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APPLICATION OF LIGHTWEIGHT DIRECTORY ACTIVE PROTOCOL IN GENERAL STUDY EXAMINATIONS IN TERTIARY INSTITUTIONS IN NIGERIA

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Abstract

In the universities, mostly in Nigerian, general study courses examination popularly known as GST are written using paper and pen. This approach takes longer time for the lecturers to assess the students and more so during the invigilation. This paper is geared towards creating a more friendly approach, security based, high response time to downloading of the questions and uploading to grading in the form of computer based test having graphic user interface to administer examinations to the students of higher learning institutions using lightweight directory active protocol which runs on apache web server. The application was developed with PHP and CSS with SQL database scheme at the back end to store data of the general study questions, the answers and then grades the students immediately after the examination. This approach in general study examination having computer based test proved effective in administering examinations to the students, more secured and ubiquitous as students can stay anywhere to write the examinations when permitted by the school authority and enables by the administrator. Consequently, this approach is different from other computer based test as it incorporates both objective questions and subjective questions.

Keywords: General Study, Lightweight Active Directory Protocol (LDAP), Apache web server, Computer-Based Test (CBT).

INTRODUCTION

Today, virtually every aspect of human life endeavor is controlled and manipulated with efficient technology, in order to make life easier. Technology has significantly developed since

the 90's thereby affecting the daily activities and all aspects of human endavours [7]. The technological concept initially was regarded as an area closer to fiction. However, the new concept of technology shifted from being a fiction to a reality that has become part of humans' daily lives. When it comes to education, technology in the classroom has undergone exceptional changes. These changes have allowed learning to become more democratized, individualized and interactive [13].

Ii is obnoxious to note that, in this era of technology, college students are still being assessed with the use of paper and pen. Exam malpractices unique to paper-based tests in Nigeria include bringing in unapproved materials, writing on foreign currency notes and identification cards, watching other candidates in the exam room (popularly known as giraffe), switching out solution sheets, and extorting exam scores or marks. Others include impersonation, revealing exam questions to students beforehand, planning to cheat with managers and school officials, and body writing or tattooing, in which students, particularly female students, ink on secret areas of their bodies which the examiner can never anticipate.. It is on this that [8] concludes that Computer-Based Test (CBT) is a gadget which spurs improvement in training in addition to different sectors of the economy. CBT generally help to make certain that candidate's identification in the exam corridor is effectively cross-checked. Computer-test primarily based is totally a green manner for check sponsors to offer secure, regular surroundings for certification and licensure because it additionally complements students' experience [1].

Overview of General Study Examination

General study courses are courses offered by universities in Nigeria that cut across several faculties and departments and offered by the students irrespective of their discipline. Some of the general study courses offered in Nigeria Universities includes; use of English, use of library, philosophy of science and technology, Nigerian people and culture and Peace and conflict resolution. The general study is mostly offered as a course or courses to mainly the students in their 100 level.

It is pertinent to note that these universities that offer these courses, the students write the exams on paper, that is paper based examination while some write the examinations as objective and subjective questions with large crowd of students.

Review of Related Literature

Overview of CBT

There is a great transformation from the traditional mode of assessment to the modern method of the use of Computer-Based Test (CBT). Computer-Based Testing (CBT) is gaining popularity over the traditional Paper-and Pencil Test (PPT) due to many advantages that

computer-based assessment provides. Meanwhile, more educators and researchers have shown interest in investigating the factors that influence students CBT performance. Online Electronic Exams has developed and causing the utilization of online exams to be known. It has also become an ideal system of evaluation in both online and traditional learning environments for students. They provide various benefits for the exams process and learners when used appropriately within online learning programs [6]. Recent research methods have developed and the interest in online exams environment are in the increase. The rapid growth on the online exams have prompted some questions what is the different with the manual method [2]

There are many factors related to student characteristics, which includes student demographic attributes, learning style, computer familiarity and test anxiety. According to [10], it has been found that testing format does not affect test scores therefore CBT can be considered a valid and acceptable testing mode. As CBT began to be used for summative assessment, it is therefore important to establish whether computer-based testing is comparable to that of paper-based test. Researchers have performed large scale reviews of studies examining differences in performance of CBT and paper-based version of tests and have generally found that when CBT is similar in format to pencil and paper tests, it has little if any effect on test performance [11]. From student's perspective of the automated exams there have been a number of mixed reactions. Previous research showed that more people anticipated problems with the computer assisted assessment [3]. Their research also showed that despite fewer students being confident about CBT before completing the assessment many students stated a preference for CBT afterwards. Previous study conducted, indicated a preference for CBT over PPT [3]. Some studies reporte[1]d the main disadvantage as being increased anxiety amongst those unfamiliar with u[2]se of computer [12] and as such students agreed that they are "technophobic". The challenge to test examinees by means of microcomputers demands appropriate software design. The results of the effect of demographic attributes on students automated examination performance are not always consistent. For example, some studies indicate that gender was not related to performance differences between CBT and while other studies suggest that gender is associated with the test mode [4]; [5], with male examinees benefiting from the CBT format more than female examinees who showed slightly poorer performance on automated examination. Though age was found to be associated with the automated exam test mode effect. The study suggests no difference in the administration mode for age and class level. CBT usually assist to ensure that candidate's identity in the examination hall is efficiently cross-checked. Computer based test (CBT) is an effective manner for test sponsors to offer some secure, regular surroundings for certification and licensure because it additionally complements students' experience [1].

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Results confirmed that at each grade, the free/decreased lunch eligible college students had [9] used another four learning modes (Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualization (AC), and Active Experimentation (AE). Results showed that both learning style and formative assessment strategy are significant factors affecting student achievement in a web-based learning environment. Computer familiarity was examined as another important factor that may have an impact on students CBT performance, but the results were not consistent.

Computer Assisted Learning

The phrase Computer Assisted Learning (CAL), also known as Computer Aided Learning (CAL), Computer Based Instruction (CBI), or Computer Aided Instruction (CAI), has gained prominence over the past ten years [12]. A whole new field of computer-assisted learning is computer-mediated human-human interaction, which presents unique methodological challenges and necessitates a separate study [8].

Since the educational experience with these apps is greater and their future prospects are equally impressive, the current evaluation will concentrate on computer assisted learning (CALL) programs where contact between the user and the information is restricted. These apps for computer-assisted learning were initially created for local use as a component of the conventional curriculum. However, as technology and educational practices advance, distant learning is where these programs' true potential is realized. It is significant to note that interactive computer-assisted learning programs follow the same pedagogical principals even though they can be accessed from many locations.

Approaches to E-learning Services

Since the introduction of computers in the classroom, e-learning services have developed. Blended learning services, which combine computer-based exercises with real-world or classroom scenarios, are becoming more popular [10] and the OECD (2005) suggest that different types or forms of e-learning can be thought of as a continuum, from no e-learning, i.e. no use of computers and/or the Internet for teaching and learning, through classroom aids, like making classroom lecture PowerPoint slides available to staff through a course website or learning management system, to laptop programs, where staff is required to bring laptops to class and use them as part of a face-to-face learning.

The importance of technology in examinations includes the following;

a. Security of Examination Paper
b. Quick Result Processing

c. Get rid of Examination Centers

d. Reduced Logistical Costs

e. Remote Supervision

ATERIALS AND METHODS

In this paper, the processes and the implementation of Automated examination with lightweight directory active protocol is depicted with the high level model shown in figure 1.

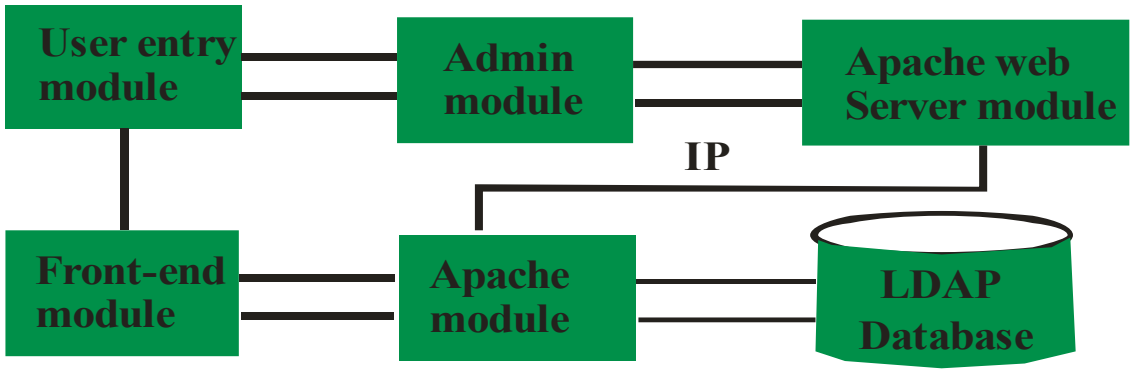

Fig 1: The High Model of the GST Examination System

The figure 1 shows the level of interaction in the automated exam system. The high level diagram contains six segments, the user entry module which is the client side, the admin module, the apache web server module, the front end module, the apache module and the lightweight directory access protocol.

Admin Module

The admin module contains the pages that enable the administrator to manage the admin's details. **T**his is the module in the system that provides the following functions

a. Manages the Administrator details
b. Create exams and answers
c. Create Faculty/department
d. Create exam time
e. Generate registration pins

The User entry Module

This is also referred to as the client/student's Side. **T**his is the student's portal page where the students can perform the following

a. Creates student's account
b. Registration of exams
c. Write exam[3]

The Front-End Module

The front-end module is specifically meant to design the interfaces necessary for the clients to do the following in form of graphic user interface

1. **Question Platform:** this is a page that allows to students to select and their exams and perform other functions like

a. Enable students to view exam
b. Enable student to write exam
c. Summit and grade exam

Apache Web Server

The apache web server is responsible for accepting directory (HTTP) requests from internet users and sending them their desired information in the form of files and web pages.

The Automated Examination system is divided into 5 segments namely: the admin side, student's side, questions platform, Users platform and Database segment.

The Lightweight Directory Active Database

This module does the following functions

a. Keep track of student's profile
b. Keep record records of exams registered
c. Reserve grades for the students
d. It also contains information that allows and interfaces the applicant or the student to create his/her account by entering his personal details like the name, exam no, sex, age, also to register exams by selecting the required subjects/courses and it will grant the user access to write exams of the selected courses. The database side servers as the link between the user and the administrator(server-side), this page houses the information from the user (User details) and the administrator (exam questions and required answers, generated pins)

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The Lightweight Directory Active Protocol implementation

Active Directory (AD) is the authentication to group and user management. It is used to provide policies. It will authenticate and authorize all kinds of user and computers.

The Lightweight Directory Active Protocol is very much secured, the directory services runs over TCP and IP. It is open and cross-platform. LDAP is a way of speaking to active directory and active directory is a directory services database and LDAP is always used to talk with them. Therefore, it is a protocol that is used to talk.

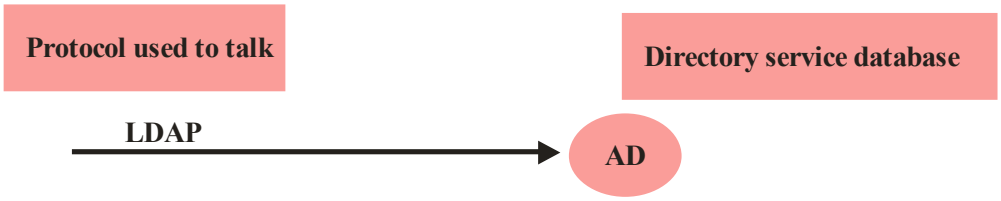

Fig. 2: Directory Service Database

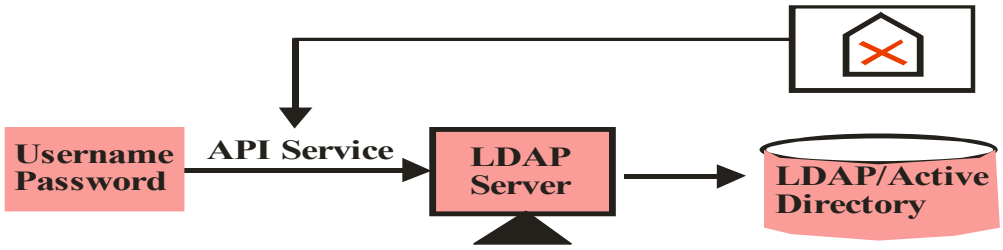

Fig. 3: Link between client and the LDAP Active Directory

From figures 1 and 2 the client side enters the username and password details and it will go to the LDAP server, after that, LDAP server will talk with the database(LDAP database) and it verifies whether the user is valid or not. If the user (client) is valid, it will give authentication, but if not, the authentication will be halted. The LDAP is employed in this research work because the students taking GST examinations in our institutions are many and if not checkmated may result into the fraudulent activities may jeopardize the aim of creating the automated GST examination. Moreover, with the deployment of LDAP, multiple GST examinations could be taken at the same seamlessly.

Structured Flow Chart of the System

The beginning of the flowchart in Automated Exams System is the General Homage which contains the link to the users' login and Admin login. From the user's login page, the new user is expected to fill the details and select the necessary exams to write, if the user is already existing, the user is required to select the start button for the appropriate exams to be enabled. From the Admin's Home page, the administrator is required to create sessions and segments. And this sections and segments will have another subsection like the year of the exams. The ad[4]min will also create the exam questions based on the sessions and segments as will be directed by the course lecturer(s). The admin will also set the question numbers and the format of the question whether texts or option questions.

The administrator is also responsible for activating the exams to start at a fixed date and time. The figure 4 shows the flowchart of the system.

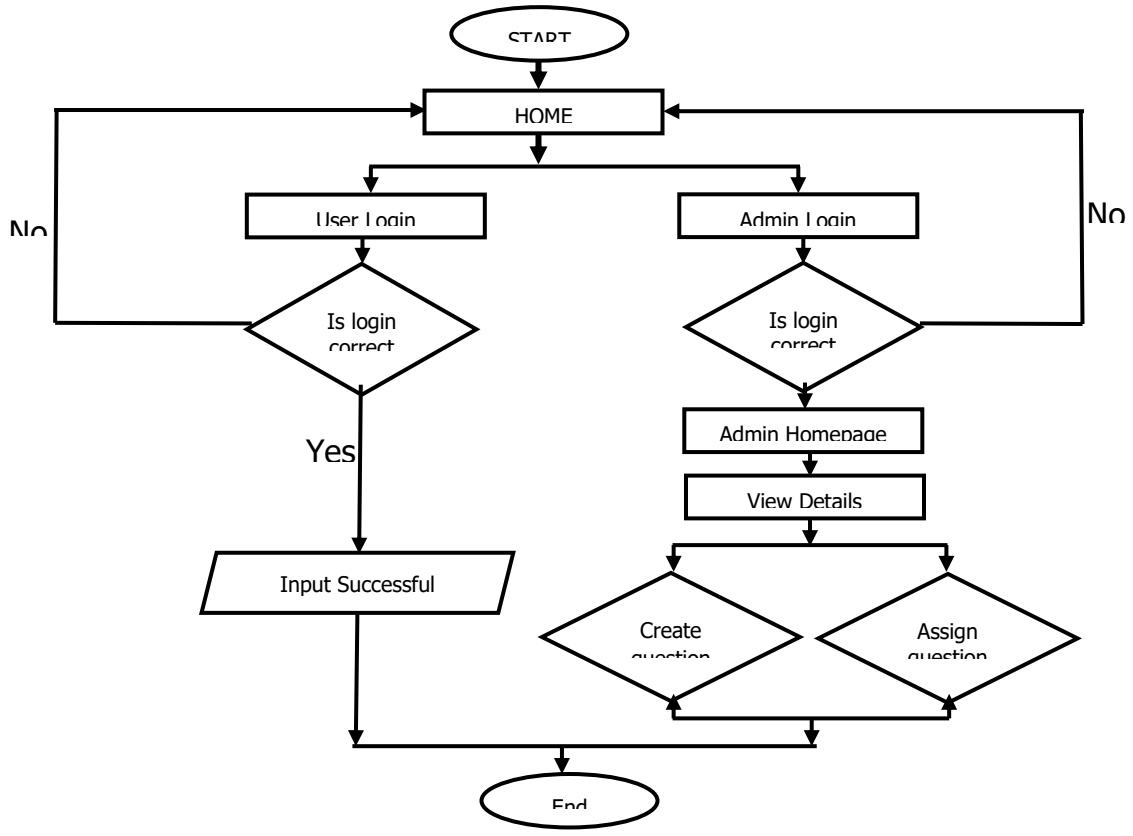

Fig. 4: Data Flow Diagram of the System

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From the backend of the automated exam system is where the data flows starts, the backend will grant the user access to set questions and the question be options or subjective, from the backend the administrator can also edit the user detail or grant access to the user and at the backend the timer and date of the questions can be set and allocated. The backend will enable the user ac[5]cess o save records to the database.

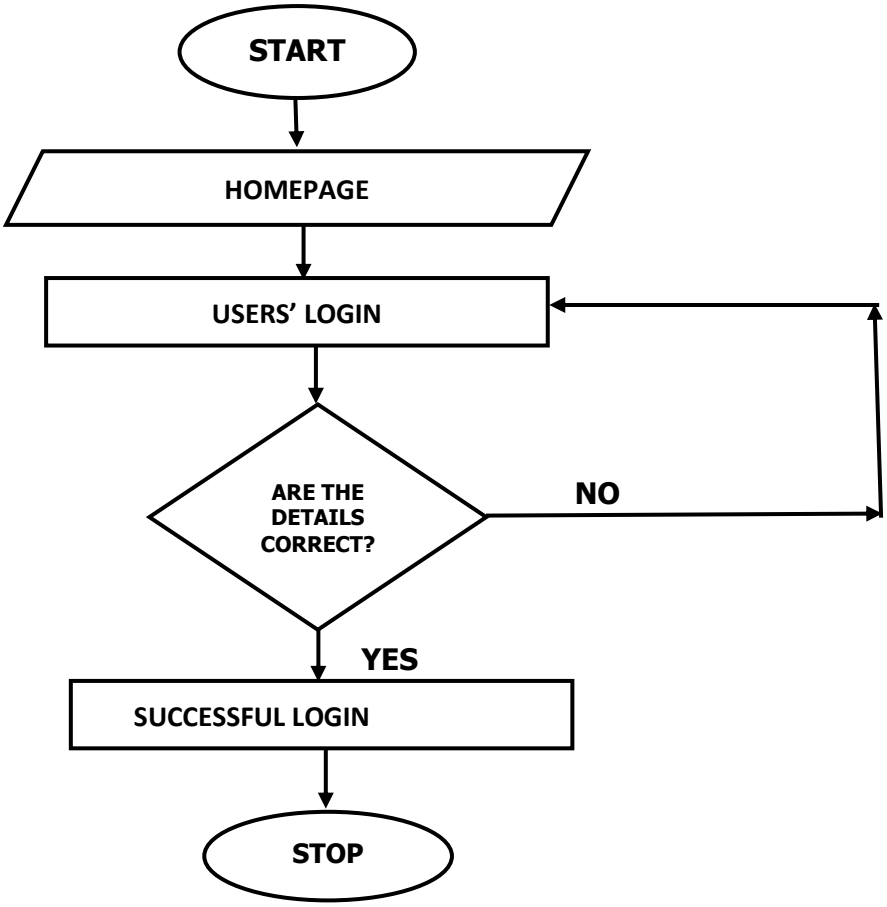

Fig. 5: Flow Chart of User Details Module

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Flow Chart of Admin Login Module

In Automated Exam system, the storage of information, the retrieval and update of information is processed in the database module. The database module collects data from the user and Admin interface and store the records at the database for proper data flow. The figure 5 shows the flowchart of the user login and admin details respectively.

Database Design

MySQL is the Database Management system that is used in the design of Automated Examination system. The database is designed to hold or store the data or record entered from the input form. The database consists of one Database and three tables. The below picture shows the structure of the Automated Examination System structure, while configuration and the[6] data type are shown in the table 1.

Table 1: Database Design

FIELD NAME	FIELD TYPE	SIZE
Student Name	String	30
Gender	String	6
Reg no[7]	Varchar	24
Department	String	20
Level	Integer	3
Email	Varchar	20
Phone No	Integer	11
Password	Varchar	18

5. EXPERIMENTS

The idea of the automated Examination system is to eradicate the manual way of writing GST examination and unsecured computer based general study examinations by providing a more adequate, security and efficient method to enhance the seamless writing of the examinations using lightweight directory active protocol. The figure 7 shows the homepage interface where the user (student) can create new account details. In this scenario, the administrator configures

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the username of each student with the student's matriculation number while the student creates his/her password as desired.

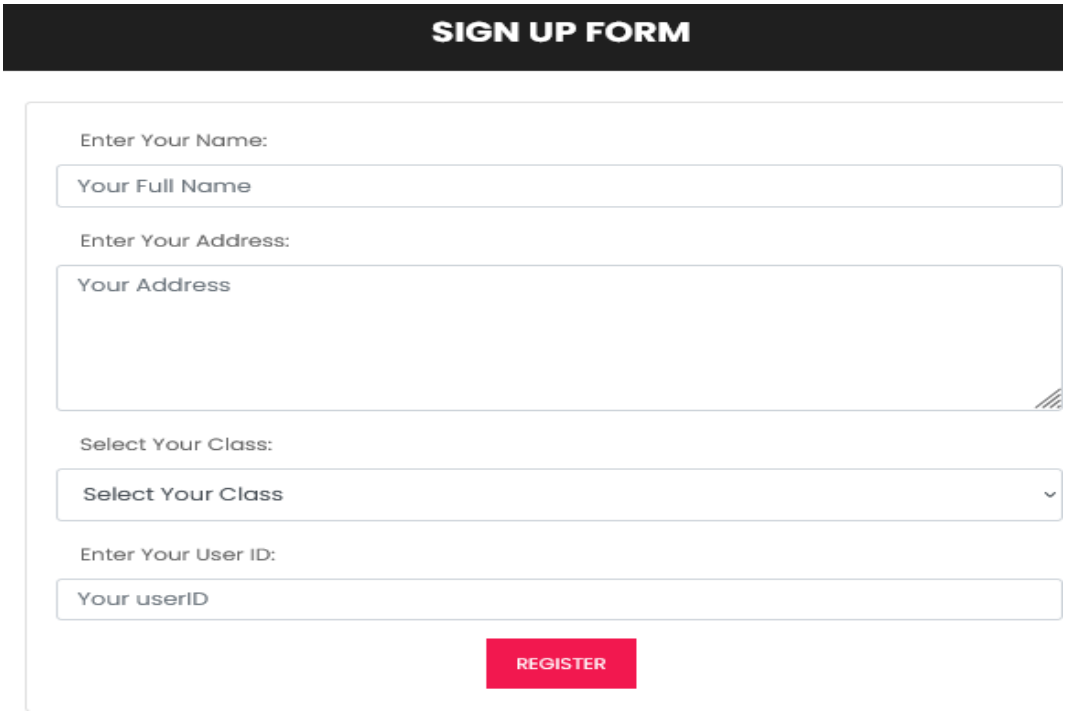

Fig. 7: Signup form page

The user login page/interface will grant the already registered user access to start exams, amend details, and check examination scores.

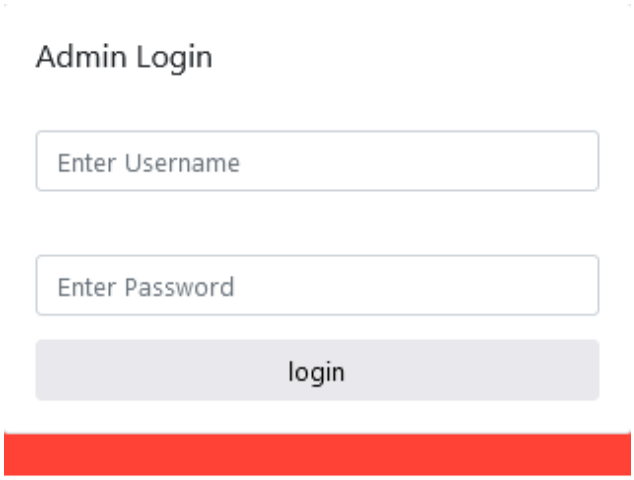

Fig 8: Admin Login Form

The admin login form depicted in figure 8, shows where the administrator of the system domicile in the ICT unit enters his username and the password. The essence of creating this form is to avoid unauthorized administrators having access to the automated system. At the discretion of the ICT administrator, he can assign specific roles to other administrators of the system.

The figure 9 depicts the administrators roles, which grants the administrator access to load examination questions set by the course lecturer(s), tag examination question type such CSC 111, creates dates and time for the examination as stipulated in the university examination time table, update user records, generate pins for each of the general study course examination, post and save the exam results to general viewing portal in the ICT department of the school. This portal works with the lightweight directory active protocol either through the internet or intranet of the school to provide timely and more secured automated general study examination as shown in fi[8]gure 9.

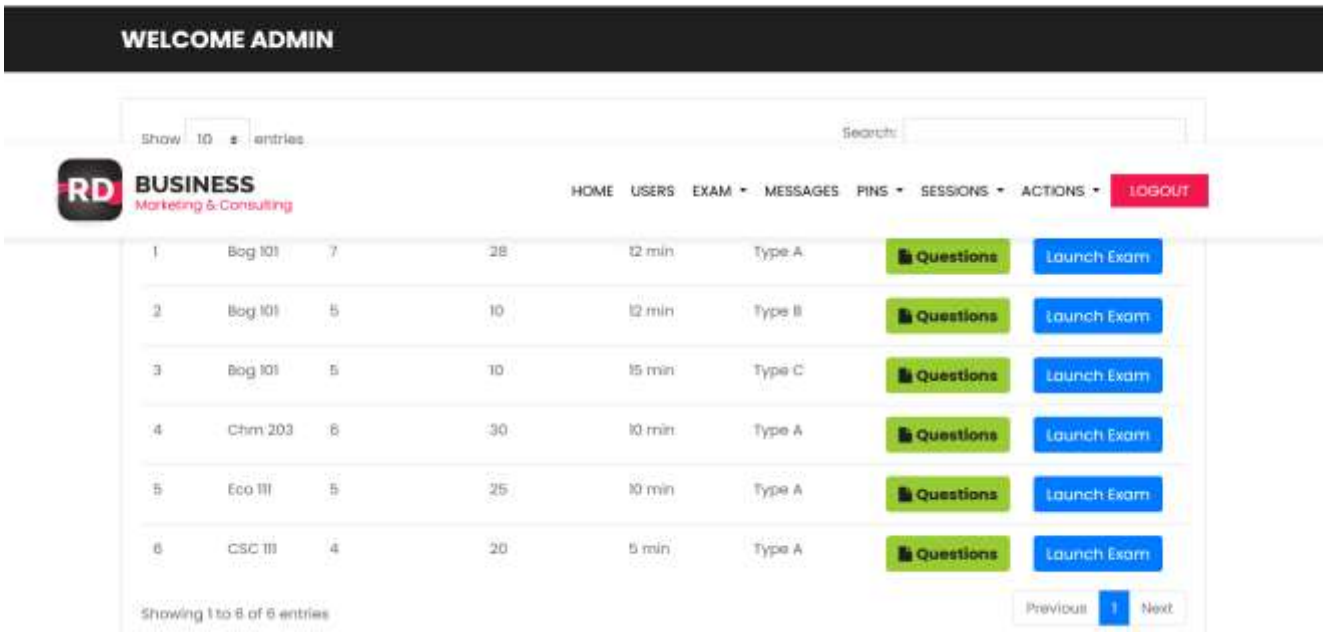

Fig 9: The Admin Management Platform(Roles)

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The figure 10, shows the objective questions. Common to some computer based general course test, this attribute of objective questions is normally used. The problem is that when using only objective questions, if the questions are not differentiated from one client computer the other, the tendency is there, that the students will copy from each other making a mess of the whole process. In this research work, we employed the technology of varying question technology, where the number objective question in client 1, will be the objective question of number 50 in client computer 2 and so on.

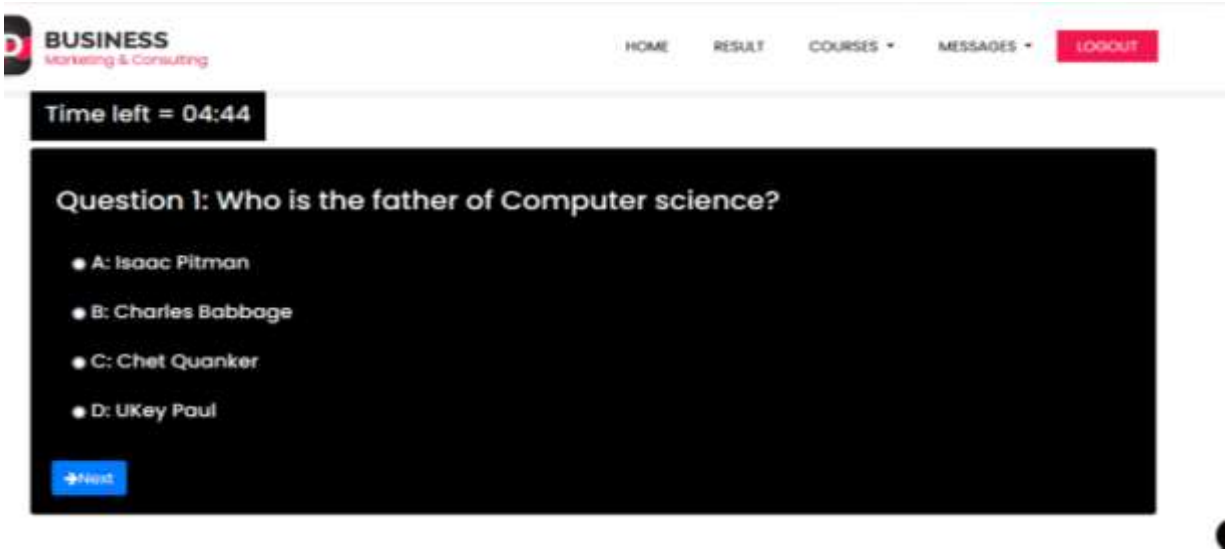

Fig. 10: Sample Objective GST Question

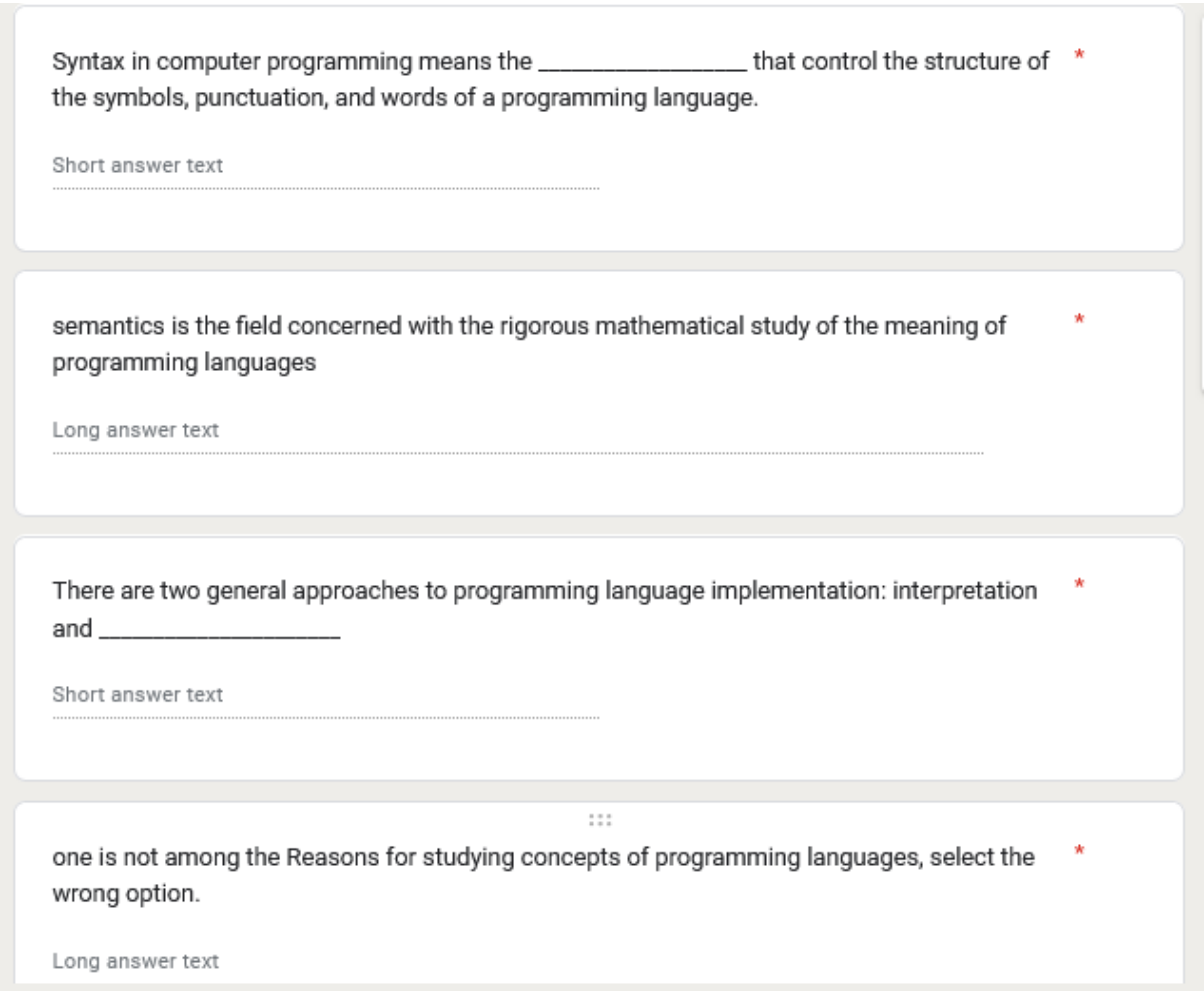

Fig. 11: Sample Subjective Question

In the figure 11, the sample of the subjective questions are showcased. This feature also makes the system different from other automated computer based test. This avails the student the opportunity to write short answers to questions. The overall system combines both the objective and subjective questions in the automated general study examination.

RESULT DISCUSSION

At the end of the experiments conducted on the automated general study examinations using lightweight directory active protocol, results were achieved. These results were proven to show that the system performs optimally in general study examination in both the downlink and uplink using the internet or intranet.

Table 2: Response Time in Clients Connecting to LDAP Database

Clients	Response Time from Apache Web Server
Client 1	10
Client 2	11
Client 3	10
Client 4	10
Client 5	11
Client 6	12
Client 7	12
Client 8	10
Client 9	10
Client 10	11

From table2, the response time using the apache database when downloading question from the server as obtained when testing the systems with 10 client computers s[9]hows that the response time fall on the same parameter within the confide of 10 secs to 12 seconds.

Table 3: Response Time Using LDAP Database in Loading Questions

Clients	Response Time in Downloading Questions (Secs)
Client 1	3
Client 2	4
Client 3	3

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Client 4	3
Client 5	3
Client 6	3
Client 7	3
Client 8	3
Client 9	4
Client 10	4

In table 3, the response time from loading of questions from each of the clients through the LDAP database is shown with high internet speed of 200mbps. It is pertinent to note that this feature may be slowed down or have traffic if the internet is down. But the good thing in this work is that two methods are proposed

1. With internet connection
2. Without internet connection

With internet connection, a student can write the examination where ever location he/she chooses. More especially when a student is hospitalized, the student can leverage on this application to write the examination as permitted by the administrator.

In the latter, the school may decide not to use the internet at all if the students are on ground on the campus to write the general study examinations.

Table 4: Response Time in Questions Submission and Feedback Results

Clients	Response Time in Submitting Questions to Server Database (Secs)
Client 1	10
Client 2	12
Client 3	13
Client 4	14
Client 5	10

Client 6	11
Client 7	13
Client 8	12.5
Client 9	10
Client 10	12

Table 4, shows the result got from clients submitting results to the LDAP server. Using 10 client computers to log in and write the GST exa[10]minations, the submission response time was recorded. It was also determined the period of submission and the time for the server to respond in grading the individual (client) examinations. The response time was optimal ranging between 10 to 14 seconds which a good achievement in the new system. This response time outweighed the other methods employed in general course examinations. This could not be compared with manual method of writing the examinations and grading patterns in the existing systems.

Fig. 12: Result Platform

In figure 12, the individual results are displayed after each of the general study examinations. This stage is paramount to the students in order to verify their performance during the examinations. The figure 12 shows the total questions required by the student to answer using a client computer, the number of questions answered rightly, the number of questions wrongly answered and the overall score of that student. This result is transmitted real time to the general

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university ICT database. From the ICT unit, the results are distributed to the various departments in the university that offered the general study courses. This makes the whole process efficient and secured since we are using the lightweight directory active protocol in the apache web server.

CONCLUSION

The importance of this research work cannot be over emphasized. The integration of lightweight directory active protocol database with the apache web server construed a veritable equipment for talking with each during the GST examinations and in creating the students directories for effective performance. The new system has carefully worked on a more advantageous way in which information will be processed quickly, by eliminating the problems encountered in the existing **(**manual general studies exam and other automated systems). It is very clear evidence that the Automated Examination systems software can be very timely, accurate, consistent, efficient, accessible and secured. It can therefore be concluded that this automated system of writing examinations which employed objectives and subjective questions will greatly reduce the setback encounter in the existing system of operations in writing general studies examinations in the universities in Nigeria.

RECOMMENDATION

This research work is highly recommendable to every institution offering general course in Nigeria both in the universities, polytechnic and colleges of education to minimize the use of paper and pen in writing GST examinations. It will affords the institutions a great opportunity to have queue in to the [11]new technology, reducing the workload of lecturers in marking general study exami[12]nations which is cumbersome. It is also recommended to the institutions because it has an efficient and enhanced security through the integration of lightweight directory active protocol which creates students directories more efficiently and easy to search details of users.

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