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# Development and Computerization of an Electronic Identification System (eID) for Edo State Polytechnic, Nigeria

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***Abstract:*** ***The computerise electronic identification system is a system design to enable us assign electronic identification code to every staff and student for effective monitoring and management of staff and students by the institutions. This process was achieved by using a passive card (MIFARE, ISO 14443 A) for the identity card and a Total Wireless Reader (TWR PRO) as the RFID reader. The Microsoft Visual Studio 2012 was use to develop the Graphic User Interface environment (GUI). The C# programming language was used to implement the system and the .NET frame work 4.5 is used for the frame work. The Microsoft access database was used because of its portability.***

***The database was created by entering the individual data into the system and this information was used to generate electronic Id which was encoded in the chip contained in the passive card by placing the card close to the Rfid device. The accuracy of the system was tested by selecting 36 students with their passive identity cards and ask them to go into the classroom were the Rfid have been set up and the system was able to read the cards and generate report within five minutes.***

***Keywords: eID, RFID, Data, Computerization, Auto ID, Frequency, Radio Waves.***

## I. INTRODUCTION

Electronic identification (eID) is one of the tools to ensure secure access to service delivery and to carry out electronic transactions in a safer way . Secure electronic identification is an important enabler of data protection and the prevention of fraud [9]. An electronic identification (eID) is an electronic identification solution of citizens, organizations, institutions etc.

All eID are automated systems which gives rise to the name Automatic identification, or auto ID for short, it is the broad term given to a host of technologies that are used to help for the identification of objects. Auto identification is often accompanied with automatic data capture.

One form of eID is an electronic identification card (eIC), which was employed in this research work. It is a physical identity card that can be used for personal identification or authentication. The eIC is a smart card in ID form of a regular identity card with identity information printed on the surface (such as personal data details and a passport photograph) and in an embedded RFID microchip, similar to that in biometric passports. The chip stores the information printed on the card (such as the holder's name and date of birth) and the holder's biometric photo.

Radio-frequency identification (RFID) uses electromagnetic fields to automatically identify and track tags attached to objects. The tags contain electronically stored information. Passive tags collect energy from a nearby RFID reader's interrogating radio waves. Active tags have a local power source (such as a battery) and may operate hundreds of meters from the RFID reader. Unlike a barcode, the tag need not be within the line of sight of the reader, so it may be embedded in the tracked object. RFID is one method for Automatic Identification and Data Capture [1][2].

According to [6][7], Radio frequency identification, or RFID, is a term for technologies that use radio waves to automatically identify people or objects. There are several methods of identification, but the most common is to store a serial number that identifies a person or object, and perhaps other information, on a microchip that is attached to an antenna (the chip and the antenna together are called an RFID transponder or an RFID tag). The antenna enables the chip to transmit the identification information to a reader. The reader converts the radio waves reflected back from the RFID tag into digital information that can then be passed on to computers that can make use of it [3][4][5].

According to [10][6][11][12], there are two types of transponders, which correlate to the two major types of RFID tags.

- Passive transponders and RFID tags have no energy source of their own, relying on the energy given off by the reader for the power to respond. Cheaper, passive RFID tags are the most likely to be used for consumer goods.
- An active transponder or tag has an internal power source, which it uses to generate a signal in response to a reader

The aim of most auto-ID systems is to increase efficiency, reduce data entry errors and free up staff to perform more value-added functions, such as providing customer service [8].

## II. RESEARCH METHODOLOGY

The study will be divided into two stages. The stages include: acquiring the readers and identification tags

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and developing a software tool. eID systems consist of an RFID setup with the following components a transceiver (transmitter/receiver) and antenna are usually combined as an RFID reader, A transponder (transmitter/responder) cards with microchips and the display unit..

## III. HARDWARE ARCHITECTURE

*TWR PRO Transceiver:*

The TWR PRO is made up of two components, the RFID reader as show in figure one and RF transceiver as shown in figure two. The RF transceiver is connected to the USB port of a computer and the RFID receiver has its own battery and the two devices communicate with each other using wireless link on a frequency of 433MHz. Since the RFID reader is contactless, when a passive card and tag come in the range of 4cm to the surface of the RFID reader, the RF signal radiated by the reader will activate the card thereby enabling the reader to read the information on the card and transmit same to the transceiver.

Fig. 1. RFID Reader


Fig. 2. RF Transceiver

*Specifications of TWR PRO:*

- Operating Frequency: 13.56MHz for card reading and 433MHz for device
- Wireless Range: Up to 50meters for between Reader and Transceiver
- Card Format: MIFARE, ISO 14443 A
- Operating Temperature: -10 to $+60^0$C
- Power Consumption: Max.12µA
- Features: Buzzer
- RFID Passive Card


Fig. 3. RFID Card

This card can also be use as an identity card for both staff and students, the card format is MIFARE, ISO 14443 A. When the card comes in contact with the radio frequency emitted from the card reader the passive card will be energize by the signal thereby granting access to the reader to collect information stored in the chip

## IV. SOFTWARE DESIGN

Software design for database and Graphic User Interface (GUI)

- The Microsoft Visual Studio 2012 was use to develop the GUI environment.
- The C# programming language was used to implement the system.
- The .NET frame work 4.5 is used for the frame work.
- The Microsoft access database was used because of its portability.

## V. FLOWCHART FOR THE SYSTEM

When the Admin enter the username and password on the platform, if the username and password is correct the panel will open to Data Capture,

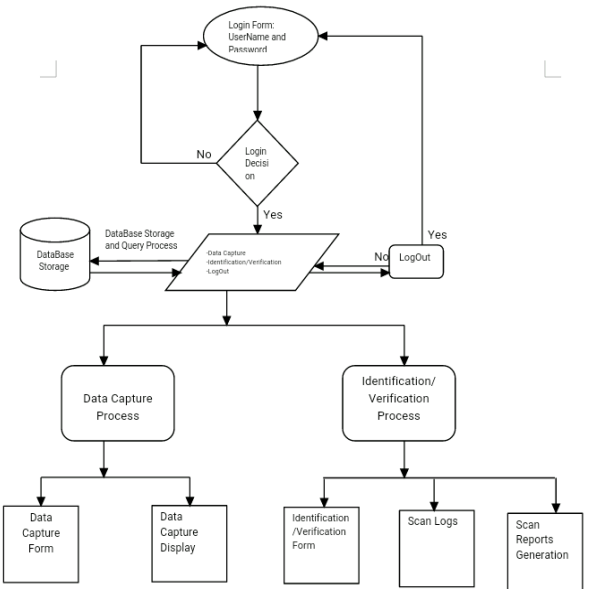

Fig. 4. Flowchart for the System

Identification/Verification, Log Out and the administrator will decide which operation to carry out, if data capturing the admin have to enter the student/staff information into the system or upload from the data base and transfer same to the card using the RFID reader by placing the card close to the reader. But if the admin is to identify/verify then the already store information of the student/staff will be display on the panel.

## VI. EXPERIMENTAL RESULT

The GUI design and the experimental results screen shot are shown below

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*1. Login Panel:*

To be manned by the administrator, here the administrator needs to enter the username and password to access this system. This section was introduce to prevent any unauthorized person from gaining access to the data base as the data could be compromised if not well secured

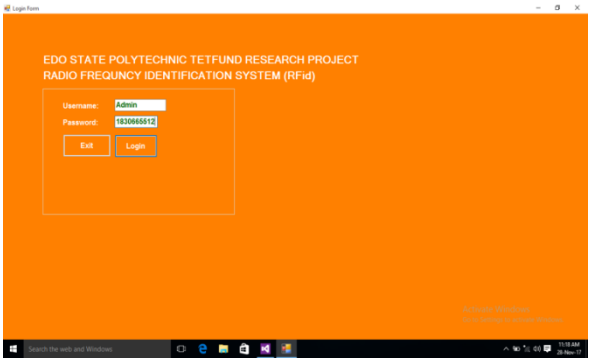


Fig. 5. Login Panel

*2. Data Capture Panel:*

This panel eneble the admin to input relevant data to form the data base and also for synchronization of tag ID(s) and database. Sometimes the capturing and data entering can be done directly while encoding the card is done by the admin using the computer and the RFID reader.

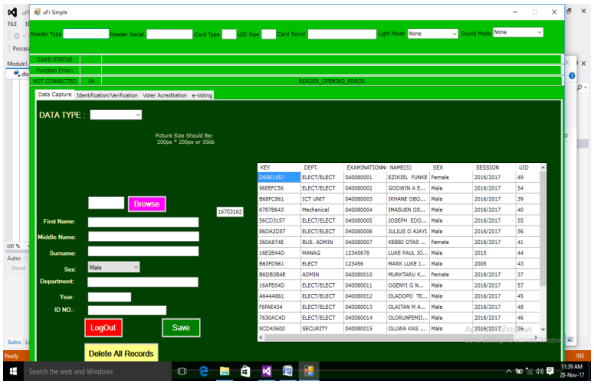


Fig. 6. Data Capture Panel

*3. Identification/Verification Panel:*

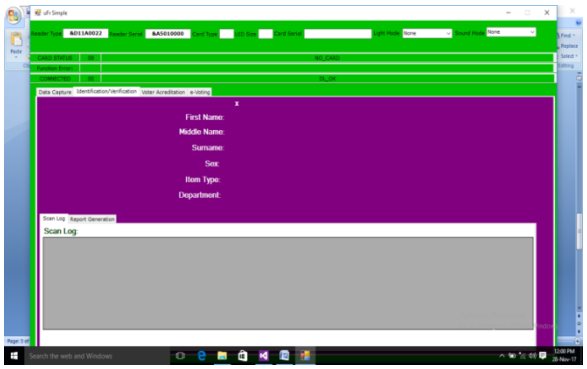


Fig. 7. Identificat / Verification Panel

This panel display the information to be verified such as the photograph, surname, middle name, first name, sex and department.

*4. A Card for a Student of Electrical/Electronic being Verified:*

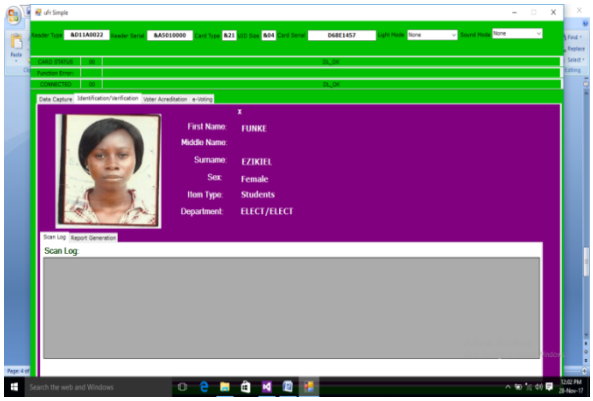


Fig. 8. Showing a Displayed Information for a Student After Scaning Her Card

*5. Scan Log Report Generation:*

This panel is use to generate the log for the students who has been scanned and it also help to create log for a particular day or time which make the issue of identification to be very easy.

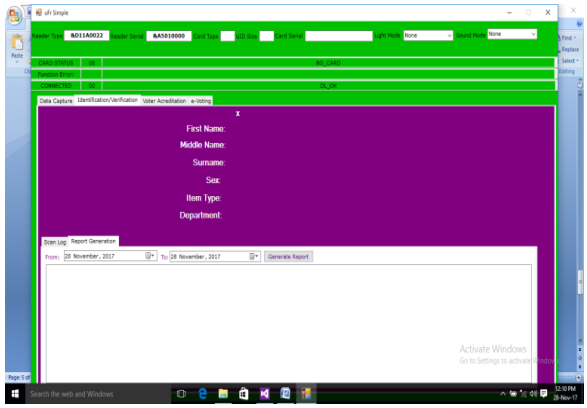


Fig. 9. Scan Log Report Generation

*6. Generated Report:*

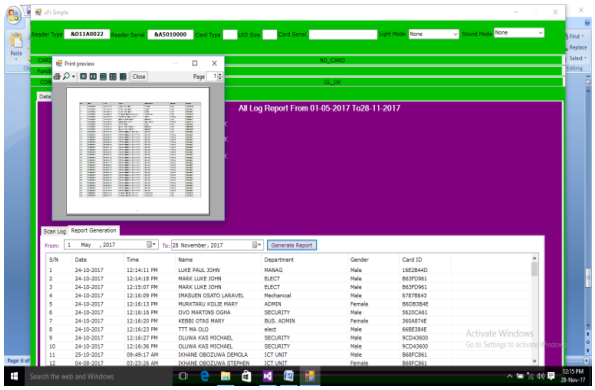


Fig. 10. Sample of Generated Report for Students that were Scan

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*7. Report For Unregistered Card:*

The system identifies and gives a no data found on the row/column notification for such student.

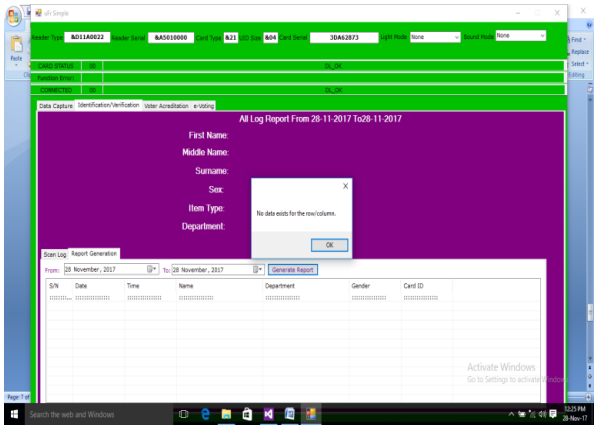


Fig. 11. Screen Shot for An Unregistered Card

*8. Generated Values for Thirty Six Students:*

Table 1. Generated Values for Thirty Six Students

| S/N | Date | Time | Name | Department | Gender | Card ID |
|---|---|---|---|---|---|---|
| 1 | 02-02-2018 | 08:54:48 AM | OLAITAN M AFINDUOMO | ELECT/ELECT | Male | F6FAE434 |
| 2 | 02-02-2018 | 08:54:58 AM | EDOMWONYI EMPEROR | ELECT/ELECT | Male | 46C8E634 |
| 3 | 02-02-2018 | 08:55:06 AM | TTT MA OLO | elect | Male | 66BE384E |
| 4 | 02-02-2018 | 08:55:14 AM | KEBBI OTAS MARY | BUS. ADMIN | Female | 360A874E |
| 5 | 02-02-2018 | 08:55:20 AM | OLORUNFEMII OLUWOLE | ELECT/ELECT | Male | 7630AC4D |
| 6 | 02-02-2018 | 08:55:27 AM | OLADOPO TEMIDAYO | ELECT/ELECT | Male | A644A861 |
| 7 | 02-02-2018 | 08:55:33 AM | MURKTARU KOLIE MARY | ADMIN | Female | B6DB3B4E |
| 8 | 02-02-2018 | 08:55:42 AM | OVO MARTINS OGHA | SECURITY | Male | 5620CA61 |
| 9 | 02-02-2018 | 08:55:47 AM | OLUWA KAS MICHAEL | SECURITY | Male | 9CD43600 |
| 10 | 02-02-2018 | 08:55:55 AM | OKE JUDE | ELECT/ELCT | Male | B9BE3600 |
| 11 | 02-02-2018 | 08:56:04 AM | OSAMEDE ABU | ELECT/ELECT | Female | 765BFF56 |
| 12 | 02-02-2018 | 08:56:10 AM | MARK LUKE JOHN | ELECT | Male | B63FD961 |
| 13 | 02-02-2018 | 08:56:20 AM | LUKE PAUL JOHN | MANAG | Male | 16E2B44D |
| 14 | 02-02-2018 | 08:56:27 AM | IKHANE OBOZUWA DEMOLA | ICT UNIT | Male | B68FC861 |
| 15 | 02-02-2018 | 08:56:35 AM | SARAH O EVBODAGHE | ELECT/ELECT | Male | B6A10457 |
| 16 | 02-02-2018 | 08:56:43 AM | GODWIN A EDORE | ELECT/ELECT | Male | 96EEFC56 |
| 17 | 02-02-2018 | 08:56:49 AM | JOSEPH EDOKPAIL | ELECT/ELECT | Male | 56CD3157 |
| 18 | 02-02-2018 | 08:56:55 AM | JULIUS O AJAYI | ELECT/ELECT | Male | B6DA2D57 |
| 19 | 02-02-2018 | 08:57:02 AM | OGENYI G NWODUM | ELECT/ELECT | Male | 16AFB54D |
| 20 | 02-02-2018 | 08:57:09 AM | EZIKIEL FUNKE | ELECT/ELECT | Female | D68E1457 |
| 21 | 02-02-2018 | 08:57:17 AM | IDEMUDIA EKIO | MECHANICAL | Male | C695344E |
| 22 | 02-02-2018 | 08:57:23 AM | KAYODE DAMI | MECHANICAL | Male | 26AD1357 |
| 23 | 02-02-2018 | 08:57:30 AM | OGRI MICHAEL | ELECT/ELECT | Male | 264AC961 |
| 24 | 02-02-2018 | 08:57:36 AM | PEACE ALEX | ELECT/ELECT | Male | C6F1E556 |
| 25 | 02-02-2018 | 08:57:40 AM | PEACE ALEX | ELECT/ELECT | Male | C6F1E556 |
| 26 | 02-02-2018 | 08:57:44 AM | IMASUEN OSATO LARAVEL | Mechanical | Male | 6787B643 |
| 27 | 02-02-2018 | 08:58:02 AM | OKE GRACE | MECHANICAL | Female | 56CBAE4D |
| 28 | 02-02-2018 | 08:58:09 AM | ADEYEM BRIGHT | MECHANICAL | Male | 164D1157 |
| 29 | 02-02-2018 | 08:58:16 AM | OLUFEMI ALEX | ELECT/ELECT | Male | 2689B34D |
| 30 | 02-02-2018 | 08:58:23 AM | OMOAGBON JOY | ACCOUNTANCY | Female | 36A2D934 |
| 31 | 02-02-2018 | 08:58:30 AM | ADORO JOHN | MECHANICAL | Male | 36E6B856 |
| 32 | 02-02-2018 | 08:58:39 AM | IGORO ROSE | ELECT/ELECT | Female | C618DB4E |
| 33 | 02-02-2018 | 08:58:49 AM | ALABI DAMILAR | ACCOUNTANCY | Male | 460CAF4D |
| 34 | 02-02-2018 | 08:59:00 AM | JOHN PAUL | MECHANICAL | Male | E678C861 |
| 35 | 02-02-2018 | 08:59:11 AM | EKENE JENNIFER | MECHANICAL | Female | B6611457 |
| 36 | 02-02-2018 | 08:59:21 AM | OKOH PRECIOUS | ELECT/ELECT | Male | D68BB34D |

From the table 1 below it is observe that within five minutes thirty six students were checked into the hall which show that the system is highly time effective compare to manual checking. The issue of unregistered students coming into the hall was also eradicated.

## VII. CONCLUSION

The project and research impact is multifaceted, both to the students and staff of the institution. This project in the first instance is capable of providing an opportunity to develop a student identification and authentication system and staff verification tool. This project has also showcase the advantages of using an automated system for identification and verification in less time compared to manually carry out the same job and task.

It is hereby recommended that this tool be adopted by the management of the Polytechnic and other organization as a means of identification, verification and authentication of goods, services, products, staff and students. It offers a comparative advantage to manually do the same things, which are also prone to human error and fatigue.

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