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DESIGN AND IMPLEMENTATION OF A WEB-BASED PROJECT ALLOCATION SYSTEM

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Data management, greedy matching, matching algorithm, project allocation, research interest, supervisor, supervision.

ABSTRACT

Using computers to carry out most processes makes work easier, saves time and prevents a lot of manual error. In many institutions, the allocation of projects to students is still done manually, students are assigned to supervisors without taking into account the research area of interest of the student. The absence of a central system that monitors and coordinates the activities of both students and their supervisors results in many complexities and inadequacies. This project is the development of a web-based project allocation system achieved using the waterfall model which involves requirements specification, software design, implementation, testing, operation and maintenance. The HyperText Markup Language (HTML), Cascading Stylesheet (CSS) and JavaScript were used for the front-end development, while C# with Kestrel server was used for the back-end development, all within the Asp.Net framework. Before students are assigned to a supervisor, the system ensures that the supervisor has at least one corresponding area of research interest with the student by allowing both students and supervisors to select their areas of research interest. The system also provides an official platform for students to interact with their supervisors online. This interaction includes suggesting project topics for approval, submitting progress reports and having the supervisor make corrections to the submitted work when necessary.

INTRODUCTION

Engineering goes beyond simply understanding the rudiments of science. Trained personnel in the field of engineering and technology have brought about numerous technological innovations in the world. Seeing that engineering is connected to almost all aspects of human activity, it is therefore not illogical to say that engineering is the bedrock of economic, social and technological development of any nation. Irrespective of the numerous resources in our country, the expectations of the businesses and industries in the country slightly differ from the quality of training received by graduates from the field of engineering. This seems to be the current trend in engineering education in Nigeria. The ability of a nation to develop its citizens toward human resources, especially in the area of science and engineering determines to a large extent the technological and industrial development of the nation. [6][10][8]

The modus operandi of the faculty of engineering in Nigerian universities has been designed to allow students to acquire these necessary skills to enable them to meet the demands of the industries and the world at large. A provision has been made for students to go for compulsory industrial training organized by ITF under the Students Industrial Work Experience Scheme (SIWES) in their penultimate year. Sadly, a lot of students miss out on this great opportunity to acquire necessary skills mostly because they are more concerned with spending their time in firms where they will receive large paychecks than firms best fit for skill acquisition and hands-on industrial experience.

Students should be exposed to the current edge technological equipment during their programs for them to be able to develop emotional stability and self-confidence in their respective places of work [2]. In a situation where a student somehow did not make good use of the opportunity provided by SIWES via Industrial Training, the provision for students to take on a project in their final year is yet

another awesome privilege. All engineering students in their final year must carry out a project which is a basic requirement. While carrying out the final year project, students see the need to apply the knowledge they gained from different courses they had studied. It also allows them to apply all the techniques and methods they have learnt in a real-world scenario [3]. Through the final year project, students are seen making intellectual commitment to engineering problems, they learn to search, gather and make use of text and references. The successful completion of a project by a student helps the student gain self-confidence and a sense of accomplishment [14].

Before the allocation of project topics to the students, they are first assigned to different lecturers who would become their project supervisors. The project supervisor will guide the student, right from the time of selecting a project to the time of defending the project. As part of the numerous responsibilities of the supervisor, he is to help the student make satisfactory progress and complete the project and also make adjustments to the project when necessary. A supervisor who possesses adequate knowledge of the area of research of his or her student will provide better supervision of the project. It has been seen that most of the time, the student's specific area of research interest is not considered when assigning him to a project supervisor. Knowing how important the final year project is to the students, the challenge of how to properly allocate projects to students in the universities is worth looking into.

METHODOLOGY

A waterfall model was used for the development of the web-based project allocation system. The activities involved in the method include requirement definition, system and software design, implementation and unit testing, and operation and maintenance[13].

REQUIREMENT ANALYSIS AND DEFINITION

Consultation with system users determines the system's services, restrictions, and objectives. They are then thoroughly defined and used as a system specification. The descriptions of what the system should accomplish, the services it delivers, and the limits on its functioning are known as system requirements. Software system requirements can be broadly classified into functional and non-functional requirements.

FUNCTIONAL REQUIREMENTS

These are statements about what services the system should give, how it should react to specific inputs, and how it should function in specific scenarios. The functional requirements of the system are shown in the table below.

Student	• Register personal information on the platform • Select areas of research interest • View the supervisor allocation list • Suggest project topics to the supervisor • Upload progress report for supervisor's review
Supervisor	• Register personal information on the platform • Select areas of research interest • View the supervisor allocation list • Upload project topics to the platform • Approve or reject project topics selected or proposed by the student • Download the student's progress report, make corrections and re-upload
Project Coordinator	• The administrator of the platform • View list of students and supervisors with their selected areas of research interests • Allocate supervisors to students • View students progress

NON-FUNCTIONAL REQUIREMENTS

Non-functional requirements are generally applied to the entire system rather than specific system features or services. For this system, the nonfunctional requirements include the following.

- Permission must be granted to any entity in the system before they are given access to the system.
- The system will allow the upload of text documents.
- The system should be able to display a full supervisor allocation list.
- The system should be able to display the full project list.
- The system should work perfectly once connected online

SYSTEM AND SOFTWARE DESIGN

The underlying software system abstractions and their interactions are identified and described throughout the system design. By developing an overall system architecture, the systems design process distributes the requirements among hardware or software systems.

BLOCK DIAGRAM OF THE SYSTEM

The block diagram of the system as shown in figure 1.1 shows a general overview of how the system works. In the first phase, the students and lecturers select their areas of interest while filling out the form to sign up in the system, the project coordinator allocates supervisors to students based on their chosen areas of interest which will be achieved by a matching algorithm. In the second stage, the supervisors create groups for the students under them and allow them to suggest project topics for approval, should they have anyone in mind. When projects are approved, the last stage involves the submission of a progress report by the students, the correction of submitted work by the supervisor and the updating of the student's progress bar.

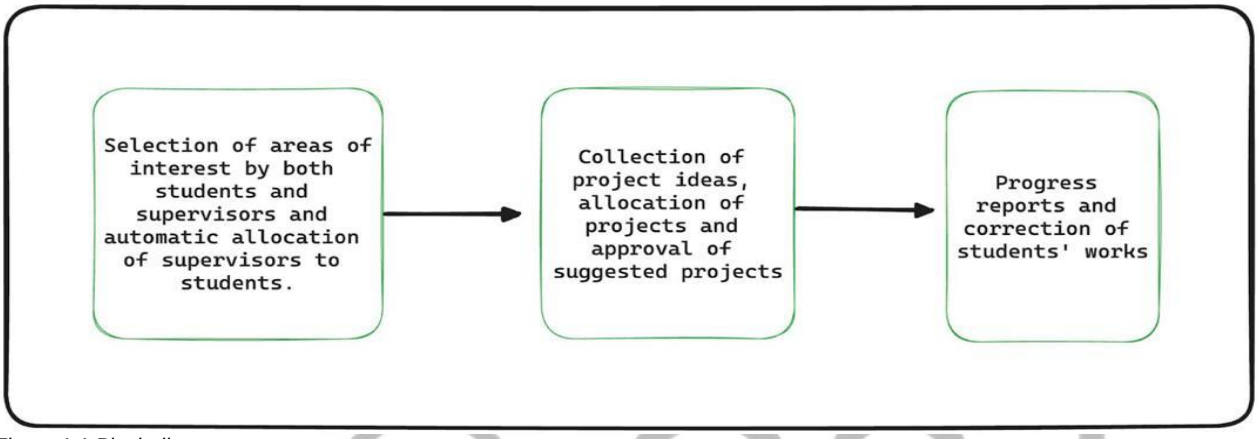
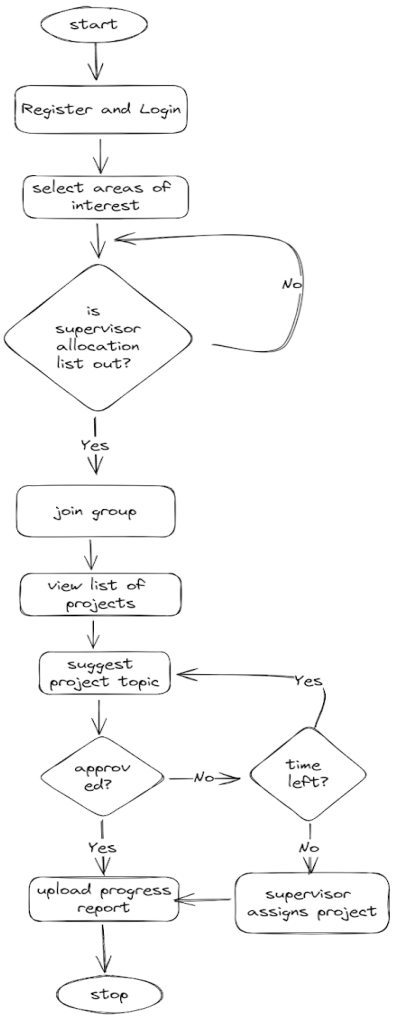


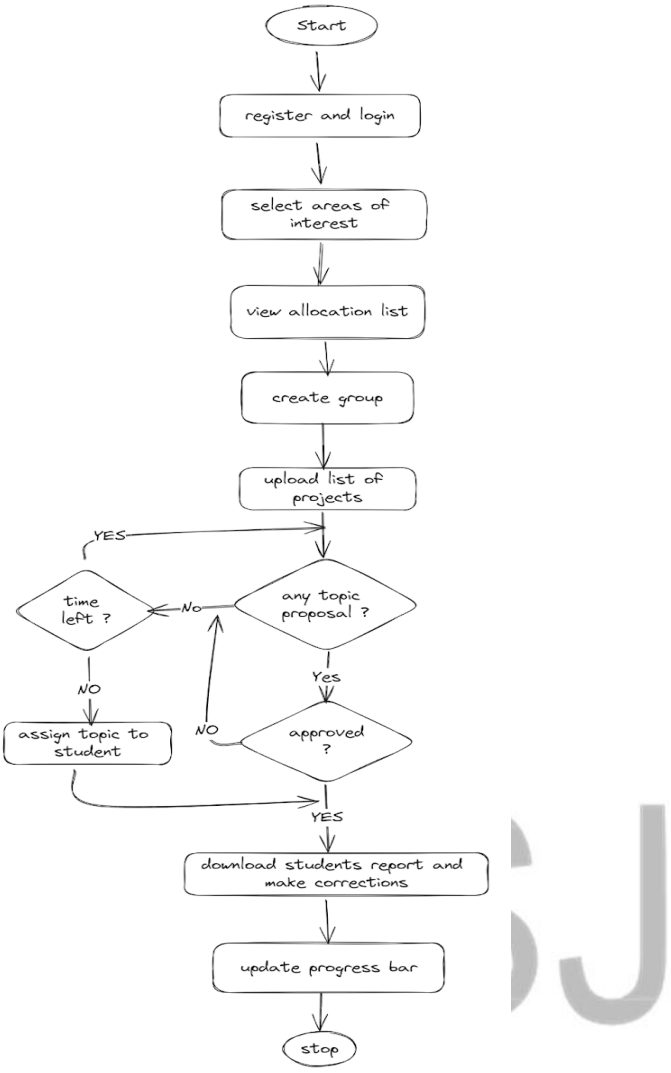
Figure 1.1 Block diagram

THE STUDENT AND SUPERVISOR FLOWCHART

The student flowchart as shown in Figure 1.2 illustrates the flow of processes for both the student and the lecturer from start to finish. The student at first, will log in and then select areas of research interest before waiting for the supervisor allocation list to be published. On seeing that a supervisor has been assigned to them, the students can easily communicate with the supervisor. The student goes ahead to suggest project ideas to the supervisor and waits for approval, if none of the suggested projects is approved, the student can still suggest more so long as the time allotted for the suggestion of projects has not elapsed. The supervisor automatically allocates projects to the students without any project yet. The student intermittently uploads progress reports for the supervisor to see the progress and make necessary corrections. The figure also illustrates the flow of the process for the supervisor. The supervisor will log in and select areas of interest. On seeing the supervisor allocation list, the supervisor creates a group for the students and presents a list of projects that students can pick if they want to. The supervisor accesses the suggested projects and approves or disapproves them. The project report is submitted by the supervisor after which the progress bar is updated.



(a) StudentFlowchart



(b) Supervisor Flowchart

Figure 1.2 Flowchart

SYSTEM IMPLEMENTATION

The software design is realized as a set of programs or program modules at this level. The tools used for the implementation of this system are shown below.

SOFTWARE	HARDWARE	PROGRAMING LANGUAGE
Visual Studio Version 2019 Operating system: 64-bit Windows 10 operating system Web browser: Google Chrome, Microsoft Edge, Mozilla Firefox, etc Webser: Kestrel webserver (ASP.Net core) Object-relational mapper: Entity framework core	Personal Computer Core i3 processor 2.1 Ghz Processing speed 6GB RAM 500GB HDD	C sharp HTML CSS JavaScript

RESULTS AND DISCUSSION

The secure web application was developed with the requirements gathered. Snippets of the user interface are shown in the figures below. Figure 3.1 shows the first page a user sees when the web application is opened. Figure 3.2 shows the login screen, where the user enters his credentials to access the web application. Should the user forget their password, there is a provision for securely reset-

ting the password by clicking the forget password button. Figure 3.4 shows the list of project preferences already added by the coordinator. On this page, the coordinator can delete or add more preferences.

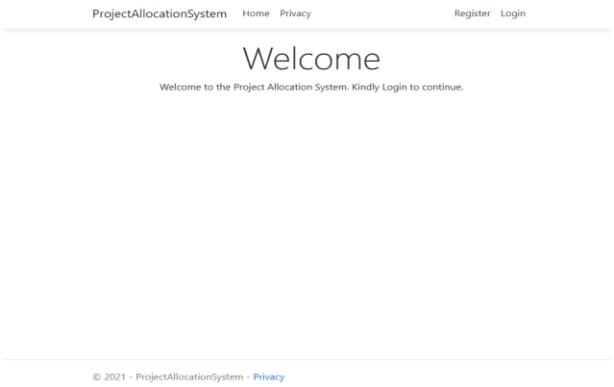


Figure 3.1 Welcome page

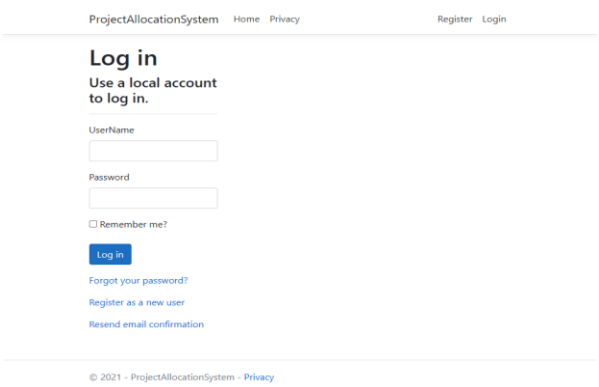


Figure 3.2 Log in page

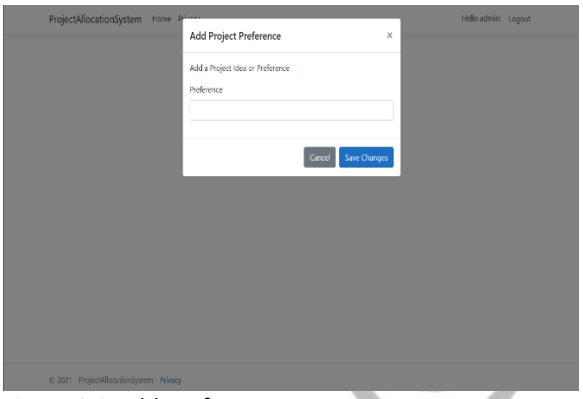


Figure 3.3 Add preference

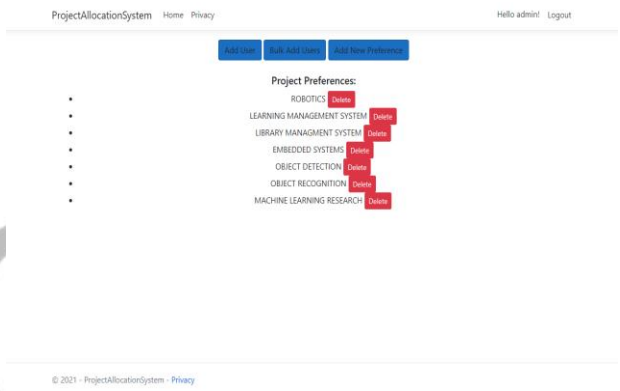


Figure 3.4 Project preference list

CONCLUSION

The project aimed to develop a secure web application that can be used to allocate supervisors to students considering their areas of research interest, collect project ideas, select projects, and allocate projects to final-year students in the Department of Computer Engineering. The web-based project allocation system has been designed and implemented. With the system, the following were achieved;

- Students can indicate their areas of research interest before a supervisor is assigned to them.
- Only supervisors with a matching area of specialization will be assigned to students.
- Students can suggest project topics to their supervisors and wait for approval.
- Supervisors can communicate with their students and receive progress reports via the system

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