A Secured Mobile Learning Platform for Assessment in South-South Part of Nigeria

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Abstract— This paper is based on a secured mobile learning platform for assessment South-South Part of Nigeria. The use of mobile devices for learning (mobile learning) is more suitable and flexible than electronic learning (e-learning), since a lot of people own mobile devices and learning can take place anytime and anywhere. The geographical terrain of the South-South Part of Nigeria being surrounded by water bodies make it difficult for students to always attend classes, hence the need for a mobile learning platform. This system must be secured to pervert malpractice and impersonation during assessment. The proposed system software which can run on mobile devices and personal computers is designed using a modular approach. PHP and HTML were used for the effectiveness of the design together with MYSQL as the integrated database. The design system is meant to register candidates and their courses, before accessing the examination questions with the aid of a biometric fingerprint scanner. Only registered candidates with the right details can have access to the examination questions, which is in various formats and is randomly selected. The report for the assessment is immediately displayed at the end of the assessment. The result of the design system shows that candidate authentication using biometric aids can provide a solution to the difficulty of identifying the genuine candidate for examination, be it distant learning or campus learning. This definitely reduces malpractice and impersonation found in the education sector.

Keyword- Assessment, biometric, e-examination, e- learning, M-learning, mobile, security

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1 INTRODUCTION

M- learning is the delivery of learning materials to learners through mobile computing devices (Parsons & Ryu, 2006). With M-learning; smaller and sophisticated mobile devices is capable of delivering data in a variety of formats anywhere, and any time (Schooler, Jelinek, & Dahle, 2010). Unlike e-learning that require a learner to be at a computer that is connected via some kind of cable to a network which make learning places restricted. M-learning as a new educational method, is capable of being easily managed than e-Learning method (Georgiev, Georgieva, & Trajkovski, 2006). The devices involved are of small sizes that can be carried around and also easy to access on a regular basis, unlike laptops that takes time to boot. Devices like mobile phones, PDAs, and MP3 players can be used as mobile learning devices (Mellow, 2005; Andronico et al, 2003), due to the wireless network technology embedded in them. This Wireless technology provides learners with the chance to access learning management system (LMS) wirelessly via online. In Nigeria, the blended learning method is often used. This involves the use of e-learning together with the traditional method of learning. In areas such as the south _south region of Nigeria, there are hardly electricity supply or internet facilities needed for e-learning, likely because of its natural terrain that is embodied with water. These create a huge challenge for learners. But with the availability of mobile devices commonly used for communication, same device can also be used for learning.

Again, some schools in Nigeria that are into e-learning uses it as teaching/ learning means, and not for assessment/ evaluation. They still use the traditional method of using invigilators, Pens and Papers for assessment. This though not to be since examination can also be conducted electronically.

Electronic-examinations are made to assess the student's knowledge using modern computing technology instead of the traditional paper-based. The e-examination is more reliable, flexible and easy with less effort on the part of students and invigilators. Electronic examination can be made easier if it can be done anytime and anywhere. This is achievable when a good security measure is put in place.

One way to achieve this is the use of biometric authentication system rather than the commonly used username and password. This is to determine the exact person taking the examination (Onyeizu, 2003) and solving the problem of malpractices and impersonation that can result from security breaches. Biometric authentication is the identification and authentication of humans based on their biological distinctive features (Diaz, 2007). Fingerprints as unique to each individual is one such system for biometric identification. Also new, is the introduction of fingerprint scanners into PDAs like ipaq pocket PC that has a good fingerprint scanners installed in it. So with mobile technology and biometric technology, e-examination is saved and secured to be carried out at any time and in any way.

2 METHODOLOGY

2.1 The Design

The biometric electronic assessment system was designed using a modular approach which is the top-down method. The overall system design is broken down into modules. These

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modules carry out different functions that are interwoven with one another. The entire system block diagram is shown in Fig. 1.

Fig.1   Block diagram of the design system

The system modules are designed as web pages to support a large number of users both offline and online. The modules were programmed using HTML and PHP codes that are embedded in MySQL database, that request and retrieve stored information. A fingerprint scanner with model (U.are.U 4500) is coded into the design system to capture fingerprint image into the system database for biometric authentication.

The system is designed to carry out five different functions. These include registration, authentication, creating/editing examination, taking examination and result computation. These functions are being controlled by the three (3) layers of the design system. These layers are; the presentation layer that offers an interface for users; the logic layer which is responsible for processing the user's requests and the database layer which is the archive of the design system where data are stored. The graphical presentation of the layers is shown in fig 2.

The system modules are implemented using codes of server side scripting language and client side scripting language. These languages are used to actualize the functionality of each module by properly applying the syntax and programming practices of the programming languages used.

The programming languages used in the design of the software are PHP (hypertext preprocessor) language, Hyper Text Markup language (HTML), and cascaded style sheet (CSS). These languages are used interwoven to achieve the design system. The overall flow chart for the system is shown in Fig 3.
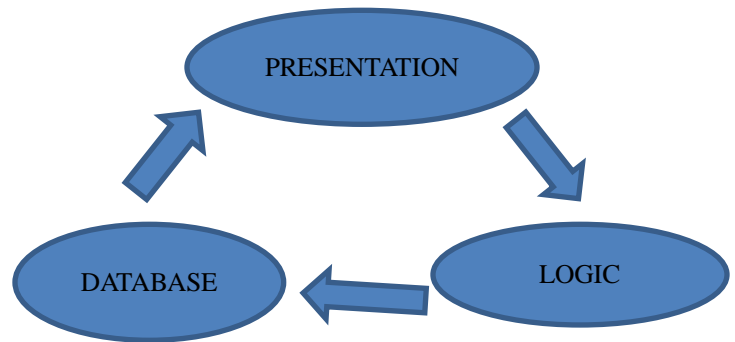

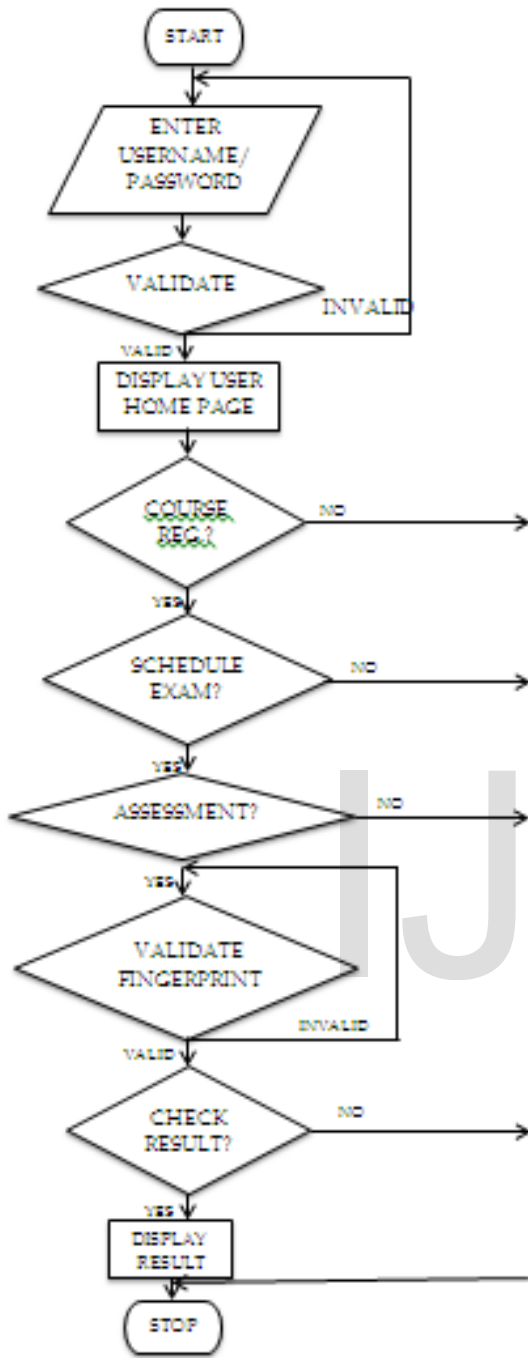Fig. 2 Presentation of the system layers

Fig.3 System flow chart

password if forgotten. The authentication module authenticates the user's username and password at the sign-in point while biometric authentication is carried out when user want to access the examination module and the edit-examination module. The biometric authenticates examiners before creating the questions and does same for students to get access to the examination questions.

The authentication module only gives further access to the user if the parameters are valid. The algorithm for these modules is as shown.

Step 1: Start
Step 2: Launch e-assessment
Step 3: Register as new user
Step 4: If (registration is accepted)
        Then Goto Step 5
        Else Goto Step 3
Step 5: Sign in using username and password
Step 6: System authenticates the username and password
Step 7: If (Username and Password is valid)
        Then Goto step 8
        Else Goto step 5
Step 8: Stop

2.2 Home Module

This module contains the individual action to be performed by the design system. Several modules can be accessed and executed through this interface. This depends on the user type which may either be student or examiner. The student home page consist of course registration, examination and result. While that of the examiner consist of create examination questions, edit examination question and result. This is to ensure that students don't have access to the examination questions and on other hand, examiners don't take examination. One can as well log out from the home page. The algorithm for the module is as shown.

Step 1: Start
Step 2: Launch e-assessment
Step 3: Sign in using username and password
Step 4: System authenticates the username and password
Step 5: If (Username and Password is valid)
        Then Goto step 6
        Else Goto step 3
Step 6: Display user Home page
Step 7: Stop

2.3 Course Registration Module

This module permits students to register for examination. For the student to access this module, the pin code for school fees payment must be activated. Users can only register for courses that administrator has created under the user's faculty and department. Each course to be registered for is treated as an individual, such that the user selects the courses of interest and registers them. Once a user has registered for a particular course, that course is no longer found in the course registration leaving only non-registered course. Registered courses can be viewed in a sub menu of the course module.

The functions and algorithms for each module of the design system are as follows.

2.1 Sign-in and Authentication Module

The sign-in module provides the entry point into the software. This option is open to both the students and examiners to allow them have access to the system. In both cases, they will have to first register their details which includes; username, password and fingerprint image that is stored in the database. This module also allows user recover their username and

The algorithm for the module is as shown.

Step 1: Start
Step 2: Launch e-assessment
Step 3: Sign in using username and password
Step 4: System authenticates the username and password
Step 5: If (Username and Password is valid)
          Then Goto step 6
          Else Goto step 3
Step 6: Display user Home page
Step 7: Click on course menu
Step 8: Select Pay fees sub-menu
Step 9: Click on the currency symbol
Step 10: enter school fees code
Step 11: If (school fees code is valid)
Step 12: Then Goto Step 13
          Else Goto Step 10
Step 13: Select Course Registration sub-menu
Step 14: Click the course title to be registered
Step 15: Click the register selected courses button
Step 16: Stop

2.4 Create Examination Module

This module is use in creating examination questions. It can only be accessed by registered examiners. The module authenticates users by requesting fingerprint authentication. The examiner can only get access into the module when the authentication is valid. It consist of two (2) steps; the examination particulars; that has to do with faculty, department, course title, level, semester, assessment name, exam duration, and examination date/time and the enter questions where creating of examination question is carried out. The question formats are in MCQ's, True/False statement and the free responds. The answers to each question are given and saved into the system database. The system is designed such that the created examinations cannot be access by students before or after the scheduled date. The algorithm for the module is as shown.

Step 1: Start
Step 2: Launch e-assessment
Step 3: Sign in using username and password
Step 4: System authenticates the username and password
Step 5: If (Username and Password is valid)
          Then Goto step 6
          Else Goto step 3
Step 6: Display user Home page
Step 7: Click on Create assessment menu
Step 8: Enter fingerprint authentication
Step 9: System authenticates fingerprint
Step 10: If (Fingerprint is valid)
          Then Goto Step 11
          Else Goto Step Step 8
Step 11: Display New Assessment wizard page
Step 12: Fill in the Assessment particulars
Step 13: Save
Step 14: Enter Question
Step 15: Click on Add Question
          Otherwise
Step 16: Stop

2.5 Examination Module

This module is where assessment of students is carried out. The student can only have access to the questions if the biometric fingerprint authentication process is valid and at the scheduled date. This is to avoid someone taking the examination for the registered candidate and to ensure that the examination system is organized. The questions are randomly selected by the system, within the time limit assigned by the examiner, so as to avoid malpractice. It has an automatic start and stop time, which log out the candidate from the questions bank at the end of the stop time. This module also displays the result immediately. The algorithm for the module is as shown.

Step 1: Start
Step 2: Launch e-assessment
Step 3: Sign in using username and password
Step 4: System authenticates the username and password
Step 5: If (Username and Password is valid)
          Then Goto step 6
          Else Goto step 3
Step 6: Display user Home page
Step 7: Click on Assessment menu
Step 8: Enter fingerprint authentication
Step 9: System authenticates fingerprint
Step 10: If (Fingerprint is valid)
          Then Goto Step 11
          Else Goto Step Step 8
Step 11: Display Assessment Welcome page
Step 12: Start Examination
Step 13: End Examination
Step 14: Display Result
Step 15: Stop

2.6 Result Module

This module gives the report about examinations taken. It gives the full details about the student and the examination scores. The module displays the grade alongside with the candidate personal information like, names, photograph and registration number. This is to identify the rightful owner of the result. It also gives remark of the result which tells if the candidate has pass or fail the exam. The algorithm for the module is as shown.

Step 1: Start
Step 2: Launch e-assessment
Step 3: Sign in using username and password
Step 4: System authenticates the username and password
Step 5: If (Username and Password is valid)
          Then Goto step 6
          Else Goto step 3
Step 6:   Display user Home page
Step 7: Click on Results menu
Step 8: Select the course title of the result
Step 9: Display Result
Step 10:   Stop

3   RESULT AND DISCUSSION

This research is carried out for the purpose of designing a

mobile electronic examination system with a fingerprint biometric authentication system for south _south Nigeria educational systems. The obtained result is also analyzed to ensure that it conforms to the design objectives. To fully implement the system, various steps were taken and the result discussion is based on the steps. This is because the design is modular base. The overall system is designed to register user information and courses which assess students through biometric authentication and to produce immediate result.

3.1 Registration Interface

This interface is where users sign in using username and password. It also holds the part to register as new user.
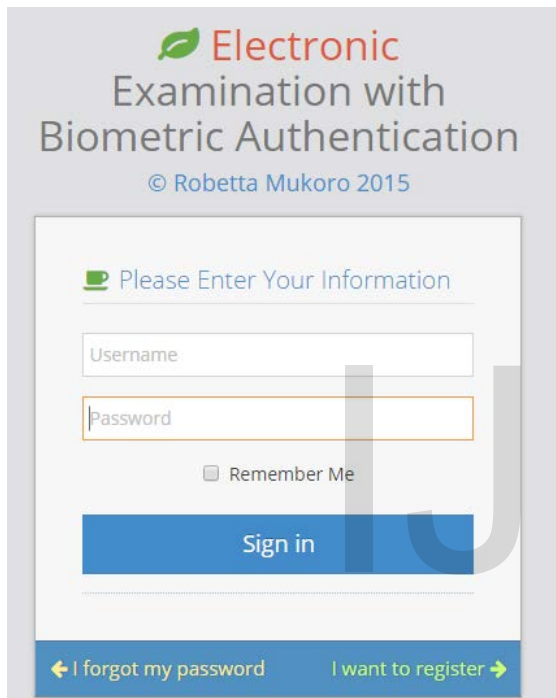
Fig. 4a Registration interface
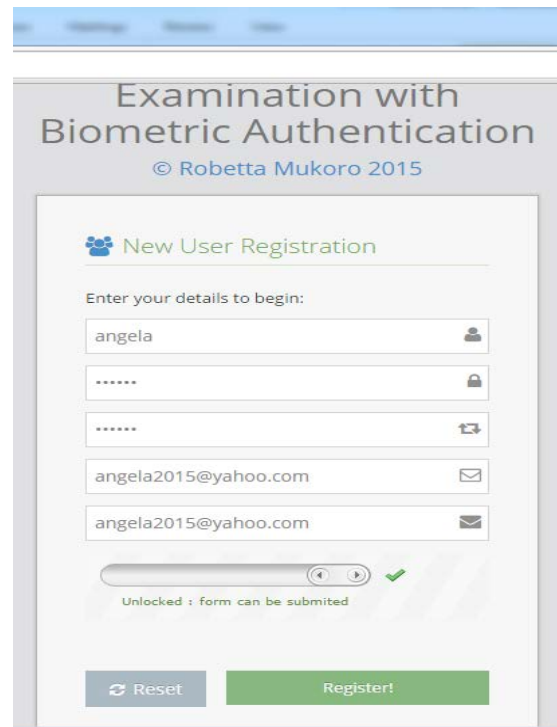
Fig. 4b Registration interface

For new user to register, click on the "I want to register" arrow at the lower right corner of the login interface. There are two steps in the registration process. The first step involves the log in details. Enter the username (which must not be less than five characters), password (not less than six characters), and mail ID. Unlock the security button, by moving the button to the right, then click on register. This process sends a link to the e-mail provided, to continue the second step of the registration. Clicking on the link send to the e-mail allow user to upload the passport, which must be in JPG format, and other personal information. When that is done, it save the information and display same page to register the user fingerprint. The fingerprint scanner then reads a particular finger five (5) times, so as to create a template for the user. This gives a link to login if the process is successful.
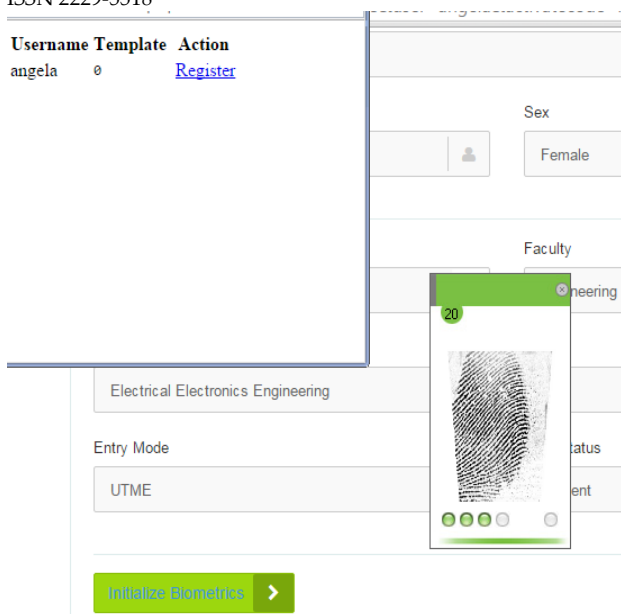
Fig.5 Biometric registration of fingerprint
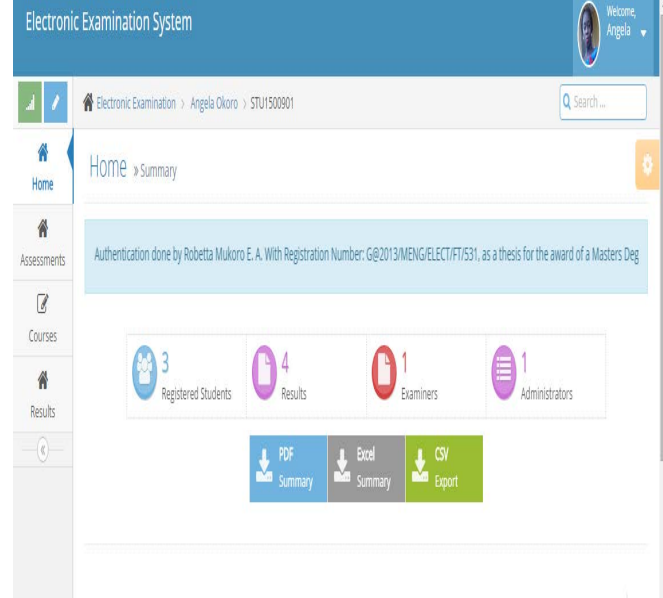
3.2 Sign-in Interface

This interface is where registered users' sign in using their username and password. To access the system, enter the username and password in their respective boxes. Then click on the sign-in button below. The system then authenticates these parameters to check if they are valid.
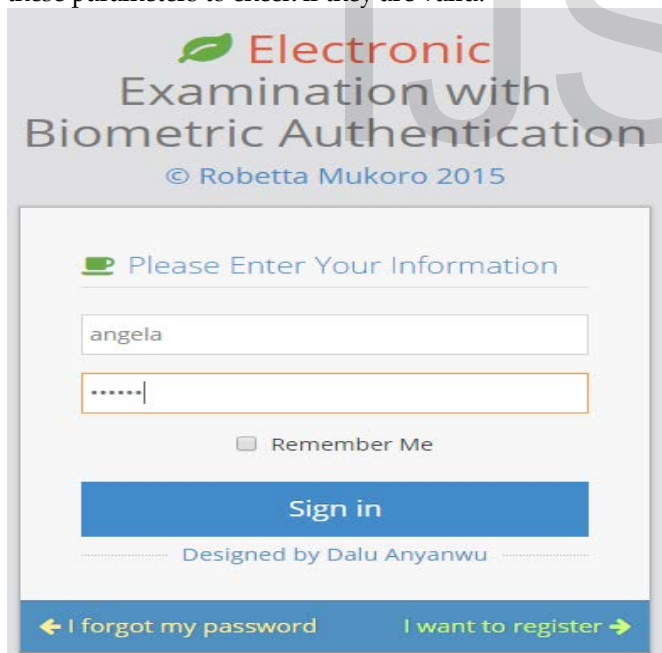

Fig.6 Sign-in interface

3.3   Home Interface

This is the main interface through which other interface can be accessed and executed. It can only be accessed when the username and password is valid. It is the user type that determines the menus on the home interface will display. Users with student privilege have access to assessment menu, course re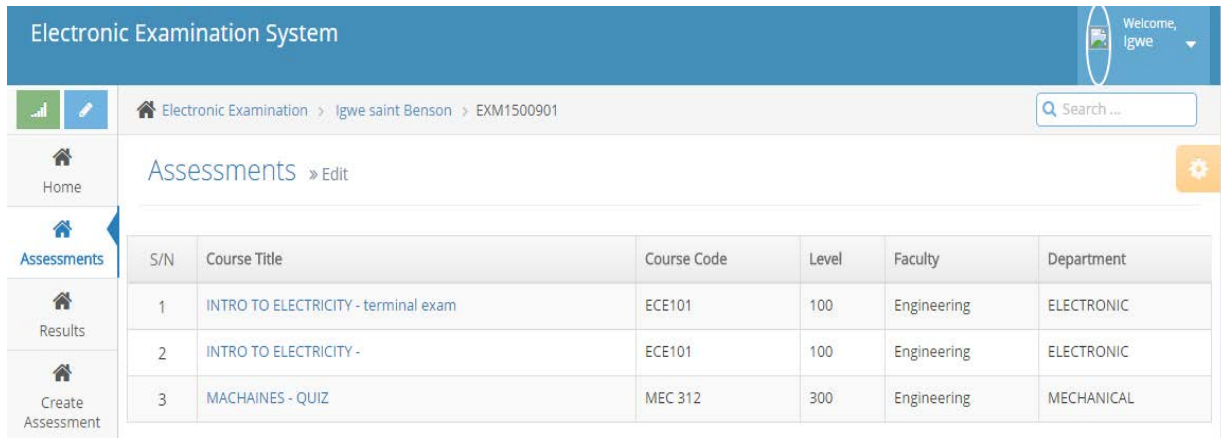gistration menu and result menu. While those with examiner privilege have access to assessment menu, create assessment menu and results menu on their home interface.

Fig.7   Home page for student

Fig.8   Home page for examiner

3.4   Create Examination Interface

This interface is where an examiner creates questions for assessment. It requires fingerprint authentication before it can be access. Only a user with examiner and administrative privilege can have access to it. The interface is a wizard that consist of two parts; the assessment particulars and the enter questions.

To achieve this, click on create Assessment menu at the left hand side of the home interface. It pops up the fingerprint authentication page. With the fingerprint reader connected to the device, sign-in using your finger.
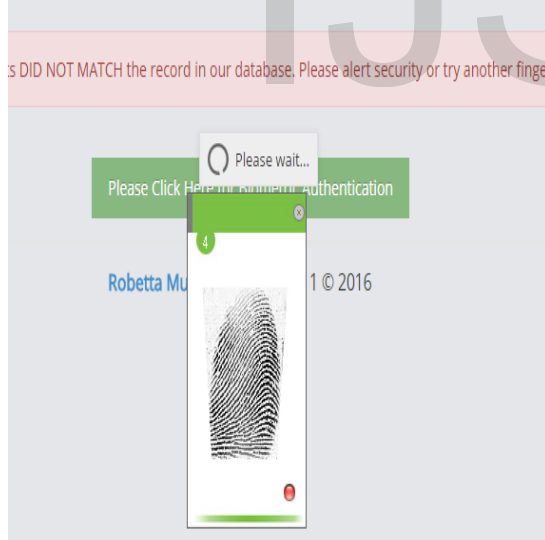

Fig. 9   Non-registered fingerprint

If the finger that is not registered is being read, the scanner displays red and denies user access. But when the registered finger is placed on the scanner it displays green and gives user further access to the wizard page.

Fig.10 Assessment particulars for creating assessment

Select the necessary information as required for the examination and click on the blue button below. This then

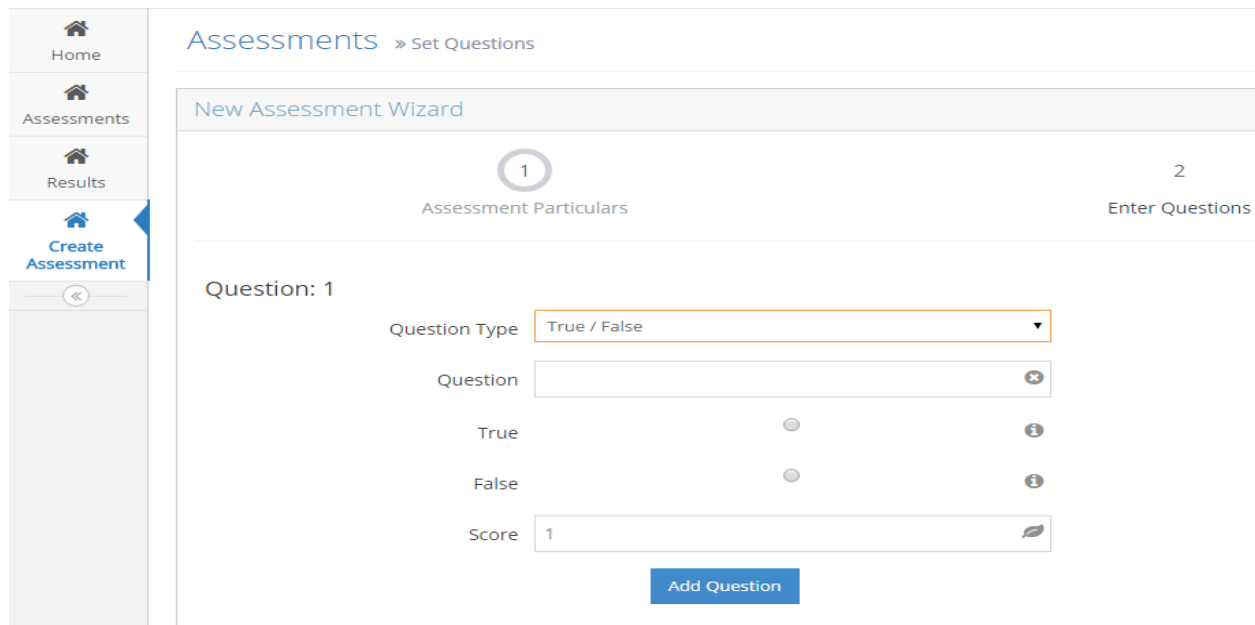activate the second part which is entering questions.

Fig. 11 Creating Examination questions

The question type gives room to choose the format the question should be. One can choose multiple choice questions, true/false statement or the free response. After which the question, option, correct answers, and score are entered. Click on the add Questions button to continue creating more questions.

3.5 Course Registration Interface

This is where student register for the examinations to be taken. Before a student can register for any course for the first time, the school fees status must be verified. This is done only once for the session. To activate the school fees, click on pay fees, a sub menu of the courses menu, to display the pay fees page. Then click on the currency symbol, which displays the box where the payment code is entered.

Fig.12 School fees page

When the code is verified, the user can then register for the course(s) by clicking on courses registration sub menu of the courses menu at the left hand side of the home page.

To register the course, click on the check box of the available courses to be registered and then clicks on the "Register selected courses" box below.
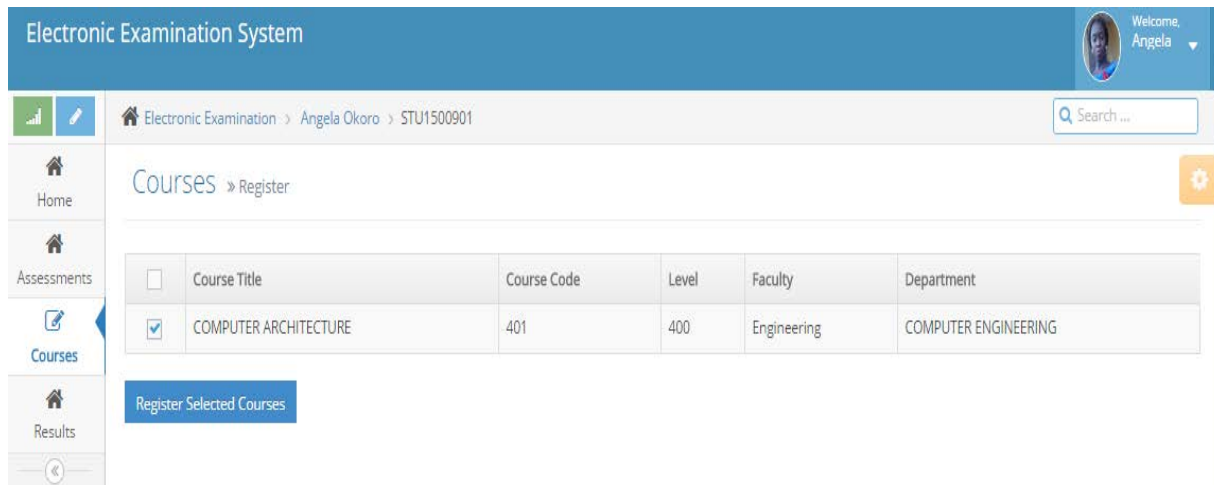

Fig.13 Course registration

3.6 Assessment Interface

This interface is where student(s) takes the examination. Click on the assessment menu of the student home page to take an examination. It immediately asks for biometric fingerprint authentication. If the authentication is valid, it displays all the course titles that the user registered, but can only access the examination of the due date.
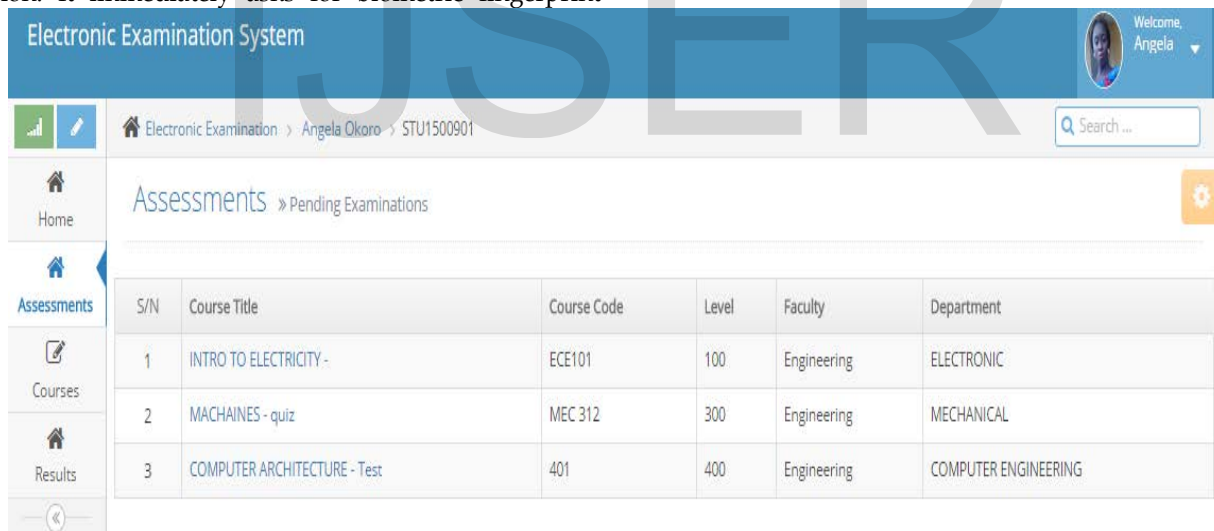

Fig.14 Assessment Page

Click on the course title of the examination to be taken. If is not the scheduled date, it cannot be accessed otherwise a welcome page with the student information is displayed.

Fig.15 Assessment welcome page

Immediately the start test button is clicked, the time starts counting. The questions are displayed randomly, until either all the questions are answered or the time elapses.
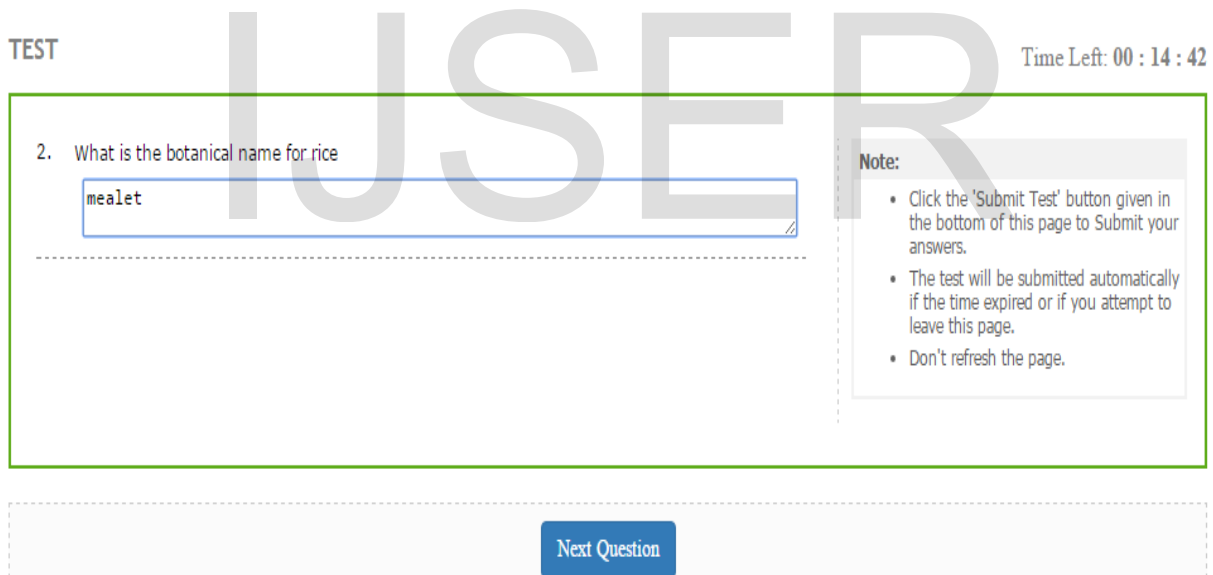

Fig.16 Examination page

On completion of the examination, click on "submit test". The system asks to be sure that the user want to submit the test. If yes, the students' result is displayed and stored immediately in the database.

3.7 Result interface

This interface is where users can access the results of all the examinations taken at any time. Click on the result menu on the home page. It displays all courses taken with a summary report.

Fig.17 Result page

Click on any of the course title to displays all information
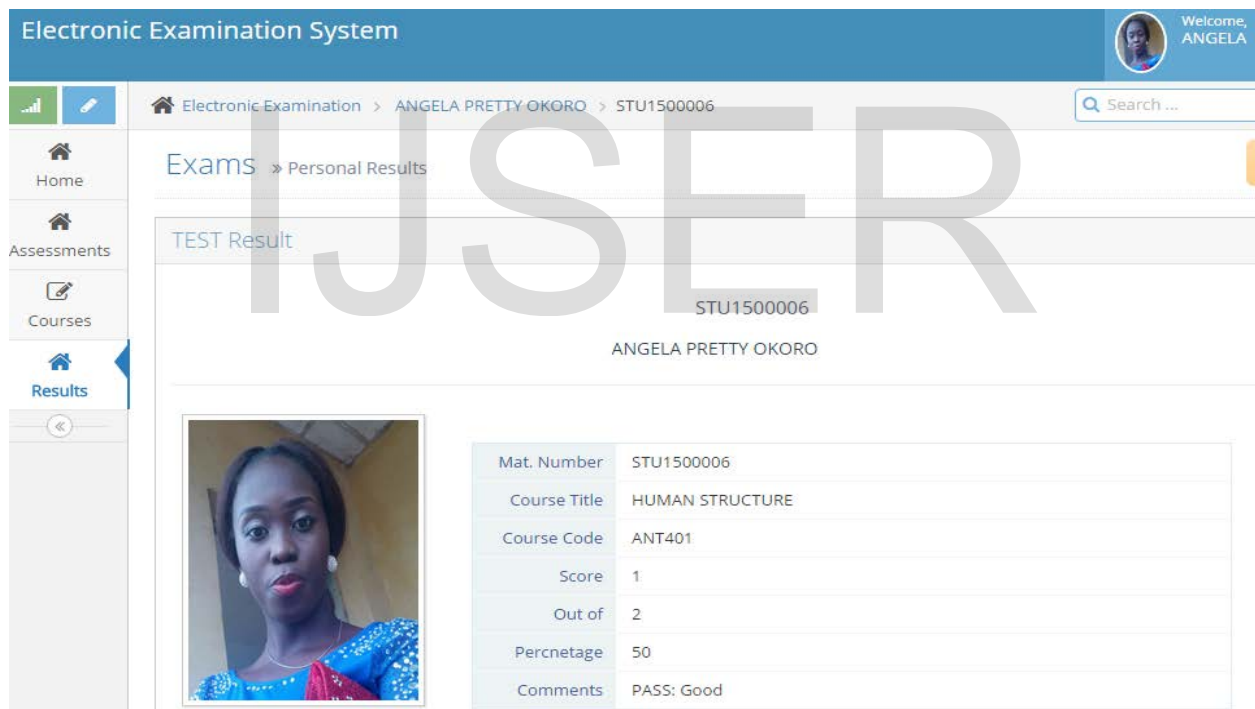about the result of that particular course.

Fig.18 Personal result

The outcome of the test reveals that the system is effective,
efficient and has a very fast response. The system was tested
by registering students, registering courses, creating some
examination questions and also being assessed.
Authentication using the biometric fingerprint scanner was
also carried out. Only registered students were authenticated.
During the test, there was no false acceptance of users. That is
a person who did not register cannot access the system. Also
the system rejects users that attempt to register twice with
same information. There were few declinations during the test
in which the design system failed to authenticate some
registered users. This could be as result of improper
placement of finger on the fingerprint scanner or placing the
non-registered finger on the fingerprint scanner.

4 CONCLUSION

From the design system testing, it is obvious that the implementation of the biometric electronic examination system is achievable. This system can be run in mobile devices like wise computer and laptops. With this examination need not to be supervised since one biological trait can't be forge. Electronic examination simplifies the whole examination process, which including creating examination questions, supervising the examination, marking of answer sheets, and computation of results. Introducing the biometric electronic examination system will save time and money while improving reliability. With this, there will be not imposter and time used for manual identification is saved and put into other use. This method of assessment completes the e-learning process, whereby teaching and assessment is done electronically. Unlike the existing blended method whereby teaching is carried out electronically while assessment is done traditional (paper and pen).

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