective question papers and submit their answer script. The process of fees payment is also linked with this section. In the teacher's login section, the admin at first creates the account of a new teacher with the institutional email id of that respective teacher and the

default password. [5] The teacher after the first login with the default credentials would find their image and biodata and there, they can change the password according to personal wish. Here the teachers can take classes, provide notes and suggestions, post and check question papers and assignments, solve doubts, and in case of any discrepancy may contact admin for assistance. Similar conditions are applied to the laboratory classes where only the application link is required for the classes.
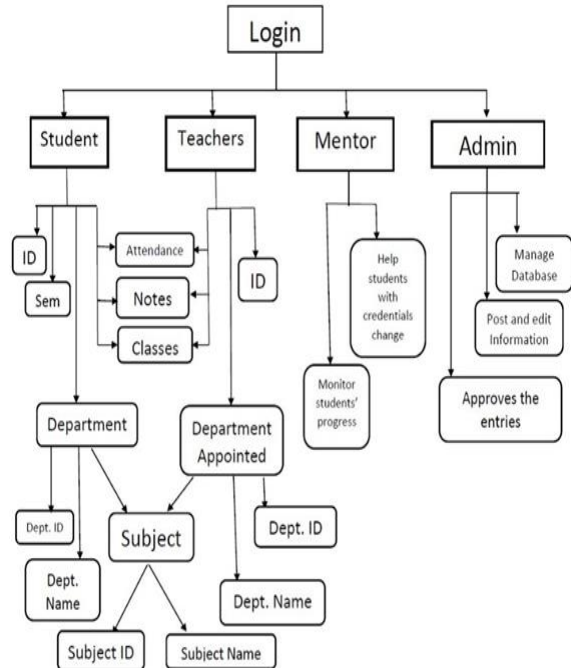

Fig.4 Working structure of the entire education portal

As we all know, mentors are those, who guide and assist students, and henceforth, a similar role of the mentors is seen in the portal as well. The mentors being teachers have to log in with the same credentials as that of the admin and this page contains hyperlinks of the classes to be mentored along with the mentor's biodata. Selecting the hyperlink will take them to the page that contains all the student's names along with all their details and the change credentials function to assist the students (when the students forget their login credentials and are unable to login into the portal, they can contact the mentor for knowing the credentials or to alter them. In case of alterations, the mentor is supposed to change the credentials as the student wants, to make changes mentors have to enter their login password to authenticate the change in data to be stored in the database). In case of a change in any credentials, the respective students will receive a

notification in their respective email id. The mentors can also post the class routine of the current semesters, post the syllabus, and finally the teacher's feedback link at the end of a semester. It can be said that the student login section can be easily monitored class-wise using the mentor's login.

Finally, the control panel of the whole website, as well as the portal, is the admin login. Every function of the portal as well as website is controlled from here. The student's account won't be created until the admin grants acceptance, a teacher new to the institute won't be able to take classes until the admin makes the teachers account and won't allow classes to be taken, while the class allotment to the mentor is done from the admin login, the maintenance of the website as well as new upgrades, post in gallery and notice is directly done from here even it controls the grievances that the students or teachers face [2]. The diagrammatic view of the function is shown in Fig.5. This is adequate to show the importance of the admin login.
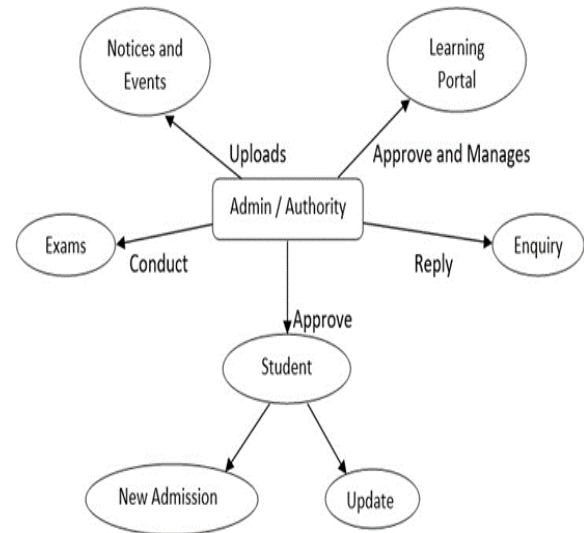

Fig.5 Function of the admin section

B.ARCHITECTURAL STRUCTURE

When a portal or a website is made, one major factor that needs to be looked after is the structure, as well as the working of the portal, needs to be simple and easy to understand and usable by all rather than being complex and makes the platform satisfying the needs of different users and the requirements of distance education and embodying the philosophy and methodology of modern education [8]. The entire system is represented in Fig.6. The architecture

includes the hierarchy of modules which is essential for the system [7]. A good website must have a structure, designed in such a way that it should have a clear and fair chance between cohesion (since every module has a specific function), coupling (as none of the two different modules are completely dependent on each other), abstraction (looking into the entire module but not in details), hierarchy (logical modules stems connecting each other) and partitioning (logically grouping the modules) of the software modules (both for the website and the portal).
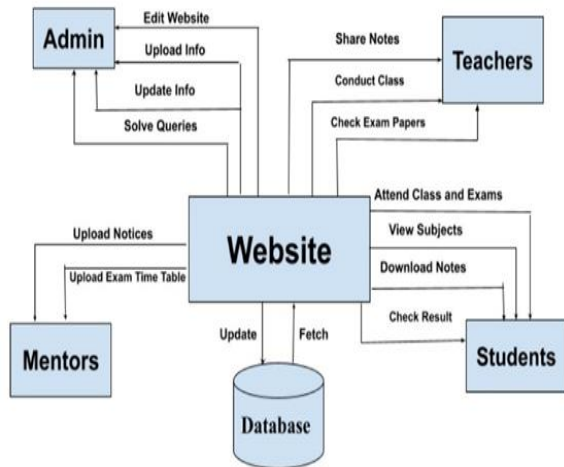

Fig.6 The Architectural Structure of the entire portal and website

C.WORKING ON THE PORTAL

In the portal, we have used client-server architecture in which the information is requested by the user at first, then the information request will be sent to the server using Ajax in coordination with jQuery. Once the request reaches the server, there is a java servlet program running within the server and it will accept and validate the request [7].

Once successful, the request will be processed, and once processed, if the request is for searching some information within the database, then the servlet will directly connect to the database using JDBC and it will fetch the specific data that is required from the database and after that, the servlet will generate a JSON response of the data and send the required data to the client and once the data has reached the client the JSON response will be parsed using jQuery and it will be shown to the user.The data that is displayed on the screen can be manipulated or altered using different programming languages like HTML, CSS, JavaScript as it helps in making the data more

presentable and dynamic to the users and when the user wishes to alter the content or even delete a content similar process is followed and all the necessary data are securely stored in the database. The detailed working of the portal is represented in the diagrammatic format in Fig.7.
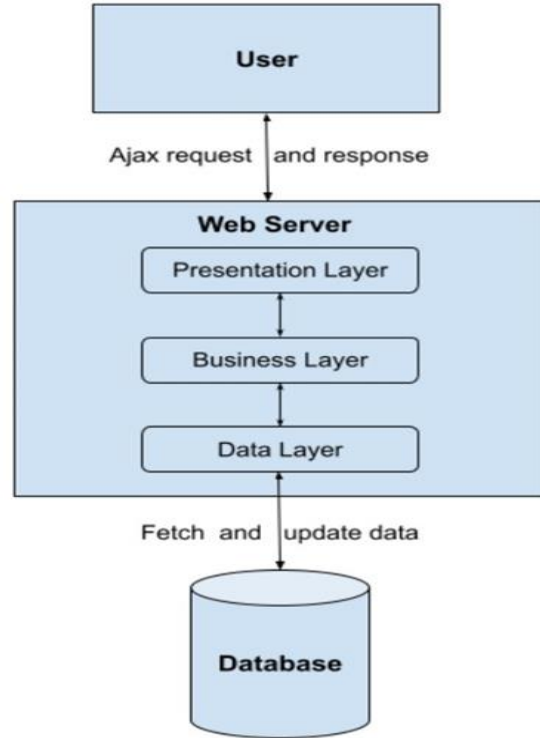

Fig.7 Entire working of the portal

III.FEATURES AND FUNCTIONS

A.FEATURES THAT AN EDUCATIONAL PORTAL MUST POSSES

- EASY TO USE – A portal may be used by toddlers as well as students from universities and colleges. As toddlers may not be accustomed to the technology therefore the architecture and working should be made in such a way that it can be easily used and understood by all.

- SAFE AND SECURED – A portal must contain all the necessary security features that might be essential to provide privacy to the user as well as protect the users' credentials. It should stop an unauthorized person from accessing and stealing the data or even causing havoc.

- COMMON AND FLEXIBLE PLATFORM – The portal must be flexible and must contain all the features of online classes, lab facility,

submission as well as monitoring the system of online assessment under a single platform rather than using multiple applications for a different task.

- MAINTENANCE AND VIGILANCE - The portal, as well as the website, needs to be updated regularly to be kept in proper function. The time-to-time monitoring should also be done to keep a check on the activities being performed within the portal.
- PROPER STORAGE OF DATA - The database that is storing and handling all the data of the server must have the proper infrastructure. The stored data must be evenly distributed so that it works always in a lag freeway and should not crash during the time of heavy access.
- PROPER WEBSITE FOR PORTAL HANDLING – The website handling the portal connected to the database must be properly designed and coordinated so that they are easily interpreted to be used by the user. The website in other words must have the essential infrastructure so that a portal can be incorporated within it.

B.FUNCTIONAL REQUIREMENTS
- SOFTWARE REQUIREMENTS- No pre-installed applications are required to run this application. It only requires an updated web browser (google, safari, web browser, Firefox, etc.) with a stable internet connection.[6]
- HARDWARE REQUIREMENTS- The portal does not require any high-end devices to run on. It will run on all the daily usage devices (smartphones, household pc, laptops, and tablets) with a proper functional camera and sound system that can be connected to the internet [6].

IV.TECHNOLOGY USED IN BUILDING THE PORTAL

A.PROGRAMMING LANGUAGES USED
- HTML - for creating static web page structure.
- CSS - for styling and presenting.
- JAVASCRIPT - used in making data more presentable and dynamic.
- BOOTSTRAP - helps in making the web pages responsive.

- JQUERY - to make Ajax calls and make DOM operations simpler.
- JAVA (SERVLET and JSP) - to provide dynamic web content.
- JDBC (Java Database Connectivity) - to interact with the database using java programs.
- MYSQL (DATABASE) - to store the data.
- Apache Tomcat - this is the server that is used in the project development.

B.DEVELOPMENT TOOLS
- VsCode
- Eclipse IDE
- SQLYOG

V.TESTING AND AUTHENTICATION

The following mandatory checks are required to be performed:
- UNIT TESTING - As the portal is completely software integration based, the proper functioning of each section (students, teachers, admin, and mentors) of login along with the database storing the data from the server is tested accordingly to check the proper functioning of the portal.
- INTEGRATION TESTING - Each data within the portal is needed to be entered very carefully as it is highly case sensitive and any mismatches in the data stored in the server would lead to a lack of integration and thus determining the efficiency of data integration within the system.
- VALIDATION TESTING - In validation testing, the system with the use of validation logic from the backend will check the entered data is valid or not. For example- during registration, the system will verify the entered mobile number or email is authentic or not.
- OUTPUT TESTING - This testing is done by recalling the stored data from the database in form of a query. For example, when the credentials of a student are registered successfully, then the student can check it by logging in with the credentials to access the proper functioning of the portal.
- AUTHENTICATION - When the portal, as well as the website, is completely functional and successfully executing all the assigned tasks and provides the desired output in each of the tests

then it can be easily justified that the system is authentic.

VI.CONCLUSION

On working on such a topic, we are enlightened on the specific topics:

- The importance of the online system of education and the ways it can be beneficial in the coming periods.
- The importance of a proper web portal with proper architecture as it plays an essential role in the interest of the students.
- The importance of modification of application according to a human need, reducing time and help in better work output.

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