

# IMPLEMENTATION OF STUDENTS' SMARTCARD SYSTEM

(Case study: Lagos State Polytechnic, Ikorodu)

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## *Abstract*

*This paper addresses the possibility of using the Smart Card technology to propose Smart Student's Data Card System towards sustained controlled academic environment. Although dockets are generated for students at the departmental level, students are faced with difficulties in getting their dockets ready before the commencement of examinations, and the time involved for the Head of Department to append his/her signature on every student's docket is another time-consuming task. The cases of docket forgery by students is also of concern. Relying on the features of smart data card when connected to the host computer or controller via a card reader which gets information from the smart card and accordingly passes the information to the host computer or controller provides a perfect solution to the aforementioned challenges. This paper address the challenges of authenticating qualified students during examination.*

*Keywords: Smart card, card reader, docket, examination, authentication.*

## **1.0 Introduction**

In recent years, there has been exponential growth in the number of higher institution of learning and student's population are growing. In addition, management of institutions began to realise that examination conduct and management are institutions most important responsibility. To ensure the sustained success of students' management

and examination administration, it is imperative that the students receive a high quality of service. Conventional techniques for student's management have not yielded maximum result due to the challenges posed by civilization requirements such as technological development, student population and changing demand of the industry and the society. Institution

administrators are confronted with challenges as a result of changing attitudes of students. Hence, institutions of higher learning must also use modern technology to handle these challenges. Electronic Data Card has become useful in modern education as it has proven to aid tertiary institutions to streamline their administrative tasks and provide real-time access to data and other resources. There are other prominent qualities of smart card, which includes providing mechanisms for authenticating others who want to gain access to the card or device, also providing a means of securely storing data on the card and can provide a robust set of encryption capabilities including key generation, secure key storage, hashing, and digital signing. Smart card technology is extremely difficult to duplicate or forge and has built-in tamper-resistance. It can provide a means of securing communications between the card/device and readers. Furthermore, the smart card technology can provide mechanisms to securely store biometric templates and perform biometric matching functions. Smart card technology is also built into other portable personal devices, such as mobile phones and USB devices. The effectiveness of smart data card was leveraged to propose student's datacard for Lagos State Polytechnic. This research

focused on the design and implementation of an electronic data card system for student in Lagos State Polytechnic to replace the current methods of examination dockets, course registration and student identity cards. This was achieved by creating a software application and a mobile platform which will be linked to every student's profile as well as records to facilitate accessibility of any information regarding a particular student at any point in time in Lagos State Polytechnic. Each student will be assigned a data card after their acceptance fee had been paid and have been duly cleared and registered by their respective departmental course advisers. The card will serve the purpose of identification, course registration and exam docket verification, to mention but a few. The system is a cost effective method of accessing data from databases of the institution. Smart card systems had been used in several application areas such as education, healthcare, banking, entertainment and transportation to mention but a few. These applications can all benefit from the added features and security that smart cards provide. The afore-mentioned bottlenecks can be taken care of by the introduction of a smart student data card system to create a safe learning environment that will combine access control, identification and

transactional applications into one card. This data card system makes it easy and affordable to incorporate new ID card tools that make campus life more efficient.

The remaining sections of this paper are organised as follows. Section 2.0 presents a review of related works. Section 3.0 discusses the methodology employed in the research and section 4.0 is a presentation of results and discussion and Section 5.0 concludes the paper.

## 2.0 Literature Review

Smart Cards are secure portable storage devices used for several applications especially security related ones involving access to system's database either online or offline (Mohammed *et al.*, 2004). A smart card is a device that includes an embedded integrated circuit that can be either a secure microcontroller or equivalent intelligence with internal memory or a memory chip alone. The card connects to a reader with direct physical contact or with a remote contactless radio frequency interface. The term 'smart card' refers to a plastic card with implanted computer chip (memory or microprocessor) that store and process data. They are secure and portable devices that are used for quite a number of applications. The data is stored and processed in the card's chip

and is usually associated with value, information, or both. Key application areas of smart cards include healthcare, banking, entertainment, and transportation. Muhammad *et al.* (2004), classified smart cards in two different ways:

- a. *Memory and microprocessor*- these store data and can be regarded as a floppy disk with security features. It is possible to add, remove or update data stored in a memory or microprocessor card.
- b. *Contact and contactless* - contact smart cards require physical contact with the smart card reader inserted into a smart card reader. On the other hand, contactless smart cards do not require contact and therefore have an antenna embedded in the card that allows communication with the reader without physical contact. There is also the combi card which is able to combine the two characteristics.

According to Bodake *et al.* (2012) A smart card, typically a type of chip card, is a plastic card that contains an embedded computer chip— either a memory or microprocessor type—that stores and transacts data. This data is usually associated with either value, information, or both and is stored and processed within the card's chip. Systems that are enhanced with smart cards are in use

today throughout several key application, including healthcare, banking, entertainment, and transportation.

In order to access these smart cards, they are either in a special reading device (smart card reader) or near enough for the antenna to communicate (if it is contactless) for the duration of use. The transaction may involve retrieving information from the card, performing computations and also, updating the content of the card after processing. While the card is in the reader, its electrical contacts make contact with the reader's electric connectors. Data is then read from or written to the card's chip. It is important to have standards that will ensure the possibility of every retailer with a smart card reader being able to read the smart cards, Shelfer and Procaccino (2002). Specifications for smart card production and regulations guiding their communication are as defined by the International Organization for Standardization. Details can be found in Shelfer and Procaccino (2002).

Smart cards have been applied as bank cards, SIMs in mobile phone, public transportation cards, identity documents (for example, modern passports and national ID cards), access cards (to control access to buildings, computer networks, laptops) and pay TV,

electricity cards, etc. Smart cards have also been applied in the management of higher institutions. Several implementations are now available with varying level of complexity. These include the research of Praveen *et al.* (2017). They demonstrated the use of a campus smart card for authentication, attendance, door pass, storage of biodata, payment and registration. They also identified benefits of smart cards as security (data stored on it cannot be accessed or altered without a PIN) and protection (data can be encrypted). The innovation in the research of Sheng *et al.* (2010) is the introduction of radio frequency (RF) card and mobile communication technology in the design and implementation of smartcard. The card serves a combined purpose of campus, mobile phone and bank transaction smartcard. The design also made use of wireless POS technology. The wireless POS technology ensures wider, secured coverage. The RFID-SIM card technology is able to accommodate both the contact and noncontact modes of operation. The mobile communication ensures the system is able to operate without the limitation of place, environment and time. The research of Singh *et al.* (2017) came up with smart card that served as identification, library, canteen, shops and online storage card. They made

use of bar coded smart cards. These have the advantage of being cheaper than other types of cards. They identified advantages of multi-application cards as reduction in card issuance and administrative costs. The convenience of carrying a single card that serves several purposes is also an advantage. The focus of this research is to use smart cards for authentication of students' identity, verification of payment status and courses registered before allowing the students into the examination halls.

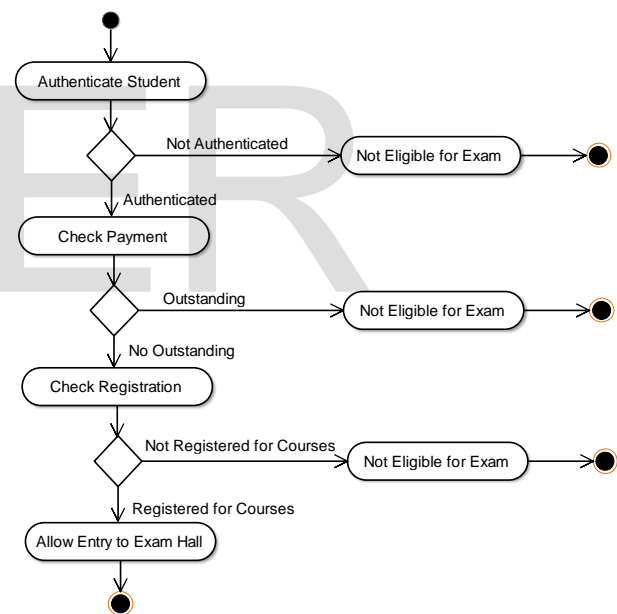
### 3.0 Methodology

The student's smartcard design was implemented using the activity diagram of the Unified Modelling Language (UML) tools. The design was implemented using a smart card that was interfaced with a card reader. In the first phase of the implementation, the software was interfaced with an existing information system such that upon payment of school fees and registration of courses, students were issued their data cards. Each student's data card contains the student's profile, payment details and courses registered for in the semester. The second phase is concerned with conducting appropriate checks before students gain access into the examination halls. The

activity diagram for this phase is shown in Figure 1.

### Authentication

Each examination area is equipped with a card reader connected to a computer system with internet connectivity. Upon inserting the card into the card reader, the student is prompted for a pin (authentication). If authentication is successful, the student's profile is displayed. The identity of the student can further be verified from the picture displayed on screen.



**Figure 1: Activity Diagram of the Data Card Functionality**

### Check payment

After successful authentication, the payment status of student is checked. If the student has

paid the school fees, then the details of the payment will be displayed.

### Check registration

If the student is duly registered, a list of courses registered by the student will be displayed. And will also confirmed if the student is registered for the course on the examination timetable. After the authentication process the student is then allowed into the examination hall.

## 4.0 Results and Discussions

Experiment was conducted on the proposed system using contact or contactless data card and a Dell Laptop intel core i3 connected to the internet to provide access of the server. The results are as presented below.

### 4.1 Authentication

A sample of the student's profile displayed upon successful authentication is shown below in Figure 2a. If authentication fails, a message is also displayed (Figure 2b).



Figure 2: Successful Authentication

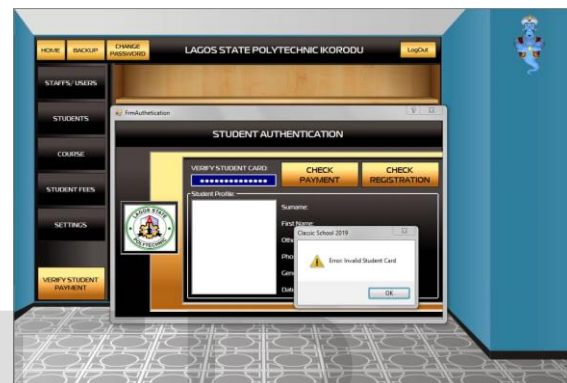


Figure 3: Failed Authentication

### 4.2 Check Payment

If the student has paid, the payment status is displayed as shown (Figure 4). If no payment record is found, a message to this effect is displayed as shown in (Figure 5).



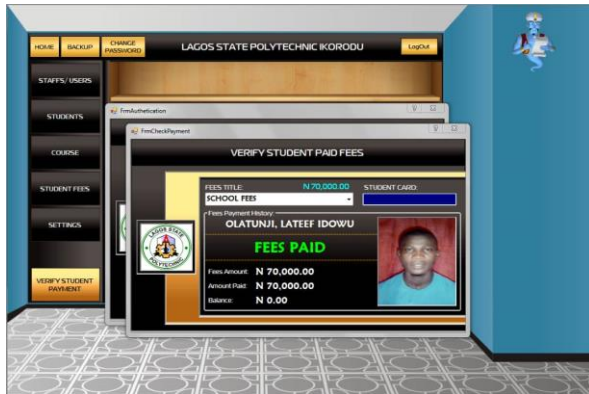


Figure 4: Fees Paid

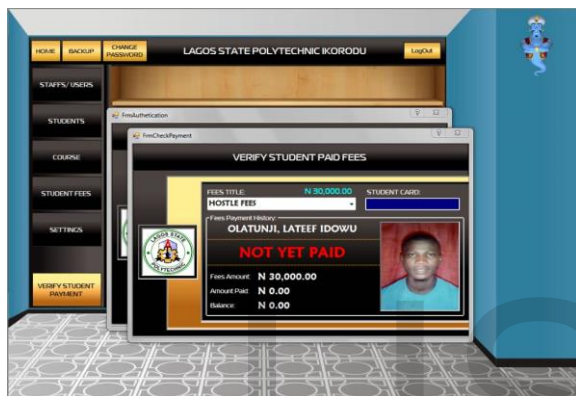


Figure 5: Fees Not yet Paid

### 4.3 Check Registration

For a student that has registered, details of such registration is displayed together with the profile and payment details shown in (Figure 6). For a student that has paid but has not registered for any course, sample output is shown in Figure 7.



Figure 6: Student's Registration



Figure 7: Not yet Registered

### 5.0 Conclusion

The students' smartcard system was implemented using contact or contactless data card and a Dell Laptop intel core i3. It was able to eliminate the hectic process of printing examination docketts and appending signature by the Head of Department. The possibility of using fake docketts was eliminated. In addition to this, the new system was able to ensure that any student that has not paid the prescribed school fees or that has not registered for a course is not able to sit for the examination.

## References

- Bodake, A., Baviskar, V., Bodake, A., Bhoite, S., and Kulkarni, N. J. (2012). Multipurpose Smartcard System. *International Journal of Advanced Research in Computer Engineering & Technology (IJARCET)*, 1(9).
- Mohammed, L. A., Ramli, A. R., Prakash, V., and Daud, M. B. (2004). Smart card technology: Past, present, and future. *International Journal of the Computer, the Internet and Management*, 12(1), 12-22.
- Praveen, C.; Mathew, G.; Lakshmi, A. and S.Anusuya (2017). Multipurpose Student Smart Card. *International Journal of Pure and Applied Mathematics*. 116 (21), 119-123
- Omar, S., and Djuhari, H. (2004). Multipurpose student card system using smart card technology. In *Information Technology Based Proceedings of the Fifth International Conference on Higher Education and Training, 2004. ITHET 2004*. (pp. 527-532). IEEE.
- Shamsaie, A., Habibi, J., and Ghassemi, F. (2007). Tierpeer: A Three-Tier Framework for P2P Applications. *IJCSNS*, 7(2), 292.
- Shelfer, K. M., and Procaccino, J. D. (2002). Smart card evolution. *Association for Computing Machinery. Communications of the ACM*, 45(7), 83-83.
- Sheng, Q., Tong, X., Song, X., Zhang, Z., & Xu, J. (2010). Design and realization of new generation campus smart card system based on the mobile communication. *Computer and Information Science*, 3(3), 80.
- Singh, A., Chopra, A., Imran, M., and Singh, R. (2017). Designing and Implementation of Smart Card Technology for the Students of Higher Education. *International Journal of Computer Science and Mobile Computing IJCSMC*, 6, 144-149.
- Shamsaie, A., Habibi, J., and Ghassemi, F. (2007). Tierpeer: A Three-Tier Framework for P2P Applications. *IJCSNS*, 7(2), 292.
- Shuwei, Q. (2010). Design and Implementation of Campus Card System Construction [J]. *Journal of Hunan University of Technology*, 24(4), 61-64.
- Xu, W. S., and Xin, Y. W. (2007). Design and implementation of middleware-based E-card system for campus [J]. *Computer Engineering and Design*, 28(7):1723-1726.