[March 2024]

# DECLARATION

We declare that, this project work entitled, **SMART ISSUE ROUTING PLATFORM FOR RESOLVING STUDENTS’ CONCERNS** is original and has never been submitted to any University or other Institution of Higher Learning.

It is our own research whereby other scholar’s writings were cited and references provided. We thus declare that this work is mine/ours and was completed successfully under the supervision of MR. Esron UHAGAZE.

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# **CHAPTER 1: GENERAL INTRODUCTION**

## **Background**

Rwanda National Police is among of the strongest security organs in either within a country or abroad, it is showing much effort in providing security to the people they protect, they are characterized by courage, patriotism, and professionalism in what they do. In their activities, they meet different challenges that can also hinder them in providing an excellent quality of service. The police officers on duty also needs a welfare to accomplish their work without being bordered much by problems being unsolved.

National police college is an established institution of Police high training for Rwanda National Police mandated to build the capacity of Police officers and other law enforcers. There are a high number of students and staff, of course they meet with different challenges in the community they live in.

In this dissertation, we introduce a supportive solution for police officers’ assistance through the development of **Smart issue routing platform**. The system addresses the need for prompt and efficient support in Real life challenges that can ask to be outside the college such as healthcare, a leave, burial ceremony, take care of families and other different issues within a college.

**Smart Issue Routing Platform** is a user-friendly web-based application that can easily accessed in any browser by users who use either a computer or phones. This **Smart Issue Routing Platform** is a combined web-based and mobile application that is going to facilitate the wellbeing of students and staff in National Police College by facilitating in real-time issue submission, escalation, and tracking.

This application **Smart Issue Routing Platform** is going to help in enhancing communication, collaboration and accountability among students and staff in addressing concerns.

The **Smart Issue Routing Platform** will contribute to conducting a current issue management and communication practices within the National police college, identifying and help in solving key challenges/problems faced by police staff and students in submitting, escalating, and resolving issues. This application will be able to show users the progress of an issue being raised.

## **Problem statement**

In the community of police education, students face challenges in effectively communicating their concerns in academic leaders and administrators, the normal or traditional methods used in an issue communication and resolution have been proven to be inefficient, have showed not to be the solution in routing the challenges met by police officers within a college. The face to face approaches, phone calls and weekly Fallin don’t have smart and efficient framework for solving their concerns.

This came as a big barrier to students and staff in getting quality results in education for students and low level of quality service for staff.

Currently, there are three (3) diverse ways of addressing an issue for both police staff and students, the following are normal ways that are being used:

**Weekly general fall-in:**

This is one of the methods that is being used in addressing a challenge of a police officer, where he/she must wait for general meeting with top leaders which will happen once in week to be raised and discussed publicly.

**Challenges:** this method is terribly slow, it takes a longtime for an issue to be discussed and solved, you can imagine when a police officer meet with a challenge on Tuesday and meeting takes place on Monday of next week, clearly the issue is delayed.

The privacy violation, physical appearance for both students and officers in charge(staff) are not comfortable with public speaking, and their issue is heard by every police officer in that meeting which is breaking the privacy.

**Approaching an officer in charge through an office:**

This is another method currently used in forwarding an issue where a student or staff must manually approach the office physically without systematic tracking.

**Challenges:** starting from the officer who is going to solve an issue, this method has proven to cause a headache as an officer can receive a substantial number of students who need a help every day, and sometimes the officer in charge is not in the office which can led to the communication delay, lack of tracking and some potential information loss.

**Phone calls or message communication:**

Recently, users reported issues via phone calls, SMS, and WhatsApp messages which were not successful at all. most of times the officers in charge don’t take all incoming calls which not good to the users who need help. As their calls are being ignored many times, tends to be delaying of their problems which can even result to the strong risks.

**Challenges:** communication errors, limited availability, lacking issue’s structure and no centralized data repository, students can call a wrong officer due to lack of knowledge about whom the issue concerns.

These challenges hinder the college's ability to provide a seamless learning experience and maintain a disciplined environment. Addressing this gap, our project seeks to develop the SMART ISSUE ROUTING FOR RESOLVING STUDENTS’ CONCERNS to enhance communication, empower students and staff, optimize the process of issue resolution within the college.

To overcome those challenges listed above, this system should leverages cutting edge web technologies like MERN stack (MongoDB, Express, React and Node) to build interactive web interfaces and beautiful pages. In addition, using PWA (Progressive Web App); The system could run in all mobile platforms or devices to support those users unable to access web-based version.

## **1.3 Objectives of the study**

### **1.3.1 General objectives**

The National Police College Smart Issue Routing Platform for Resolving Students’ concerns is going to help in enhancing communication, collaboration and accountability among students and staff in addressing concerns. This app will contribute to conducting a current issue management and communication practices with the National Police college, identifying and help in solving key challenges faced by police staff and students in submitting, escalating, and resolving issues. This application will be able to show users the progress of an issue being raised.

### **1.3.2 Specific objectives**

* To evaluate the impact of the software application on issue resolution efficiency, communication effectiveness, and overall user satisfaction within the police college.
* To Facilitate the student to submit or raise their issues/problems in a straightforward manner.
* Keeping student issues communication in a secure way that helps in maintaining the privacy of communication.
* To empower the staff to solve student issues remotely and provide instantaneous feedback.
* To create a robust reporting functionality, issues analytics, resolution timeline and user interface.
* Generate weekly and monthly report detailing resolved, outstanding issues and notify the intended user all process.
* To incorporate real-time communication features, including messages and notifications, for quick updates and clarifications.
* To ensure data security and privacy through robust authentication and authorization mechanisms.
* To design an intuitive user interface that accommodates the varying needs of police staff and students.
* To conduct user training sessions to familiarize police staff, students, and administrators with the software's features and functionalities.
* The system provides the way of addressing issues by respecting the chain of command.
* To help in escalation of an issue between the supportive staff.
* Provision of chart room for a certain issue to be discussed between the staff.

## **1.4 Interest of the project**

### **1.4.1 Personal interests.**

“SMART ISSUE ROUTING PLATFORM FOR RESOLVING STUDENTS’ CONCERNS” as Developers, it will help us to enhance our proficiency in computer science skills, given our status as students in the computer science faculty. It helps us to keep in practice the theoretical skills we have been learned in computer science and information security and we take great pride in developing this exceptional system for the NPC campus.

### **1.4.2 Staff interests.**

Implementing this software “SMART ISSUE ROUTING PLATFORM FOR RESOLVING STUDENTS’ CONCERNS” is essentials significant advantages and enhancements, including solving the student’s problems and other services among the staffs remotely, Instructors and trainers will use the system to submit issues related to training materials, facilities, or other concerns. They can also track the progress of their submitted issues, ensuring that the college's operations run smoothly.

### **1.4.3 Social interests**

Using this system of “smart issue routing platform” as Centralized app comes with substantial advantages such as app streamlines reporting and resolution for instant systematic communication, organized approach to issue reporting and resolution, enables real-time reporting, eliminating the need to wait for weekly meetings and the elected student representatives use the system to voice collective concerns on behalf of their peers. They will engage in the issue resolution process and keep their fellow students informed about progress.

## **1.5 Scope of the project**

The smart issue routing platform for resolving students’ concerns aims to develop a comprehensive combined web-based and mobile application that facilitates efficient communication and resolution of student concerns within National police college. This system is going to be used in National Police College with user friendly interface accessible to both students and concerning leaders, issue categorization and other distinctive features.

## **1.6 Research methodology**

### 1.6.1 Introduction

### 1.6.2 Research methodology approaches.

This section describes all details on how research has been done, Accurate data collection and process of gathering and analyzing accurate data from various sources to find out the answers to research problems (Research topic).

According to the research topic we would like to conduct Survey, in our research we are expecting to use the following Data Collection Techniques:

1. Observation data collection method.
2. Questionnaire data collection method.
3. Interview data collection method.

**Observation method**

We observe that most of the students have faced too many problems related to issue of communication and resolution proven to be inefficient. Where the Traditional approach relies on a weekly meeting for issue rising and discussion which is very challenge to the students and note down the observations.

**Questionnaire method**

We conducted a question for both academic staff and students, throughout both a combination of open-ended and closed-ended questions to find out if that Platform is relevant and user requirement.

This approach is functional for collecting data from respondents through a structured set of questions, either in written or electronic form.

**Interview method.**

An interview is a conversation where two individuals share and discuss their mutual interests and ideas according to related topic, the interview will be conducted throughout qualitative face to face interview.

The purpose of this interview was to help the researchers to better understand the existing system as it provides in-depth information to be used while designing the proposed system. according to the gathered data, the researcher successfully crafted platform for issue resolving called “SMART ISSUE ROUTING PLATFORM FOR RESOLVING STUDENTS’ CONCERNS”.

## **1.7 Organization of the project**

This project called SMART ISSUE ROUTING PLATFORM FOR RESOLVING STUDENTS’ CONCERNSis going to be organized in five different chapters.

**CHAPTER 1: GENERAL INTRODUCTION** (This chapter includes a general background of the study, simply explanation of what this project is going to do in community, the problem to be solved, the objective of the research, the methodology to be used in this project and how the study is organized also includes in this chapter)

**CHAPTER 2: LITERATURE REVIEW** (This chapter includes the deep analysis of the current systems to know how it works, mentioning its weaknesses and know all other problems related to it).

**CHAPTER 3: RESEARCH METHODOLOGY** This chapter describes the methodologies used by the researcher to help in achieving the mentioned objectives and different techniques used in collecting data. Includes how data will be analyzed and implemented.

**CHAPTER 4: ANALYSIS AND THE DEVELOPMENT OF THE SYSTEM (**This chapter shows detailed techniques used to collect information that facilitated the system developer to analyze the existing system and again to be used in the development and implementation of the new system**).**

**CHAPTER 5: CONCLUSION AND RECOMMENDATIONS** (This chapter declares in short, the conclusion regarding on the developed research, outcomes and provide recommendations to different individuals that could get interest in the system).

# **CHAPTER 2: LITERATURE REVIEW**

## **2.1 Introduction**

Effective communication between academic leaders and students is very important in fostering a supportive and conducive studying environment. Despite that, traditional ways of addressing students concerns like manual approaches such as phone calls, general meetings, often lack the systematic mean needed to ensure the timely and efficient problem solving.

The research has shown the limitation of such approaches, highlighting problems such as delays in response time, poor communication, and lack of being held accountable in resolution process.

This carried research, we have studied different aspects of issue resolution within National Police College educational prospects, starting from identifying the concerns of student to the development of smart platform and means for facilitating communication and collaboration.

## **2.2 Definition of concepts related to the project.**

**2.2.1 Smart issue Routing Platform**

A combined web-based and mobile application designed to facilitate the submission, categorization, and resolution of student concerns within educational institutions. Utilizes advanced technologies such as machine learning and intelligent routing algorithms to optimize the routing and allocation of student issues to appropriate leaders or departments.

**2.2.2. Student concerns.**

Any issues, problems, or grievances raised by students pertaining to their academic experience, campus life, or administrative matters. Examples include academic challenges, campus facilitates issues, financial aid inquiries, and student support services requests.

**2.2.3. staff members.**

Refers to academic leaders, administrators, and other personnel responsible for addressing student concerns within educational institutions. This includes administration in charge, intelligent officer, chief instructor, academic officer in charge, commandant, and other different leaders.

These individuals play a key role in reviewing, prioritizing, and resolving student issues submitted through the platform.

**2.2.4 Issue Escalation**

This is the process of raising student issues to the next level within the college hierarchy if are not solved**.**

**2.2.4 Chatrooms:**

This is an online platform or feature that allows users to engage in real-time-based conversations between two or more people.

**2.2.5 Smart:** Smart" in technology usually implies a level of, automation, or connectivity that enhances functionality, usability, and/or convenience for users.

## **2.3 Related studies**

### 2.3.1 Impact of feedback request forms and verbal feedback on higher education students’ feedback.

In higher education, students often misinterpret written feedback, which is constitutes the primary form of feedback. To address this issue, organizing feedback conversations using feedback request forms and verbal feedback emerges as a promising intervention. A sample size of N=128 was conducted to assess the impact of feedback request forms and feedback modes (written Vs verbal). Result revealed that verbal feedback significantly enhanced students’ feedback perception compared to written feedback, through it did not affect self-efficacy or motivation. Furthermore, feedback request forms did not influence students’ perceptions, self-efficacy, or motivation, suggesting a need for further research in this area.

Moreover, Schools websites often offer contract forms or feedback forms for students to submit inquires, complaints, or feedback directly to administrative staff or support services. These forms enable students to specify their issues and provide additional details, which are then routed to the relevant department or staff member for follow-up.

According to this article, it will help us to accomplish our goal by implementing the way where both staffs and student will be able to share feedback. During issue close-up, staff can be able to provide feedback form with series of questions to ask students if he is satisfied. According to response or conversions discussed, student will answer those questions accordingly. [1]

### 2.3.2 Through the Lens of Students: How Online Discussion Forums Affect Students’ Learning (Afef Ahmed Gasmi)

Education institutions often host online forums or community boards where students can interact with peers and staff members. This platform serves as valuable spaces for students to post questions, share experiences, and seek assistance on various academic and non-academic topics. Within these forums, students can raise issues or concerns they encounter, ranging from administrative matters to academic challenges. Other community members, including peers and moderators, can then engage with these posts by providing guidance, sharing relevant resources, or directing students to the appropriate support channels within the institution. The active participation of both students and staff members fosters a supportive community environment where issues can be openly discussed and resolved collaboratively.

This approach will be us to implement chatroom where a staff member can post the issue assigned to him for further discussions between all staff members where every staff member can provide his point of view. This collaboration will promote the accurate issue resolution and efficient response or feedback will be generated.[2]

### 2.3.3 Designing and implementation a mobile-Based Issue Tracking System for Student Support services in Colleges by Laura Garcia and Daniel Nguyen

This is a Mobile App for issue tracking system developed to support services in colleges. Through this system, students are allowed to login using mobile app, submit support issues, and track their progress. Once an issue is submitted, it is automatically dispatched to related staff for its resolution. The student receives real-time updates and notifications on progress on his/her issues. When it is resolved, he/she can provide feedback throughout the app.

This system faces challenges like lack of offline functionality for issue submission and tracking, it lacks web accessibility, no way to prioritize issues effectively, struggles to engage students effectively. Furthermore, the system lacks robust reporting and analytics capabilities. To address these gaps, The implementation of offline support is needed, implementation of user engagement strategies such as user training are recommended, lastly there should be a way to track reports and analytics for a certain date to check the more busting issues.

## **2.4 Tools and programming languages**

Vs code: Visual Studio Code is a lightweight but powerful source code editor which runs on your desktop and is available for Windows, macOS and Linux. It comes with built-in support for JavaScript, TypeScript and Node.js and has a rich ecosystem of extensions for other languages and runtimes.

ReactJS: is a JavaScript library used to create reusable user interface components, and library for creating modular user interfaces (MUI). It encourages the creation of reusable user interface components, which present data that changes over time. Many people use the React as the V in the MVC (model view control).

Node.js is an open-source and cross-platform JavaScript runtime environment where node.js app runs in a single process, without creating a new thread for every request. Node.js provides a set of asynchronous I/O primitives in its standard library that prevent JavaScript code from blocking and generally, libraries in Node.js are written using non-blocking paradigms, making blocking behavior the exception rather than the norm.

Express JS is a node js web application framework that provides broad features for building web and mobile applications and it is designed to simplify the process of building web applications and APIs. [https://devdocs.io/express/]

Tailwind CSS: this is the kind of CSS works by scanning all your HTML files, JavaScript components, and any other templates for class names, generating the corresponding styles and then writing them to a static CSS file.

Swagger: is a set of open-source tools built around the Open API Specification that can help you design, build, document, and consume REST APIs.

PostgreSQL: PostgreSQL is a powerful, open-source object-relational database system. which is used as the primary data store or data warehouse for many web, mobile, geospatial, and analytics applications.

Nodemon: is a tool that helps develop Node.js based applications by automatically restarting the node application when file changes in the directory are detected.

# 

# **CHAPTER 3: RESEARCH METHODOLOGY**

## 3.1 Introduction

Any institution of higher learning works not only as a focal point for academic success but also as a solution for personal and professional growth. Within these mainstays of education, it is crucial that students have avenues to raise their concerns and challenges, ensuring a happy environment for learning and development.

The National Police College faced different challenges, that’s why we recognize the need for a helpful system to address the raised concerns by its student body effectively and efficiently.

We show the research methodology employed to develop and verify the proposed system. We have dug into the complexity of our approach, including data collection, analysis, and techniques.

By making clear our methodology, we want to provide clearness and transparency, showing the solid foundation for understanding the framework’s efficiency and potential in almost the same educational contexts. By basing on rigid analysis and observational evidence, we want to demonstrate the efficient and helpful impact of this smart approach to addressing students’ concerns within the educational environment.

## 3.2 Software Development Process Models

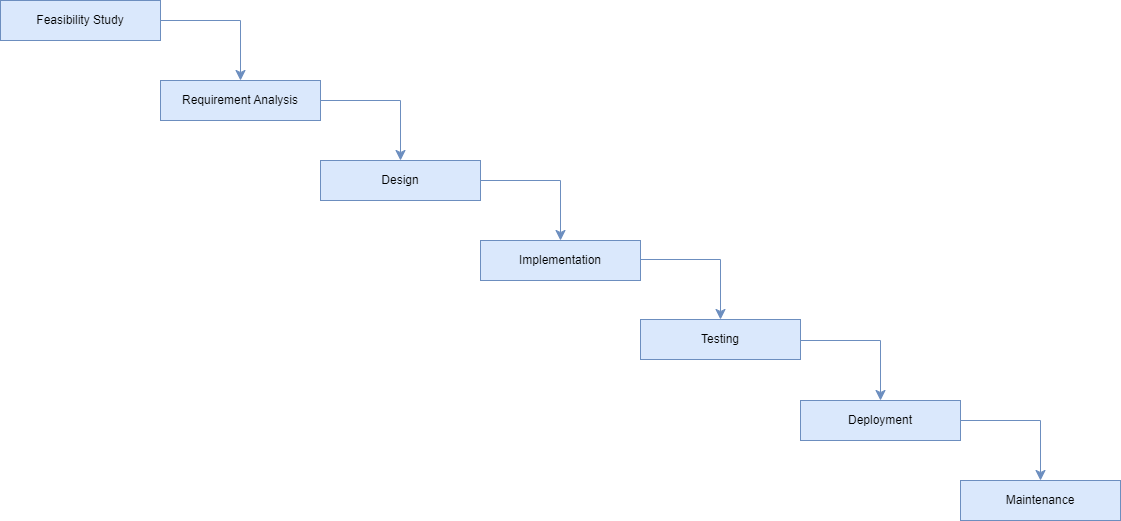
### 3.2.1 Introduction

We delve into research methodology in software development, it is very important to show various models that guide our project. Each development organization has its own working process that evolves for how it gets software development done. It sounds easy when you hear the project, but it requires plenty consensus on what the steps are make up the whole project, and then requires the way to arrange those steps. One of the fundamental process models is the waterfall model, and in our research, we have chosen to use it.

## 3.2.2 Waterfall model

This is the software development model characterized by the structured and sequential approach to software development. With this model, each phase is completed before moving to the next stage. This approach is commonly used in many different areas of engineering, it is very easy to use, that’s why we have chosen it over other models. We have chosen to use this model because we have well defined requirements and are unlikely to change.

**Figure 1: Waterfall model**



### Phases of waterfall model

**Phase 1: Feasibility study**

By performing feasibility study, three different studies are undertaken. Economic, technical and schedule feasibility studies.

Technical feasibility determines whether the technology used can support the requirements of the project. It assesses features like compatibility, scalability, and the performance of the software. Economic feasibility shows if the software is financially possible to be developed. Schedule feasibility tells you if it is possible to meet users’ requirements with respect to the predetermined timeframe.

**Phase 2: Requirements gathering.**

This is the first phase of the waterfall model; it includes the identification and documentation of users’ needs. Collection of all information needed to develop software takes place in this phase. Once the requirements are gathered, they are analyzed to check for completeness, and feasibility studies.

Software requirements and developments tools:

* System of 32-bit or 64 bit-type machines
* Any operating system
* React.js
* Tailwind.js
* Node.js
* Express js
* PostgreSQL

**Phase 3: design**

The software requirements that we have obtained have analyzed to turn them into a computer system and then helping us in designing. The design shows the flow of information and structure.

The system design is composed of system architecture, database design, system flowcharts, system sequence diagrams, and output design.

**Phase 4: Implementation**

This stage includes coding based on the design specifications. This is the easiest phase because all requirements needed and the design are done, then they are turned into a running software through coding. Wea have started coding using different programming languages and tools. Different modules performing different tasks are combined to form a software. This stage is very crucial as it helped to turn the requirements into effective software.

**Phase 5: System testing**

This is the stage that comes after being done with the implementation of the system. Includes the testing of the system to make sure that it complies to the specified requirements and needed functions effectively. In phase, different individuals help in test, different users of the system can help you in testing the system which is called beta testing and as developer we will test the system to make sure that it works what it intended to do, this is called alpha testing. All flaws and bugs detected during this phase wea have fixed before proceeding to the next stage.

**Phase 6: deployment**

During this phase, the software is going to be delivered into the live environment in order to test its performance. This is the phase of making the software available to the end-users. Simply after finishing coding the software, after being tested and accepted by users, it is deployed to the intended environment.

**Phase 7: Maintenance**

Now this is the last phase of waterfall model, it takes place after system is installed. This is the provision of support and taking care of the software by making sure that it runs smoothly. Any issue raised must be handled in this phase.

### Features of waterfall model that facilitated in project.

There are different features of waterfall model compared to other models, the following are some of them.

. Requirements are very well documented, clear, and fixed.

. Quality control: at each stage this model helped us with quality control and testing to make sure that the software meets the requirements.

. With this model, project scope and timelines are defined and monitored through the project wheel of life.

. Sequential approach: every stage is finished before taking the other phase to make sure that no mistake occurred.

### **Advantages of waterfall model.**

There are different advantages of waterfall model that encourage us to use this model.

* This model is very easy to use and track on each stage which made our research easy.
* It has defined phases, each phase is processed and completed individually.
* All processes and obtained results are well documented.
* It is suitable for small projects where requirements are steady and very clear, which reduces too many modifications.

### **Disadvantages of waterfall model**

* This model assumes that the user requirements are not going to be modified, it is very difficult to make a change request after the requirements specification is finished.
* Limited customer involvement: Customer feedback is often sought only at the beginning and end of the project lifecycle, leading to potential misunderstandings or mismatches between the final product and customer expectations.
* Late detection of defects: Testing is often left to the end of the project lifecycle, which means that defects may not be discovered until the late stages, leading to potentially costly rework.
* This model is not suitable for large projects.
* No parallelism, if a team is working on a stage, the other team must wait until it is done.
* Design flaws, when discovered, you must start over from scratch.
* Limited user involvement, users are only involved in early stages (requirements gathering) of the project but may not be involved in the later stages like implementation.

### **3.3 Data collection techniques**

### 3.3.1 Observation method

Using this technique, as researchers we have found out more information about the current system and its processes that have been followed forward and works through about the issue/problem raised. from our observation, the users of the system have been fallowing throughout channels of command to arise the issue, while users of a current system have encountered numerous challenges in communication between staff and students, hindering progress towards reaching a conclusive solution and violation of private issues submission to direct related staff. This hinders them in providing an excellent quality of service. We chose observation as our preferred method because it offers in-depth and contextual information, enabling us to adjust to unfolding events.

### 3.3.2 Interview data collection method.

An interview is a conversation where two individuals share and discuss their mutual interests and ideas according to related topics, as researchers would prefer to conduct the interview through qualitative face to face approach. The purpose of this interview was to help us to better understand the existing system as it provides in-depth more information to be used like existing issue submission system and its follow up while designing the proposed system. according to the gathered data, we successfully crafted platform for issue resolving called “SMART ISSUE ROUTING PLATFORM FOR RESOLVING STUDENTS’ CONCERNS”.

### 3.3.3 Questionnaire method

questionnaire is a method of data collection which is completed by the respondent in written format. We conducted a question for both academic staff and students throughout both a combination of open-ended and closed-ended questions to find out if that Platform is relevant and user requirement. This approach is functional for collecting data from respondents through survey or statistical study a structured set of questions, either in written or electronic form.

The purpose, design, and administration of a questionnaire for data collection.

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