Portal Integrated Students Biometric Based Verification System For Examination.

Abubakar, M.*, Idris, B.*, Lawal R. L.*, Akande H. F.**

*Department of Computer Science, Directorate of ICT Centre Kaduna polytechnic, Kaduna state, Nigeria

*Department of Chemical Engineering, Directorate of ICT Centre Kaduna polytechnic, Kaduna state, Nigeria

Abstract — Any software relies heavily on information. In the academic environment, knowledge is especially necessary and crucial. Students must enrol in classes, take attendance, quizzes, and examinations, and review their grades. Students return to submit some transcript years after graduating from an institution. As a result, it is critical to treat student records in an open and transparent manner. As a result, it's critical to manage students' information in a way that's easy to access, maintain, and secure. The manual technique of compiling and keeping student records is prone to human mistake and is also insecure, leaving it vulnerable to unauthorized personnel. This paper describes the design and development of a biometric student record management system that acts as a conduit between students and the institution, allowing students to check their grades, track their progress, and efficiently record each student's attendance for every lecture they attend using a biometric device. The waterfall methodology was utilized to construct this system since it is a one-dimensional model, which means it is simple to apply and the documentation is completed at the start of the software development process.

Keywords *– computer-based tests, fingerprint, authentication, biometrics, impersonation.*

— — — — — — — — ◆ — — — — — — — —

1. INTRODUCTION

Student records are crucial and play an important role in every institution's educational system (Samson.A.A & Adekunbi.A.A., 2013). These institutions are tasked with both monitoring individual students' progress and demonstrating that all students are reaching the prescribed learning standards. An educational institution's ability to alleviate this load is influenced by its access to students' information, which must be reliable and timely. There are numerous advantages to having a well-designed student record.

According to data from the National Center for Education Statistics, the most essential benefit of a well-designed student record is the ability to present information on individual students, school programs, and the institution as a whole for decision-making at all levels of management (U.S. Department of Education, N. C., 2000). In the process of grading the students, the records might get lost or destroyed in case of a disaster (Añulika E. A et al, 2014). The student record system is necessary for the entire operation of the educational system, but it also helps to improve student growth and suit their needs. Individual student information, student academic reports, institution information, course information, and other resource-related information are all handled by the student information system. The student

record system is necessary for the entire operation of the educational system, but it also helps to improve student growth and suit their needs. Individual student information, student academic reports, institution information, course information, and other resource-related information are all handled by the student information system. A well-designed student record system entails the development, storage, retrieval, and maintenance of students' records in order to ensure that they are easily available to an educational institution (Bharamagoudar S. R. et al, 2013). However, many educational institutions, particularly in Nigeria, continue to use the manual technique of recording and managing students' information, which wastes time and is inefficient.

2. REVIEW OF RELATED WORK

This section examines the most closely comparable works, followed by a comparison of the linked works and our system.

Cinfores Web Portal:

This software is used to provide services such as information about an institution, its many schools and faculties, and departments; account maintenance; online payments and record payments; email services; and student examinations. It is an online application that assists with student registration, academic course registration, personal and academic records of students, academic result approval, and CPGA check. (Njamu O & Ugwu C., 2013)

An attendance monitoring system:

This technique is used to keep track of staff attendance. It was created to be an accurate, quick, and effective tool to track personnel. It uses the extraction of minutiae technique to verify fingerprints. According to a poll conducted with this system, the fingerprint biometric identifier was found to be suitable for

the institution's/staff organization's attendance management system (Satoa, K. & Seema, R., 2013).

Online Biometrics Class Attendance Management System:

Covenant University uses this software primarily to track student attendance in class. Class attendance is processed and managed via fingerprint biometrics. The technique is reliable, with an average of 89.33 percent accuracy for first signature attempts in trials done on 60 Covenant University students. (Adetiba, E et al, 2013)

Biometric-based Attendance System:

For LASU Epe Campus, this technology is utilized to take attendance during lecture sessions utilizing fingerprints as a biometric. It improves attendance accuracy, security, and the efficiency with which the attendance % is calculated. The attendance system employs a fingerprint identification technology that compares students' biometrics to every record in the database. (Idowu, O. & Shoewu, O. 2012)

Web-based Student Academic Records Information System:

This program was utilized for the seamless and interactive management and processing of data/information for every student in the school. It addresses the need to track students' academic progress at each level, as well as other administrative tasks. The system was built using client/server technology. Visual Basic.NET was used to create the client side, and MYSQL was used to create the server side. This approach gives students in a certain curriculum with a three-year performance analysis. (Njamu O & Ugwu C., 2013)

Biometric Attendance Management System:

Wireless ZigBee technology is used in this system. It contains an attendance report that is provided once every 15 days to the corresponding department HOD or class in-charge. Reports can be sent to the parents' e-mail address as well. RFID was also utilized by some to track student attendance (Gunjan .T, et al, 2013).(Karthik.V.E. et al, 2013).

Following a thorough examination of the aforementioned work, the similarity between this system and ours is:

It keeps track of the information that managers and decision-makers need from the pupils.

The system is a single platform that allows for the interactive and seamless management and processing of data and information for all pupils. The efficiency of service delivery is improved by this system.

The following are some of the flaws that can be identified as a result of this work:

There is no way to record student attendance, which is a crucial student record.

It doesn't have any additional security measures in place to protect its documents and prevent unauthorized personnel from seeing them.

This system would address these issues by:

Taking student attendance and analysing it to see how they are performing in class.

Using a biometric device to check users logging on to the system to add an extra layer of protection.

Providing data that will be used for purposes beyond than simple data processing. These processed data will be used to aid decision-making, making all managerial tasks more efficient.

Providing the ability to create the necessary academic documents.

Finally, in order to address these concerns, the following steps were taken:

I spoke with a variety of people, including Ahmadu Bello University management and students.

Examined different techniques and systems for gathering and managing student data that would aid us in gaining a thorough understanding of the system's features and functions.

For the department of Computer Science at Kaduna Polytechnic, a year's worth of academic results for ten students every session was simulated.

3. METHODOLOGY

The waterfall methodology of software development was used to complete the layout of this application within the stipulated time limitations and constraints. It is a sequential design method that is frequently used in the software development phase and depicts each step as if it were a waterfall (Tutorials level, 2014). This is due to the fact that each stage and process involved in the development of an application is depicted in detail. All application and user specifications are completed prior to the system design event. Process evaluation methods such as interviews and on-site observation are used to acquire accurate information about the current system in order to detect its flaws. Useful information gathered from the current system was used to meet the proposed system's necessary objectives and aims.

The attendance system would be implemented using HTML, PHP, Zend Server, SQL Yoga, PHP Runner and a biometric device. It has two

stages: the enrolling stage, in which each student's biometric information was collected and saved in the database, and the authentication step, in which each student's biometric information was retrieved and matched to all fingerprint templates.

The integrated web portal for the system was divided into two modules. The initial module was created to manage all operations related to student registration for courses and lectures, as well as to record and store grade scores for students. The second module was created solely to generate authenticated students for use in Kaduna Polytechnic's examination halls. Using a Student Records Management system has various advantages. The utilization of a central database is one of the advantages. This server is at the heart of all system behavior, and it may be readily updated and used to simplify system operations. This way of processing is more efficient than a paper-based filing system. The program has taken into account the possibility of human error in the reporting and filing procedure, which is prevalent in database systems. It also allows for simple repairs of any errors that have been done.

Benefits of the proposed system:

1) Reduced Time Consumption:

Reduce the time it takes to respond to user enquiries and obtain student records for decision-making etc.

2) Reduced Manpower with Paperless Record:

Reduce the amount of people required to complete all record-keeping and administration tasks by minimizing the amount of paper required.

3) Cost reduction:

Reduce the costs associated with student record management.

4) Operational Efficiency:

Improve the quality of the process to increase operational efficiency.

A. Modules of The Proposed System

Only authorized persons are permitted access to certain modules, according to the system's design. Only the administrators would be able to change the records. The application would always be at the control of the user.

Administrator:

A user ID and password are required to access this module. Regular users of the software will not be able to access this section of the program. The module will concentrate on user management, record editing, and record validation and authentication.

1) Lecturer:

A user ID and password are also required to access this module. It is made up of all academic staff members who have access to students' records. Lecturers will be able to post grades as well as add scores, notices, and activities.

Students:

A username and password are required to access this module. Students can access information about their course here, including grades, announcements, and planned events.

There are three modules in this use case: administrator, lecturer, and student. These modules will be covered further down.

B. Administrator Module:

For the Admin, this feature will simply show the function of each entity included in the use case.

1) Admin Login Module

Using the username and password, the administrator is authenticated to access his or her functions in the system. The user is refused access to the system if either the username or password are incorrect.

2) Edit User Details Module

This is where the administrator changes a user's information by updating or removing their records.

3) Upload Courses Module

This is where the administrator uploads all of the available courses for each semester for students to choose from and register for.

C. Lecturer Module:

This feature will simply display the purpose of each entity in the Lecturer use case.

1) Signup Module

To be able to use the system, the professor must first register with the student record management system.

2) Lecturer Login Module

It is here that the professor is authenticated so that he or she can govern his or her functions in the system using the username and password. The lecturer's access to the system will be blocked if either the username or password are incorrect.

3) Attendance Module

This is where the lecturer guides students through the attendance process and uses attendance reports to acquire information about the students and assess their quality.

4) Record Scores Module

This is where the lecturer keeps track of the students' quiz, assignment, midterm, and final exam scores, which can be used to calculate their GPA.

D. Student Module:

This feature will simply display the purpose of each entity in the Student use case.

1) Student Login Module

This is where the student enters his or her username and password to gain access to his or her system features. The student is refused access to the system if either the username or password are incorrect.

2) View Score Module

This is where the student can view his or her test, assignment, and exam results. This will allow pupils to know their score ahead of time.

3) View Announcement Module

Students can view notifications from various professors about the courses they are presenting in this section.

4) Download Materials Module

Students can use this page to download various course resources created by their professors to aid them in their study.

5) Submit Assignment Module

This is where students turn in their assignments to be evaluated and graded by their lecturers and then posted online for other students to see.
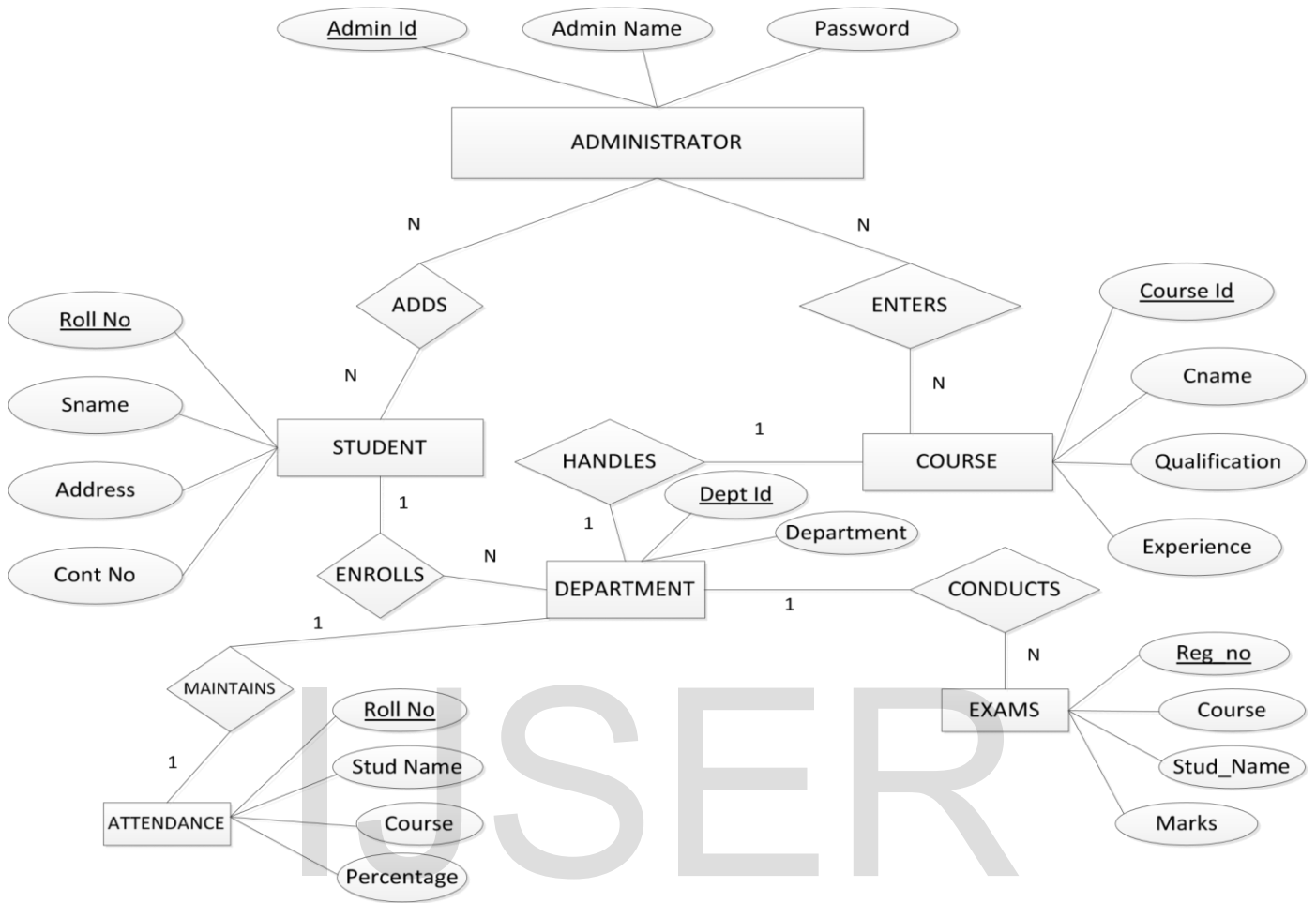
Figure 1: Framework of the proposed system

3) View Announcement Module

This is where students turn in their assignments to be evaluated and graded by their lecturers and then posted online for other students to see.

4) Download Materials Module

Students can use this page to download various course resources created by their professors to aid them in their study.

5) Submit Assignment Module

This is where students turn in their assignments to be evaluated and graded by their lecturers and then posted online for other students to see.

Figure 1. Entity Relationship Diagram for the proposed system

The entity relationship diagram for the System is shown in Figure 1. This diagram is a graphical depiction of the system's entities and their relationships. In this situation, an entity is a concept that describes where data is stored, but a relationship describes how data is shared across entities. Administrator, attendance, tests, department, student, and course are the six entities in this system.

E. Design Tools/Modelling of Proposed

   System

The functions and advantages of the development tools chosen for the proposed system's design are detailed.

1) Web Editor

These allow you to design and alter web pages visually or using html coding. Users who do not know HTML can use a visual editor to create and edit web pages and content (UNIVERSITY, C. S., 2010). Sublime Text Editor was used as the text editor.

2) Hypertext Markup Language

HTML (Hypertext Markup Language) is a markup language that describes how a web page should look. There are numerous Web browsers, each of which interprets HTML codes in different ways. When creating web content, web developers take into account the fact that it may appear differently in different browsers (UNIVERSITY, C. S., 2010). .

3) Cascading Style Sheet

CSS (Cascading Style Sheets (Cascading Style Sheets). It specifies how HTML elements should be displayed and how you want your content to appear. The nonvisual and visual appearance of web objects/documents is specified using CSS rules.

4) Hypertext Preprocessor

PHP is a server-side programming language for web application development. MySQL, Oracle, and other databases are examples of databases supported by PHP.

Why use PHP?

Simply said, when it comes to constructing dynamic websites, PHP is the best, fastest, and easiest to learn programming language (Ullman, L. 2008).

5) Adobe Photoshop:

One of the best picture editors available. It was utilized to design our banners and edit photos in order to give our site a professional appearance.

6) MySQL

The most widely used open-source database system is MySQL. It's a programming language that's used to create web-based applications. It is used to run applications on the server side. Tables are used to store information. A table is made up of rows and columns. MySQL is a fast, dependable, cost-effective, and simple to use database.

7) Apache Server

Since April 1996, Apache has been the most common Web server (HTTP server) on the Internet, and it is widely believed to be more stable than other servers, which is why we use it.

8) Java Script

JavaScript is a scripting language that is supported by the majority of browsers. It contributes to a better user experience on HTML pages. JavaScript is kept as source code that may be included in an HTML page.

F. System Requirements

The system requirement is a document that contains and specifies what the clients desire from a system. It's a technical document that includes extensive descriptions of the system's services. The following are some of the system requirements:

To use the web application, lecturers would need to log in.

Lecturers should be able to see a well-organized summary of students' cumulative grades.

Lecturers would be able to use a biometric gadget to track student attendance.

Lecturers should be allowed to post announcements that students can view and download.

Students and professors should be able to communicate in real time via a chat room or forum. vi. Logging out should be possible for all users.

G. User Requirements

Some of the user requirements for this system are:

The system requires a computer that can connect to the internet.

The system will include a database that will house all of the currently available academic materials.

A biometric authentication device is required by the system.

H. Functional Requirements

Some of the functional requirements for this system are:

It should take attendance of students.

The system should be able to calculate the grades of students and give the grade point average (GPA) as well as the cumulative grade point average (CGPA).

I. Non-Functional Requirements

i. At least 90% of the time, the system will be able to stay up and active. The system maintenance and upgrade would be the cause of any outage or inability to access the system.

ii. The layout of the system will be focused and clear. This would lessen the likelihood of consumers becoming perplexed by the UI. It will only show data that is required for the present task.

iii. The system will have to deal with a lot of data storage and a lot of users using it at the same time.

J. Hardware and Software Requirements

The hardware and software components that are necessary to execute this application are highlighted in this section.

K. Hardware Requirements

- An intranet connection

- Processor 2.5 GHz

- 1014 MB RAM

- A biometric device (Digital Persona)

L. Software Requirements

- Zend Server Enterprise Edition

- PHP Runner Enterprise Edition.

- SDK for Finger Print Scanner

WAMP server Operating system of any kind (Microsoft Windows, Mac OS, Linux)

Java Runtime Environment 1.4 or higher, as well as JavaScript, must be installed in the web browser (Safari, Firefox, Internet Explorer, Google Chrome, and Opera).

4. RESULT AND DISCUSSION

In Kaduna Polytechnic, we developed a portal that integrated students' biometric-based verification mechanism for examinations. This will further sterilize our examination system. Lecturers who utilize this biometric student record management system in the classroom will be able to handle students' records more effectively and save time. Students will benefit from this program as well, as they will be able to view announcements online, view schedules, and take attendance more easily. To that purpose, the system designed will improve the way lecturers keep and maintain students' records, make them more accountable for their data, and assist the institution in more efficiently managing students' overall records.

Fingerprint Biometric Enrolment

Figure 2 depicts the process of registering a student's fingerprint. The data is saved in the database as a template. The enrolment template is then used to match records throughout the verification process. A successful enrolment method is depicted in Figure 3.

Fingerprint Biometric Verification

The templates are used to compare the scanned fingerprints to identify a finger after a successful login using credentials. The result of a fingerprint match is shown in Figure 4. (a failed fingerprint match is indicated by a red arrow, while a successful fingerprint match is indicated by a green arrow.)

After a successful fingerprint verification, a success message appears, along with a link to the Student portal, as illustrated in Fig. 5.

A variety of factors influence the usage of fingerprint biometric authentication. The fingerprint device that is available, the programming language that is chosen, the SDK that is available, and the project budget all have a role in the implementation.
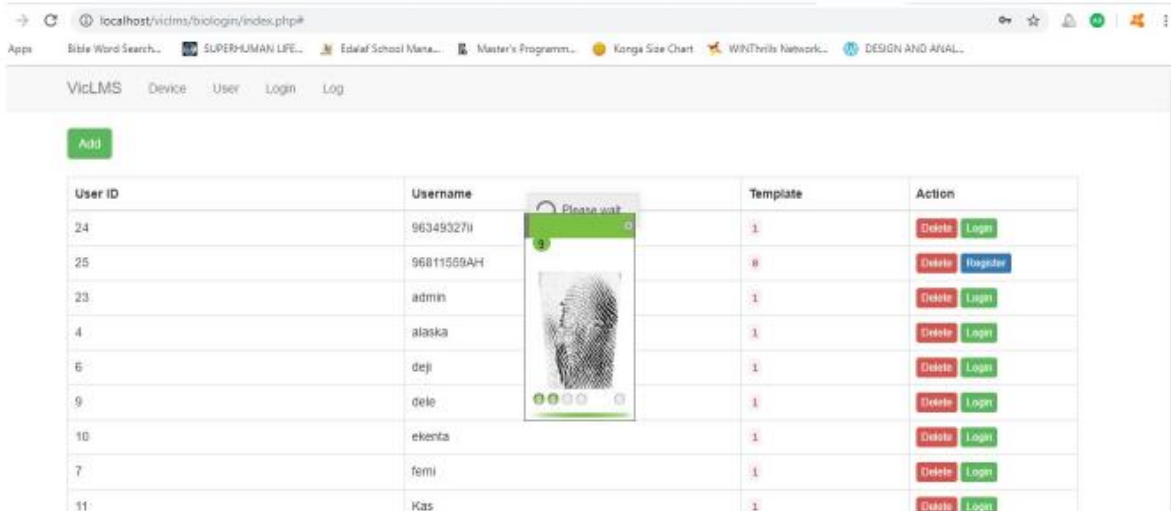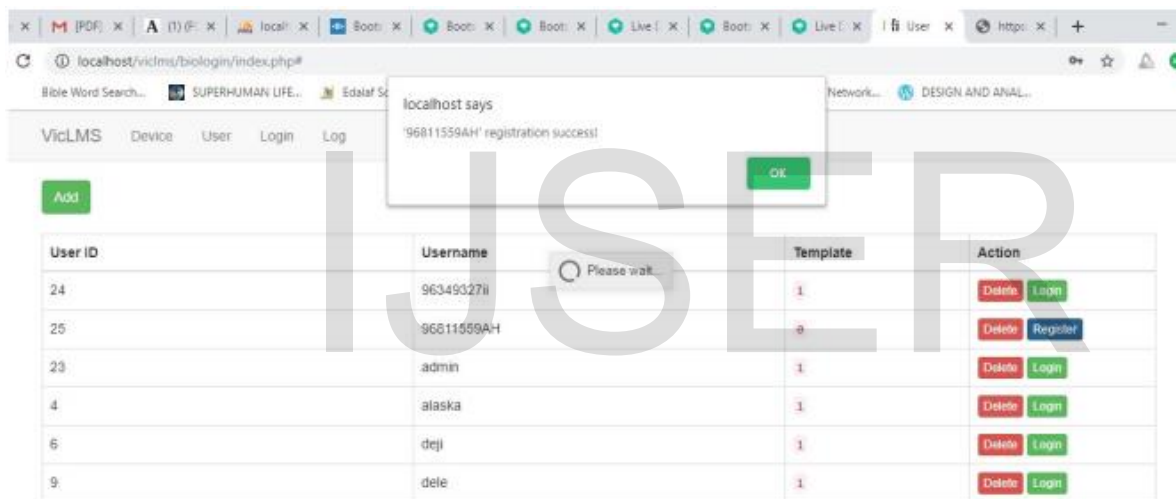
Figure 2: Fingerprint biometric enrolment

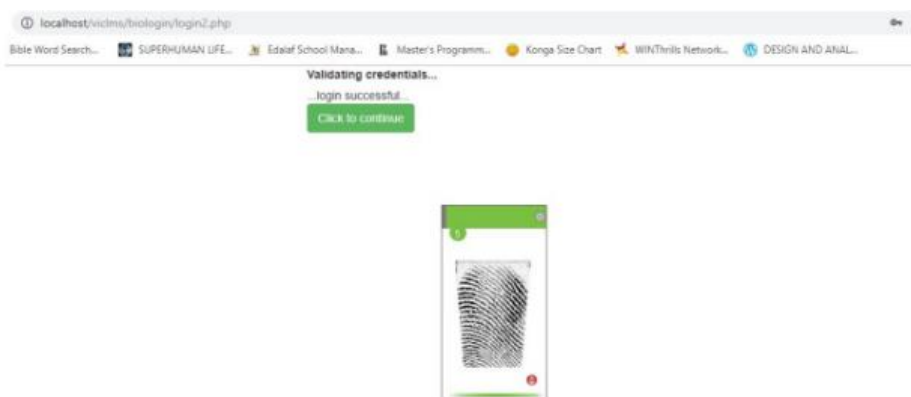
Figure 3: Successful fingerprint enrolment

Figure 4: Fingerprint verification

Figure 5: Success message showing access to the

portal

5. CONCLUSION

The traditional method of validating students' entrance into the examination hall at Kaduna Polytechnic was researched, and it was discovered that the existing method of authenticating examinees may compromise the system's outcomes' acceptance and authenticity. It was suggested that a fingerprint biometric authentication technique be used. The fingerprint biometric authentication system was created using the FlexCode SDK and then implemented on a Digital Persona 4500 fingerprint scanner. The portal integrated biometrics system was created using the PHP programming language, and it was implemented on a local XAMPP server with MySQL as the database system. In Kaduna Polytechnic, the result raised the degree of authentication and access to the portal integrated biometrics.

REFERENCES

1. Adetiba, E., Iortim, O., Olajide, A. & Awoseyin, R. (2013). OBCAMS: An Online Biometrics-based Class Attendance. African Journal of Computing & ICT, Vol 6. No. 3.

2. Añulika, E. A., Bala, E., & Nyap, C. D. (2014). Design and Implementation of Result Processing System for Public Secondary Schools in Nigeria. International Journal of Computer and Information Technology, Volume 03 – Issue 01.

3. Bharamagoudar, S.R, Geeta R.B & Totad,S.G (2013). Web Based Student Information Management System. International Journal of Advanced Research in Computer and Communication Engineering Vol. 2, Issue 6.

4. Gunjan .T, Rahul. R & Shete. A.K (2013). Wireless Fingerprint Based College Attendance System Using ZigBee 5. Technology, International Journal of Engineering and Advanced Technology (IJEAT), Volume 2, Issue 3.

6.Idowu, O. & Shoewu, O. (2012). Development of Attendance Management System using Biometrics. Pacific Journal of Science and Technology, 13(1):300-307.

7. Karthik.V.E, Shanmuganathan.S & Sumithra. A. (2013). A Foolproof Biometric Attendance Management System. International Journal of Information and Computation Technology. Volume 3, Number 5 (2013), pp. 433-438

8. Njamu O & Ugwu C. (2013). A Novel Web-Based Student Academic Record Information

System. West African Journal of industrial and Academic Research. Vol 7, No 1 pp 31- 45.

9. Parvathi.A. (2005). Security of Biometric Authentication Systems. 21st Computer Science Seminar. pp1-7.

10. Samson.A.A & Adekunbi.A.A. (2013). Design of a Prototype Web-Based Students' Record Management System – WEBSTREMS. Information and Knowledge Management. Vol.3, No.5

11. Satoa, K. & Seema, R. (2013). An Attendance Monitoring System Using Biometrics Authentication. Internatioal Journal of Information and Computation Technology, Volume 3, Issue 4.

12. Tutorials point. (2014). sdlc_waterfall_model.htm. Retrieved from tutorialspoint.com
13.http://www.tutorialspoint.com/sdlc/sdlc_wa terfall_m odel.htm.

14. U.S. Department of Education, N. C. (2000). Building an Automated Student Record System. Washington, DC 20006: U.S. Department of Education.

15. UNIVERSITY, C. S. (2010). Web design An Introduction. 1,2. w3c. (n.d.). Retrieved from www.w3cschools.com.