Development of a Biometric Capturing System for Preventing Impersonation in Examinations in Tertiary Institutions in Akwa Ibom State

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Abstract

The focus of this work was to develop a biometric capture system for the enrollment, and verification of the candidates into the examination hall. The study comprised two stages: the fabrication of the biometric device and the development of the biometric application software to drive the fabricated biometric device. The list of software components comprised the Windows Operating System, MySQL, a database for storing captured data concerning the students, PHP programming Language, and so on for the development of software applications used in driving the fabricated biometric capturing system. The population of the study comprises all the one hundred and twenty (120) academic staff and eight hundred and ninety-six (896) students of 200 level from the Vocational Education, Library and Information Science, University of Uyo, Uyo, Akwa Ibom State. The sample size was 908, made up of 12 academic staff of vocational education, library and (896) students of 200 level of Information Science, eight hundred and ninety-six based on ICT proficiency. A 15-item questionnaire titled "Perception Reliability Indices of the designed Biometric System Test Questionnaire "(PRBSTQ) was used. The instrument was validated by three experts in the Faculty of Education, University of Uyo and the reliability of the two instruments was established using perception reliability and descriptive statistic respectively. The perception reliability indices were analysed using mean and standard deviation. Items with a mean score of 3.50 and above were considered agreeable, while those with a mean value of less than 3.49 were rejected based on the rating of items on the decision rule. Findings reveal that the development of a Biometric capturing system for the prevention of examination impersonation was reliable. As such the perception reliability indices of the development of the biometric capturing system for prevention should be highly considered during examination checking. Findings also showed that lecturers' and experts' responses towards using the developed biometric capturing system to prevent examination impersonation were strongly agreed and agreed, as determined by the responses provided by respondents to the Perception Reliability Indices of the designed Biometric System Test Questionnaire (PBSRTQ). It was suggested, based on the findings, that this biometric technology be adopted by universities and other educational system stakeholders in Nigeria to check for impersonation during exams. To accomplish this, the university should look for a biometric capture system with a strong user interface for enrollment and examination candidate verification.

Keywords: software development, biometric, enrollment, verification, software reliability

Introduction

The term 'biometric' is defined from two Greek words: 'bio' meaning life, and 'metric' meaning measurement. Biometrics is the "automated recognition of individuals based on their physiological and behavioural characteristics," according to the International Standards Organisation (ISO). Based on physical and behavioural traits, every human can be uniquely identified. Fingerprints, faces, hand geometry, palm print, heartbeat, finger veins, gait signature, palates, DNA recognition, iris, facial expression, body language, and voice are among the several biometric indicators used for personal identification. In order to recognise fingerprints, photographs of the fingerprints must be taken and kept in a database (Yang and Verbauwhede, 2020).

A sort of body-based security known as biometric technology verifies a person's identity based on bodily traits such as voice patterns, iris patterns, and facial structure, security is the main priority. In today's highly competitive world, security is of the utmost importance. The most important step in biometrics-based security systems designed to recognise and establish an individual's identification based on his or her physical or behavioural features is accurately identifying the person. For authentication, verification, and identity purposes, biometrics technologies measure and analyse aspects of the living human body. Biometric identification can be created using any aspect of human physiology, chemistry, or behaviour. However, according to Kumar and Wu (2016), a biometric identifier needs to have properties like universality, uniqueness, permanence, measurability, performance, stability, collectability, acceptability, and circumvention.

In order to test consistent biometric data, biometric verification systems first gather and store a copy of each person's distinctive traits in a database. It can then be tested in the future for verification purposes, according to Kumar and Wu (2016). Over the years, several biometric features have been researched, tested, and successfully implemented in applications such as information security, law enforcement, surveillance, forensics, smart cards, access control, time/place control points, and computer networks. Biometric-based identification systems have been widely used in many security applications. A wonderful technology that is less expensive, quicker, and more accurate is biometrics rating.

A biometric device, according to Hossain and Chetty (2018), is made up of three main parts: a reader or scanning device, technology to transform and compare the biometric data that is acquired, and a database for storage. A sensor is a tool used to measure and record biometric information. Many times, technologies like fingerprint readers, speech analyzers, or retina scanners gather data that is compared to the recorded data to determine whether a match exists. The biometric data is processed by the program, which then compares it to data points that match it. The majority of biometric information is kept in a database connected to a single, all-inclusive server. Physical data-based techniques are gaining attention as a personal authentication method that is more practical than traditional methods like a password or ID card because it uses data taken from measurements and such data is unique to individuals and remains so throughout one's lifetime. Therefore, fingerprint becomes the most mature and popular biometrics technology used in automatic personal identification.

The reason for the popularity of fingerprint verification is that fingerprints satisfy uniqueness, stability, and permanency and easily taking (Chandra, 2018).

Biometric-based identification can be applied in universities for screening before, during and after an examination. An Examination could be seen as one of the most objective techniques used in the measurement of learning outcomes at all levels of education in Nigeria and the world over. An Examination may be administered orally, on paper, on a computer, or in a confined area that requires an examinee to physically perform a set of skills. However, despite the importance of examination in teaching and learning situations, several factors affect the credibility of examination scores. One such practice that may affect the reliability of examination scores is examination malpractice through impersonation. Examination malpractice is any illegal act committed by a student or in collaboration with others; like fellow students, parents, teachers, supervisors, invigilators, printers, and anybody or group of people before, during, or after an examination to obtain undeserved marks or grades (Farzad, 2021).

One of the most disturbing types of examination malpractice is impersonation. This involves students working together, possibly with academic staff, to sneak an unregistered, but brilliant student into taking exams in place of a registered student. The impact on the entire educational system and society as a whole is disastrous. The widespread frequency of examination impersonation in recent years has raised concerns within the worldwide education system, and the academic community views it as posing an even greater risk (Nwadiani, 2022). Despite the widespread advancement and adoption of information technology in all facets of human endeavours, the current system requires students to be manually verified and admitted into the examination hall through the presentation of their examination cards. This makes the process incredibly burdensome, time-consuming, and fraudulent. Additionally, some institutions partially verify students as they take their exams; nevertheless, this could eventually lead to impersonation, a kind of examination malpractice, which would lower the bar for education.

Design is an activity that involves the pursuit of design solutions often needing to reframe or redefine the initial design problems that have been presented, before beginning the project's development phases, the product's design must be carefully evaluated. Making interfaces simple to use and visually appealing is known as user interface (UI) design (Candela, 2018).

However, user experience (UX) design is concerned with making a product that offers its users a valuable and pertinent experience. Design representation is an increasingly important factor in both design communication and design thinking. With the development and widespread adoption of computational modelling, digital design representations now dominate most design processes, assisting designers to "off-load" their cognitive load and also to offer the increased flexibility of interacting with external/virtual representations. Designers typically focus on visual stimuli and look for visual references when designing a product; therefore, they tend to apply such stimuli when designing solutions, particularly during conceptualization. Designers and other stakeholders including managers and engineers

communicate and interpret design intentions via design representations differently (Chen *et al*, 2022).

Developing new equipment and the latest technologies compete for designing, developing, testing, and supervising the manufacturing of electrical equipment. This equipment can include the likes of Robotics, Artificial Intelligence and machine learning, transforming engineering., communications systems, and electric motors (Banderet and Lieberman, 2018). Software development is the process of conceiving, specifying, designing, programming, documenting, testing, and bug-fixing involved in creating and maintaining applications, frameworks, or other software components. The development of design theories and methodologies for increasing understanding of designers' cognitive behaviour is crucial. Traditionally, the most dominant method used in design studies is protocol analysis; however, that method is susceptible to more subjective factors and usually relies upon designers' externalisations of their design intention, which makes the results difficult to validate (Bryman, 2021).

Software reliability examines how well a piece of software will perform under specific environmental conditions over a predetermined period. Numerous issues with the functionality and design of the software are found thanks to software reliability testing. Finding all factors that are important for a program's proper operation and testing every combination of those factors is the key to reliability testing. If the test data produce the anticipated results, the reliability is said to be valid; however, if the test data does not produce the anticipated results, the reliability is said to be invalid. If the test data selection criteria are not satisfied. The tester must first establish the reliability goals before starting the test. This involves preparing the test environment, collecting data, creating test schedules, and selecting test points (Thapar *et al*, 2021).

When all integration tests in which all modules are tested together are completed, the reliability test is finished. Since estimating the number of decisions from software specifications is simpler than estimating the number of lines of code. Software testing's main goal is to find program faults and, if none are found, to establish the program's correctness. Testing plays a significant role in the overall software development process, even if it cannot replace process improvement. The management of the testing process is a big part of what makes software testing challenging. Functional and coverage testing are both necessary for thorough testing. By using the features outlined in the specification, functional testing aims to ensure that a program's requirements are met. Program constructs that have not been used throughout testing are identified via coverage testing. It provides a gauge of test thoroughness and aids the tester in developing a comprehensive set of tests (Joseph and Lynette, 2018). It is common practice to describe performance in biometric testing in terms of the "reliability of the biometric system," which refers to the biometric system's consistency in terms of throughput, metrics of "failure to enroll," "failure to acquire," and throughput rates on independent variables. In the design and development of biometric systems, testing and assessment play a crucial role.

Statement of the Problem

Despite the National Policy on Education's emphasis on exams, examination malpractice has continued to be a serious concern for education professionals. It appears that examination fraud has not been adequately tackled in universities in Nigeria. Examination malpractice has a variety of detrimental effects. The Ministry of Education, Science, and Technology as well as the Nigeria Universities Commission (NUC) have made attempts to stop students from impersonating other people during exams, although the practice persists. The majority of the time, a student who is registered to write the exams is replaced by an examination candidate or a person who is not registered as a candidate for a certain course. While some students report the loss of the identity cards at the point of checking into the examination hall, the candidate is still permitted to sit for exams even without an identity card having a face on it. Sometimes students pretend to have lost their identity cards that have their faces on them so that issues of an identity card without a face on them can be maneuvered. When this occurs, the real applicant arranges for someone to take the exams in his or her place. It has been noted that cultists and hoodlums have found it easier thanks to the physical way of examination screening. Nothing significant has been done to address the issues of examination malpractice (Situma and Wasike, 2020).

Examination impersonation is one of the issues that most Nigerian universities face. Students can take exams by presenting identification such as ID cards, library cards, fee waiver cards, photo cards, and so on as part of the manual authentication and verification process that is currently in place. The presentation of fake clearance and identification cards is just one of the obvious issues with this way of authenticating a student for entry to the exam rooms. Due to the test's unethical practices and the basic flaws in the manual paperbased clearing process, academic stakeholders must look for other methods of authenticating students for examination. Therefore, the goal of this study is to develop a biometric capturing system for preventing impersonation in examinations in tertiary institutions in Akwa Ibom State while taking into account other intervening variables like the biometric capturing system's perception reliability and the academic staff's perception towards its implementation.

Purpose of the Study

The purpose of this study was to develop a biometric capturing system for preventing impersonation in examinations in tertiary institutions in Akwa Ibom State.

Specifically, the study sought to:

- i. To design a biometric capturing system for the prevention of examination impersonation in tertiary institution in Akwa Ibom State.
- ii. Determine the perception reliability indices of the designed biometric capturing system for the prevention of examination impersonation in tertiary Institution in Akwa Ibom State.

Research Questions

The following research questions are raised to guide the study:

- i. To design a biometric capturing system for the prevention of examination impersonation in tertiary institution in Akwa Ibom State?
- ii. What are the perception reliability indices of the designed biometric capturing system for the prevention of examination impersonation in tertiary institution in Akwa Ibom State?

Research Methodology:

Design of the Study:

The design of the study is from two perspectives, a software design and a descriptive survey design.

Software design

The study adopted an iterative waterfall design model was used to identify the biometric application software that was developed to serve as an interface between the server and the biometric fingerprint system as shown in figure below:



Figure 1: The iterative waterfall model of software at Bell Laboratory is proposed in a series of short Plan-to-Study-Act (PDSA), cycles for quality improvement. Software development is broken down into large numbers of iterations, where each iteration is a complete development loop resulting in a release of executable software and it allows for improvement and changes to be made at each stage of the development process.

The descriptive survey design method was also used to ascertain the fabrication of the biometric capturing device designed to help uncover the how, when, what, and where questions in a research problem. Descriptive statistics helps to find an explanation for the existence of a phenomenon. The research project was segmented into hardware and software units. The hardware unit includes the fabricated biometric capturing system, while the software tools include the biometric software application that was developed to link and create interface between the biometric hardware and the students during enrollment and verification process.

The hardware unit, which is the biometric components, was further broken down into sub-components such as the fingerprint scanner module and Arduino Uno Microcontroller (ESP8266 WIFI) module, while the software unit was further broken down into server-side

Application Programming Interface (API) and the client-side Application Programming Interface (API), which were link to other integrated software like Apache, PHP, PhpMySql as the middleware. The Arduino Uno Microcontroller also served as a driver for the fabricated fingerprint device, while the operating system in the computer system served as the driver for the digital camera, which was used to capture the student's passport during enrollment. Middleware application act as an adapter between two applications XAMPP and Visual Studio 2010. The program was coded in PHP, a script programming language. In terms of the operation stages of the bimodal biometric-based system, it can be viewed from the user's context or the developer's perspective.

The two operation stages were viewed in two perspectives, the user's and developer's perspectives. The user's perspective was in two operation stages which were the enrolment stage and authentication stage. In the enrolment stage, all the students in the 200 level 2022/2023 academic session of the University of Uyo, Faculty of Vocational Education biometric characteristics were captured and labeled with their names, passports, or registration numbers. Generally, the iris or face images were acquired using cameras either a webcam on the laptop or an external webcam, department, courses, name, email, and fingerprint were obtained through a fabricated biometric scanner by the researcher assistant. At the beginning of a semester, the students were required to register their biometric traits during the enrolment stage. These biometric data were stored in the database and served as a templates for the authentication stage. Next was the authentication stage which involved matching captured biometric data with those templates in the database. During an examination, the students' biometric characteristics are captured once again with either the awareness or the ignorance of students. For the iris, voice, and fingerprint, students are aware because they need to be in contact with the devices to capture their biometric traits. However, the students were not informed of the actual purpose of the capture, as this was to make the impostor stay away for the day of examination to authenticate these new data, which followed by either identification or verification process. For identification, these new data are compared to all the existing templates in the database (one-to-many). Conversely, verification involves comparison only to the templates of the claimed identity (one-to-one).

Developer's played an important role in the study in checking the developed biometric system to find the strength and weaknesses during enrollment and authenticating operation process. Also to check how efficient, effective, and user-friendly is the Bimodal Biometric system within less time, as well as whether it matches the correct identity.

Furthermore, a database was also implemented whereby the user stored the biometric data of the students on the server using an XAMPP Server hosted over a localhost used to store information that can be accessed locally and at any time. Additionally, the database was used to store up to 1000 templates. On the other hand, Fingerprint was able to capture between 120 and 1000 templates.

Area of the Study

The area of the study of this research work was tertiary institutions in Akwa Ibom State, specifically the University of Uyo, Akwa Ibom State, faculty of vocational education,

library and information science. It operates from four campuses: The Permanent Site/Main Campus which accommodates parts of Central Administration, Faculties of Engineering and Natural and Applied Sciences, Faculty of Agriculture, International Centre for Energy and Environmental Sustainability Research (ICEESR), and the Postgraduate School. The town campus accommodates faculties of arts, education, social sciences, and pharmacy. The Annex Campus is home to Business Administration, Law, Environmental Studies, and General Studies. The Ime Umana Campus, Ediene Abak, accommodates the Pre-Degree, JUPEB, and other special courses. The permanent site which houses the main campus of the university along Nwaniba Road is about 4.5 km from the city center and covers an area of about 1,443 hectares. The University of Uyo has 12 faculties: the School of Continuing Education and the Postgraduate School. The faculties are as follows: Faculty of Agriculture, Faculty of Arts, Faculty of Basic Medical Sciences, Faculty of Business Administration, Faculty of Clinical Sciences, Faculty of Science, Faculty of Social Sciences, Faculty of Pharmacy, Faculty of Communication and Media Studies, Faculty of Vocational Education.

Faculty of Vocational Education consists of a Pre-Degree Programme whose options are: Computer Education, Home Economics Education, Technical Education, Auto-Metal Technology, Electrical/Electronic Technology, Wood Building Technology, and also as a Bachelor of Science B.Sc. (Ed) Degree consisting of Agricultural Education, Business Education-Accounting and Management options, Computer Education, Home Economics Education, Technical Education, Auto-Metal Technology, Electrical/Electronic Technology, Wood Building Technology. Faculty of Vocational Education, Library and Information Science is the preferred faculty for this study, because of the close monitoring, where the researcher can easily have access to the students on campus during system implementation to observe the efficacy and reliability of the instrument and also to observe other improvements. **Population of the study**

The population of the study comprises all the one hundred and twenty (120) academic staff and eight hundred and ninety-six (896), two hundred (200) level students of Faculty of Vocational Education, Library and Information Science, University of Uyo. The Biometric system was used to capture students' biometric identifiers into the system to form the biometric database.

Sample and Sampling Technique

The sample size was 908, made up of 12 academic staff of vocational education a library and (896) students of 200 levels of Information Science, eight hundred and ninety-six. The one hundred and twenty (120) academic staff were sampled and two(2) academic staff each out of six (6) department, making it twleve (12) were selected from each department purposively based on the ICT proficiency.

Instrumentation

The researcher developed two instruments that were used in the study, as follows:

- (i) Fabrication of a biometric capturing system.
- (ii) The Perception Reliability of Biometric System Test Questionnaire (PRBSTQ): The researcher framed the instrument into two sections: Section A has 5 items and Section B

has 15 items to obtain information from the experts based on the reliability perception indices of the biometric capturing system.

Section A PRBSTQ instrutment was structured to obtain information about the biometric materials and proficiency levels of the experts. It was structured in multiple-choice rating scale response, which were: fingerprint sensor, Arduino (ESP8266), WI-FI modules and advanced beginner, intermediate, proficient, expert, respectively, having four (4) categorised options.

Section B of the PRBSTQ instrument was structured with a 5-point Likert scale questionnaire with response options: SA=Strongly Agree, A= Agree, U=Undecided, D=Disagreed, SD = Strongly Disagree. The options were weighted on real limits on decision rule ranging from 4.50 - 5.00, 3.50 - 4.49, 2.50 - 3.49, 1.50 - 2.49 and 0.50 - 1.49, respectively.

Validation of the instrument

The two instruments were validated by three system design experts, one from the Measurement and Evaluation Unit in the Department of Educational Foundation and the Guidance and Counseling Department of Computer Science, all from the University of Uyo, for determining the internal consistency and content validity of the instrument. The expert was required to read through the instrument make corrections where necessary, and indicate the suitability of the items, the language used, and the arrangement of the items in logical and chronological order. Their comments, suggestions, corrections, and other inputs were considered before producing the final copy.

Reliability of Instrument

The reliability of the two instrument were established using perception reliability indices and descriptive statistic respectively to determine the internal consistency of the instruments. According to Udo, (2014). The data collected from the survey were analysed and subjected to perception reliability indices test and most of the values with mean 3.50 and above indicated that they agreed with the decision rule and that the instrument was suitable for the study.

Method of Data Collection

The research questions were administered to the respondents by three(3) experts and three (3) academic staff of University of Uyo, Uyo, respectively. The research assistant was briefed on the use of a fabricated biometric system which was used to enroll and authenticate the selected students. Responses were collected using the "Biometric System Reliability Perception Test Questionnaire by the researcher on the procedure for administration and collection of the instrument. The research assistants were drawn from the Faculty of Vocational Education, Library and Information Science at the University of Uyo to administer the questionnaire to the selected 896 200-level Students from the Faculty of Vocational Education Library and Information Science during 2023/2024 second semester academic session. The initial stage of data collection was using the research assistant to capture the students into the database, while the next stage of data collection was administering the questionnaire to use the machine to check the reliability perception

indices of the biometric system. A period of two weeks was set aside for the respondents to complete the questionnaires, thereafter, the researcher and the research assistants retrieved the completed copies for the respondents. In the end, 100 percent retrieval was made, and all 12 questionnaires were retrieved and used for the analysis.

Method of Data Analysis

Mean and Standard deviation were used to answer the research questions 2, while the decision rule was used for the interpretation and highlighting of the findings. The mean values of 3.50 and 3.50 above were accepted, while the mean values where values were less than 3.49 when interpreted according to the values given in the decision rule.

Decision Rule

The decision in regard to research question two (Dertermination of Perception Reliability Biometric System Test Questionnaire) instrument was determined using upper and lower limits as indicated below:

Response option	Values	Real Limit
Strongly Agreed (SA)	5	4.50 - 5.00
Agreed (A)	4	3.50 - 4.49
Strongly Disagreed (D)	3	2.50 - 3.49
Strongly Disagreed (SD)	2	1.50 - 2.49
Undecided (U)	1	0.50 - 1.49

These are the criteria used for the interpretations of the findings based on the research questions.

Results:

Research Question 1

Design of a biometric capturing system for the prevention of examination impersonation at the University of Uyo.



Figure 3: The Inner View of the Designed Biometric System Source: Field Data (2023).

The fingerprint of the sampling students were enrolled in the database template and verified accordingly. Match and non-match data were obtained effectively using the design boimetric system.

Research Question 2

Determine the Perception reliability indices of the designed biometric capture system for the prevention of examination impersonation at the University of Uyo.

Table 1: Summary of Mean Perception Reliability Indices of the Designed BiometricCapturing System Testing Questionnaire for the Prevention of ExaminationImpersonation at the University of Uyo(N = 908)

S/N	Items	Mean	Std. Deviation	Decision
1	Using a biometric system eliminate impersonation.	4.62	0.45	S. Agreed
2	A biometric system designs authenticated candidates for examination.	4.45	0.44	S. Agreed
3	Biometric system designs capture candidates for examination data into the database.	4.57	0.42	S. Agreed
4	The biometric system design provides access to the database.	4.50	0.41	S. Agreed
5	Biometric system design interface with users in a friendly way.	4.52	0.40	S. Agreed
6	Using a biometric system produces the correct results under minimal conditions.	4.50	0.59	S. Agreed
7	Using a biometric system produces the expected flow of control correctly.	4.49	0.54	S. Agreed
8	Using biometric system parameters, they parameters, they functioned correctly	4.48	0.87	S. Agreed
9	Using biometric system, the lines of codes were not reliable.	4.38	0.45	Agreed
10	Using biometric system the complete software links up the hardware.	4.37	0.44	Agreed
11	The program produced the correct results under minimal conditions.	4.36	0.42	Agreed

	ASIA-AFRICA JOURNAL OF RECENT SCIENTIFIC RESEARCH ISSN: 2814-0400 VOL. 4(1) doi:10.5281/zenodo.1234567 available online at: www.journals.iapaar.com/index.php/aajrsr				
12	The program produced the expected match.	4.35	0.41	Agreed	
13	The program produced the expected flow of control.	4.34	0.40	Agreed	
14	The program performed correct computations of parameters.	4.33	0.59	Agreed	
15	The software runs efficiently and fast.	4.60	0.54	S. Agreed	

Source: Field Data (2023)

The result in Table 1 shows the summary of items of analysis of difference in responses and mean perception reliability indices of the designed biometric capturing system testing questionnaire for the prevention of examination impersonation at the University of Uyo. Findings from the analysis show that all the mean items 1,2,3,4,5,6,7,8,9,10,11,12,13,14 and 15 exceeded the criterion level of 3.50 and had values between 3.50 - 4.49 on the decision rule table and were considered agreed. Those values indicated that the indices of the entire perception reliability test for the instrument were 3.50, which indicated that the instrument was reliable for the study. Any item with a mean score of 3.50 and above was considered to agree because of the rating of items on the decision rule. This is because the result of the responses of the item-by-item analysis means on each item was greater than 3.50, which was the criterion, and mean for the decision rule. It also revealed that the mean perception reliability statistics of the utilization of a biometric system in checking impersonation at the University of Uyo are close to one.

In addition, the Standard deviation for all the items is within the same range showing that the respondents are homogeneous in their views, among the fifteen statements given on the (PRBSTQ) questionnaire, the most highly ranked item was "Using biometric system eliminate impersonation," with a score value of 4.62. The less tanked item was "The program performed correct computations of parameters," with a scored value of 4.33.

Discussion of Findings

Design a biometric capturing system for the prevention of examination impersonation at the University of Uyo.

The analysis of the responses to the research question 1 revealed that the design of biometric capturing system for the prevention of examination Impersonation at the University of Uyo is strongly agrees that a biometric system's design, use, and dependability have a substantial impact on user adoption. Also, as an alternative method for enrollment and verification technology-based tool for authenticating students during examinations. The result can be interpreted as indicating that the Universities of Uyo realised the benefit of the design of the biometric capturing system for the prevention of examination impersonation at the University of Uyo. The findings is in agreement with the observation of Socheat and Wang, (2020), who indentified the primary goal of the design of biometric system circuits in this research work was to provide insights into the latest technological developments in modern

device combinations. System reliability and user satisfaction were the focus of this research design.

Research Question Two: Determine reliability perception indices of the designed biometric capturing system for the prevention of examination impersonation at the University of Uyo.

The study findings showed that the statistical analysis of the responses to the research question two presented revealed that the reliability perception indices of the designed Biometric Capturing System for the prevention of examination impersonation at the University of Uyo are strongly agreed to be a relible alternative method for enrollment and verification technology-based tool for authenticating students during examinations. The result can be interpreted as indicating interpreted that the Universities of Uyo realised the benefit of the determination of reliability perception of the designed biometric capturing system for the prevention of examination impersonation. The findings are in agreement with the observation of Nesreen, (2020), who indentified the causes of conceptions of a design process for a reliable biometric system to include: as just a continuous refinement, design can be regarded in terms of cognitive effort shifts that occur between a designer's appraisal of the problems and solutions.

Conclusion:

In conclusion the study shows that the design of biometric capturing system in prevention of impersonators in examination in University of Uyo is highly efficient and proffers better performance in solving common challenges confronted in the existing educational examination system. Based on the results of the study, it served the stress of carrying their identification, misplacement of fee cards, students identity cards without a passport on it and so on. From the analysis and conclusion made, the study takes the position that using biometric capturing System as a veritable tool and an overriding factor in the detection of impersonation during examinations. Also, the mentality of using ready-made products and embracing the sophisticated use of the available resources within the immediate environs in manufacturing things to bring about innovation in our society and also encourage our upcoming young engineers and technicians.

Educational Implications of Findings

- i. The findings revealed that this research can help society become more tech-savvy day by day. An age-old manual attendance management system in schools turns out to be a thing of the past subjecting it to error-prone, time-consuming, and inaccurate timetracking processes.
- ii. The findings reveal that biometrics can offer a scalable solution to government schools in circumventing issues like high absenteeism of teachers and other staff, buddy-punching by students, and examination malpractices like impersonation, making false entries in examination registers and disclosing students' identities in

answer sheets.

- iii. The findings disclosed that the biometric attendance system for teachers and staff is one of the reasons for the poor quality of education in government schools including the absenteeism of a good number of teachers from school every day. However, the increasing acceptance of biometric technology by the government has led the public educational institutes of multiple states to gear up for the implementation of biometric systems for teaching and non-teaching staff, which helps the government monitor and manage the clock-in and clock-out times of the government officials, including the faculties of government schools. Therefore, it can help the government boost quality education, improve the punctuality and availability of teachers, strengthen student admissions in government schools, and provide real-time attendance monitoring for teaching and non-teaching staff.
- iv. Student registration and verification for examinations: rising occurrences of impersonation in examinations by students have become a matter of concern for the educational department. Thus, it becomes essential for the government to embrace a stricter rather accurate, and authentic process of identifying students and recording their attendance in examinations.
- v. The findings of this study have implications for all the educational stakeholders: parents, teachers, ministries of education, and examination body personnel amongst others. Proper implementation of these identified strategies for curbing examination impersonation by the various stakeholders implies that the products of such public examinations were able to defend the result so obtained. This has on the other hand, improved the quality of education in Nigeria.

Recommendation

Based on the findings of this study, the following recommendations are here by proffered:

- i. Universities Stakeholders of the Nigerian Educational System should adopt this biometric system for checking Impersonation in examinations in universities. To achieve this, the university should seek a robust design user's, a friendly interface and adaptable system design.
- ii. The Universities' administrators specifically, the academic staff should adopt this biometric system for checking impersonation, and keeping attendance in examinations in universities. In order to achieve this, it is advisable for the universities to seek utilization of the system user interface with intuitive designs.
- iii. The other researchers should adopt this topic of biometric systems for checking impersonation in examinations in universities and improve upon ensuring it runs in real-time for more convenience.

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