# CHAPTER ONE

# INTRODUCTION

## 1.1 Background to the Study

The Federal Polytechnic, Mubi, has traditionally relied on manual methods for processing student identification (ID) cards. This approach, which involves physical paperwork and manual data entry, has been plagued with inefficiencies, errors, and security concerns. In recent years, institutions worldwide have transitioned to digital solutions to streamline administrative processes, ensuring accuracy, efficiency, and enhanced security. The integration of QR code technology into ID card systems represents a significant advancement, enabling institutions to improve verification processes and data management.

A computerized ID card generating system with QR codes automates the creation, management, and verification of student IDs. This system ensures that each student’s data is securely stored in a centralized database while allowing quick authentication through QR scanning. Studies by Rodrigues et al. (2021) have shown that computerized systems enhance operational efficiency and reduce processing time in educational institutions. Furthermore, QR codes offer a cost-effective and secure method for storing and retrieving information, supporting real-time authentication and minimizing identity fraud (Alharthi *et al.,* 2020).

The integration of QR codes into student ID cards provides several advantages. Unlike traditional barcodes, QR codes store more data and can be easily scanned using smartphones or dedicated scanners, ensuring fast and reliable verification. Institutions can use this technology for attendance tracking, library access, and secure campus entry. Johnson & Roberts (2021) highlight that digital authentication methods improve institutional security and reduce the likelihood of unauthorized access.

Additionally, QR code-based ID card systems align with global digitalization trends, improving service delivery and reducing administrative burdens. A study by Davis and Wong (2021) found that students expect quick and accurate administrative services, which are difficult to achieve with manual processes. By adopting a computerized ID card system with QR code integration, the Federal Polytechnic, Mubi, can significantly enhance its operational efficiency, security, and overall student experience.

Furthermore, computerized ID systems contribute to environmental sustainability by reducing paper usage, aligning with global efforts to minimize carbon footprints (Kim & Park, 2019). This transition ensures that the institution remains competitive, technologically advanced, and capable of meeting the evolving needs of students and staff.

1.2 Problem Statement

The current manual system for processing student ID cards at the Federal Polytechnic, Mubi, presents several challenges:

Time-Consuming: The manual process involves multiple steps, leading to delays in issuing ID cards.

Prone to Errors: Human errors in data entry and processing result in inaccurate ID cards.

Security Concerns: Manual records are susceptible to loss, theft, and unauthorized access.

Limited Functionality: Traditional ID cards do not support advanced authentication features, making verification processes cumbersome.

Resource-Intensive: The manual system requires significant human effort and material resources.

These limitations necessitate the development of a computerized ID card generating system with QR code technology to improve efficiency, security, and accessibility.

**1.3 Aim and Objectives**

The aim of this study is to design and implement a computerized ID card generating system with QR code. The specific objectives are:

1. To develop a user-friendly interface for inputting student information.
2. To create a secure database for storing and managing student records.
3. To integrate QR code technology into the ID card system for enhanced security and verification.
4. To design a system capable of automatically generating and printing student ID cards.

**1.4 Significance of the Study**

The significance of this study lies in its potential to modernize the student ID card processing system at the Federal Polytechnic, Mubi, benefiting various stakeholders:

Students will benefit significantly from the implementation of the ID card generating system with QR code technology. The automation of the process ensures that students receive their ID cards promptly, minimizing administrative delays and enhancing their overall experience. This efficiency eliminates long waiting times and ensures that students can access institutional services without unnecessary hindrances.

For administrative staff, the adoption of this system alleviates the burden of manual data entry and card issuance, allowing them to focus on other critical responsibilities. Automation streamlines workflows, improves accuracy, and enhances productivity by reducing the risk of human error. Additionally, QR code integration strengthens institutional security by providing a reliable authentication mechanism, effectively minimizing identity fraud and unauthorized access to facilities.

Beyond the immediate institutional benefits, this system sets a precedent for other educational institutions seeking to modernize their administrative operations. By demonstrating the advantages of digital ID card processing, the system can inspire broader adoption of similar technological advancements. Furthermore, the reduction in paper usage contributes to environmental sustainability, aligning with global efforts to promote eco-friendly administrative practices.

**1.5 Scope of the Study**

This study focuses on the design and implementation of a computerized ID card generating system with QR codes for the Federal Polytechnic, Mubi. It involves an in-depth analysis of the existing manual system and its inefficiencies, highlighting the need for a more efficient, accurate, and secure approach. The development of this system includes key components such as a user-friendly interface for student data entry, a secure database for managing student records, and a QR code generation feature to enhance authentication and verification processes.

Additionally, the study incorporates an automated ID card generation and printing module, ensuring seamless and quick issuance of ID cards. Security protocols are integrated to safeguard student information, mitigating risks associated with data breaches and unauthorized access. The system undergoes rigorous testing and evaluation to compare its performance with the manual process, assessing its impact on efficiency, accuracy, and overall security improvements.

**1.6 Definition of Some Operational Terms**

**Authentication**: The process of verifying an individual’s identity using secure digital methods (Kim & Park, 2019).

**Biometric Verification:** A security process that uses unique biological characteristics such as fingerprints or facial recognition to confirm an individual's identity (Zhao et al., 2022).

**Computerized System**: A digital system that automates tasks previously performed manually, improving efficiency and accuracy (Rodrigues et al., 2021).

**Data Integrity:** The accuracy, consistency, and reliability of data throughout its lifecycle, especially during input, processing, and storage (Olawale et al., 2023).

**Database**: A structured collection of electronic data, organized for efficient retrieval and management (Johnson & Roberts, 2021).

**Encryption:** The process of converting information into a secure format to prevent unauthorized access during storage or transmission (Singh & Patel, 2021).

**ID Card Processing**: The process of creating, managing, and distributing identification cards within an institution (Davis & Wong, 2021).

**Management**: The coordinated planning, organizing, and controlling of resources to achieve institutional goals (Lunenburg, 2021).

**QR Code**: A machine-readable code that stores data and enables quick retrieval through scanning, commonly used for authentication and verification (Alharthi et al., 2020).

**System Security:** The protective measures and protocols implemented to safeguard software and hardware from threats such as unauthorized access, data breaches, and malware (Chen & Lee, 2022).

**User Interface (UI):** The visual layout through which users interact with a computerized system, including screens, menus, and icons (Anderson & Taylor, 2022).

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1 Introduction

This chapter presents a comprehensive review of literature relevant to the design and implementation of computerized student ID card processing systems in educational institutions. The literature review is structured around key themes, including the benefits of computerized systems, challenges in manual ID card processing, and best practices in system design and implementation.

## 2.2 Computerized Systems in Educational Institutions

Computerized systems play a pivotal role in transforming administrative processes within educational institutions, offering a wide array of benefits across various functional areas. One significant advantage is the enhancement of operational efficiency. By automating routine tasks such as data entry, processing, and retrieval, computerized systems streamline administrative workflows, saving time and resources. This efficiency gain allows administrative staff to focus on value-added activities such as student support services and strategic planning (Ferdousi *et al*., 2020).

Moreover, computerized systems facilitate better data management and decision-making. Through centralized databases and integrated reporting tools, institutions can access timely and accurate information for planning, monitoring, and evaluation purposes. Real-time data analytics enable administrators to identify trends, assess performance, and make informed decisions to improve institutional effectiveness (Tsolakidis & Kartakoullis, 2019).

Another significant benefit of computerized systems is the improvement of service quality and student satisfaction. By providing seamless access to information and services through user-friendly interfaces, institutions can enhance the overall student experience. Automated processes reduce wait times, minimize errors, and ensure consistency in service delivery, leading to higher levels of satisfaction among students and other stakeholders (Yi & Hwang, 2018).

Furthermore, computerized systems contribute to institutional agility and innovation. By leveraging emerging technologies such as artificial intelligence, machine learning, and data analytics, institutions can develop innovative solutions to address complex challenges and seize new opportunities. These technologies enable predictive modeling, personalized learning experiences, and adaptive decision support systems, fostering a culture of innovation and continuous improvement (Alrajawy *et al*., 2021).

## 2.3 ID Card Processing Systems in Educational Institutions

ID card processing systems play a crucial role in ensuring the security, efficiency, and effectiveness of operations within educational institutions. These systems encompass a range of processes, from capturing and storing student information to issuing and managing identification cards. In today's digital age, the implementation of computerized ID card processing systems has become increasingly common, offering numerous benefits over traditional manual methods.

One significant advantage of computerized ID card processing systems is the enhancement of security. By integrating advanced security features such as biometric authentication, encryption, and access controls, institutions can safeguard sensitive student information and mitigate the risk of unauthorized access or identity theft (Alotaibi *et al*., 2021). Additionally, digital systems allow for centralized management of access privileges, enabling administrators to revoke or modify permissions quickly and efficiently in case of lost or stolen cards.

Moreover, computerized ID card processing systems improve operational efficiency by automating routine tasks and streamlining workflows. Through barcode or RFID technology, these systems enable swift identification and verification of students, staff, and visitors, reducing waiting times and enhancing overall productivity (Saini & Grewal, 2020). Furthermore, digital databases facilitate seamless integration with other institutional systems, such as attendance tracking and library management, enabling real-time data sharing and analysis for improved decision-making (Rocha *et al*., 2021).

Another significant benefit of computerized ID card processing systems is the enhancement of service quality and user experience. By providing self-service kiosks or online portals for ID card requests and renewals, institutions empower students and staff to manage their identification needs conveniently and independently. This self-service approach reduces administrative burden and enhances satisfaction levels among users, leading to a more positive overall perception of institutional services (Liu & Huang, 2019).

Furthermore, computerized ID card processing systems support sustainability initiatives by reducing paper usage and promoting environmentally friendly practices. By digitizing ID card issuance and management processes, institutions minimize their ecological footprint and contribute to conservation efforts (Leal *et al*., 2021). Additionally, digital systems facilitate remote access and online transactions, reducing the need for physical presence and transportation, thereby further reducing carbon emissions and promoting eco-friendly behaviors.

## 2.4 Related Studies

Rodrigues, Silva, and Oliveira (2018), investigated the impact of computerized systems on administrative efficiency within educational institutions. Their study revealed that automation significantly reduces the time required for processing tasks, such as ID card issuance, which enhances overall operational efficiency. The research emphasized the importance of integrating such systems to streamline administrative workflows and minimize human error.

Smith, Brown, and Wilson (2019), focused on the security enhancements provided by computerized systems in educational settings. Their study highlighted the implementation of encryption and secure access controls in computerized ID card processing systems, which protect against unauthorized access and data breaches. The findings underscore the critical role of robust security measures in safeguarding sensitive student information.

Alharthi *et al.* (2020), explored the broader implications of digital transformation in higher education. Their research identified computerized systems as key enablers of this transformation, facilitating improved data management, decision-making, and service delivery. The study provides a framework for assessing the maturity of digital initiatives within educational institutions.

Johnson and Roberts (2021), examined the challenges associated with manual student services and the potential of computerized systems to address these issues. Their study revealed that automation not only improves efficiency but also reduces errors and administrative burdens. They recommended adopting computerized systems to enhance service quality and operational effectiveness.

Davis and Wong (2021), investigated student expectations and experiences with administrative services in higher education. Their research showed that students prefer digital solutions for administrative tasks, including ID card processing, due to their convenience and reliability. The study highlighted the positive impact of computerized systems on student satisfaction and institutional reputation.

Kim and Park (2019), studied the environmental benefits of adopting digital solutions in educational administration. They found that computerized ID card processing systems significantly reduce paper usage and contribute to sustainability goals. Their research emphasized the role of technology in promoting eco-friendly practices within educational institutions.

Azeez, Khalid, and Yusuf (2022) explored strategies for future-proofing educational administration through technology integration. Their study identified the need for adaptable and scalable systems that can evolve with technological advancements. They highlighted the potential of computerized systems to enhance administrative resilience and flexibility.

Alotaibi *et al.* (2021), examined the integration of biometric authentication in computerized ID card processing systems. Their research demonstrated that biometric technologies, such as fingerprint and facial recognition, significantly enhance the security and reliability of ID verification processes.

Saini and Grewal (2020), explored the use of RFID technology in computerized ID card systems to improve operational efficiency. Their study found that RFID-enabled ID cards facilitate quick and accurate student identification, reducing delays and enhancing service delivery.

Rocha *et al.* (2021), discussed the benefits of integrating computerized ID card systems with other institutional systems, such as attendance tracking and library management. Their research showed that such integration leads to better data coherence and more efficient resource utilization.

Liu and Huang (2019), emphasized the importance of user-centric design in developing computerized ID card systems. Their study highlighted that systems designed with user experience in mind lead to higher satisfaction rates and more effective adoption by students and staff.

Marques *et al.* (2020), explored the emerging trend of mobile ID solutions in educational institutions. Their research showed that mobile ID cards, accessible via smartphones, offer convenience and flexibility, enhancing the user experience while maintaining security standards.

Wang *et al.* (2021), investigated the application of blockchain technology in ID verification systems. Their study found that blockchain can provide a tamper-proof and transparent method for managing student identities, significantly enhancing security and trust.

Rahman and Hossain (2022), explored the use of artificial intelligence (AI) and machine learning in enhancing the capabilities of computerized ID card systems. Their research demonstrated that AI can improve the accuracy of ID verification processes and predict potential security threats.

Gonzalez *et al.* (2019), focused on methodologies for evaluating the performance of computerized ID card systems. Their study provided frameworks for assessing system efficiency, user satisfaction, and security, offering valuable metrics for continuous improvement.

Designing and implementing a computerized student ID card processing system requires careful consideration of various factors, including user interface design, database management, security features, and system testing. Kim & Park (2019), discuss the environmental benefits of digital solutions in educational administration, emphasizing the importance of minimizing paper usage and optimizing resource allocation. Azeez *et al.* (2022), explore strategies for future-proofing educational administration through technology integration, highlighting the need for adaptable and scalable systems. These studies offer valuable insights into best practices for system design and implementation, providing a framework for developing an effective and sustainable solution for the Federal Polytechnic, Mubi.

## 2.5 Information System

According to Hevner (2014), Information Systems (IS) are implemented within an organization for the purpose of improving the effectiveness and efficiency of that organization. Two paradigms that characterize much of the research in the IS discipline are behavioral science and design science. The behavioral science paradigm seeks to develop and verify theories that explain or predict human or organizational behavior. The design science paradigm seeks to extend the boundaries of human and organizational capabilities by creating new and innovative artefacts.

These two paradigms are complementary but distinct (March & Smith, 2015). The behavioral science paradigm has its root in natural science research methods. It seeks to develop and justify theories that explain or predict organizational and human phenomena (Hevner, 2014). The design science paradigm has its roots in engineering and the science of the artificial (Simon, 2016). It is fundamentally a problem-solving paradigm and seeks to create innovations that define the ideas, practices, technical capabilities, and products through which the analysis, design, implementation, management, and use of information systems can be effectively and efficiently accomplished (Denning, 2017).

This project work falls in the realm of the design science due to the problem-solving nature of the work. As the Information System (IS), literature recognizes, while the importance of design is well recognized, designing a useful system is complex. This system is built on the work of the design science paradigm and followed the literature suggested guidelines in (Hevner, 2014).

## 2.6 Summary

The literature reviewed in this chapter provides a comprehensive understanding of the benefits of computerized systems, challenges in manual ID card processing, and best practices in system design and implementation. Drawing on these insights, the subsequent chapters will focus on the practical application of this knowledge in the design and implementation of a computerized student ID card processing system for the Federal Polytechnic, Mubi.

# CHAPTER THREE

# SYSTEM DESIGN AND ANALYSIS

## 3.1 Introduction

This chapter presents the system design and analysis employed to achieve the aim of the project. We will detail the design and implementation of the Student ID Card processing system. The system aims to provide an efficient and user-friendly experience for students to apply for ID cards, manage their applications, and ensure smooth operations for the administrative staff at Federal Polytechnic, Mubi. This chapter will cover the overall system architecture, database design, user interfaces, and the integration of various components.

## 3.2 Disadvantages of the Existing System

The manual ID card processing system, which typically involves paper forms and in-person submissions, has several disadvantages that highlight the need for an automated processing system. Manual systems are prone to human errors such as misplacing application forms, incorrect entry of student information, or miscommunication between staff members. These errors can lead to processing inaccuracies, delays, and student dissatisfaction.

Manual systems rely on physical interactions and paper forms, which can be time-consuming and prone to delays. Students may experience difficulties in submitting their applications during peak periods or may have to wait for confirmation, leading to inefficiencies. This can result in longer processing times, decreased student satisfaction, and potential administrative bottlenecks. Physical application forms can be misplaced or lost, causing confusion and frustration for both students and administrative staff as they try to rectify the situation or recreate lost applications.

## 3.3 Advantages of the Proposed System

The following are the advantages of a Student ID Card processing system:

1. Increased Accuracy: Reduced human errors in application processing and data entry.
2. Improved Efficiency: Streamlined application submission and management, reducing processing times.
3. Enhanced Application Tracking: Real-time application tracking for students, improving transparency and engagement.
4. Centralized Information: Easy access to accurate and up-to-date application information for students and staff.
5. Enhanced Student Convenience: Remote application submission, customization, and saved preferences for a seamless processing experience.

## 3.4 Software Development Model

The Waterfall Model of the System Development Life Cycle was employed to design a website for the ID card processing system, ensuring it is available at all times and accessible from any device. The system was developed using PHP for server-side scripting and MySQL for database storage, along with HTML, CSS, and JavaScript for full functionality. The Waterfall Model consists of six stages: requirements, analysis, design, coding, testing, and deployment.



Figure 3.1: Waterfall model

**Requirement Stage:** During this stage, all possible system requirements were documented in a requirements document. This stage requires technical expertise and knowledge that personnel will use in operating the proposed application.

**Design Stage:** In this phase, high-level and low-level designs were prepared. The software design was created to verify the authenticity of the applications and ensure a seamless user experience.

**Development Stage:** In the Development phase, the software development team started coding and developing the software. This is the longest phase of the Waterfall Model as developers need more time to build the software. Once the development of the software is completed, the project is handed over to the testers.

**Testing Stage:** The software is developed and then tested to ensure it runs successfully. The researcher will ensure that the end-to-end software is complete and functional.

**Deployment Stage:** Once the software has been successfully tested, it is deployed to become live for real-time users. The deployment phase makes the application available to students and administrative staff.

**Maintenance Stage:** After deployment, the application enters the maintenance phase. Clients usually require a maintenance period of one or two years to address any bugs or to implement slightly enhanced features as needed.

## 3.5 Method of Data Collection

Data collection for the development of the Student ID Card processing system included both primary and secondary sources. Primary sources include direct interactions with stakeholders, such as interviews and surveys, to gather requirements and feedback. Secondary sources encompass existing literature, research, and relevant documentation related to online application systems and system development.

## 3.6 System Design

System design for the Student ID Card processing system involves defining the platform's architecture, modules, interfaces, and data structures to meet specified requirements. It entails the application of systems theory to product development, ensuring the alignment of design elements with the objectives and needs of the Student ID Card processing system.

## 3.6.1 Algorithm Diagram

Use case diagram: A use case diagram shows the system and the various ways that users interact with the system.

Login

Add Bulk Student

Add Student

Print ID Card

Admin

Print Bulk ID

Log out

Print report

Figure 3.2: Use case diagram

## 3.6.2 System Architecture

**ADMIN**

**STUDENT ID CARD PROCESSING SYSTEM**

System Database

Figure 3.3: System Architecture

## 3.6.3 Database Tables/Queries Structures

**Table 3.1: Students Details**

**Top of Form**

| **Name** | **Type** | **Extra** |
| --- | --- | --- |
| id Primary | int(11 | AUTO\_INCREMENT |
| Name | varchar(50) |  |
| Department | varchar(255) |  |
| Level Index | varchar(50) |  |
| Matric No | varchar(50) |  |
| Passport | varchar(50) |  |
| Phone number | varchar(50) |  |

**Table 3.2: Admin Records**

Top of Form

| **Name** | **Type** | **Extra** |
| --- | --- | --- |
| id Primary | int(11) | AUTO\_INCREMENT |
| First name | varchar(20) |  |
| Surname | varchar(20) |  |
| Email | varchar(50) |  |
| Password | varchar(50) |  |
| Phone | varchar(50) |  |

Bottom of Form

## 3.6.4 Input and Output Design

**ADD STUDENT**

Surname

Registration Number

Phone number

**SUBMIT**

First Name

Level

Department

**CLOSE**

Figure 3.4: Add Student Form

**LOGIN**

**LOGIN**

**LOGIN**

Email address

Password

Figure 3.5: Login form

**BULK PRINT**

FROM:

TO:

**SUBMIT**

Figure 3.6: Bulk Print

| **Student Name** | | **Registration Number** | | **Phone Number** | | **Department** | | **Level** | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| KPONKIUS JAKE | | ST/CS/ND/22/002 | | kponkius@gmail.com | | COMPUTER SCIENCE | | ND1 | |
| KPONKIUS JACOB | | ST/CS/ND/22/003 | | kponk@gmail.com | | COMPUTER SCIENCE | | HND1 | |
| AKAMSHU JACOB | | ST/CS/ND/22/003 | | kponk@gmail.com | | COMPUTER SCIENCE | | HND1 | |
| INUSA SARAYA | | ST/CS/ND/22/005 | | ndbhalerao91@gmail.com | | COMPUTER SCIENCE | | ND | |
| 5 | JAMES JOHN | | ST/CS/HND/22/003 | | 08023123404 | | COMPUTER SCIENCE | | HND | |

Showing 1 to 5 of 5 entries

Figure 3.7: Student Report

The bearer whose photograph appears overleaf is a staff of

THE FEDERAL POLYTECHNIC, MUBI

If lost and found please return to the Security Unit, Federal Polytechnic, Mubi, Adamawa State

Authorised Signature

Property of THE FEDERAL POLYTECHNIC, MUBI



**THE FEDERAL POLYTECHNIC, MUBI**

Student Name:

**AKAMSHU JACOB**

Level:

**HND1**

Matric No:

**ST/CS/ND/22/003**

Department:

**COMPUTER SCIENCE**

Figure 3.8:ID Card report

## 3.7 System Requirements Specification

## 3.7.1 Hardware Requirements

The software to be design needs the following hardware for an effective operation of the newly designed system.

1. A system running on intel, P(R) duo core with higher processor
2. The-Random Access Memory (RAM) should be at least 512MB.
3. At least 20-GB hard disk.
4. A monitor.

## 3.7.2 Software Requirements

The software requirements include:

1. A window 7 or higher version of operating system.
2. XAMP or WAMP for Database
3. PHP
4. MySQL
5. Browser

## 3.7.3 Personnel Requirement

Any computer literate who has a technical knowhow of internet surfing can use the system because it is user friendly.