A Secured E-Assessment Platform for an Educational Institution

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ABSTRACT

Technology has significantly transformed various aspects of life, enhancing human efficiency and accuracy. The assessment of student is very important in the academic journey of students in the higher institution which was done traditionally in the past. This traditional method has numerous shortcomings like examination malpractice, increased financial burdens on the management, poor lecture delivery, insufficient space for lectures, poor time management during lectures/examinations, and instance of students being exploited by lecturers, among other issues. The introduction of technology has given rise to electronic assessment, commonly referred to as e-assessment, aiming to address the deficiencies inherent in the conventional student assessment methods. E-assessment entails the use of ICT devices for evaluating students. This research introduces a secured e-assessment platform for an educational institution that is focused on enhancing student's assessments electronically with an improved and secured environment. The platform is powered by a cutting-edge fingerprint biometrics technology for user's authentication that ensures a robust and reliable assessment process. It was developed based on the principles of object-oriented methodology with different modules which facilitates scalability, code reusability and maintainability. The system will address some of current challenges associated with traditional assessment methods. The development of a secured e-assessment platform for an educational institution utilized the web authoring tools of ASP.Net, C#, bootstrap, javascript, and JQuery, with careful attention given to creating an intuitive and user-friendly interface. The software was implemented in the default Delta State Polytechnic, Ozoro which showed a great improvement in the conduct of student's registration, continuous assessment and examination processing over the traditional method that was previously used in the institution.

1.0 INTRODUCTION

Today's technology has significantly transformed various aspects of human life, enhancing efficiency and accuracy across different domains. In societies, education plays a crucial role in driving technological advancements, thereby influencing the economies of nations. Education serves as a platform for individuals to integrate into organizations, acquire skills for daily tasks, pursue leisure activities, and instill ethical values for personal and societal well-being [1]. Assessment, regarded as a crucial component of the educational journey, aims to offer proof of learning, track students' advancement, and demonstrate comprehension of the curriculum. Additionally, it lays the groundwork for students' acquisition of diverse skills vital for self-directed learning. In the contemporary higher education landscape, technological advances largely guide individual and societal development, with an emphasis on accessing these technologies. Electronic assessment, also referred to as e-assessment involves a computer-based systems, which is utilized for evaluating individuals or groups in various contexts such as education, health, psychiatry, and psychology [3]. Recently, educational institutions have experienced notable advancements in information communication and technology, resulting in trends such as distance learning, online delivery systems, and computer-aided instruction. Online and distance learning have become increasingly common in tertiary educational system [4]. E-assessment takes various forms, ranging from automating administrative procedures and digital paper systems to conducting online testing, which includes multiple-choice tests and the online assessment skills [5]. This implies that e-assessment involves utilizing computers, such as web-based assessment tools [6]. Online assessment/examination systems have become integral in educational sectors like schools, colleges, and universities. However, recognition of web based examination method faces challenges related to security vulnerabilities and assurance measures. For instance, impersonation leading to examination malpractice has prompted the need for enhanced authentication measures beyond usernames and passwords [7]. To address security concerns in e-assessment systems, biometric technology is employed.

Biometric systems use mathematical models and features from biometric information to recognize specific physical human properties, providing a robust solution for securing assessment processes [8]. The secured e-assessment platform for an educational institution will reduced some of the highlighted shortcomings created by the traditional method of students assessment by creating a responsive and secured platform that will improve student/lecturers communication, online lecture/ examination delivery system, repository for student reading material, online student information etc based on fingerprint biometric authentication method.

2.0 REVIEW OF RELATED LITERATURE

E-assessment encompasses the comprehensive electronic assessment processes where information technology is leveraged for teaching, assessment, and student information management [9]. Leveraging student learning management systems and computer-mediated communication can establish a virtual learning environment that enriches the learning process [10]. With the expansion of higher education and remote learning systems, the adoption of electronic assessments (e-assessment) has become unavoidable. It is of paramount importance to consider student perceptions when enhancing the system for the user's needs and foster their acceptance [11]. E-assessment employs web-based methods to systematically evaluate the skills of learners, intelligence, and capabilities [12], offering numerous benefits for the effectiveness and efficiency of tertiary school of studies, benefiting lecturers, students, and institutional management [13]. In [14], they developed a methodicalrecommendations for test designers to address challenges in organizing online assessment processes.

As a natural progression of web-based approaches to teaching [15], the students assignment, examination and other educational activities are submitted online from wherever they are which shows the extent technological advancements and electronic devices/tools have significantly impacted various aspects of our lives [16], inevitably affecting the student's school activities which basically teaching and learning processes. Presently, tools facilitating interactions among lecturers, students, management, and other users are available, fostering inclusive participation in the learning process by students of tertiary institution [17].

E-assessment necessitates careful planning regarding the timing and method of assessment, meticulous attention to its purpose and assessment plan, adherence to basic assessment principles, and proficiency in the tools and software employed, along with the development of skills to utilize them effectively [18]. One notable advantage of e-assessment is its potential to expedite the feedback process, which is highly beneficial in universities, polytechnics and colleges [19]. It has been suggested that employing sophisticated algorithms in e-assessment platforms could facilitate the creation of effective feedback procedures [20]. Numerous e-assessment models have been devised to serve diverse objectives, particularly in educational contexts [21]. Another feature provided by e-assessment platforms is computer-based tests, which can be either standard or non-standard, and assessments based on these tests are termed computer-based assessments [22].

Recent research suggests that technologies and its associated devices/platforms is swiftly integrated into curriculum programs within higher education institutions, notably in assessment systems [23]. The widespread acceptance and increasing research focus on e-assessment in universities, polytechnics and colleges which highlights its importance in the educational system [24]. Developers and administrators of e-assessment systems who are in charge of overseeing the development and implementation of the whole system, while the registration unit are in charge of the student's admission and registration of courses [25]. Integrating e-assessment into e-learning platforms is advised for effectively evaluating student knowledge and performance [26]. E-assessment serves as a valuable substitute for traditional assessment methods, enabling a more student-centric approach by empowering students to identify learning gaps [27]. In the educational sector, there is increasing interest in identifying indicators and information to assist teachers in curriculum development, designing activities and tools to enhance student learning [28].

Assessment data can be leveraged to evaluate the learning materials and their quality, particularly when students struggle to achieve stated objectives [29]. Deploying e-assessment systems to cater to user preferences, such as language choices and methods for student verification and monitoring, can improve user satisfaction and the system's acceptance [30]. The effective deployment of an electronic assessment system depends on three main factors: human, technical, and institutional considerations, with specific emphasis on the system's unique attributes [31].

According to [32], the e-assessment platform can be segmented into four distinct components:

i.   Evaluation Component: This section encompasses different types of assessments, including essays, research reports, review articles, project reports, audio or visual media records, presentations, and more.

ii. Automated Tools Component: This component includes tools intended for automated scoring, such as multiple-choice questions, short answer tests, matching exercises, gap-filling tasks, right-wrong assessments, drag-and-drop items, and simulation questions.

iii. Interactive Component: The interactive segment entails activities such as online discussion tasks, discussion groups, role-play activities, case studies, and other collaborative elements.

iv. Web Publishing Component: The web publishing component did not provide the information in the given text.

v.

3. 0 SYSTEM ANALYSIS AND METHODOLOGY

System methodology employed in this work is the Object-Oriented design techniques. It functions as a software development approach emphasizing the reuse of software components. Through this methodology, information systems are constructed using reusable components, facilitating the efficient utilization of existing resources and enabling sharing across various systems.

3.1   Analysis of the Existing System

Based on the information obtained from the students and staff using the existing e-assessment software it was observed that the prevailing approach to lecture delivery is traditional in nature.In this traditional method, lecturers orally deliver lectures in the classroom and write on the white-marker boards are made available by the respective by the institution. Both users (lecturers and students) are required to physically attend the classroom, regardless of the potential risks of overcrowding, which accumulates over time as inefficiencies and ineffectiveness. Notably, students residing far from the school premises often struggle to attend classes regularly due to this setup.

3.2   Benefits of the Proposed System

The proposed system, a secured e-assessment platform for an educational institution will have the following benefits after implementation;

i.   The system will provide platforms for delivering courses in real-time, irrespective of the physical locations of lecturers or students.

ii. Students will have the capability to securely log in to a platform and comfortably sit for their exams from their preferred location.

iii. To address impersonation during examinations, students will need to authenticate themselves using a biometric device, like a fingerprint scanner, as proposed by the system.

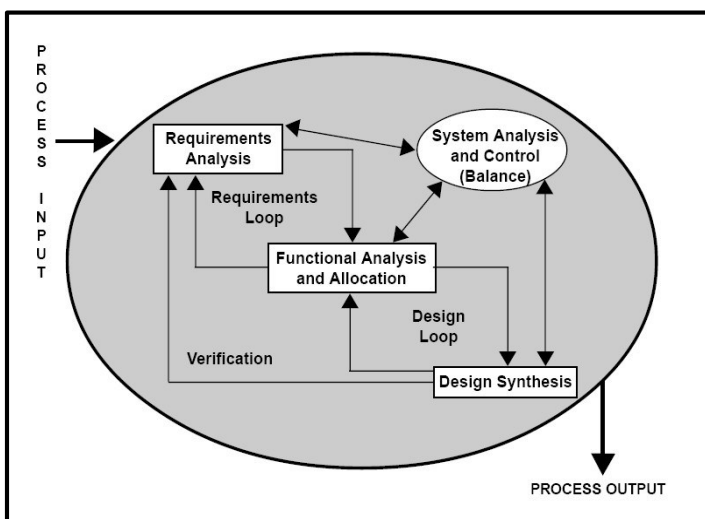iv. The system will feature a repository or database where educational materials can be readily accessed and downloaded based on various criteria, such as material/book titles and course names. Lecturers will be responsible for uploading these materials into the database.

v.   Students' information and profiles will be securely stored and can be retrieved upon request within the system. This information will be linked to students' biometrics through the enrolment of fingerprint images.

The system will streamline the evaluation and assessment of students during lecture hours through a dedicated platform.

3.3 Analysis of the Proposed Systems

The objective of this system is to develop an efficient, effective and secured platform aimed at narrowing the communication divide between lecturers and students, which is often attributed to constraints in time and space. The delivery and reception of lectures will primarily rely on real-time interaction. Lecturers will upload lecture materials to a designated directory, enabling students to search for and download them as needed.

3.3.1 Requirement Analysis Modeling

During software design and development, requirements analysis is centered on identifying the responsibilities that define the needs or conditions necessary to fulfil the objectives of a new software system. This process takes into consideration the potentially conflicting requirements of various stakeholders, involves analysing data, documenting findings, validating, and managing the software or system requirements.

The system's requirements analysis was demonstrated through the utilization of an entity-relationship diagram. This diagram visually represents the flow of information within the system, depicting various functions in a pictorial manner.
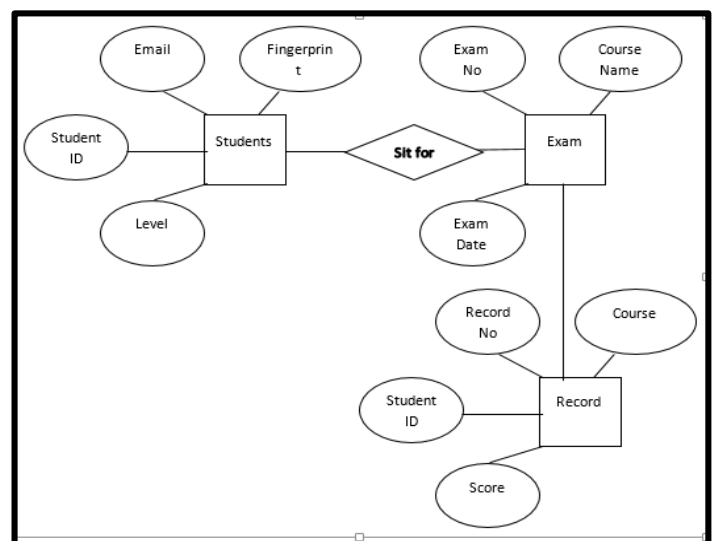

Figure 1: Requirement Analysis Modeling
(Anuradha, *et al* (2020))

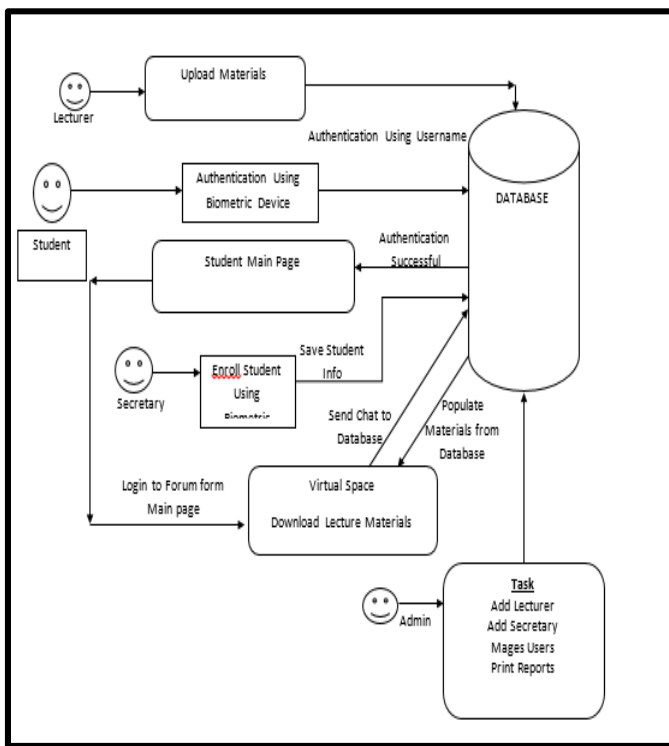Figure 2: E-R Diagram for Student Examination Process

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Figure 3: Architecture of the Propose System

The system's architectural design shown above shows a pictorial representation of how its components function and interact with one another. The system comprises four primary sub-systems: the Administrator, the Student, the Secretary, and the Lecturer. These modules or sections are tasked with managing the whole system and generating reports to facilitate prompt decision-making regarding student academic performance. The Secretary section facilitates student registration platform, enabling them to utilize its functionalities. The Lecturer module is utilized by lecturers to deliver lectures to students and upload lecture materials. Lastly, the Student section is accessed by fully registered students of the system to attend lectures and download lecture materials

4.0 RESULTS AND DISCUSSION
4.1 Results
The main menu design illustrates the system's accessibility between modules, showcasing the structure for navigation from one module to another. This concept is most effectively depicted through the hierarchy chart provided below;

4.1.1 System Implementation
To install the software, the following steps are followed;
  i. Load the IIS on you web server by doing the following: start setting Control Panel Administrative tool IIS Manager.
  ii. Expand the computer name node, and then select the web service extension option.
  iii. Make sure that webKIZITO (web-based Distributed Authoring Versioning) option is listed and allowed. If it is prohibited, click allow button to allow it.
  iv. Expand the websites tree node, by right clicking onto the default website node and choose the virtual directory option available from new submenu.
  v. Activate IIS on the web through the steps indicated: begin by navigating to Control Panel > Administrative Tools > IIS Manager.
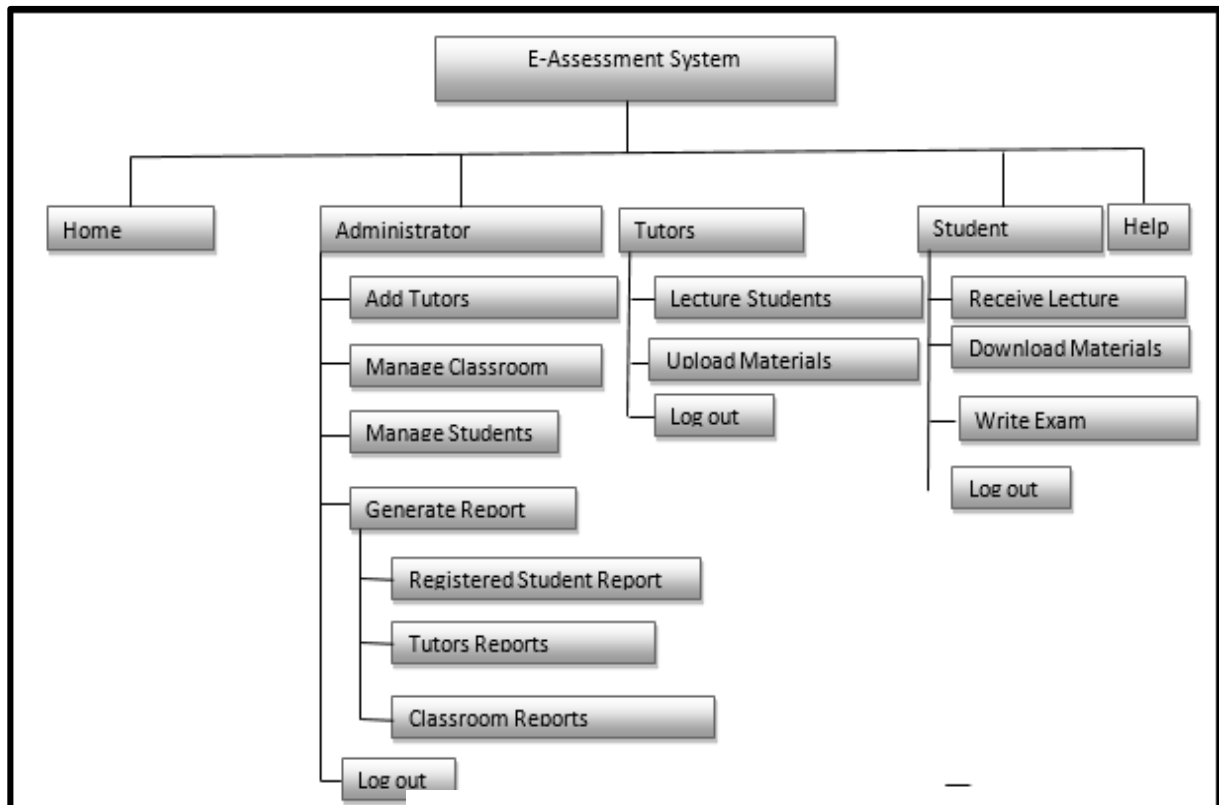 vi. Navigate to the computer name node and then choose the web service extension option.

Figure 4: Main Menu of the System

Table 1: Test Data Table

NO	User's Test Date	OUTCOME
i.	**Registration of Pre -Student Form:** The data utilized in this test originated from both data extracted by programmers and beta data provided by the school. This form enables students to enrol themselves during the registration process. .	The outcome generated by this form proved to be prec ise, with all information securely kept on the repository.
ii.	**Enrollment of Student Form:** The data here was gotten through Alfa testing and students were allowed to enroll their bio data which includes: student names, registration number, address, passport photograph, fingerprint image and data of birth. Beta Data testing w as also carried out on Enrollment of Student Form.	The student demographic utilized this information to self -enrol into the system. The form was completed without errors, although the fingerprint enrolment device encountered difficulties in scanning fingerprints. This obstacle was overcome by acquiring a new device.
iii.	**Registration of Examination Student Form:** This form facilitated student access to online examinations administered by the course lecturer. The data utilized primarily consisted of programmer's information.	The outcomes derived from this form were authentic and aligned with the expectations of stakeholders, fulfilling the intended deliverables.
Iv.	**Uploading of Question Form:** This forms helps in uploading examination questions for students. The data employed here is constructed by programmers.	The outcome displayed by this form was flawless, with all questions successfully uploaded to the remote database.
v.	**Registration of Department Form:** This form facilitates the addition of new departments, with all data sourced by the programmer.	The information obtained from this form fulfilled the exp ected deliverables.
vi.	**Registration of Staff Form:** This form assists administrators in adding new staff to the platform. The data utilized in this form is extracted from real life data within the higher institution	The information was meticulously and uniformly uploaded and saved in the repository without any compromise

vii. Confirm that the webKIZITO (web-based Distributed Authoring Versioning) option is both listed and permitted. If it is currently prohibited, click on the allow button to enable it.

viii. Expand the websites tree node by right-clicking on the default website node, and select the virtual directory option from the available submenu

ix. Proceed by clicking "Next" once Wizard Creator Library is displayed.

x. Input the alias name, which in this instance is "Distance Learning System," and Next.

xi. Navigate to the E-Assessment System Path on the server, click "Ok," and then proceed by clicking "Next."
Activate the "Read," "Run," "Write," and "Browse" options, and Next.

xii. To conclude, click "Finish" to exit Wizard Creator Library.

4.2 Discussion

4.2.1 User's Test Date

Data specifically gathered for these testing purposes is known as user test data. Certain data can be employed in a confirmatory fashion, such as validating that a specific set of inputs to a function yields the expected output.

4.2.2 Different Modules of the System

Registration of Pre-Student Form: This form is utilized by the secretary to pre-register students into the system, enabling them to subsequently complete their registration independently.

Figure 5: Registration of Pre-Student Module

Enrollment of Student Form: This form allows students to self-enroll, granting them access to attend their online classes and participate in their exams.

Figure 6: Enrollment of Student Form

This module aids students in downloading uploaded lecturer materials, ensuring they have access to the necessary materials precisely when needed, thus keeping them well-equipped.

Student's Lecture Module

This module facilitates remote lectures for students, allowing them to receive instruction from a tutor or lecturer from a remote location.

Figure 7: Student's Lecture Module

4.2.3 Materials Download Module

Figure 8: Materials Download Module

5.0 SUMMARY AND CONCLUSION

The system, a secured e-assessment platform for educational institutions, holds immense potential in managing student lectures and assessments. E-assessment offers numerous advantages in overcoming constraints inherent in traditional assessment methods. Its utility extends to identification and access control across various examination systems in sectors such as education, administration, and government, among others. Biometric identification method, like fingerprinting, is highly regarded as a robust access control method owing to its innate characteristics. Its convenience is apparent as users are relieved from the necessity of carrying identification cards or other documentation. Moreover, it enhances security by facilitating the verification and detection of imposters and impersonators, thereby ensuring standard and high-quality security measures. Its simplicity of use underscores its potential adoption by Nigerian educational institutions.

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