World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(REVIEW ARTICLE)

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Web-based statement of result verification system for Federal Polytechnic,

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World Journal of Advanced Research and Reviews, 2022, 15(03), 386–393

Publication history: Received on 16 August 2022; revised on 21 September 2022; accepted on 23 September 2022

Article DOI: https://doi.org/10.30574/wjarr.2022.15.3.0937

Abstract

Over the years there has been a continuous request by Organizations Academic Institutions, Recruiters and Employers to verify graduated students' statements of results from Federal Polytechnic, Mubi. This occurs as a result of the delay in issuance of Certificates which are expected to be ready after three years of Student graduation as it is obtainable by other Institutions in the country. This issue is causing Organizations, Institutions and the Polytechnic time and resources over the years. This paper aims to design an online result verification system that will provide easy, fast and real-time verification of student Statements of the result. This system of verifying students' results will reduce the level of result forgery, ease the stress on the Polytechnic and reduce verification time which is done by physical document verification. The current system requires an employer or anybody concerned to send a representative to the Exams and Record Unit of the Polytechnic to verify a particular statement of result which takes a long time and is not cost-effective. This paper designed and implemented a proposed Web Base Statement of Result Verification System using Hypertext Markup Language (HTML), Cascading Style Sheets (CSS), JavaScript, Hypertext Preprocessor (PHP), MySQL Database and Windows, Apache, MySQL, and PHP (WAMP) Server. Unified Modeling Language (UML) Diagrams and System Architecture were designed for the proposed system. The proposed system was designed to process student results with an embedded Quick Response (QR) code and a Result Verification Code (RVC) which will help organizations to verify students' statements of results in real-time. This system could be integrated into an already existing institution's official portal.

Keywords: MySQL Database; Result Verification Code (RVC); Quick Response (QR) Code; Authenticate; Portal

1. Introduction

One of the primary issues facing academic institutions and employers of labour has been traditional-based credential verification [1]. Despite the increase in the growth and use of the internet in this era, there is continuous use of traditional paper verification methods by institutions and organizations to verify and authenticate the result provided to them. Most of these organizations cannot instantly verify and confirm the authenticity of the result presented to them [2]. The major problem with the traditional paper base is that recruiters and employers find it difficult in knowing the validity of documents such as academic certificates presented to them because there is no way they can authenticate those documents instantly [3]. In the current scenario, most of these organizations do not have the technology to instantly authenticate the documents presented from the Polytechnic. Paper certificates are still extensively used, mostly because they are seen to be more secure than digital certificates [4]. Some Institutions develop and maintain student credentials using a computerized system that allows the school to make certificates for students, print certificates, and most significantly, verify a certificate for any student [5]. With this computerized system, there will be no hassle and stress to verify any results or certificates. If the user is registered, the user can create and maintain all the

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students' certificates. All these modules will help the institution to manage all the student certificates more efficiently and conveniently. It will also help in the verification of student certificates in an easy and stress-free way [5].

This paper adopts a real-time online verification system that will save the challenges of the manual verification method of students' results from the Federal Polytechnic, Mubi. This will enable organizations and employers to verify students' results from the institution online without having to come down to the institution to do so. All that is required of the employer is to use either the student Registration Number, Result Verification Code (RVC) on the result, and or Quick Response (QR) Code on the result to verify the result using a QR code scanner. The scanner can read the QR code on the statement of result to obtain information on the statement of result that will be displayed on the screen.

Verification of statement of result before the collection of certificates by graduated students of Federal Polytechnic, Mubi is a major concern in Organizations, Academic Institutions, Recruiters and Employers due to the delay of issuance of certificates after graduation. Employers have been experiencing a high alarming rate of fake results. This is a result of the production of fake statements of results by expected graduates from business centres and the printing press[3]. Presently there is no means of verifying or authenticating statements of the result by organizations and other institutions except by coming or writing to the Institution to confirm the results in question[3]. The signature and stamp on most fake results are forged exactly like that of the original. In most cases, it is very difficult to determine the authenticity of a result by the Exams and Record Unit of the Polytechnic Registry. These processes of verifying questionable results take a lot of processes which sometimes require the Exams and Record Unit to extend it to the respective student's department to determine the details from student files and results. Furthermore, there is difficulty and delay in the traditional paper-based verification method currently deployed by the Institution which normally takes days also contributes to the continued production of fake results. These challenges have posed difficulty in knowing the validity of such academic results presented to Organizations and Institutions because there is no way they can authenticate them instantly. It is important to note that the present modern technology and the rise of the internet have undoubtedly contributed to the widespread trend of educational fraud and fake results with accuracy and convenience.

The paper aims to design and implement a statement of results with an embedded QR code for easy verification of graduated students' results from the Federal Polytechnic, Mubi. However, the specific objectives are to resolve the issue of manual verification of results which normally takes time and costs money if representatives are used to send it back to the Polytechnic for physical verification. Furthermore to enable organization, academic institutions, recruiters and employers to automatically verify students result's on the Polytechnic portal using the registration number on the result, Result Verification Code (RVC) or through the use the QR code reader on mobile devices or any device to verify the result.

2. Literature Review

2.1 Overview of Certificate Verification

Singhal [6] States that a student who completed all of the degree's studies received a degree certificate from the institution. The University degree certificate is extremely important in a person's life, but the creation and circulation of false certificates are inexpensive due to the availability of advanced printing and copying technologies, which make a paper document easily falsified. Hence, there is a need for the adoption of a process that can verify and assure the authenticity of a document. To prevent the spread of false degree certificates, a system is presented in which the integrity of the certificate's contents may be confirmed using a QR code and a smartphone application [6]. A QR code will be placed over the student's results which will contain the result serial number, student full name, registration number, course of study, class of graduation, date of approval of the result by the Academic Board of the Institution and signatory of the registrar of the institution. Validation of student's result will require the use of a student registration number and or smart phone application that will scan the QR Code and authenticate the result.

Nowadays, a document such as a degree certificate can be easily faked, either entirely or partially, by altering the achieved score result, such as the GPA (Grade Point Average). Digital signatures are used to prevent unwanted data change and to verify the signatory's identity. The QR code was created for data storage and readability at a rapid pace [7]. Their study offered a system in which a QR code has a digital signature containing student data such as the degree holder's name, major program, GPA earned, and more, which is signed by a Higher Educational Institute (HEI). To use this system, all HEI must first register with the central system, which will then give another system for each HEI to deploy. The entire process of generating digitally signed certificates is done offline. Ahmed & Jang [7] designed a specific smartphone application to check the digital signature signed with a QR code, which will scan and authenticate the certificate without requiring the user to contact the certificate issuing organization or getting access to the user's security credentials

Obilikwu, Usman & Kwaghtyo [3] States that Certificate fraud in the issuance of academic documents such as degree certificates is common. This situation has persisted because obtaining a fraud certificate is simple and inexpensive. It has become a global issue, and the procedure of validating certificates is time-consuming. This form of deception not only jeopardizes an institute's reputation but also makes it difficult for employers to trust the issuer and graduates. Anti-certificate counterfeit is a crucial solution to defend the legitimacy and prestige of an institution, especially as more individuals graduate and certificates become more relevant. Yahya et al. [8] Present a mobile app solution for securing issued certificates that are supported by secure web services for any high institution or organization. The system will look for a student's information in the database. According to [9] a certificate is a vital document whose authenticity must be established. To verify that this document is legitimate, fraud concerning its originality necessitates a high level of protection. The Digital Certificate Legalization system (DCL) may govern and ensure the document validity procedure's mechanism. The information contained in the photo scan of the certificate can be authenticated using the Advanced Encryption Standard (AES) and QR Code algorithms. The scan findings are encrypted using the legalized code in the AES Algorithm for verification purposes. The code will be matched to the data in the server system using the QR Code. The system will determine whether or not the certificate is authentic. Black box testing is used to validate the system's functioning and capacity testing in terms of execution time and memory load is used to assess system performance. Finally, user response testing is carried out to see how well the system is received by the users. As a consequence, the use of AES and the QR Code algorithm in an authorized certification checking system gives a good performance, efficiency, lightness, and quick execution replies which are less than one second and less than one megabyte [9].

Yanti, Aidil, Surya, Akhyar & Ambarwati [9] stated that the greatest instrument for authenticating any document with embedded QR codes is a smartphone scanner, which can be used anytime and anywhere. This smartphone scanner will make encoding the resulting code more straightforward. The goal of their study is to improve the quality of authentication time, which may now be performed anywhere and at any time without regard to location or connectivity. Smart card technology, on the other hand, has not been widely adopted, particularly in developing nations like Nigeria, due to a lack of information technology innovation. They propose a real-time student identity card authentication system using an Android phone's built-in camera scanner as a solution. The devised method takes a matriculation number, which is unique to each student, as input and uses a QR generator to encrypt it into a two-dimensional bar code. The QR code is then incorporated into the identity card together with other cardholder information, resulting in a dynamic authentication output. On the smartphone, there is a QR scanner software program pre-installed. This enables the authentication procedure to be reversed to reconcile the decrypted code with the student matriculation number. The experiment's findings show that the smartphone scanner is both effective and quick.

One of the most crucial documents for a graduate is the certificate granted by educational institutions. It serves as proof of the graduate's credentials and can be utilized in any setting. False certificates can now be easily made because of the developments in printing and photocopying technology, and the quality of a fake certificate can now be as good as the real. Many institutions' certificates have been faked, and the forgeries are difficult to detect [3]. Furthermore, a variety of reasons have resulted in decreased operational efficiency in student services at several universities. The verification process for educational credentials and related papers is one of the most important components [1]. Certificate verification is required to guarantee that the certificate holder is genuine and that the certificate originates from a legitimate source. The verification of certifications, on the other hand, is a difficult task for the verifier (the prospective employer who wants to verify the certificate). To address this problem, a Certificate Verification System for Institutions (CVSI) is developed, which employs a Top-Down Design method and an iterative model [3].

Emmanuel, Adedoyin, Mukaila & Roseline [10] States that there are changes to the data on the Universitas Airlangga system, students often find it difficult to verify the mark that came out in the Kartu Hasil Studi (KHS) is called Study Result Card or courses taken in the Kartu Rencana Studi (KRS) is called Study Plan Card. This convoluted KRS and KHS verification process arose because student-owned KRS and KHS documents are easier to forge than data stored in the system. The Implementation of digital signature and QR Code technology was developed as a solution for proving KRS or KHS legitimacy. Digital Signature and QR Code established the KRS and KHS validation mechanism. The QR Code is a form of matrix code that was created to allow its contents to be deciphered quickly, whilst the Digital Signature serves as a marking on the data to confirm that it is the original data. Reading the Digital Signature and printing the document that works by scanning the data from the QR Code where the two sorts of verification processes. The system's application was carried out with the addition of the QR Code on KRS and KHS, which necessitated readiness.

2.2 Overview of Certificate Verification Methods

The increase in document forgery by fraudulent individuals has brought about a dire need to develop methods that protect the integrity of documents, both hardcopy and softcopy documents. This is achieved through developing

preventive, detection and mechanisms tools that provide security to the information contained in a document. Some of the most prominent integrity mechanisms include Steganography; which is the art of encoding information within other information, Watermarking, Digital signatures, Printer and Scanner Identification Tools [11].

2.3 Types of Certificate Verification

There are two main methods for verifying a certificate's authenticity [5].

2.3.1 Manual Verification

This is a sort of verification in which an organization or Institution that wishes to verify a certificate writes a letter or sent delegates to the institution requesting verification of the result and waits for a response. This method in most cases is time expensive, and the response usually takes a long time. It is the most common form of verification in use by many institutions currently and is causing a lot of time and challenges to Organizations, Academic Institutions, Recruiters and Employers in this digital era.

2.3.2 Web-Based Certificate Verification

This form of verification is done through an Institution's website by requesting organizations and or institutions. This form of verification is faster and more cost-effective. Only a few institutions adopted and deploy this method to fulfil the demands posed by the massive increment in student numbers. There is a need to create an environment that can handle such advancements in the educational sector. The introduction of a web-based certificate verification process would be an important contribution to creating a conducive educational environment for institutions.

3. System Analysis and Design

PHP, HTML, CSS, MySQL Database, *WAMP Server* and JavaScript were chosen in designing and implementation of this System. Hypertext Pre-processor is a widely used general-purpose scripting language that was originally designed for web development to produce dynamic Web page. CSS was used for beautifying the interface of the web pages and MYSQL Database for data storage. For this purpose, PHP codes is embedded into the HTML source document and interpreted by a web server with PHP processor module, which generates the web page document. JavaScript was used in authenticating the client side of this application. JavaScript is appropriate to implementing this system because it is a powerful debugging facility that provides useful hints and suggestions for error handling.

3.1 System Design

3.1.1 UML Diagram

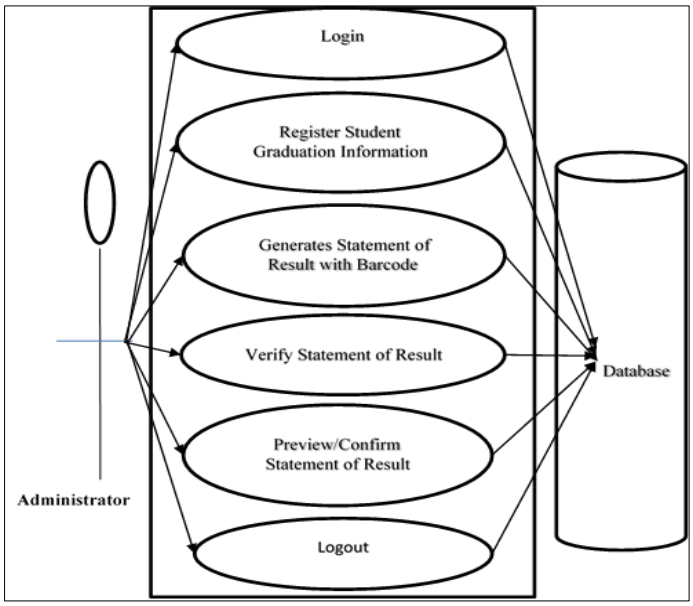

Figure 1 Use Case Diagram

3.1.2 System Architecture

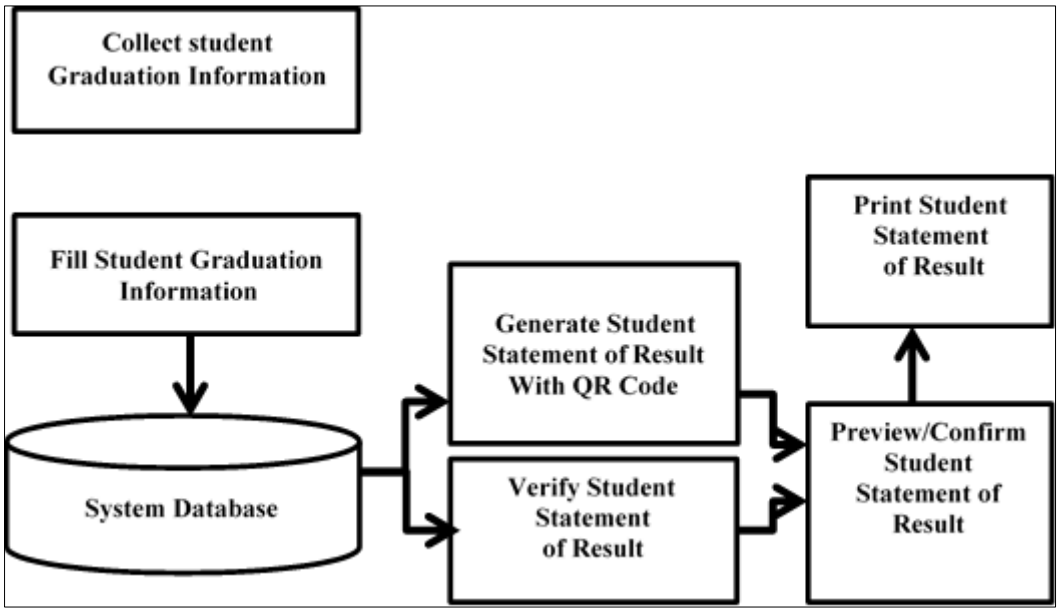

Figure 2 System Architecture

4. Results and Discussion

The achievement made in the proposed Web Base Statement of Result Verification System for Federal Polytechnic, Mubi is the inclusion of the QR code on each student Statement of result and an online verification of the authenticity of the result. The inclusion of the QR code will provide a three-way method of student result verification. The student Registration Number and Result Verification Code (RVC) on the statement of result can be confirmed on the Verify Result tab of the portal. The other method is through the QR code on the result. QR code reader can be used for instant verification and authentication of the Statement of result using QR code reader.

4.1 Interface of Staff Login Page

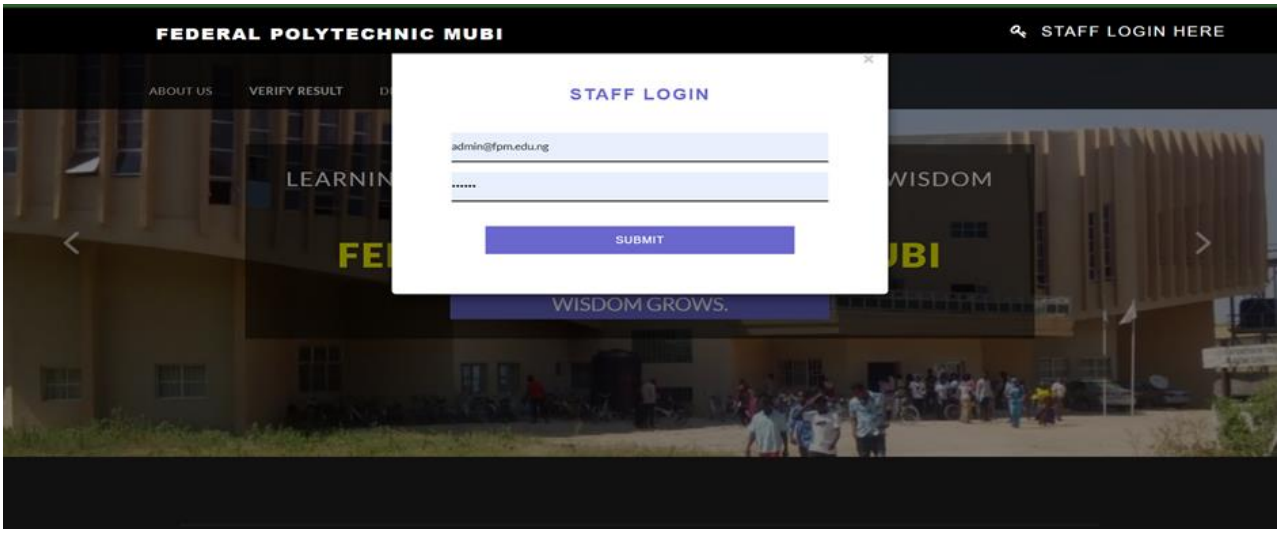

Figure 3 Staff Login Page

Figure 3 above is the Staff login interface. The above interface is where the Staff/Administrator of the Institution will log in to process the student's statement of a result after the academic board has approved the graduating results. Only authorized members of staff will be able to get access to this page.

4.2 Add Student Record Interface

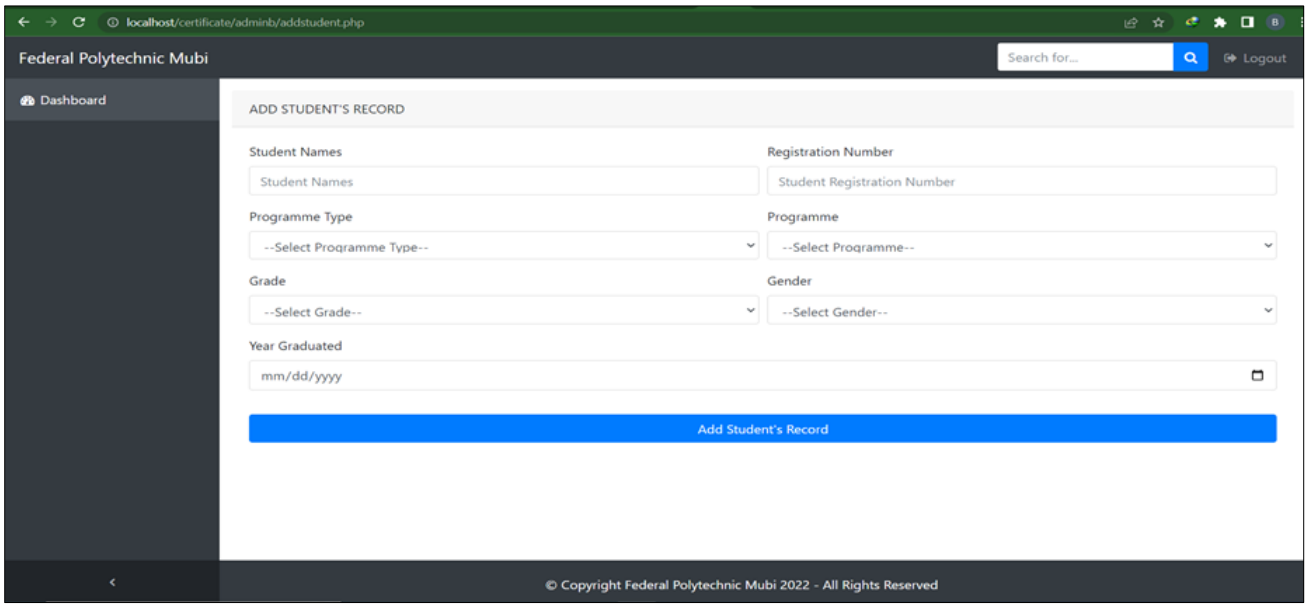

Figure 4 Add Statement of Result Page

Figure 4 above is the Add statement of the result page. This is the page that displays how student information can be inserted into the database for processing student statements of results with an embedded QR code for easy verification of the graduated student result.

4.3 Statement of Result Report Page

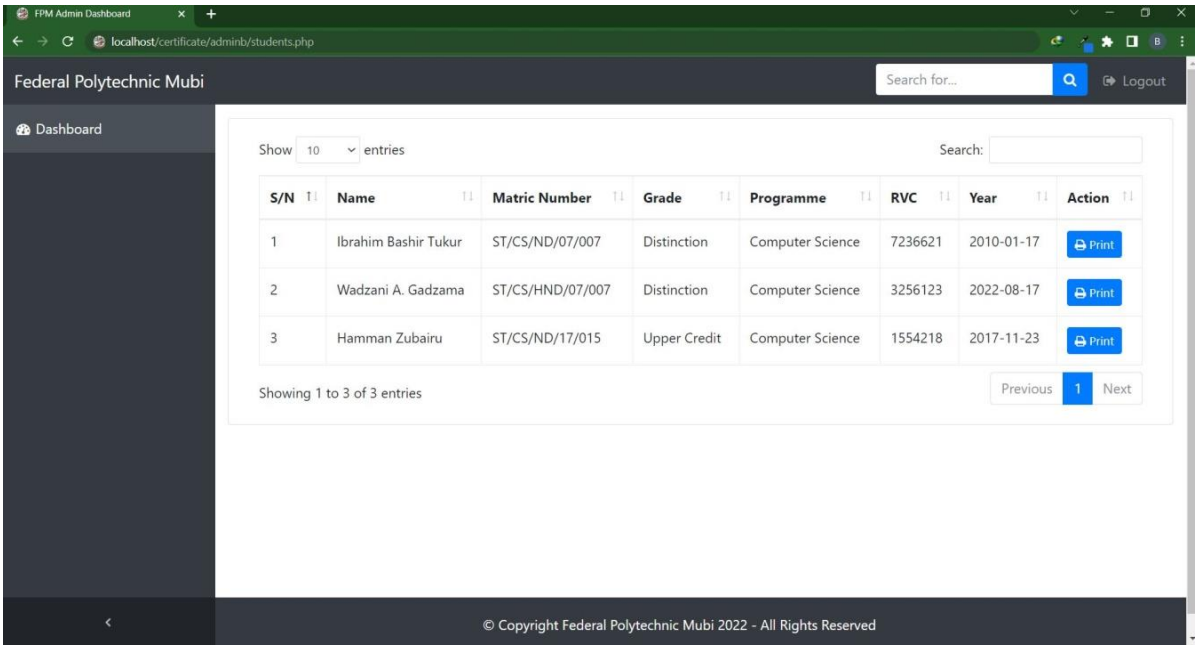

Figure 5 Statement of Result Report Page

Figure 5 above shows the statement of the result report page. The page displays the student record that has been inputted into the system by the staff. It shows the student detailed information which also gives an assurance that the student record is stored on the system. The admin verified the student information before printing of the result.

4.4 Verification Page Interface

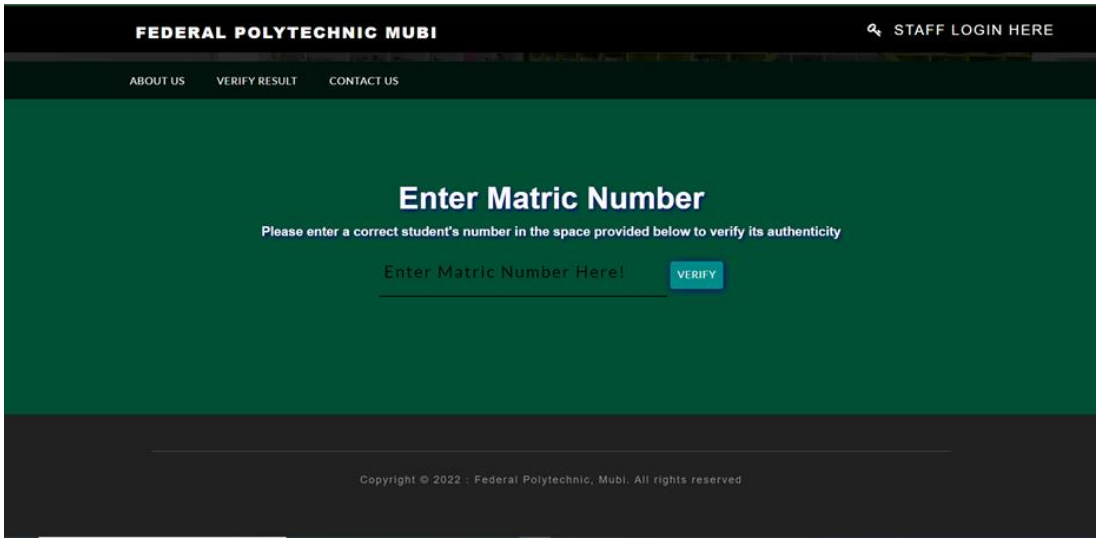

Figure 6 Statement of Result Verification Page

Figure 6 above shows a statement of result verification page where Organizations, Academic Institutions, Recruiters and Employers can use either the student registration number or the result verification code on the statement of the result of the student by inserting it under the Verify Result tab of the Portal for Confirmation. This can be done by entering the student registration number/Result Verification Code in the text box provided under the respective tabs and clicking the button verify at the top left corner of the web page. Verification can also be made using a QR codes reader to scan the QR Code on the result on the computer screen or the hard copy of the result.

4.5 Verification Statement of Result Page Interface

Figure 7 Verified Statement of Result Page

Figure 7 above displays the proposed sample of student statement of result page with Result Verification Code (RVC) number and embedded QR Code which contains students name and registration number. The above figure will only be

displayed if either the registration number or Result Verification Code (RVC) number is entered correctly by individuals, Organizations and Institutions. It will also be displayed if a QR codes reader is used.

5. Conclusion

Online Statement of result verification for higher institution is among the most important explosion propelled by the internet transformation. This allows employers to ascertain the authenticity of results and certificates presented to them in more faster and easier means which also relief them of the expenses that they would have acquired to verify a particular student result. Finally, the objectives of the research on the Design and Implementation on an Enhanced Web Base Statement of Result Verification System for Federal Polytechnic, Mubi, Adamawa State, were successfully.

Compliance with ethical standards

Acknowledgments

The authors acknowledged the efforts of the staff of Exams and Record unit of the Federal Polytechnic Mubi for supplying the data required for this research.

Disclosure of conflict of interest

The authors declare that there is no conflict of interest as regards this paper.

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