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Development of Integrated Web-Based Continuous Assessment Management System

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Abstract One of the key functions of schools and educational institutes is to impart learning and knowledge. Assessments represent an important aspect of measuring the learning and knowledge imparted by the school. Schools adopt continuous assessment as tools of assessing students periodically on class lessons before end of semester examination. The goal of continuous assessment is to help students improve their learning by giving them tasks and examinations as their learning experiences grow in preparation for the end of semester examinations. Lecturers have been faced with the challenge of computing students' assignments, tests, and examinations results, particularly in a school with large number of students in a class. The implemented system employs computer technology and the Internet's networking capabilities to deliver and score tests efficiently. The continuous assessment system developed is more flexible than the traditional paper-based approach. Its success relies heavily on Information and Communication Technology (ICT), with key attributes such as consistency, stability, and security ensuring smooth operation. A computer-assisted approach was employed to simplify the evaluation process and significantly reduce the paperwork involved. A Browser/Server framework was incorporated, allowing examiners and authorized personnel to handle grading and assessment processes seamlessly. Technologies such as HTML, CSS, Tailwind CSS, JavaScript, Livewire, and Laravel were used in the system's development. The continuous assessment management system has proven to be efficient, user-friendly, and reliable, relieving lecturers and students of the tedious tasks of uploading, updating, searching, and retrieving assignments, test scores, and exam results, while greatly enhancing operational efficiency

Keywords: Continuous assessment, Traditional paper-based, ICT, Browser framework, Server framework

I. Introduction

The process of evaluating learning is continuous and comprises a thorough, systematic approach to assessing and adjusting learning processes. "Continuous assessment" refers to an evaluation that teachers perform in the classroom on an ongoing basis [1]. This approach includes periodic observations to gather information on the level of students' performance and knowledge, accomplished by giving students specialized tasks based on their prior academic success. Teachers monitor students' actions to gauge their level of class participation, helping them assess what the students have learned.

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Since its adoption by the National Policy on Education in the early 1980s, continuous assessment has faced numerous challenges related to its usage and implementation. The goal of continuous assessment is to enhance students' learning by providing tasks and examinations that align with their evolving learning experiences in preparation for the end-of-semester exam. However, lecturers, particularly in schools with large class sizes, often face challenges in computing students' assignments, tests, and examination results. The workload within the school system has led to dissatisfaction with the evaluation process,

prompting the need for more efficient methods to enhance productivity and student performance evaluation. The surge in internet usage has dramatically changed the world of education, becoming a popular and cost-effective means of communication, information dissemination, teaching, evaluating courses, and conducting research. An essential component of web technology is the development of online-based testing and assessment systems [2]. With the growing necessity to manage students' results, particularly continuous assessment, the advancement of technology in recent years cannot be overlooked. Education has evolved beyond the physical presence in schools, embracing online teaching and assessment systems. The global outbreak of the COVID-19 pandemic, which began in Wuhan, China, in December 2019, has heightened the need for online school teaching and evaluation. This pandemic kept students at home for an extended period before online learning was considered, although not all institutions have successfully implemented this method. Achieving online continuous assessment of students is a crucial part of the modern educational system. This approach has garnered significant attention in recent years, particularly in developing nations [3]. If implemented, it will increase school productivity by allowing students to access their academic performance in real-time. Exams, assignments, computer-based tests, written reports, and classroom assessments are some of the assessment types that can be captured and handled by an integrated web-based system [4; 5]. This study aims to develop an integrated web-based continuous assessment management system (CAMS) for Lagos State University (LASU) as a test-bed. The system is designed to organize students' assessments, reduce time-consuming paperwork, and make reports instantly accessible upon completion of the computation process. The effectiveness of the system is heavily dependent on Information and Communication Technology (ICT) and its attributes, such as consistency, stability, and security. The system uses computer-assisted control to simplify the evaluation process and minimize the amount of paperwork required, operating on a Browser/Server framework where examiners and authorized personnel carry out grading and assessment processes. Among other functions, the system facilitates attendance records, assignments, practical and test scores collation, and report production for assessments. This will substantially reduce the workload associated with computing, collating, grading, and reviewing. The role of ICT in the 21st century has been elaborated by various studies [5], highlighting its management techniques used to handle information related to social, economic, and cultural matters, which have become integral to our lives. ICT has made the teaching-learning process easier and more engaging. Teachers' perceptions of how ICT can improve educational experiences were examined, showing how ICT enhances education and training [6]. Expanding the use of ICT to improve teaching and learning in East African schools, including national policies on ICT in education, has also been evaluated [7]. ICTs have transformed traditional learning methods into a more modern and dynamic environment, playing a pivotal role in the educational revolution [8]. Teacher's education is crucial for developing the skills needed to effectively and efficiently use ICT in secondary school classrooms, making it a necessary resource in today's teaching environment [9]. The influence of ICT on educational assessment has been researched, revealing apprehensions about its impact on educational aims and objectives, with significant

implications for teaching and learning [10]. Evaluations of ICT use in secondary school teaching emphasize its transformative impact on how we live and work [11]. An integrated system for continuous assessment and examination management offers several advantages, including increased accuracy in result computation, reduced instances of misplaced student files, and minimized paperwork [12]. Schools must enhance their commitment to building better assessment practices that support teachers, students, and other stakeholders by utilizing ICT to bolster educational assessment practices in various ways [13]. Existing methods related to continuous assessment management include manual systems, traditional learning management systems (LMS), automated grading tools, web-based examination systems, and custom-built school management systems (SMS). Manual methods, though widely used, are prone to errors and inefficiency, while LMS platforms like Moodle and Blackboard, although comprehensive, are not specifically designed for continuous assessment [14]. Automated grading tools such as Gradescope focus more on end-term evaluations, and web-based exam platforms like ProctorU are limited to high-stakes assessments rather than ongoing evaluations [15]. Custom-built SMS platforms, while integrating multiple school functions, often lack the specialized focus on continuous assessment required for detailed performance tracking [15]. In contrast, an "Integrated Web-Based Continuous Assessment Management System" will offer tailored continuous assessment features, real-time feedback, progressive data analytics, and a centralized platform for teachers, students, and administrators, addressing the limitations of these existing methods.

II. Materials and Method

The architecture of the system design is shown in Figure 1. It comprises the client system on

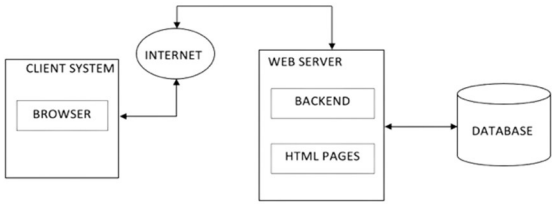

Figure 1. Architecture of the System

The system's graphical user interface allows users (lecturers and administrators) to interact with the system. This part is a web application to be used on a web browser and was built with modern web technologies such as HTML (Hypertext Markup Language), CSS (Cascading Style Sheet) Tailwind, JavaScript, and Livewire. Laravel, a PHP (Hypertext Pre-processor) framework that allows developers to create secure web server applications and web services, was used to build the backend service. PHP is a multipurpose programming language used to create dynamic, interactive websites. The database is the one source of truth for the entire system, storing data received from the Frontend through the Backend service. The entity relational (ER) model for the system is depicted in Figure 2. The relationship between the various data classes (curriculum, courses, allocations, semester, assessments, students, lecturer, and results) were carefully designed.

CAMS was developed utilizing a variety of programming paradigms and languages, including PHP and MYSQL for the backend and

HTML, CSS, JavaScript, and Livewire for the front-end interface.

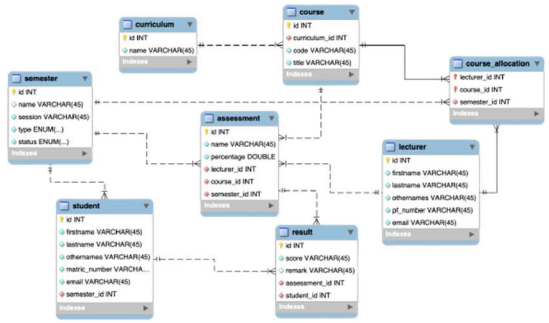

Figure 2: ER Model of the System

It was hosted on a web server. The user interface is appropriately developed and laid out. Based on the user of the system and the appropriate information in the MySQL-managed backend database, PHP, which is a web scripting language, was utilized to create dynamic content. In addition to deciphering PHP scripting commands that are placed on the page, the web server is in charge of serving web pages to users. CAMS was implemented using a three-tier distributed architecture that comprised client-side application, middleware application, and database server for data storage. HTML, Tailwind CSS, JavaScript and Livewire were used to create the client-side, which was then viewable in a web browser. The middleware application was developed using the PHP server-side programming language, and the student records and data are stored on the MySQL online database server.

A. Admin section

i. ***Dashboard:*** The dashboard displays pie charts containing each course's top performers.

ii. ***Lecturer's module:*** This page shows the admin's list of lecturers added to the system. To add a lecturer, the admin clicks the *"Add Lecturer"* button, and a form pops up requesting the details (full name, email, and pf number) of the lecturer, the admin supplies the required information and clicks the *"Save"* button.

iii. ***Curricula module:*** The curricula module keeps records intact regardless of how long it has been in existence. For example, ECE 502 (SOFTWARE ENGINEERING II) has just been replaced with ECE 502 (DATA ANALYSIS). The admin need not worry about what happens to the records where SOFTWARE ENGINEERING II previously existed. A new curriculum, DATA ANALYSIS is added as a new course under this module.

iv. ***Semester module:*** The semester module is to ensure uniformity and to avoid altering results after the semester has ended. At the end of the semester, the admin creates the next semester and sets the status of the current semester to *"closed"*. When the status of a semester is set to *"closed"*, information retrieval is the only operation that can be carried out. No additional data can be added to the system, and no update can be done on any assessment created in that semester. If changes need to be made after a semester has been closed, the admin can reopen the semester for the changes to be implemented.

v. ***Course module:*** In this module, the admin creates courses and allocates courses to lecturers. When creating a course, the admin specifies a curriculum the course belongs.

B. Lecturer section

When a lecturer logs in to the system, he is redirected to the dashboard where a chart

showing top performers for each course is displayed.

"My Courses" section contains the list of courses allocated to the lecturer, while ***"Students"*** section shows the list of students enrolled for each course allocated to the lecturer. Students can be enrolled by either adding them manually or uploading a spreadsheet containing their details.

"Assessments" section shows the list of assessments for each course allocated to the lecturer. After an assessment has been created, results for that assessment can then be added. The results can be added manually, or by uploading a spreadsheet containing the result details (matric number, score and remark). After assessments have been added and results have been collated, a report can then be generated and exported as a spreadsheet in the *"My Courses"* section.

III. Results and Discussion

Shown in Figure 3 is the case diagram of the CAMS.

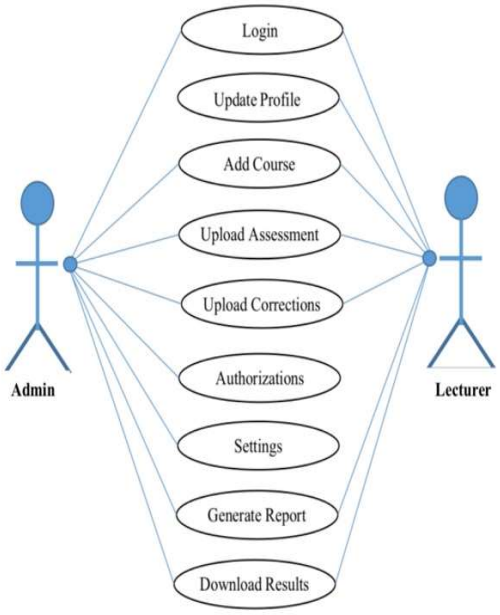

Figure 3: Use Case Diagram of the System

The flow from login stage all the way down to when results are downloaded by students and assessment reports generated by lecturers.
Figures 4 through 11 displays the graphical user interface menu for the developed CAMS.

Figure 4 is the initial interface for lecturers to access CAMS page. It provides a secure login mechanism for lecturers input their credentials (username and password) to authenticate and gain access to the system. This page ensures that only authorized personnel can access the system, maintaining data security and integrity. Upon successful login, lecturers are redirected to the dashboard where they can view their assigned courses and perform various assessment-related tasks. Figure 5 displays a list of courses allocated to the logged-in lecturer. This page provides an organized view of all the courses, enabling lecturers to quickly navigate and manage each course. Lecturers can select a course from the list to view detailed information, including enrolled students and assigned assessments. This feature streamlines the management of multiple courses by providing a centralized interface.

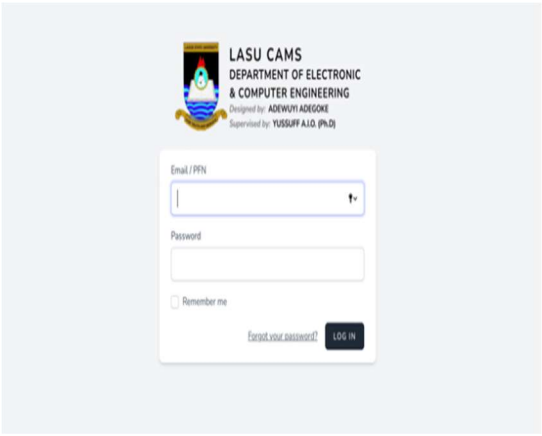

Figure 4: Lecturer Login Page

Figure 6 shows the list of students enrolled in a selected course. This page allows lecturers to manage student information, including adding

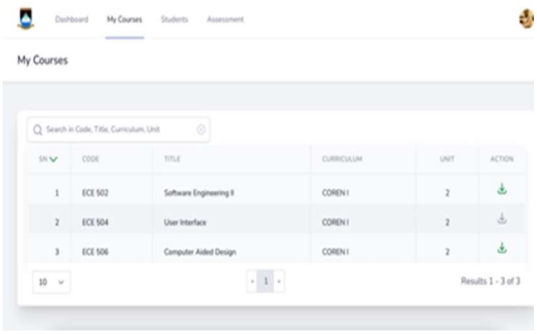

Figure 5: Courses List Page

or removing students from the course. The page also supports the manual addition of students or uploading a spreadsheet containing student details, making it easier to handle large classes. This feature ensures that student records are up-to-date and accurately reflect course enrollment. Figure 7 provides functionality page for uploading student information via a spreadsheet. This is particularly useful for large classes, as it automates the process of adding multiple students at once.

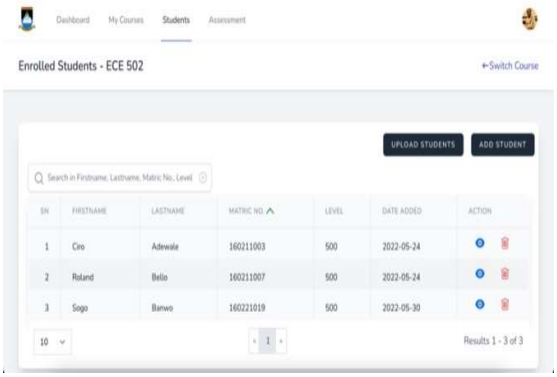

Figure 6: Students List Page

The page includes options to upload a file, map spreadsheet columns to system fields, and validate the data before importing it into the system. This feature reduces manual data entry errors and saves time.

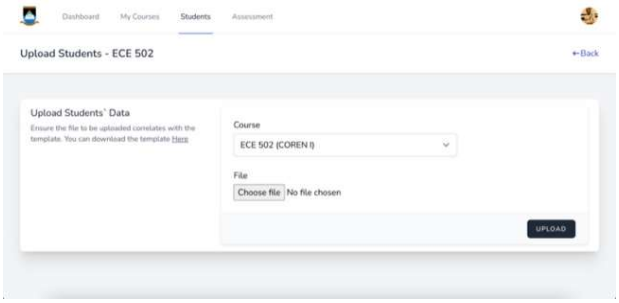

Figure 7: Upload Students' Page

Figure 8 provides a list of all assessments created for a selected course. Lecturers can view existing assessments, create new ones, and manage assessment details such as titles, descriptions, and due dates. This page centralizes assessment management, allowing lecturers to keep track of various evaluation components throughout the semester. It supports both continuous and summative assessments, providing flexibility in assessment types. Figure 9 allows lecturers to upload results for a particular assessment. Similar to the student upload feature, results can be uploaded via a spreadsheet containing student matriculation numbers, scores, and remarks. This page facilitates efficient grading and result entry, ensuring that assessment data is accurately captured and stored in the system. This automation enhances the reliability and speed of the grading process.

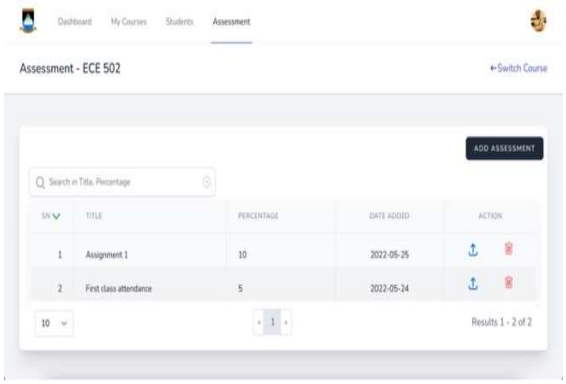

Figure 8: Assessment List Page

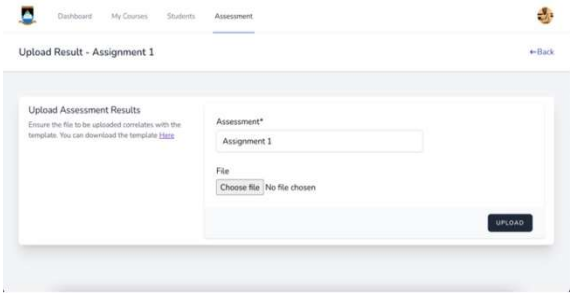

Figure 9: Assessment Results Upload Page

Figure 10 displays the compiled results for a particular assessment or course. Lecturers can view detailed performance metrics for each student, including individual scores and overall grades. This page may include sorting and filtering options to help lecturers analyze student performance more effectively. The results can be exported for offline review or further analysis. This feature provides transparency and detailed insights into student achievement. Figure 11 is used to generate comprehensive reports on student performance across all assessments in a course. This page provides an overview of continuous assessment outcomes, highlighting trends and identifying areas for improvement.

Lecturers can use this report to provide feedback to students, adjust teaching strategies, and ensure that learning objectives are being met. The report can be exported for record-keeping and

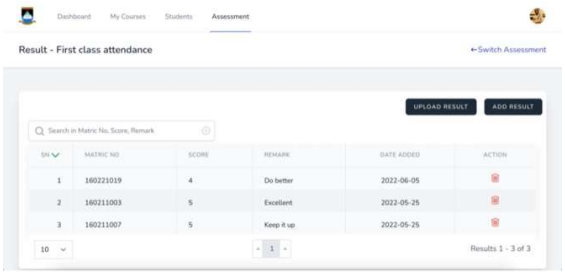

Figure 11: Continuous Assessment Report

All these collectively enhance the functionality of the Continuous Assessment Management System; thereby providing a robust and user-friendly interface for managing continuous assessments in an academic setting. The integration of various features streamlines the assessment process, improves data accuracy, and supports effective teaching and learning.

Figure 12 illustrates the number of students who passed and failed, providing a clear visualization of the overall class performance in the continuous assessment. This categorization into pass and fail helps educators gauge the success of their assessment methods, and a high number of passes suggests that most students are meeting learning objectives. However, a significant proportion of failures may indicate the need for adjustments in teaching or assessment strategies to better support student understanding. Figure 13 offers a more detailed breakdown of individual student scores, from poor to excellent, revealing the range of achievement within the class. By analyzing score distributions, lecturers can spot trends such as score clustering, or identify students who may need extra support.

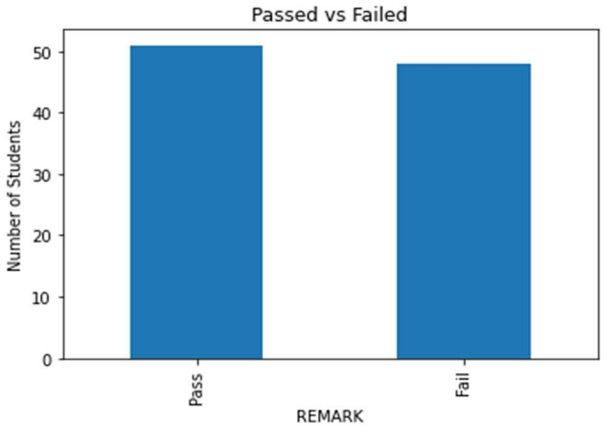

Figure 12: Plot of Number of Student's "Pass" and "Fail"

If a large number of students score poorly, this could point to issues in content delivery or student preparation. Conversely, a broader spread of higher scores indicates a strong understanding of the material among most students.

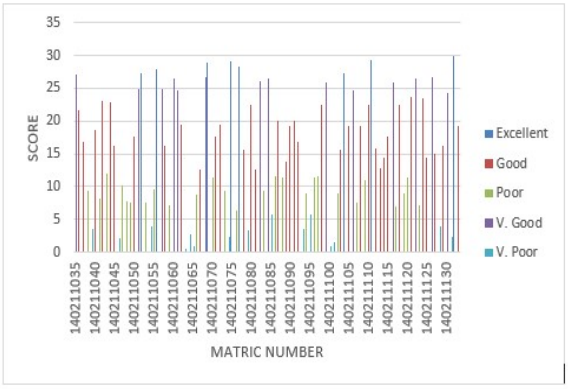

Figure 13: Plot of Student Score

IV. Conclusions

Assessments represent an important aspect of measuring this learning and knowledge imparted by the school, and lecturers have been faced with the challenge of computing students' assignments, tests, and examinations results, particularly in a school with large number of students in a class.

A Browser/Server framework where examiners and other authorized personnel carry out the grading and assessment process was incorporated. HTML, CSS, Tailwind CSS, JAVASCRIPT, Livewire, and Laravel were adopted in the system implementation. The continuous assessment management system is efficient, usable, and reliable.

The analysis and assessment of the designed system revealed that the continuous assessment management system is efficient, usable, and reliable. The new system is expected to provide benefits to the end-users in terms of efficiency in its usage. The system should be integrated with an online examination database to automatically pull results and collate the assessment when a CBT test is taken.

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