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CHAPTER I

THE PROBLEM AND ITS BACKGROUND

This chapter discusses the background of the study and the current state of the technology used by the beneficiary, which provides the research foundation and leads to the problem and objective of the study. It also contains the scope and delimitation of the research and the relevance and definition of terminology.

Background of the Study

According to the 2020 census, the Municipality of Norzagaray, Bulacan, has a population of one hundred thirty-six thousand and sixty-four (136,064) people. It is politically subdivided into 13 Barangays with a total land area of three hundred-nine-point seventy-seven square kilometers (309.77 km2).

Table 1. Selected Indicators from Cities and Municipalities Competitive Index for the Municipality of Norzagaray, Bulacan

Ranking Indicator	2019	2020	2021
Safety Compliant Business	401	430	276
Social Protection	203	210	182
Peace and Order	181	151	74
Employed Population	288	306	220

The Cities and Municipalities Competitive Index is an annual ranking of Philippine cities and municipalities developed by the Regional Competitiveness

Committees (RCCs) with the assistance of the United States Agency for International Development. Table 1 illustrates exciting facts about selected indicators from the Cities and Municipalities of Norzagaray, Bulacan Competitive Index from 489 Municipality 1st and 2nd Class. There are four columns in the table. The first column has the ranking of the arrows, followed by three columns labeled with the years observed during the study.

Based on the table, 2020 showed a high score range in all ranking indicators, while 2021 showed a low degree of ranking hands. Norzagaray, Bulacan The table shows the current standing of the Peace and Order from all municipalities around the country. As shown in the third column, Norzagaray ranked as the 151st Municipality under Peace and Order, climbing to 74th in 2021. (https://cmci.dti.gov.ph/data-portal-process.php, 2021)

According to Norzagaray Municipal and Planning Office (MPDO), Barangay Tigbe, with a population of 16,058, and Barangay Friendship Village Resources (FVR), with a population of 14,690, garnered the most crime in the Municipality. Based on the blotter record, cases of Theft or crime against property and violators against Municipal ordinances are very rampant. The level of crime in Norzagaray is 49.97% which has a Moderate finding according to the data MPDO. The crime of theft has a 52%, and the crime of robbery recorded a 54.54%. The average crimes for the past three (3) garnered 53.38%.

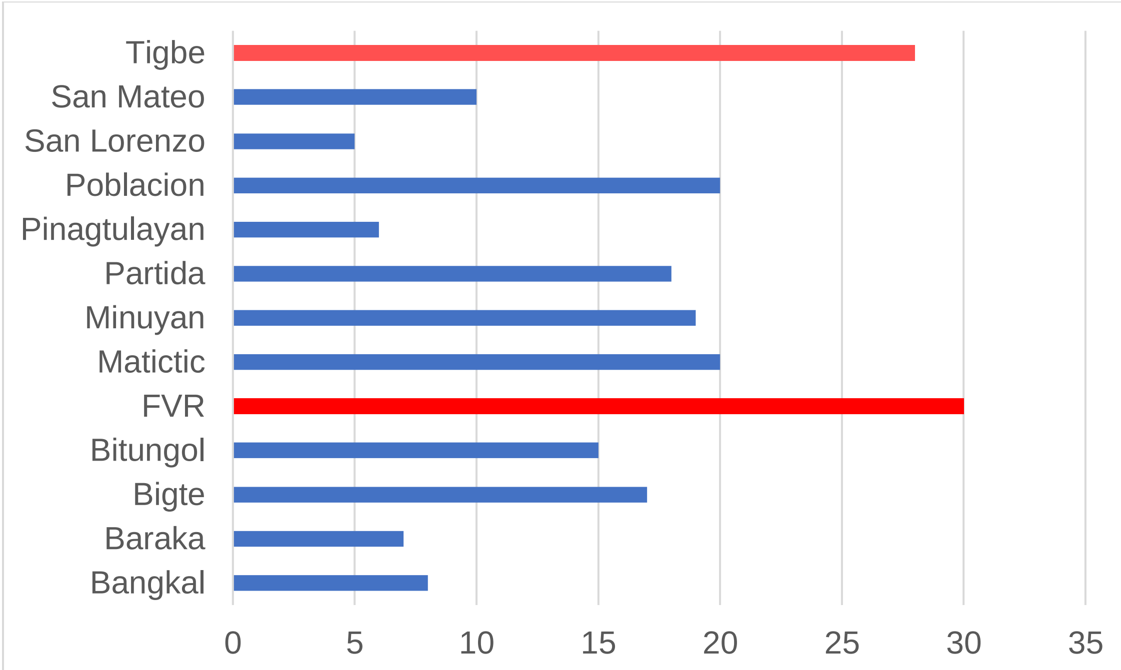

Figure 1
Average reported case complaint recorded in the blotter book

Figure 1 describes an average of 30 crime complaint reports per month. Barangay FVR has the highest crime complaints recorded in the blotter book, followed by Barangay Tigbe, which has the second-highest rate. One good factor to better understand crime monitoring and data analytics in the Municipality is Real-time monitoring. This monitoring and analysis will identify a crime-prone area, especially when a well-organized data system makes comparisons convenient to our law enforcers.

nurture Filipino culture, and promote the courts' prompt and high-quality administration of justice. The Blotter report is kept in the Barangay office when a suspect is booked, which includes recorded information on the grievances of the case. Whether civil or straightforward, all disputes are misunderstood by both parties residing in the same barangay, which the Barangay Justice System manages. The Norzagaray Municipal Police Station (NMPS) and the Barangay Peace Action Team

Having the hand records, NMPS is ineffective, especially when mobilization is limited. In addition, with that, accessibility to the information in every barangay is never uniform. Moreover, the numerous crimes occurring in Every Barangay Municipality are inefficient in tracking perpetrators. Every month, there is a continuous dialogue in each Barangays to understand crime status better and think of a concrete solution. The numbers of personnel in Norzagaray MPS and BPATs are minimal. In addition, the anti-criminality campaign of the Law enforcer is ineffective with regards to an efficient way of documenting reports and encouraging people to report the crime.

Table 2. The attribute of Crime in the Municipality of Norzagaray, Bulacan

Attributes	Description
Date Committed	Exact Date of Crime Event
Time Committed	Actual Time of Crime Event
Location	The Barangay where the crime happens
Crime types	Type of Crime
4W1H	What, Who, Where, When, and How

Regarding recording information in the Barangay, they are using a blotter record book for the specific crime complaint committed. The dataset was cleaned by removing all the noises, especially information that may provide errors and other problems such as the unique character, symbols, and redundant words.

Settings of the Study

This study will be conducted within the residential area of the Municipality of Norzagaray, Province of Bulacan.

Figure 1

Map of Municipality of Norzagaray

Statement of the Problem

General Problem

The main problem of Barangays in the Municipality of Norzagaray, Bulacan, is its poor management of criminal data and records, resulting in the deteriorating report regarding peace and order levels in the Municipality.

Specific Problem

Specifically, the proponent was able to identify the following issues and concerns that need to be addressed:

1. The lack of data gathering tools resulted in the unsystematic retrieving of crime information from the blotter book in the different Barangays.

   Crimes may happen unpredictably. Capturing vital information about a crime when it is being reported is essential. Merging reports from different Barangays using a paper base recording of the crime from the blotter book consumes too much time and effort for Barangay personnel. The Police officer used a spreadsheet application to facilitate data entry consolidating the report from different Barangays. However, these spreadsheet tools do not enforce data entry restrictions unless specifically instructed. Without enforcement, anyone can enter data in the wrong fields, use the incorrect format, or leave data fields unfilled.

2. The absence of analytical tools for use in data processing in the future for the improvement and development of the Local Government Unit.

   The output will be unreliable if the input is poor. Identifying the frequency of crime committed, type of crime, place, date, and time of the incident, and the detail of the suspect and the victim are vital information. Manual data input errors are a significant source of erroneous data. If the analysis is utilized to influence decisions, this can have serious negative repercussions. Analytical calculations could be thrown off by mistakes in the data, leading to wrong conclusions.

3. How to test the software works as expected that meets the functionality and reliability of the system requirements.

   Manual testing is an essential part of software quality assurance based on functionality and reliability standards, where a human tester proceeds a quality check without using any automation tools

4. How to evaluate a web-based application system based on the International Organization for Standardization software quality model.

   System evaluation can assist the developer in identifying areas for development and ultimately help the developer more efficiently achieve the set objective base on the ISO software quality model.

Objective of the Study

General Objective

The main objective of this study is the design and development of a “Web-based Crime Information Management System," which aims to provide effective and efficient management of criminal data and records to help alleviate the deteriorating peace and order levels in the said barangay.

Specific Objective

Specifically, the proposed study aims to:

1. To design a module that will manage and process the information about different crimes committed in the Municipality.

   The centralized blotter system captures vital information about a crime when reported. Law enforcement officers will store records electronically using a web-based system, eliminating the risk of physical copies being lost or forgotten. It will enable speedy and consistent editing by users in many places, reducing the chance of data loss when updates are made. Furthermore, computerized blotter records can make it easier for law enforcement officers to track the details of complaints using the system. Data privacy and cybersecurity are also highly considered vital in developing the application.

2. To develop a module that will generate reports about the crime incident reports with data analytics.

Monitoring crime incident reports should continually remain updated on everyday transactions to deliver accurate outcomes and results. The data analytics will analyze the current crime situation in every Barangays. It provides data analytics to transform criminal data into relevant and valuable insights that law enforcers can improve decision-making.

3. Test the functionality and reliability of the prototype.

   The developers used Manual Test Case Scenario to identify flaws and places for improvement, allowing the developers to make the necessary changes and build a system that meets the needs and expectations of the users. Testing is a way to look at a program, practice, intervention, or initiative to see how well it lights the developer's objectives

4. Evaluate the acceptability of the prototype using the ISO 25010 software quality model

   Evaluation assists in deciding what aspects of a program or effort operate well and what factors could be improved. Developers used ISO 25010 software quality model to ensure quality and determined to analyze the features of the system's foundation. It can also distinguish the quality of the system features and standards.

Scope and Delimitations of the Study

With digital transformation and software modernization, the study and the development of a crime information management system work as tools to record the case within a Barangay. The recorded information of the victim, complainant, and perpetrator, including the narrative report of the case from the Barangay blotter, is vital since the information will be managed in the system.

The Development of a Web-Based Crime Information Management System applies to Norzagaray Municipal Police Station (NMPS) and Barangay Peacekeeping Action Teams (BPATs), explicitly investigating crime detection. Conviction criminals' are reliant on a highly responsive information management backbone. The efficiency of the law enforcers and the effectiveness with which it tackles crime depend on the quality of information it can derive from its existing records from Barangays and how quickly it will obtain it. For updating the system's data, the BPATs, the system's users must input the information correctly and frequently. All the recorded data by Barangay personnel will be added to the database to improve the data analytics learning continuously. It will also provide new knowledge or patterns that are significant in the future operation of the Law enforcers. Our law enforcer is responsible for analyzing the crime situation based on the report generated by the system and making the decision and possible solutions and recommendations for the BPATs.

The user’s BPAT and NMPS modules, login security, file maintenance for barangay cases, and E-blotter module are all the information concerning the crime are entered. Report Module, based on the encoded data in the system, reports such as crime volume, kinds of crime, and the total number of crimes reported, solved, and unresolved can be accessed throughout the system. Chat / Messages modules have a messaging element that allows Barangays to send messages and alert the police if they have any inquiries or concerns.

The system records the suspect, victim, and narrative reports about the crimes. It shall be accessed into the existing desktop in the Barangay office and Police station. It will be utilized by the Barangays to enter blotter/incident reports directly to the system using the standard format. Data Analytics for the data interpretation and supports decision-making for our law enforcers unit.

There is a search module for clearance purposes; barangay personnel may search the person's name for record verification. Search module features where the user will look for specific blotter data they were looking for. There will be a log-in page for all the Users. There are Four (4) types of users in the system; 1st is the Barangay Personnel responsible for encoding the Blotter entry and preparing the reports for endorsement by the Barangay Captain. The 2nd User of the system is the Barangay Chairman, accountable for supporting the Blotter report, viewing the Data Analytics, managing the message module, adding new Incident Types, and updating Patrolling Module. The 3rd User of the system is the Tactical Operation Command (TOC) has access to viewing the Data analytics module, Message module and can post Announcements using the system. The last User of the system is the Technical Support team, responsible for creating the User’s account and administering the audit trail.

The reports such as the crime volume, types of crime, and the total number of crimes reported, solved, and unsolved can be viewed through the system based on the encoded data. A graph will present reports for better understanding and interpretation of the data. The Data Analytics module can identify high crime areas within defined areas. This module has features of sorting the crime according to its kind and number of occurrences. A report module allows the Law enforcer unit to generate reports that will help them monitor the crimes and help in the decision-making purposes of the law enforcers.

There will also be an Audit Trail log under the administrative module to monitor who uses the system. The police department can also post announcements so every Barangays will receive the information. There is a module for messaging; the barangay user sends messages to the police if the latter has any questions and concerns. The blotter report module is used for entering all details about the crime. It contains the date and time, name of Barangay where it is recorded, place, nature of the crime, location of the crime, etc. Suspect documentation is the gathering of essential information and saved in the system's database. The vital information is used to have a detailed description of the suspect.

The cybersecurity and privacy of the web are essential and most important aspects of the website to avoid security hindrances while using cloud computing resources and services. The focus on the user and human-to-computer interactions is one of the most significant features of website authentication.

Understanding user authentication is critical when building or refining a user’s login process. Only authorized users can access the information as recommended. Policies and procedures, including guidelines that outline the proper use of and access to electronic media, must be developed to monitor and regulate access to and activities in the room, workstation, or facility. Natural, power outages, external access, and other similar hazards must be disasters protected in the room and workstation where personal data is processed.

The delimitation of the study is the following: The formal complaint issued by the Barangay Justice system is not covered by this study. The blotter record for minors under Children in Conflict with the Law (CICL) is also excluded in the study due to the protection law of minors. The same case goes for the blotter against Violence Against Women and Children (VAWC) under Republic Act 9762. The study no longer covers cases or reports already filed in court. At the end of the term, the system's users and exchanging officers in Barangays. This study is not an official application to disclose correct data at this time if Government agencies do not yet approve it. The Web-based Crime Information Management System with data analytics will be limited only to Norzagaray Municipality, Bulacan.

Significance of the Study

This study's results will help fill the gaps of the studies in the Development of a Web-based Crime Information Management System for Selected Barangays in the Municipality of Norzagaray, Bulacan. This research would be beneficial for the following:

In the Municipality of Norzagaray, Bulacan, the result of this study could serve as baseline data to improve programs in every Barangays in their efforts to campaign peace and order in the area. In addition, the crime spot incidents area will be able to track down.

Norzagaray PNP and BPAT members will be accessible, and responding to a particular location will be much easier because of the generated reports and analysis.

Teachers may benefit from the study since it will help the profession gain knowledge for the academe.

Proponents: The study will help the proponent enhance his skills and knowledge in developing a system and making the documentation.

Future researchers give opportunities to conduct data gathering and observation, leading to future references. The study will also broaden new knowledge about conducting problem-solving research and opening new doors for improvement. The study is also open for development and revision.

Definition of Terms

4W and 1H – What, When, Where, Who, and How

Amicable Settlement - Both parties are now closed to reaching a peaceful settlement, which can be the only sensible outcome.

Anti-criminality is opposed to discouraging or preventing crime, incredibly violent anti-crime legislation, and an anti-crime campaign.

BJS – Barangay Justice System in the Philippines is a community mediation program whose overarching objective is to deliver speedy, cost-efficient, and quality justice through non-adversarial processes.

BPAT – the BPAT is the Barangay-based anti-crime strategy to intensify public safety information campaigns through regular police bulletins of crime modus operandi.

BPO – Organize and mobilize various community sectors to support the maintenance of peace, order, and safety.

CICL - Children in Conflict with the Law

Crime Against Person - people are a category of crime consisting of offenses that usually involve causing or attempting to cause bodily harm or a threat of physical harm. These actions are taken without the individual's consent that the crime is committed against the victim.

Crime Against Property - Crimes that affect another person's ownership rights (or, in some cases, possession or control). The primary offenses against property are theft, offenses of fraud, deception and making off without payment, criminal damage, arson, forgery, and forcible entry.

CSC – Crime Solution Efficiency

Crime Rate - the ratio of crimes in an area to the population of that area, expressed per 1000 populations per year.

Crime Volume - The number totals all crimes committed in an area over a period. Crime volume is computed by adding the total index and non-index crimes.

IRF – Incident Report Form is a standard form for Blotter report from Philippine National Police

LGU – Local Government Unit

NMPS – Norzagaray Municipal Police Station

MPDO - Municipal Planning and Development Office

PNP – The national police force of the Republic of the Philippines. It is both a national and a local police force in that it provides all law enforcement services throughout the Philippines.

TOC – Tactical Operation Unit

UCPER - Unit Crime Periodic Report

VAWC – Violence Against Women & their children any act or series of acts committed by any PERSON. Against a WOMAN who is his wife, former wife, or with whom the person has or had a sexual or dating relationship, or. with whom he has a common child, or. against her child/child under her care.

CHAPTER II

CONCEPTUAL FRAMEWORK

This chapter includes a discussion on the relevant and supporting materials that will provide the foundation of knowledge for the study. This gives insights into both research and conceptual literature and the rationale of the framework of the study. Benchmarking will also be presented to discover the best performance in this research.

Review of Related Literature and Studies

This chapter includes discussing relevant and similar studies, project ideas, conclusions, and others with the same features as the proposed system. The primary purpose is to know any relevant issues associated with the proposed system and the concept behind the crime information management system.

Real-Time Monitoring

Real-time monitoring helps the community know the actual situation in their environment concerning crime and prevention and solution; it is better and promotes safety in our community.

One research found in India by Swapnali Rayte, Rohini Bhamare, Kaustubh Barhate, and Mahendra Sonawane entitled “Crime Monitoring and Controlling System by Mobile Device.” Closed-Circuit Television (CCTV) has been used on a vast scale for monitoring, recording, and getting popular in the whole world. In that case of an emergency, location, problem, and all possible difficulties can be determined comparatively less time by concerned authorities like police as they have already monitored the situation. The developer of this project used CCTV cameras and mobile devices to monitor the crime situation virtualized. This project studies a monitoring system for mobile smartphone users based on a CCTV system. Information will be sent from mobile phones to the server so that the CCTV system can work more precisely and accurately by monitoring and tracking objects. Their system aims to use surveillance and smartphones to accomplish the entire surveillance task as automatically. (Rayte, Bhamare, Barhate, & Sonawane, 2015)

Crime Information Management System is the system that monitors the crime incident that happened and is recorded in the blotter report from the different Barangay in the Municipality of Norzagaray. The legality and accuracy of the information from the blotter record of Barangay serve as the data will be real-time monitored by the system. It helps and supports our law enforcers in their decision-making regarding peace and order situations and campaigns in crime prevention and prevention.

Online Transaction

Nowadays, online transactions are both rapid and straightforward. Users can follow all transactions in the case of online transactions. All transactions will be kept on file. It enables them to comprehend corporate growth readily.

According to Pratibha Mishra and other Indian colleagues' research titled "Online Criminal Record Management System," the research indicates that the purpose of the Online Criminal Record Management System, according to the study, is to automate the existing manual system using computerized equipment and full-fledged computer software, meeting the needs of all police officers so that their valuable data/information can be stored for a more extended period with easy access (Mishra, N, S, Sultana, & Singh, 2019).

Crime Information Management System will help to encode information online and keep data safe since the files are not readable unless they have access to the algorithms used to encode them. This is an excellent way to protect data from theft since any stolen files would not be usable. Gathering information from different Barangays will help the online encoding of information for an ideal solution for crime prevention and resolution transaction.

Cloud-Based Monitoring

A way of reviewing, watching, and managing the operational process in a cloud-based IT infrastructure is known as cloud monitoring. Using automated management strategies, websites, servers, applications, and other cloud infrastructure are checked for availability and performance.

According to the research entitled “Cloud Monitoring System: A Review” by Chetan Bulla and Mahantesh N. Birje, individuals and companies can use cloud computing to create service-oriented solutions at a low cost since it provides a flexible and large-scale infrastructure. Cloud infrastructure management becomes increasingly complicated as data centers grow in hardware and software resources. As a result, an effective cloud monitoring system is essential to manage cloud infrastructure and maximize overall performance. A multi-agent system is one of the most effective techniques to improve cloud performance (Birje & Bulla, 2019).

The development of a Crime Information Management System can configure monitoring to track record metrics, processes, users, and databases. It provides data to help to focus on valuable features or disrupt functionality. The system does not suffer interruptions when local problems emerge because resources aren't part of the organization's servers and workstations.

Web Application

Web-based applications offer a variety of business benefits as compared to desktop applications. Software as a Service (SaaS) is a web-based software that runs on a virtual, cloud-based environment. For example, the development of cloud-based email systems has allowed users to access email on the go without having to install a desktop email client. In comparison to on-premises software, SaaS applications provide tangible business benefits.

The application that uses a website as the interface or front-end is a web-based application. The research project entitled "Web-Based Location-Aware System Architecture for Combating Electoral Criminal Activities in Nigeria" by Nnebe S. E., Ijomah O., John-Otumu M. A. & Eriata U. F. presents the growth of location-aware technology's computing capabilities has made it a suitable medium for a wide range of activities involving information transmission. Identifying, reporting, and preventing electoral crime is one area where location-aware technology is proving to be extremely valuable in society. Considering Nigeria's recently finished election, one key issue impeding electoral crime detection and reporting is the lack of an effective communication platform between the Independent National Electoral Commission (INEC), police, other security officials, and the general public (E, O, A, & F, 2015).

Web-based applications may provide several advantages for our Law enforcers. The Development of a Web-based Crime Information Management System for Selected Barangays in the Municipality of Norzagaray, Bulacan is a desktop software developed into a web-based application, which means that the application can access via the internet. Users can use a regular browser to access the application from any computer connected to the Internet.

Centralized Monitoring

Having a centralized reporting system often means more control over the report's structure and structure. Users will not alter the report's specifications or layout design. Any quality management system must have control over this.

A centralized reporting process is vital. In the research project entitled “Criminal Record Management System in the Perspective of Somalia” Project Report, 2019 by Fowzi Jamal Barrow, in the context of Somalia, the project Criminal Record Management System is a criminal record management system used to track criminal activity. It is possible to use it to report criminal activity. This initiative is primarily for Somalia's law enforcement authorities. They are using the technology, a centralized reporting procedure made for the law enforcement agencies to keep track of offenders' records and search for any criminals (Barrow, 2019).

The information from the blotter record from the different Barangays in the Municipality of Norzagaray, Bulacan, is important because data will be stored in the exact location and immediately accessible. Since it requires less human resources and maintenance, the centralized database is less expensive than other databases. All of the data in the consolidated database can be viewed simultaneously and from the exact location.

Data Analytics

Data analytics is a broad phrase that refers to various data analysis techniques. Data analytics techniques can be applied to any data to gain knowledge that can be utilized to improve things. Data analytics techniques can discover trends and metrics that might be lost in a sea of data. This data can then enhance a company's or system's overall efficiency by optimizing procedures.

According to a study entitled “Technological Innovations in Crime Prevention and Policing. A Review of the Research on Implementation and Impact” by James Byrne and Gary Marx, New technical innovations have been developed to prevent crime and improve police performance. Still, they know surprisingly little about how and why specific technologies are adopted and the consequences of technology-driven solutions to the problem of crime, both intended and unintended. This article examines the variety of new technological advances that have applications in crime prevention in general and criminal control (by police) in particular. The current technological innovations highlight the current information on adoption in the United States and then examine the present research on the influence of each type of new technology on crime prevention and police performance, both intentional and unexpected. (Byrne & Marx, 2011)

Development of a Web-based Crime Information Management System for Selected Barangays in the Municipality of Norzagaray, Bulacan with data analytics considering the numerous issues attempt Philippine society nowadays, and it is a requirement to understand that a lot of is left to be done. To effectively crime prevention and solution, the government has consistently worked and continues to establish a coordinated approach including all sectors and levels of Philippine society. A holistic approach, emphasizing an active and empowered group wherever community provides importance to stability to form justice and human growth, should be carried out smartly to curb criminality. To emphasize, crime interference and concrete safety become one in all the activities devoted to increasing the relevance of the community as a sociocultural organization making every citizen both the "server" and "served." Society should face the challenge and be willing to participate as a stakeholder in a crime-free community. A management information system capable of projecting crime was successfully constructed using predictive crime analytics and the software development life cycle (Khamooshi, 2015).

Table 3
Benchmarking

Features	Crime Monitoring and Controlling System by Mobile Device	Online Criminal Record Management System	Cloud Monitoring System: A Review	Web-Based Location-Aware System Architecture for Combating Electoral Criminal Activities in Nigeria	Criminal Record Management System in the Perspective of Somalia	Development of a Web-based Crime Information Management System for Selected Barangays in the Municipality of Norzagaray, Bulacan
Real-Time Monitoring	✓	✓	✓		✓	✓
Online Transaction	✓	✓	✓	✓	✓	✓
Cloud-based Monitoring			✓	✓		✓
Web Application	✓	✓	✓	✓	✓	✓
Centralized Monitoring				✓	✓	✓
Data Analytics						✓

Synthesis

Introductory concepts, researched literature, and studies directly or indirectly related to the current research provided additional insights into the nature and scope of the study, which is the study of the crime monitoring system.

The related literature generally accords that using a monitoring system is essential both for the citizens' safety and for future analysis and prediction of crime. Enhancing interactively and visual feature applications is also beneficial in reporting and discovering the crime. A crime monitoring system can be divided into four areas: (1) predicts whether, in an area, there will be a high, medium, or low percentage of violent crimes that can happen in the future, (2) awareness of the law enforcement agencies, (3) places where support system, mapping, analysis, management, and information of crimes exist, and (4) the advantage that will be able to eliminate the redundancies when it comes to reporting a crime incident. The studies will also be helpful to back up the results of our research in the latter part of this paper. The related literature and studies have a significant relationship with the present study in that both discuss the effectiveness of the monitoring and data analysis system.

The crime prevention strategies usually aim at ever-changing the motivations and predispositions of offenders. A brand-new approach has developed within the last decade that focuses on the ever-changing behavior of potential victims. The researchers explore the theoretical foundations of the new ways of reducing crime, ordinarily called community crime prevention. They recommend that the innovation result from a significant shift in the analysis paradigm for finding out the consequences of crime. The orientation underlying the community crime prevention is labeled the "the victimization perspective."

The new system advantage will eliminate the redundancies once it involves reporting a crime incident. Also, all the blotter records will be saved during an information wherein whenever the police will require specific blotter records from the Barangays, it will be simple to see and notice since it will have storage. It will conjointly eliminate the manual count and compute the very time-consuming reports for them.

Theoretical Review

A Journal Article entitled "Public Management Information Systems: Theory and Prescription" by Barry Bozeman and Stuart Bretschneider converse the existing theoretical framework for research in Management Information Systems (MIS) is critiqued for not paying enough attention to organizations' external environment. A new paradigm is designed that better accommodates MIS in public enterprises: PMIS stands for Public Management Information Systems. Four publicness models are combined into a single model that reflects external organizational settings. The basic paradigm of publicness is then utilized to generate a set of propositions/prescriptions that distinguish public and private management of information systems. These propositions are illustrated using real-life examples.

Crimes are a shared public concern that affects a society's quality of life and economic progress. It is essential in determining whether people should relocate to a new city and which locations should be avoided when traveling. With these crimes on the rise, law enforcement agencies press for advanced geographic information systems and novel data mining methodologies to improve crime analytics and safeguard their communities.

Rapid urbanization, industrialization, and migration to cities are factors in the Philippines that lead to a greater crime rate. These factors include the impact of unplanned urbanization and resource inequality. Street crime, illegal drug trafficking, robbery and theft, aggressive crimes against women and children, and terrorism are only a few crimes directly linked to urbanization that the government and civic society are concerned about.

Conceptual Model of the Study

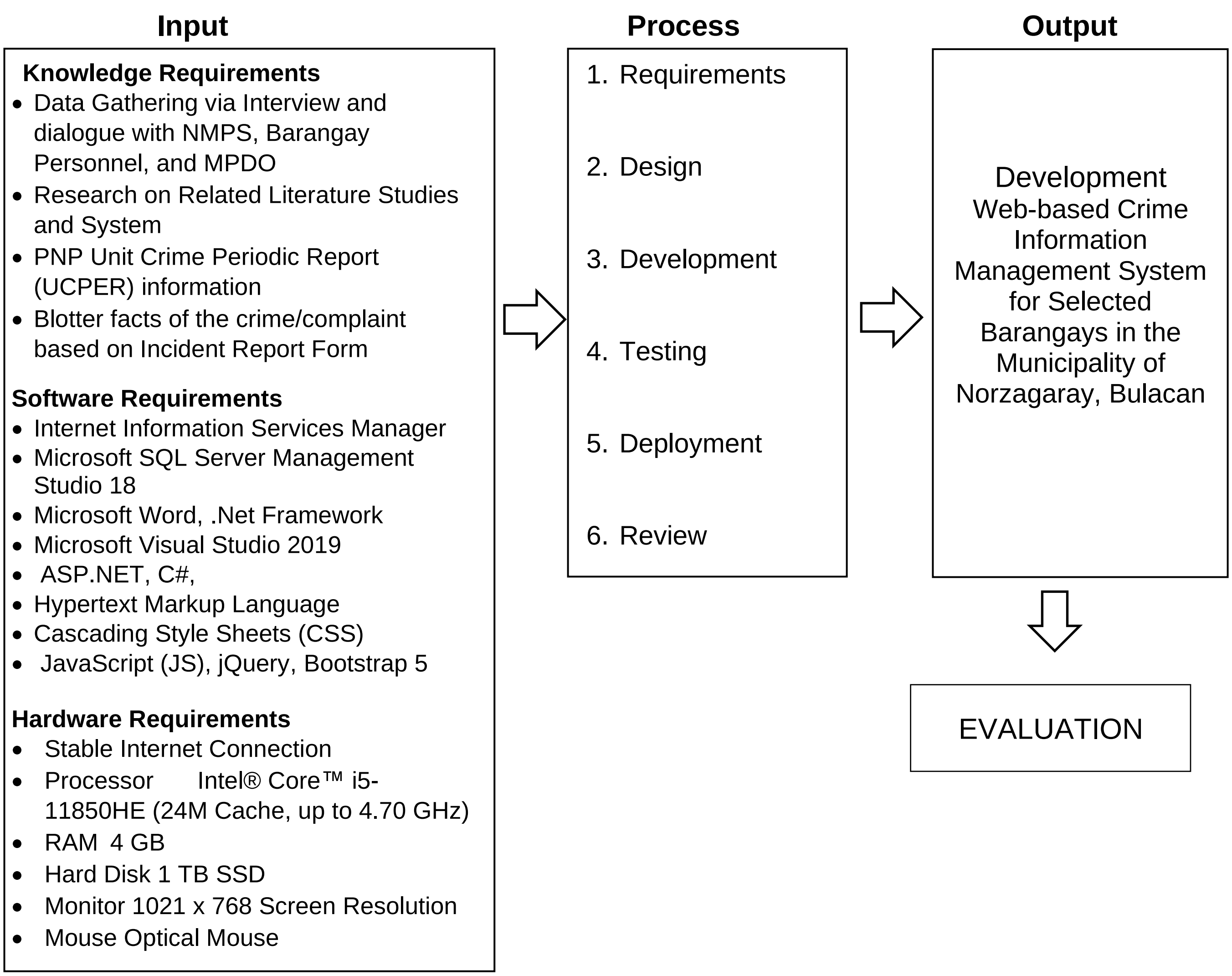

Figure 2. Input-Process-Output

In the IPO Model, the inputs represent the data flow into the process to output. Knowledge requirements are based on the data gathering via Interviews and dialogue with NMPS, Barangay Personnel, and MPDO. The research on Related Literature and Studies helps the developers conceptualize the idea needed in developing the study. The form PNP Unit Crime Periodic Report (UCPER) information from PNP serves as a guide in making the system modules. Information about system module requirements to construct the web-based application system. Blotter details to be collected about the crime/complaint based on Incident Report Form format as required in gathering facts information. For the process, the developer will use Agile methodology since it is a model approach that has been historically dominant. This model perfectly suits the developer proposed project. The final component of the model is the output in which only one variable or factor has been included which is in line with adequate research, namely the Web-based Crime Information Management System for Selected Barangays in the Municipality of Norzagaray, Bulacan. The importance of a test and evaluation system to meet users' and developers' objectives.

CHAPTER III

RESEARCH METHODOLOGY

This chapter presents the design procedure, development phase, testing, and evaluation of the Web-based Crime Information Management System for selected Barangays in the Municipality of Norzagaray, Bulacan. This chapter clarifies the entire development stage of the system, including the flow and functional and non-functional operation of the system

Project Design

The developer performed open-ended interview questions and visual observation at the Norzagaray MPS and selected Barangays to capture their genuine operations and reveal real concerns. Benchmarking was done by looking at the systems that other developers utilized. The process of obtaining data on each crime in the barangay is essential in the Norzagaray MPS and the Barangays report. Inaccurately monitoring and lack of data gathering tools and methods result in the ineffective gathering of criminal and crime data. Crimes are not uniformly distributed in an area; they may happen unpredictably. Capturing vital information about a crime when it is being reported is essential. There is no data processing in the current process because of the misinterpretation of criminal data. It produces a problem in analyzing the current crime situation in the Municipality. To help the Norzagaray MPS and the Barangays use the data from the blotter book, the developer has proposed a system that manages to use a centralized database and web-based application that they can use to put the data they need into daily reporting. When a crime is reported, the centralized blotter system records vital information. Using a web-based system, law enforcement officials will store records online, minimizing the possibility of paper copies being lost or forgotten. It will allow users to edit quickly and consistently in various locations, lowering the risk of data loss during updates. Furthermore, electronic blotter data may make it easier for law enforcement agents to trace the details of complaints filed through the system.

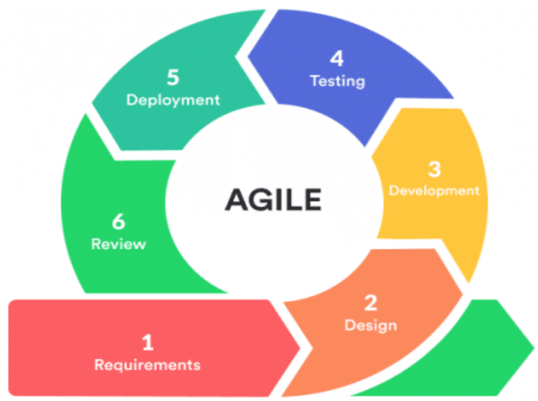

Figure 3. Agile Development Methodology

The system development methodology that was developed to respond to the need for the delivery system is very fast. The project is suitable for add if it has a focused scope read the objective are well-defined and narrow; the scheme is appropriate for Agile Development if a small number can make users' decisions. The technical architecture is well defined and clear, and the critical technology components are in place and tested (Seige, 2007).

Planning and Requirements: The developer determined a reasonable timeframe and action plan for the system by identifying and defining the project scope in this step. This step is also responsible for determining the proposed study's challenges and the solutions required to address those issues. The planning phase lays out the events that will take place during the entire life cycle to ensure that the system meets the users' expectations.

In the Design phase: the developer needs to analyze the gathered information and satisfy the objectives of the requirements. The developer uses a diagram to interpret information to make efficient communications while the system identifies the details to be included. This diagram contains Flowchart, Data Flow Diagram, and System Architecture, showing ideas about system development. It also determines how to solve the problem and identify the weaknesses during the system's development phase.

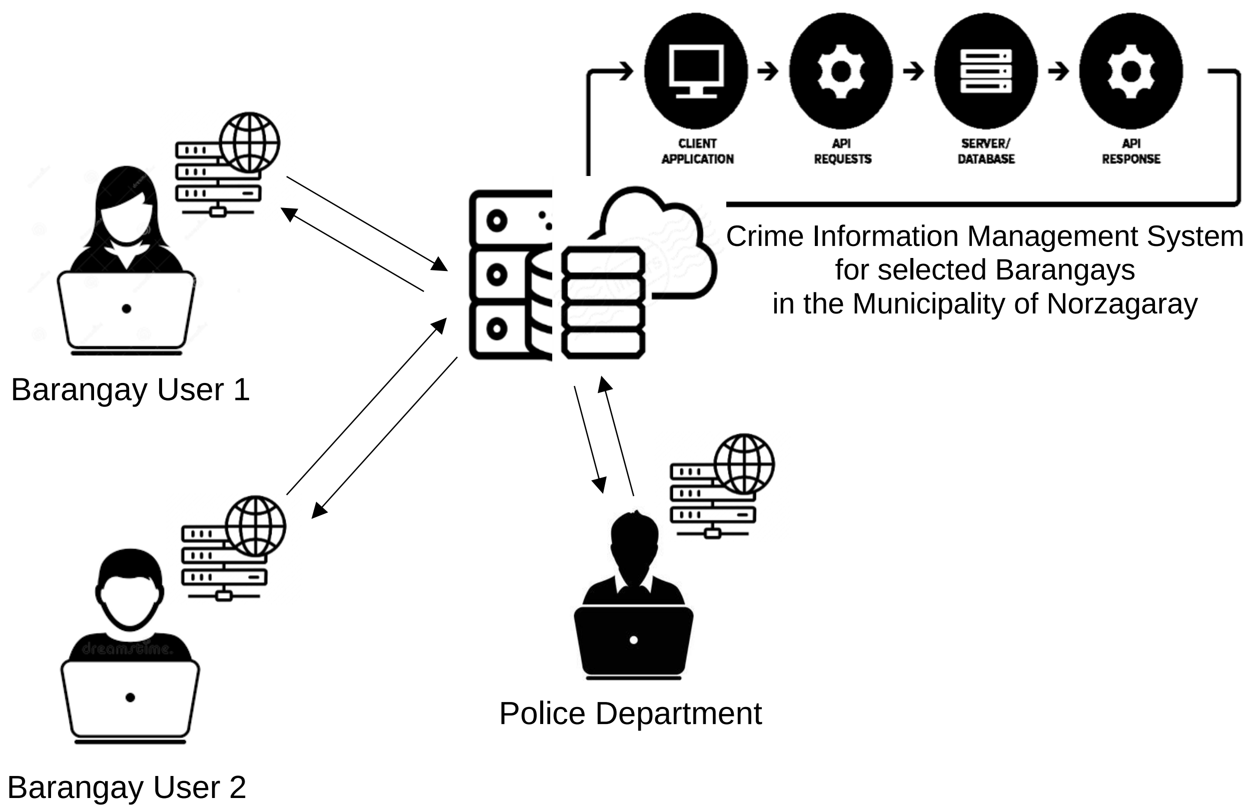

Figure 4. System Architecture

In figure 5, System Architecture shows Desk Officer entertains and receives a report from the complainant and initially records the brief details of the incident using a template in the barangay blotter. The complainant and Barangay duty investigator review the summary details of the incident. Barangay duty investigator stores data into the system. Police and Barangay officers can access data encoded by Barangay duty investigators to make reports, search for information, validate information, and print information. Using Application Programming Interface (API) as middleware applications can access data in our centralized Database system and interact with external software components, operating systems, and microservices using an API, a set of functions. User response is delivered to a plan, and the system's answer is returned to the user through an API.

Implementation/Development: The developer began building the suggested solution using the Agile Development technique after conceiving it. This was an excellent approach to adopt because the development time was reduced. After all, the project was prototyped as the project progressed. In addition to this process, the developer employed prototyping to demonstrate the notion to the intended users necessitates commitment from both the developer and the user. The developer used HTML (Hypertext Markup Language and CSS (Cascading Style Sheet) to design the website's front-end. JavaScript is also used to validate forms and make the web page light while loading and interacting without reloading the page. The system's back end is built using C# programming languages and MS SQL SERVER 2019 for the database. Core API is also used to deliver interface websites, and client applications need to access data on the system. Queries applied in the system were implanted to improve the performance of the database's operation. Some of the front-end designs are stored in tables; they need an IIS 7(Information Services 7.0) to run the system, and the page request it from the database. It also made system construction abstained helped in the design-automation techniques, code generation, and computer-aided planning and analysis of system development

Testing and integrating the developed system are evaluated in this phase to verify if the system is working as planned and fully meets all the target audience's needs and expectations. The developer will conduct unit tests to test individual components, followed by integration tests to test all integrated features, such as the connections between each module, system tests to test the entire system, and finally, acceptance tests to test the system by IT professionals, Norzagaray MPS, and Barangay users.

The next session will be quality function Deployment, wherein this technique, user satisfaction is the prime concern; hence it emphasizes the valuable requirements to the user's feedback will be evaluated.

Review and Maintenance: The cycle begins the stage of continual maintenance once the program is tested and released. The system is continually tested for bugs and errors to be modified. The developer will train the system's administrator and users to use the system. The Norzagaray MPS and selected Barangays were part of the project from start to finish. The review stage allows for sharing feedback on what is good, what is not, what works and what does not. Not only does feedback pertain to pure functionality, but also visuals and interfaces. Prototyping continues with this feedback in mind. The steps are repeated until a final product is created that meets the requirements of both the developer and the client and agrees on the software's features, functions, aesthetics, and interface.

Project Development

The developer first scheduled a meeting with the Norzagaray MPS to gather information. To acquire knowledge, the developer conducts a closed interview. They prepare open-ended questions for the Norzagaray MPS to discover information and holes in their present system.

The identification of modules is critical in Project Development to propose a solution and make the system effective. Cybersecurity and Data privacy was given a lot of care during the project's development. Using Application Programming Interface (API) as middleware applications can access data in our centralized Database system and interact with external software components. A centralized database was created to execute the query and store the system's data for usage in data analytics reports. The only authorized user only can access the web application. The developer made a system function and non-functional requirement for the system to be given.

The Norzagaray MPS has full access to the E-Blotter modules. The data exchange capability with the connected Barangays. They can also generate reports based on their requirements submitted from different Barangays—a module for announcements and messages from barangays to Norzagaray MPS for inquiry and clarification. Achieving cases is also part of the system requirements. In monitoring the logs, Audit Trail was created.

The ability to display different modules in the system based on the user level's credentials. The design should run on the bare minimum of system specifications. The system's user interface should be more straightforward to use—the ability of the system to show data analytics.

There will be a login page for all users on the User Login page on the Barangay Users page. Login security considers the minimum number of characters for the password, considering mixed letters and numbers, symbols, or upper case. The administrator is provided by a user's name for the new user, while the system defaults the password with a specific format. Still, when the user first logs in, the user must change the password immediately. If the user forgets his password, a Forgot password is needed to click to reset the password, but the system needs some credentials to reset the password.

The Dashboard Module is essential to have a reporting tool that allows for a visual display of the most important data collected and grouped on a single screen, allowing real-time data to be monitored immediately. Dashboard modules consist of Total Crime Reported, Total Unsolved Crime, Total Solved Crimes, and Crime Solution Efficiency (CSE). It also includes the Total Crimes from January to December based on the current year, Announcements posted by the Tactical Operation Command, and the Most recent active blotter entry from different Barangay. All the data comes from the database encoded by the Barangay users and the Administrator.

The Search module will enable the user to search the database for a particular individual, allowing barangay personnel to look for a person's name for record confirmation for clearance and verification purposes. A tool wherein different barangay share the information and works with the centralized database to quickly check if the person has a derogatory record or is clear of the result.

The Blotter Report Module is where all the crime-related information is encoded. Under Create Entry submodule are the information about the reporting person, suspect, and victim personal data. Additionally, it includes the incident's reported date and time, the incident's type and place, the incident's status, who recorded it, and the narrative report or fact of the case. There is also an option for attachment if the reporter has a picture of the suspect or evidence as a reference in the Blotter Report. All the required fields are needed to populate to continue the process. Active Blotter Entry is the listing of all ongoing and unsolved blotter reports. Blotter Entry Archived lists all solved/settled blotter entries from the database.

The Data Analytics modules allow our law enforcer to find high-crime areas within Barangays. This module can categorize crimes depending on the nature and frequency they occur. Data Analytics reports are the numeric value of the total Crimes reported, unsolved and solved crimes, the Crime Solution Efficiency, and the real crimes per Barangays. The Data Analytics module can be filtered by barangay and year. It also shows the Top 5 reported cases, crime status, suspects employment status, gender, patrolling report, crime age range, and crime time range. This Data Analytics report is vital in analyzing the actual situation in every barangay regarding peace and order status as per record in our blotter report. Data analytics were used to develop a Web-based Crime Information Management System for selected Barangays in the Municipality of Norzagaray, Bulacan.

To assist and address the reports from data analytics, the Patrol Module will serve as action taken by the barangays where there are many reported cases. The number or record of patrols in the morning and evening is a significant factor in determining if their campaign against crime is effective. The users need to encode the title of the Patrol as a header, Patrol type such as foot, motorcycle, and mobile patrol. The date, start time, end time, and the patrol details are needed to encode to save the information. This data is to count how many times the Barangay personnel conducted a patrolling concerning their peace and order campaign in their area of responsibility.

Creating a messaging component in the Message Module, data exchange capability with the connected Barangay allows Barangays to send messages and notify the Police if they have any questions or concerns and vice versa. Barangay also can request personal information from the other Barangays. A contact number or email address is needed, and the title and the message narrative. Under message details, the user also can use attachments as part of the additional information requested by the sender.

Reports such as crime volume, types of crime, and the total number of crimes recorded, solved, and unsolved can be obtained through the system based on the encoded data and shown in the Dashboard and Data Analytics modules. The law enforcement unit can use a report module to create reports that investigate crimes. It will also improve decision-making by law enforcement officials. Blotter Search and generate printable blotter document. Reports are generated in a graph to understand better and interpret the data in the Dashboard and Data Analytics modules. To print the blotter report, the endorsement of the Barangay Chairman is essential.

The User maintenance module manages user information and the personal data associated with the Barangay user’s type. There are Four (4) types of users in the system; 1st is the Barangay Personnel responsible for encoding the Blotter entry and preparing the reports approved by the Barangay Captain. The 2nd User of the system is the Barangay Chairman, accountable for supporting the Blotter report, viewing the Data Analytics, managing the message module, adding new Incident Types, and updating Patrolling Module. The 3rd User of the system is the Tactical Operation Command (TOC) has access to viewing the Data analytics module, Message module and can post Announcements using the system. The last User of the system is the Technical Support team, responsible for creating the User’s account and administering the audit trail.

Finally, there's the Privacy policy module; according to the Data Privacy Act of 2012, the state's policy is to "protect the fundamental human right to privacy in communication while ensuring the free flow of information to promote innovation and growth." This module reassures the user that the system will use its data to compile a report. In the module for Privacy Policies, the system will display content that complies with the 2012 Data Privacy Act's standards.

Hardware and Software Components

The software and hardware components required for the system to function appropriately and efficiently in the workplace are described in this section. Hardware devices are essential prerequisites for establishing a web application system. A web application system cannot be developed without laptops, desktop computers, or mobile devices. Hardware devices are also essential components of the testing step for determining the web application system's performance.

The following are the specification of hardware and software requirements that help the developer for the completion of the project:

Table 4. Hardware Requirements for Developer

Hardware Components	**Specification Requirements**
Operating System	Windows 10
Processor	Intel® Core™ i5-11850HE Processor (24M Cache, up to 4.70 GHz)
RAM	4 GB
Hard Disk	1 TB SSD
Monitor	1021 x 768 Screen Resolution
Mouse	Optical Mouse

Table 4 shows the hardware specifications of the machine, which allows it to be developed as required in the system.

Software Requirements for Developers

Internet Information Services Manager

The web developer uses the IIS (Internet Information Services) Manager tool to change website features like default pages, error pages, logging settings, security settings, and performance optimizations. IIS can serve static HTML pages and dynamic webpages like ASP.NET apps and PHP pages.

Microsoft SQL Server Management Studio 18

The tool is the system's database and contains all the information. It will enable the system to read and write data in the database using the web application's users. It holds the library's data, records, and resources, which are accessed by various modules, and those records or data are used to generate reports.

Microsoft Word

The developer utilized Microsoft Word to generate the system's documentation and effectively organize words and phrases.

.Net Framework

The developer was able to develop the system in Microsoft Visual Studio using this software.The.NET Platform is a software development framework for creating and running software applications, particularly.NET applications. It is a necessary piece of software for the system's development. Net Framework provides libraries and runtimes that include string, date number, garbage collection, and exception handling when designing a system.

Microsoft Visual Studio 2019

The developer utilized this program to create an e-Blotter system web application. It is a programming language that allows you to create programs, websites, and even web services. It comes with a functionality that will enable the developer to debug the system. It's a good choice for making a web application. The developer will use the web application framework ASP.NET.

ASP.NET – The developer will use this framework or programming language to create the web application. Microsoft's server-side web application framework is open source. It's used to create dynamic websites, apps, and services.

C# - This programming language is often used to create online, desktop, and mobile applications, among other things. Microsoft's programming language allows developers to create web applications for the e-Blotter system.

Hypertext Markup Language (HTML) – It is made up of components that will aid in the creation of the website's interface. This markup language creates and displays the content in a web browser like Google Chrome, Mozilla, Opera, etc.

Cascading Style Sheets (CSS) – The developer will improve the design and visual presentation of the web application. A markup language is used in conjunction with HTML to emphasize the structure of the HTML or website. A website's color, style, layouts, and custom fonts are all controlled by CSS. It's also compatible with JavaScript.

JavaScript (JS) – The markup languages HTML and CSS provide structure and style for web pages, while JavaScript provides interactive components for users. This programming language is utilized on both the client and server sides, allowing the web application's pages to interact with the system's users.

jQuery – This minimizes the JavaScript code and will be used to develop the system by lowering the number of lines in the application. A lightweight JavaScript framework for event handling and CSS animation in the library administration web application.

Bootstrap 5 – The developer will employ prepared codes to reduce workload and provide a user-friendly interface. It's a front-end framework with pre-defined CSS code that allows developers to quickly design and create an appropriate visual or design for a web application.

Operating Procedure

The identification of modules is critical in Project Development to propose a solution and make the system effective. Data security and privacy were given a lot of care during the project's development. A centralized database was created to execute the query and store the system's data for usage in data analytics reports. The developer made a system function and non-functional requirement for the system to be given. The functional and non-functional needs enable the designed system's efficiency and effectiveness.

Functional specifications define the tasks that a software system must perform, and It denotes the purpose of a software system or module. In each module of the designed system, functional needs are identified depending on the user's role. With the database, the integrity of the data is maintained, and it becomes available when needed, along with the security using the Application Programming Interface (API) as middleware. Applications can access data and interact with external software components, operating systems, and microservices using an API set of functions. User response is delivered to a plan, and the system's answer is returned to the user through an API.

A login module ensures that only authorized users can use the system. First-time logins necessitate those users to update the password generated by the system. Norzagaray MPS has complete authority over the system modules. The audit trail and adding users to the system are restricted to users from barangays. The audit trail monitored every transaction attempt by a user to access a system module. Norzagaray MPS has permission to post an announcement to inform and update the users as necessary. Having a dashboard in the system makes it easy to see the actual data from the database immediately. In this way, it is easier to see the actual situation in every Barangays. The Search module will enable the user to search the database for a particular individual, allowing barangay personnel to look for a person's name for record verification for clearance and verification purposes. The consolidated reports from Blotter that use in Data Analytics are great for understanding the information better.

The system's non-functional requirements are the following: The system's maintainability has been designed to improve and maintain the functionalities, allowing for future system development via the system maintenance module. Reliability of the system will be reliable so that data will not be lost in the case of an unforeseen incident such as a system crash, power loss, or another system failure because backups of the database will be saved in the cloud database. The system's security will be secured so that various users cannot access all system areas due to user authorization and authentication and permissions assigned to different users. Usability of the system is only accessible to registered users from the 13 Barangays and Norzagaray MPS officials. Further modules will be granted access permissions to different users to ultimately maximize the system's usage.

Testing Procedure

The test case contains variables or conditions that enable a testing engineer or users to compare expected results to determine whether a software product meets the beneficiary requirements. The system was evaluated throughout its development stages, and the results were four-level software testing. Unit testing, Integration testing, System Testing, and Acceptance testing are all types of testing. Conducting these tests enables the developer to thoroughly examine the system, identifying and exposing any bugs or errors.

Unit Testing: During this phase of testing, the developer thoroughly examines each module of the web application, including each user's login page, dashboard, search module, blotter module, data analytics, patrol, messages, and reports.

Maintenance and Administrator module. This stage is critical for the developer because it allows them to better understand the system's functionality. Any errors or bugs can also be easily identified and corrected at this level, as each module is checked individually.

Integration Testing: The developer begins testing specific interactions for each module during this phase and ensuring that clicking on the dashboard module takes the user to the appropriate page and not elsewhere or sets an announcement and creates a message that syncs with the user’s side. The integration testing phase is used to determine the system's overall functionality rather than the functionality of individual components.

The System testing phase, which is typically conducted by a test team and is frequently referred to as "End-to-End" testing, is where the fully functional and integrated system is tested. This phase aims to try the system with a group of people who are unfamiliar with the system's internal structure, such as its codes. The final system testing phase is before the system is made available to the public for beta testing.

Acceptance Testing: Often referred to as beta testing, this final stage of system testing is referred to as acceptance testing. In this case, testing will be conducted by actual end-users of the system. Acceptance testing is crucial since it determines whether the client has approved the application or program. To test the project system, the developer uses the following attributes shown in Table 5: Test case scenario.

Table 5. Test Case Scenario Key Attributes

Test Case Scenario Attributes	**Description**
Test Scenario ID	In every test scenario, a unique ID needs to assign for the identification of the scenario
Test Scenario Description	The description of the test scenario
Test Case ID	For every test scenario, a unique test case ID is required.
Test Case Description	The description of the test case
Test Steps	A series of procedures for the test case scenario
Preconditions	Current state condition before the test is executed
Test Data	A valid data for the test steps to be used
Post Conditions	Condition after the test is executed
Expected Result	It must be equal to the actual result as expected
Actual Result	The condition must meet to accept the actual result
Status	Status for if the actual result is either passed or failed
Executed By	A person who conducts the test case scenario
Executed Date	Date when the test case scenario happened
Comments (if any)	If there is a remark necessary needed.

Table 7 shows the Test Case Scenario, defined as any capability that the system's developer can test. It is a collection of test scenarios that assists the testing team in determining the project's positive and negative features. A Test Scenario provides a high-level overview of what should be tested.

Evaluation Procedure

To measure the level of Acceptability using the five (5) criteria indicators, performance, functionality, usability, security, and compatibility. It is necessary to evaluate the efficiency level using five (6) criteria indicators: functionality, reliability, usability, efficiency, satisfaction, and maintainability.

Table 6. ISO Software Evaluation Criteria

Numerical Rating	Categorical Response	Verbal Interpretation
4	Strongly Agree (SA)	Highly Accepted
3	Agree (A)	Accepted
2	Disagree (D)	Less Accepted
1	Strongly Disagree (SD)	Least Accepted

The developer used an ISO Software Evaluation Criteria system based on the ISO-25010-2010 for Web-based Crime Information Management System for Selected Barangays in the Municipality of Norzagaray, Bulacan. The level of Acceptability and Efficiency was measured using a 4-point Likert scale.

The system will evaluate by five (5) IT Specialists from web development companies and four (4) Police Departments, and four (4) users from Barangays. The administrator and the Barangay users will test and evaluate the user's acceptability and efficiency of the system. IT Specialists consider the readability and ease of program maintenance of the system and review the source code that controls the programs and the database design and security.

The formula to calculate the Weighted Average Mean is as follows:

$$WM = \frac{SA*4 + A*3 + D*2 + SD*1}{TNR}$$

Where:

WM	Weighted Average Mean	TNR	Total Number of Respondents
SA	Strongly Agree	D	Disagree
A	Agree	SD	Strongly Disagree

To measure the level of Acceptability in the system, the users evaluate the system's performance if the web application performs at heavy workloads. The web application impacts the performance of the computer hardware and must perform smoothly under critical conditions. Ensures the function design and requirements specifications have been met from an end-user's perspective. It must provide higher value and quality to the user, and the functional accuracy is sufficient for application usability. The web application is responsive, intuitive, and engaging enough end-user. The Usability makes it easy for the user to become familiar with the user interface (UI) and easy for users to achieve their goals when using the application. The application requests access to necessary services on your device under Application Security. Using the secure protocol, a web application interacts with web services. For application compatibility, the Web application fits the user's screen resolution. The navigation of a web application necessitates various navigation strategies, and displays necessitate accurate estimation of text and objects.

To measure the system's efficiency level, the users evaluate the system's reliability, maturity, accuracy, and reinforcement. The web application is fully functional upon the final implementation. The application can deliver the correct answer if data or input is incorrect. The system can provide important information based on the user’s encoded data. The Usability of the system is essential. The developer evaluates the understandability, learnability, and attractiveness of the system. It uses language that can be understood, is easy-going, and is pleasing to the eyes of the users. The time behavior, validity, and resource utilization will evaluate under Efficiency. The web application reacts completely with every enactment of the user. The resources are adequate concerning the accuracy and completeness with which users achieve goals. The system gives the same output if input data is plotted correctly. User satisfaction such as stability, versatility, compliance, and satisfaction be fully effective and orderly. The user is satisfied with their perceived achievement of goals, including the results of use and the consequences of use of web application. The end-user has confidence that a product or web application will perform as projected. The user acquires preference from fulfilling their personal needs and being satisfied with physical comfort. The adaptability and changeability under Maintainability have a vital role in the system.

Table 7. Verbal Interpretation Numerical Value

Numerical Value	**Verbal Interpretation**
3.5 – 4.0	Highly Accepted
2.5 – 3.49	Accepted
1.5 – 2.49	Less Accepted
0 – 1.49	Least Accepted

A numerical value and range were identified on each verbal interpretation to interpret the weighted mean and overall mean. The verbal understanding of “highly accepted” has a numerical value and scope of 3.5 – 4.0. The “accepted” has a numerical value and range of 2.5 – 3.49. the “less accepted” has a numerical value and range of 1.5 – 2.49. The “least accepted” has a numerical value and scope of 0 – 1.49 to quickly identify the developed system's level of acceptance and efficiency.

CHAPTER IV

RESULT AND DISCUSSION

This chapter represents the project's technical description, testing results from the previous testing cases, and evaluation results from the beneficiary and IT specialists who conducted an evaluation.

Project Technical Description

Result Development and Design

When a crime is reported, the system captures essential information. The Barangay Personnel can record the complaint's information into the system. This system was based on current Blotter systems and the Barangay's actual practice. The technique can be used to keep track of the blotter's status. The system is a centralized web-based application that helps to record and store all reported incidents within the Municipality of Norzagaray in Bulacan. The system can print relevant documents, generate reports and blotter records, and data analytics. Using a web-based application will improve the present data processing for documents such as blotter reports, announcements, messaging communication, and patrol modules.

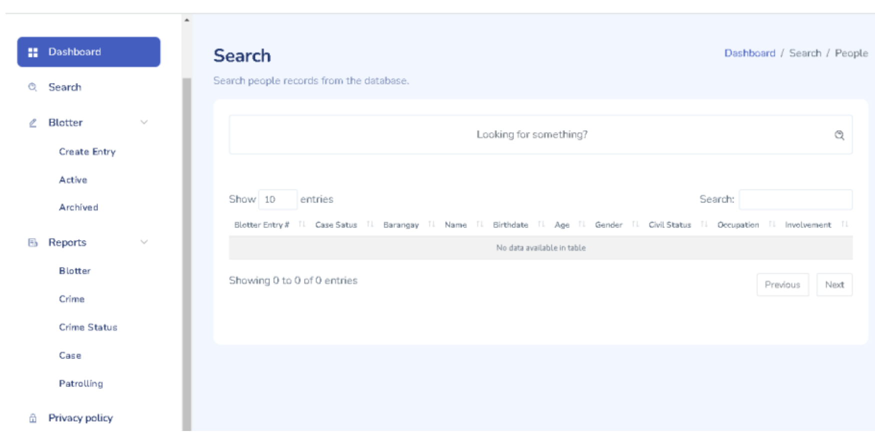

Figure 5. Barangay Personnel Modules

The system has four types of users: the first is the Barangay Personnel, who are responsible for encoding the Blotter entry and creating reports for the Barangay Captain's approval. The Barangay Chairman is the system's second user, responsible for assisting with the Blotter report, viewing Data Analytics, administering the message module, creating new Incident Types, and updating the Patrolling Module. The Tactical Operation Command (TOC) is the system's third user, with access to the Data Analytics module, the Message module, and the ability to post Announcements. The Technical Support team is the system's final user, responsible for generating the User's account and maintaining the audit trail.

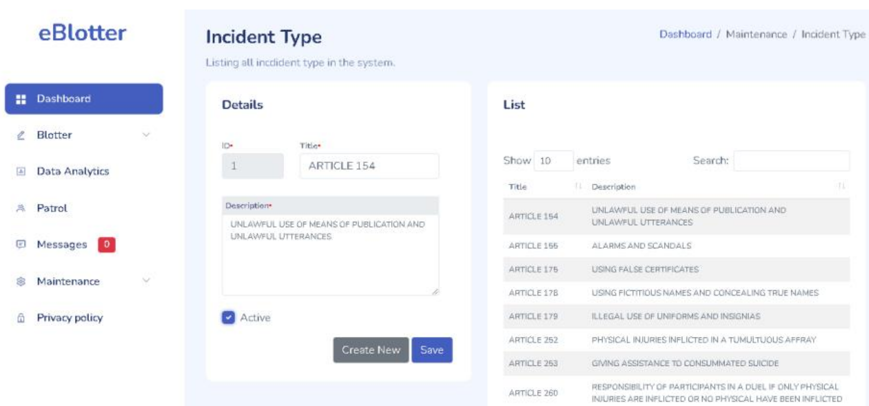

Figure 6. Barangay Chairman Modules

Every Barangay in the municipality of Norzagaray, Bulacan, should have a computer that meets the minimum hardware and software specifications (Table 4). The system will be installed on a barangay's computer and managed by qualified Barangay Personnel endorsed by Barangay Chairman. Only one person per barangay can access the system with the approval of the Barangay Chairman.

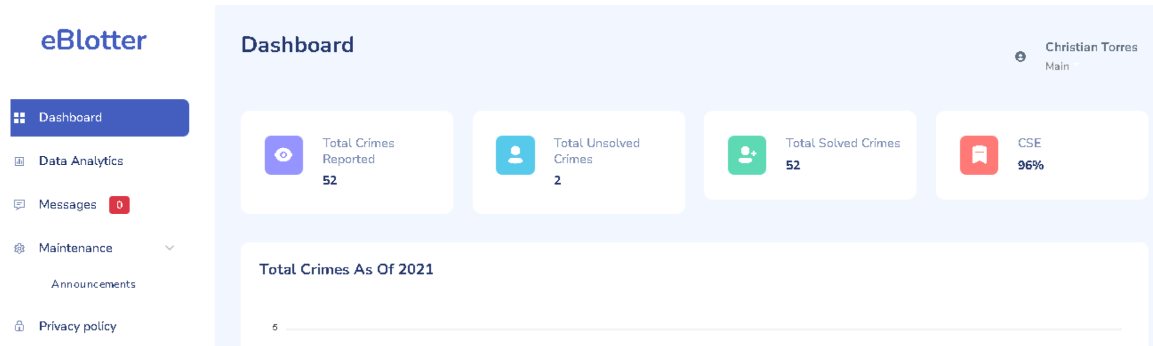

Figure 7. Tactical Operation Command Modules

The Technical Support will register the authorized user for the system. As a result, the user will be granted access to the system based on its function. The Tactical Operation Command (TOC) will receive reports from all the barangays approved by the Barangay Chairman.

Data analytics are part of the system. Because blotter records contain information about the crime's time, date, and location, these blotter records maintained in the database will be plotted to predict where crimes are most likely to occur. The crime statistics will be plotted on a barangay-by-barangay basis. Additionally, there will be a filtered option to see the data by month and year. On the law enforcer, there will be decision support to assist tactical officers in making decisions regarding the allocation of the law enforcer. A program screenshot of the system for project design is attached in Appendix 4.

Testing Result

The developers conducted software testing to evaluate the function of the system and its operation for the controls and processes while using the system. The developer used the manual test scenario as a group of related actions or operations that aid in creating a test condition, or possibly several states, for a specific function.

The developer thoroughly examines each web application module, including each user's login page, dashboard, search module, blotter module, data analytics, patrol, messages, reports, maintenance, and administrator module. For the developer, this stage is crucial since it helps them obtain a deeper grasp of the system's operation. Because each module is verified separately, any problems or bugs may be easily identified and addressed at this level.

The developer begins testing specific interactions for each system module, such as confirming that clicking on either the dashboard module of the message module brings the user to the correct page and not elsewhere or that setting an announcement and creating a message both sync to the user's side.

After a series of testing in the entire system, the user experiences a common difficulty when the user is logging in to the system. The user also made a few errors here in creating the correct password format, and this is a good result because they need to adhere to a stable and effective password in their account. There is also a chance that the user will be assigned to another barangay. In finding a solution, it is found that there is something wrong with the SQL statement used, and it will be debugged immediately. Not much error was detected during the testing phase because the developers' advisors guided inadequate adherence to the right plan.

Table 8. selected test case scenario attributes from Manual Test Case result

Test Scenario Description	Post Conditions	Expected Result	Status	Executed By
Verify the opening of the eBLOTTER web application using a web browser	The user should land on the login page	Successful	Passed	Tester_001
Verify the login functionality of the eBLOTTER login page	The user should land on the dashboard	Successful Login	Passed	Tester_001
Verify the change of a temporary password to the new password	A modal will pop up to change the temporary password to the desired password	Successful	Passed	Tester_001
Verify the functionality of the Dashboard	nothing changed in the dashboard	the Dashboard must be updated	Passed	Tester_001
Verify the functionality of the Blotter transaction	The recent blotter report displayed in the Blotter Module	new blotter report information will exhibit in the Blotter Module	Passed	Tester_001
Verify the functionality of Data Analytics	nothing changed in the dashboard	the Data Analytics must be updated	Passed	Tester_001
Verify the functionality of the Patrol module	nothing changed in the dashboard	the Patrol Report and Data Analytics must be updated	Passed	Tester_001
Verify the functionality of the Message module	No Message and Notification	new message and notification	Passed	Tester_001

For the result of testing, the manual test case scenario is an effective method used by the developer to thoroughly check every detail of this web application. It aids the developer in determining the current state of the project. To see the entire scope of work and adequately prioritize it. To ensure that the system is thoroughly tested before it is released. In software quality assurance, manual testing is an important part. A human tester does a quality check without the help of automation tools. The result of the Manual Test Scenario is included in Appendix 5 as part of this research.

Evaluation Result

To measure the level of acceptability and efficiency will be evaluated by five (5) IT Specialists from web development companies and four (4) Police departments, and four (4) users from Barangays.

The administrator and the Barangay users will test and evaluate the user's acceptability and efficiency of the system. To assess the level of acceptability will be used five (5) system indicators: performance, functionality, usability, security, and compatibility of the system. To evaluate the system's efficiency level will be used six (6) criteria indicators: functionality, reliability, usability, efficiency, satisfaction, and maintainability.

IT experts assess the system's effectiveness and examine the source code that runs the programs and the database design and security, evaluate the readability, ease of program maintenance, and other considerations.

Table 9. Summary Table for Acceptability of the system

#	**Acceptability**	**Weighted Mean**	**Verbal Interpretation**
1	System's Performance	3.67	Highly Accepted
2	System's Functionality	3.63	Highly Accepted
3	System's Usability	3.88	Highly Accepted
4	System's Security	4	Highly Accepted
5	System's Compatibility	3.83	Highly Accepted
	OVERALL MEAN	3.80	Highly Accepted

Performance: The web application performs at heavy workloads. The web application impacts the performance of the hardware device. The web application performs smoothly under critical conditions. The respondents Highly accepted the system’s performance with a mean of 3.67.

System’s Functionality: The web application function ensures the design and requirements specifications have been met. The web application functions well from the perspective of an end-user. The respondents Highly accepted the system’s Functionality with a mean of 3.63.

System’s Usability: The web application provides higher value and quality to users, and functional accuracy is sufficient, responsive, intuitive, and engaging for end-users. The web application's usability makes it easy for users to become familiar with the interface (UI). It is easy for users to achieve their goals when using it. The respondents Highly accepted the system’s Usability with a mean of 3.88.

System’s Security: The web application can only be accessed by the administrator and users through their accounts. The respondents Highly accepted the system’s Security with a mean of 4.00.

System’s Compatibility: The web application runs 100% with the user’s performance. Web application navigation requires diverse navigation strategies. The respondents Highly accepted the system’s Compatibility with a mean of 3.83.

The respondents Highly accepted the overall mean of the Acceptability with a mean of 3.80.

CHAPTER V

SUMMARY OF FINDINGS, CONCLUSION, RECOMMENDATION

This chapter presents the summary of the findings of the study depending on the objective of the study, the conclusion base on the findings, and lastly, the recommendation

Summary of Findings

1. The lack of data gathering tools and methods results in the unsystematic retrieving of crime information from the blotter book from different Barangays.

   The developer's objective is to design a module that will manage and process the information about different crimes committed in the Municipality. The developer believed that the answer to this objective is the designed centralized blotter system that captures vital information about a crime reported. The Law enforcement officers will use the stored records electronically using a web-based system to enable speedy and consistent reporting, reducing data loss when updates are done. Furthermore, computerized blotter records can make it easier for law enforcement officers to track the details of complaints using the system.

2. The absence of analytical tools for use in data processing in the future for the improvement and development of the Local Government Unit.

   One of the main goals achieved by the developer is to have developed a module that will generate reports about the crime incident reports with data analytics. The monitoring crime incident reports currently remain updated on everyday transactions. The generated data analytics now will be used in analyzing the current crime situation in the Municipality. The data analytics from the system immediately transform criminal data into relevant and valuable insights that can improve decision-making for our Law enforcers unit.

3. How to test the software works as expected and meets the technical and system requirements.

   Ensure that the program performs as planned and complies with all applicable technical and system requirements. The developers used Manual Test Case Scenarios to uncover defects and opportunities for improvement, enabling them to make essential modifications and design a system that satisfies the users' needs and expectations. Testing is a process that examines a program, practice, intervention, or effort to determine whether it adequately illuminates the developer's aims.

4. How to evaluate and determine what works well and what could be improved in a web-based application system based on the ISO standard.

   Evaluation aids in determining which components of a program or effort are effective and which features should be improved. To assure quality, developers adopted the ISO 25010 software quality model and were determined to study the system's foundational characteristics. Additionally, it can determine the quality of system features and compliance with standard

Conclusions

The project produces a fundamental approach for generating an idea that will benefit the community in the Municipality of Norzagaray. Based acceptability and efficiency of the system design are well accepted by the users and evaluated by the IT specialist. The testing result showed that it needed to be addressed and directly provided a solution for the system structure based on the project objectives. Evaluation result with an Efficient weighted mean of 3.87 and an Acceptability rating of 3.80 mean with a verbal interpretation of a highly accepted rating. With these excellent results, the developer concludes that developing a Web-based Crime Information Management System for selected Barangays in the Municipality of Norzagaray is entirely functional and dynamic and will improve the intended user's performance in documenting recording incidents in the community.

Recommendations

This project was a huge success, with an excellent rating from its users and evaluators. Developers strongly recommended implementing this web application in coordination with the Local Government Unit of Norzagaray, Bulacan.

BIBLIOGRAPHY

Electronic Sources

Barrow, F. J. (2019). Criminal Record Management System In the Perspective of Somalia. *Project Report*, 98.

Birje, M. N., & Bulla, C. (2019). Cloud Monitoring System: A Review. *International Journal of Engineering Sciences and Management - A Multidisciplinary Publication of VTU*, 49-55.

Bolla, R. A. (2014). Crime pattern detection using online social media. *Masters Theses. 7321. https://scholarsmine.mst.edu/masters_theses/7321*.

Byrne, J., & Marx, G. (2011). Technological Innovations in Crime Prevention and Policing. A Review of the Research on Implementation and Impact. *Cahiers Politiestudies*, 17-40.

E, N. S., O, I., A, J.-O. M., & F, E. U. (2015). Web-Based Location-Aware System Architecture for Combating Electoral Criminal Activities in Nigeria. *IOSR Journal of Computer Engineering (IOSR-JCE)*, 55-59.

Khamooshi, P. (2015). *The Benefits of Using a Web-based Application*. Retrieved from geeks.ltd: https://www.geeks.ltd.uk/about-us/blog/details/eQU5Ip/the-benefits-of-using-web-based-applications

Mishra, P., N, G. B., S, M., Sultana, M., & Singh, S. (2019). Online Criminal Record Management System. *International Journal of Engineering Science and Computing*.

PCOL Noel R. Sandoval, P. J. (n.d.). *Crime Information Reporting and Analytics System.* Camp Crame, Quezon City: Philippine National Police (PNP).

PNP. (2009). Letter of Instruction 02/09 Unit Crime Periodic Report. *Establishing a National Crime Information System*.

R, T. (2015). The Benefits of Using a Web-based Application.

Rafal Kozik, M. C. (2016). A Proposal of Algorithm for Web Applications Cyber Attack Detection. *HAL Open Science*.

Rayte, S., Bhamare, R., Barhate, K., & Sonawane, M. (2015). Crime Monitoring and Controlling System by Mobile Device. *International Journal on Recent and Innovation Trends in Computing and Communication*.

Rojo, S. S.-R. (2002). The Barangay Justice System in the Philippines: Is It an Effective Alternative to Improve Access to Justice for Disadvantaged People?

Seige, J. (2007). Six Constraints: an Enhanced Model for Project Control. *PMI Global Congress*.

Vocabulary.com. (n.d.). Dictionary. Retrieved from Vocabulary.com: https://www.vocabulary.com/dictionar

APPENDIX 1
Sample Evaluation Form Used and Result

Level of Acceptability of Web-based Crime Information Management System for selected Barangays in Norzagaray Municipality with Data Analytics

Directions: Below are statements to measure the level of acceptability of the Web-based Crime Information Management System for selected Barangays in Norzagaray Municipality with Data Analytics. Put a check mark (/) in the column corresponding to your choice. Use the following as your guide.

Numerical Rating	Categorical Response	Verbal Interpretation
4	Strongly Agree (SA)	Highly Accepted
3	Agree (A)	Accepted
2	Disagree (D)	Less Accepted
1	Strongly Disagree (SD)	Least Accepted

INDICATORS	STATEMENTS	SA (4)	A (3)	D (2)	SD (1)
1. System's Performance	1.1 The web application performs at heavy workloads				
	1.2 The web application impacts the performance of the hardware device				
	1.3 The web application performs smoothly under critical condition				
2. System's Functionality	2.1 The web application function ensures the design and requirements specification have been met.				
	2.2 The web application functions well from the perspective of an end-user.				
3. System's Usability	3.1 The web application provides higher value quality to the user, and functional accuracy is sufficient.				

INDICATORS	STATEMENTS	SA (4)	A (3)	D (2)	SD (1)
	3.2 The web application is responsive, intuitive, and engaging enough for the end-user.				
	3.3 The web application usability makes it easy for the user to become familiar with the user interface (UI)				
	3.4 Web application is easy for users to achieve their goal when using it				
4. System's Security	4.1 The web application can be only accessed by the administrator and users through their accounts				
	4.2 The web application is interacting with web services utilizing secure protocol.				
5. System's Compatibility	5.1 The web application can run through any devices				
	5.2 The web application run 100% with the user's performance				
	5.3 The web application navigation requires diverse navigation strategies.				

Comments/Suggestions:

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____

Name of Evaluator and Signature Date

Level of Efficiency of Web-based Crime Information Management System for selected Barangays in Norzagaray Municipality with Data Analytics

Directions: Below are statements to measure the level of efficiency of the Web-based Crime Information Management System for selected Barangays in Norzagaray Municipality with Data Analytics. Put a check mark (/) in the column corresponding to your choice. Use the following as your guide.

Numerical Rating	Categorical Response	Verbal Interpretation
4	Strongly Agree (SA)	Highly Accepted
3	Agree (A)	Accepted
2	Disagree (D)	Less Accepted
1	Strongly Disagree (SD)	Least Accepted

INDICATORS		STATEMENTS	SA (4)	A (3)	D (2)	SD (1)
FUNCTIONALITY	**Suitability**	1.1 The web application can be on major browsers such as Edge, Chrome, and Safari				
	Accurateness	1.2 The web application can give precise and complete information				
	Security	1.3 The web application can be accessed by the user who uses a smartphone, desktop, or laptop with a CRIMS account				
RELIABILITY	**Maturity**	2.1 The web application is fully functional upon the final implementation through the world wide web				
	Accuracy	2.2 The web application can provide correct answers if data or input is incorrect				

INDICATORS		STATEMENTS	SA (4)	A (3)	D (2)	SD (1)
	Reinforcement	2.3 The web application can provide accurate information and data about the appointment and queue status				
USABILITY	**Understandability**	3.2 The web application uses language that the users can understand				
	Learnability	3.3 The web application is user-friendly				
	Attractiveness	3.4 The web application is easy-going and pleasing to the eyes of the users				
EFFICIENCY	**Time Behavior**	4.1 The web application reacts completely with every enactment of the user				
	Validity	4.2 The web application effectively uses resources for the accuracy and completeness of users' goals.				
	Resource Utilization	4.3. The web application gives the same output if input data is plotted correctly.				
SATISFACTION	**Stability**	5.1 The user is satisfied with their perceived achievement of goals, including the results of use and the consequences of use of web application.				
	Versatility	5.2 The end-user has confidence that a product or web application will perform as projected.				

INDICATORS		STATEMENTS	SA (4)	A (3)	D (2)	SD (1)
	Conformance	5.3 The user acquires preference from fulfilling their personal needs using the web application.				
	Complacent	5.4. The user is satisfied with physical comfort.				
MAINTAINABILITY	**Adaptability**	6.1. Managing the web application is stress-free to capture the changes and outcomes.				
	Changeability	6.2 The web application's flexibility responds to the user thoroughly.				

Comments/Suggestions:

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____

______________________________ ______________________________
Name of Evaluator and Signature Date

Level of Performance of Web-based Crime Information Management System for selected Barangays in Norzagaray Municipality with Data Analytics

Directions: Below are statements to measure the level of performance of the Web-based Crime Information Management System for selected Barangays in Norzagaray Municipality with Data Analytics. Put a check mark (/) in the column corresponding to your choice. Use the following as your guide.

Numerical Rating	Categorical Response	Verbal Interpretation
4	Strongly Agree (SA)	Highly Accepted
3	Agree (A)	Accepted
2	Disagree (D)	Less Accepted
1	Strongly Disagree (SD)	Least Accepted

PERFORMANCE	STATEMENTS	SA (4)	A (3)	D (2)	SD (1)
Readability	Readability of the program source code				
Ease of Program Maintenance	Testing				
	Debugging				
	Modification				
Adaptation of the Source Code to Other	Version				
	Programming Language				
Other Considerations	Low Complexity				
	Low hardware resources consumption				
	Source code testing using fault injection				

Directions: Below are statements to measure the level of performance of the Web-based Crime Information Management System for selected Barangays in Norzagaray Municipality with Data Analytics. Put a check mark (/) in the column corresponding to your choice. Use the following as your guide.

IT Specialist Evaluation Table

Numerical Rating	**Verbal Interpretation**
4	Highly Accepted
3	Accepted
2	Less Accepted
1	Least Accepted

Performance	**SA (4)**	**A(3)**	**D(2)**	**SD (1)**
Readability				
Readability of the program source code				
Ease of program maintenance				
Testing				
Debugging				
Modification				
Adaptation of the source code to other				
Version				
Programming Language				
Other Considerations				
Low Complexity				
Low hardware resources consumption				
Source code testing using fault injection				
OVERALL MEAN				

Comments/Suggestions:

____

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________________________________ ________________________________

Name of Evaluator and Signature Date

Table 10. The Functionality of the CRIMS

#	Functionality	Weighted Mean	Verbal Interpretation
1	Suitability	3.60	Highly Accepted
2	Accurateness	3.80	Highly Accepted
3	Security	4.00	Highly Accepted
	OVERALL MEAN	3.80	Highly Accepted

In item 1, "Suitability – The system can run through the web browser and different operating systems; this was excellent by the respondents with a mean of 3.60. In item 2, "Accurateness – The system gives precise data about the reports and its information," this was excellent by the respondents with a mean of 3.80. In item 3, "Security – The system can only access by the administrators and users through their account," this was excellent by the respondents with a mean of 4. The respondents highly accepted the overall compromise of the functionality with a standard of 3.80.

Table 11. The Reliability of the CRIMS

#	Reliability	Weighted Mean	Verbal Interpretation
4	Maturity	4.00	Highly Accepted
5	Accuracy	4.00	Highly Accepted
6	Reinforcement	4.00	Highly Accepted
	OVERALL MEAN	4.00	Highly Accepted

In item 4, "Maturity – The system is fully functional upon the final implementation/deployment stage," the respondents Highly accepted this with a mean of 4.00. In item 5, “Accuracy – The system provides error messages for incorrect input of data,” this was excellent by the respondents with a mean of 4.00. In item 6, “Reinforcement – The system provides accurate information and data about the blotter entry and data analytics status,” this was excellent by the respondents with a mean of 4.00. The respondents Highly Accepted the Overall compromise of the Reliability with a standard of 4.

Table 12. The Usability of the CRIM

#	**Usability**	**Weighted Mean**	**Verbal Interpretation**
7	Understandability	3.80	Highly Accepted
8	Learnability	4.00	Highly Accepted
9	Attractiveness	3.40	Accepted
	OVERALL MEAN	3.73	Highly Accepted

In item 7, "Understandability – The system uses terminologies that the users can understand. The system also provides instruction on how to use the application," this was very satisfactory by the respondents with a mean of 3.80. In item 8, "Learnability – The system is user-friendly when it comes to interface and functions, less assistance from the developer," the respondents Highly accepted this with 4.00. In item 9, "Attractiveness,” the system is amiable, and the respondents acknowledged this with a mean of 3.40. The respondents' overall compromise of reliability was highly accepted, with a standard of 3.73.

Table 13. The Efficiency of the CRIMS

#	**Efficiency**	**Weighted Mean**	**Verbal Interpretation**
10	Time Behavior	4.00	Highly Accepted
11	Validity	3.60	Highly Accepted
12	Resource Utilization	4.00	Highly Accepted
	OVERALL MEAN	3.87	Highly Accepted

In item 10, “Time Behavior – The system reacts completely with every performance from the user,” this was very satisfactory to the respondents with a mean of 4. In item 11, “Time Behavior – The system uses the resources effectively about the accuracy and completeness with which users achieve goals,” this was Highly Accepted by the respondents with a mean of 3.60. In item 12, “Resource Utilization – The system gives the same method of gathering information manually to the pilot area,” the respondents Highly accepted this with a mean of 4.00. The respondents Highly acknowledged the overall efficiency compromise with a standard of 3.87.

Table 14. The Satisfaction of the CRIMS

#	**Satisfaction**	**Weighted Mean**	**Verbal Interpretation**
13	Stability	3.80	Highly Accepted
14	Versatility	4.00	Highly Accepted
15	Conformance	4.00	Highly Accepted
16	Complacent	4.00	Highly Accepted
	OVERALL MEAN	3.95	Highly Accepted

In item 13, “Stability – The user is satisfied with their perceived achievement of goals, including the results of use and the consequences of use of web application,” this was very satisfactory by the respondents with a mean of 4.00. In item 14, “Versatility – The end-user has confidence that a product or web application will perform as projected,” the respondents were very satisfied with a mean of 4.00. In item 15, “Conformance – the capability of the system depends on the user’s performance,” was Highly accepted by the respondents with a mean of 4.00. In item 16, “Complacent - The user is satisfied with physical comfort,” the respondents Highly obtained this with a mean of 4.00. The respondents Highly accepted the prevailing norm of reliability with a standard of 3.95.

Table 15. The Maintainability of the CRIMS

#	**Maintainability**	**Weighted Mean**	**Verbal Interpretation**
17	Adaptability	3.75	Highly Accepted
18	Changeability	4	Highly Accepted
	OVERALL MEAN	3.88	Highly Accepted

In item 17, “Adaptability – Transporting the system to other operating systems is versatile,” the respondents Highly accepted this with a mean of 3.75. In item 18, “Changeability – Flexibility of the system responds to the user thoroughly,” the respondents Highly acknowledged this with a standard of 4. The respondents Highly accepted the overall mean of Maintainability with a mean of 3.88.

Table 16. Summary Table for Efficiency of the system

#	**Efficiency**	**Weighted Mean**	**Verbal Interpretation**
1	Functionality	3.80	Highly Accepted
2	Reliability	4	Highly Accepted
3	Usability	3.73	Highly Accepted
4	Efficiency	3.87	Highly Accepted
5	Satisfaction	3.95	Highly Accepted
6	Maintainability	3.88	Highly Accepted
	OVERALL MEAN	3.87	Highly Accepted

Table 14 shows the Summary Table for Efficiency of the CRIMS. According to four (4) from Police Department and four (4) Barangay Users in Norzagaray, Bulacan, the table reveals the functionality, reliability, usability, efficiency, satisfaction, and maintainability. CRIMS is highly accepted, with an overall mean of 3.87.

Table 17. IT Specialist Evaluation Table

Performance	Weighted Mean	Verbal Interpretation
Readability		
Readability of the program source code	3.80	Highly Accepted
Ease of program maintenance		
Testing	3.80	Highly Accepted
Debugging	3.80	Highly Accepted
Modification	4.00	Highly Accepted
Adaptation of the source code to other		
Version	4.00	Highly Accepted
Programming Language	4.00	Highly Accepted
Other Considerations		
Low Complexity	3.60	Highly Accepted
Low hardware resources consumption	3.80	Highly Accepted
Source code testing using fault injection	3.80	Highly Accepted
OVERALL MEAN	3.84	Highly Accepted

Based on the review of five (5) IT Specialist, the source code that controls the programs is readable; the programmer uses a comment to label the program; because of that, the control flow and operation of the program in detail, the IT Specialist highly accepted this with a mean of 3.80.

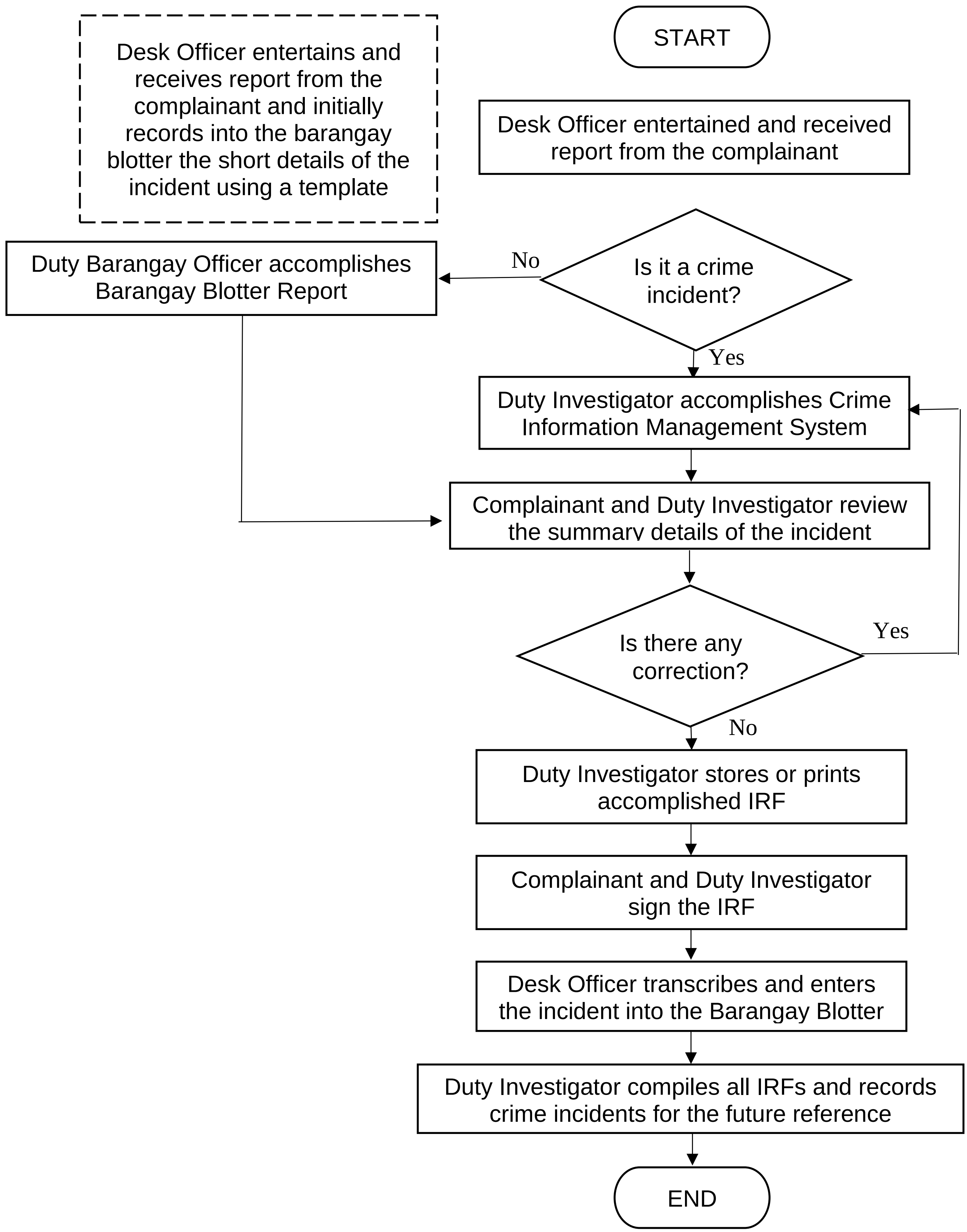
The source code can be easily maintained based on the evaluation of the IT Specialist because the program is not complicated. After all, debugging is not the primary problem. Modifying the program is not complex because the control flow and operation are well defined. The IT Specialist was excellent, with a mean of 3.80 for testing, 3.80 for debugging, and 4.00 for modification.

The adaptation to another web browser is not complicated because it has the exact reserved words, and the transition of the program code was straightforward. According to IT Specialists, adaptation to other Programming Languages is complicated because of the syntax, and reserved word uses. The IT Specialist highly accepted this with 4.00 for transformation to different versions and 4.00 for programming language.

The source code's low complexity received an excellent score of 3.60 because it is easy to understand. It also utilizes less CPU and memory consumption; according to IT specialist evaluation, it received an outstanding with a mean of 3.80. The ability of the source code to accept complete injection received a highly taken with a standard of 3.80.

Overall, the IT specialist evaluation in the CRIMS is highly accepted with a mean of 3.84 because of the simplicity of the source code and functionality of the web application.

APPENDIX 2
Flowchart of the System


START
Desk Officer entertains and receives report from the complainant and initially records into the barangay blotter the short details of the incident using a template
Desk Officer entertained and received report from the complainant
Is it a crime incident?
No
Duty Barangay Officer accomplishes Barangay Blotter Report
Yes
Duty Investigator accomplishes Crime Information Management System
Complainant and Duty Investigator review the summary details of the incident
Is there any correction?
Yes
No
Duty Investigator stores or prints accomplished IRF
Complainant and Duty Investigator sign the IRF
Desk Officer transcribes and enters the incident into the Barangay Blotter
Duty Investigator compiles all IRFs and records crime incidents for the future reference
END

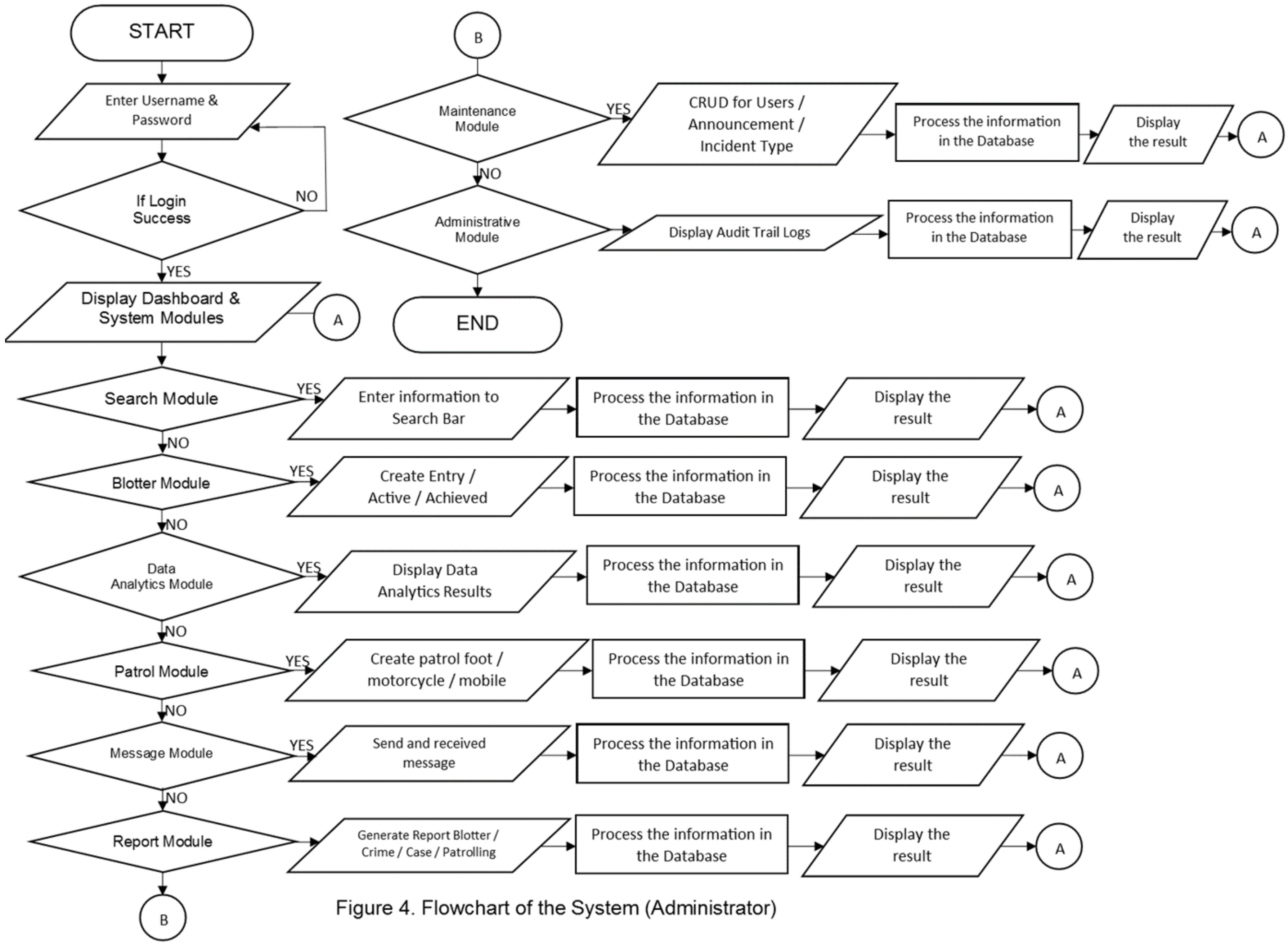


Figure 4. Flowchart of the System (Administrator)

APPENDIX 3
Data Flow Diagram

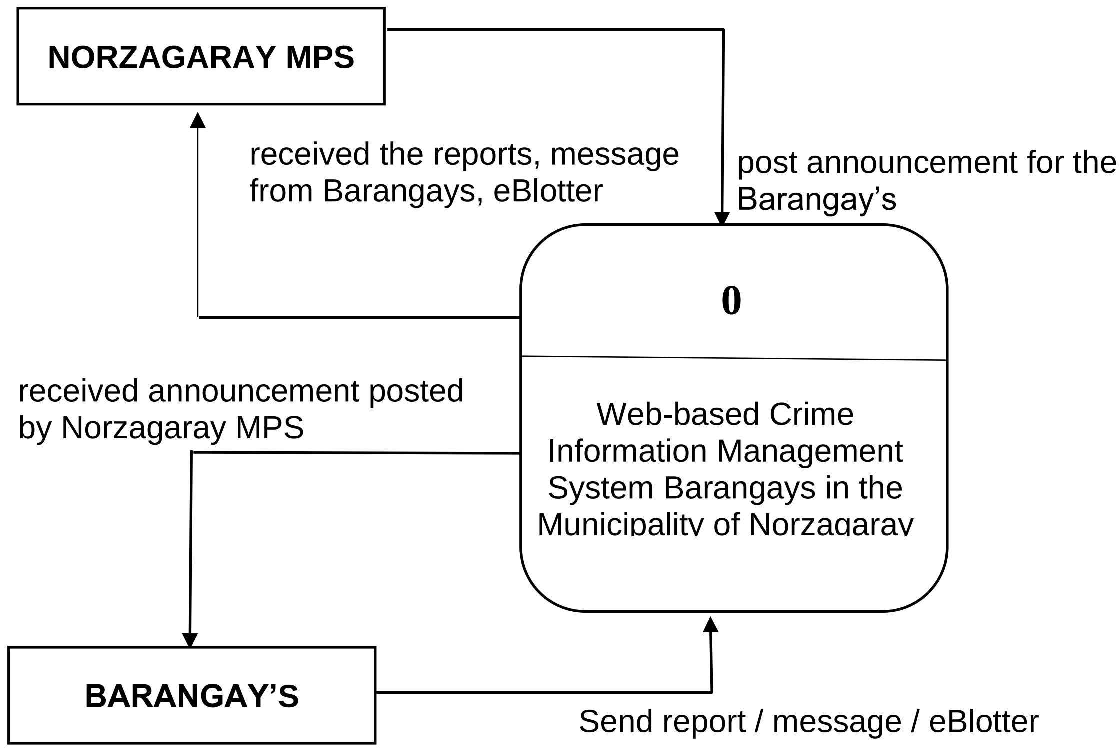


Figure 9. Data Flow Diagram (Level 0)

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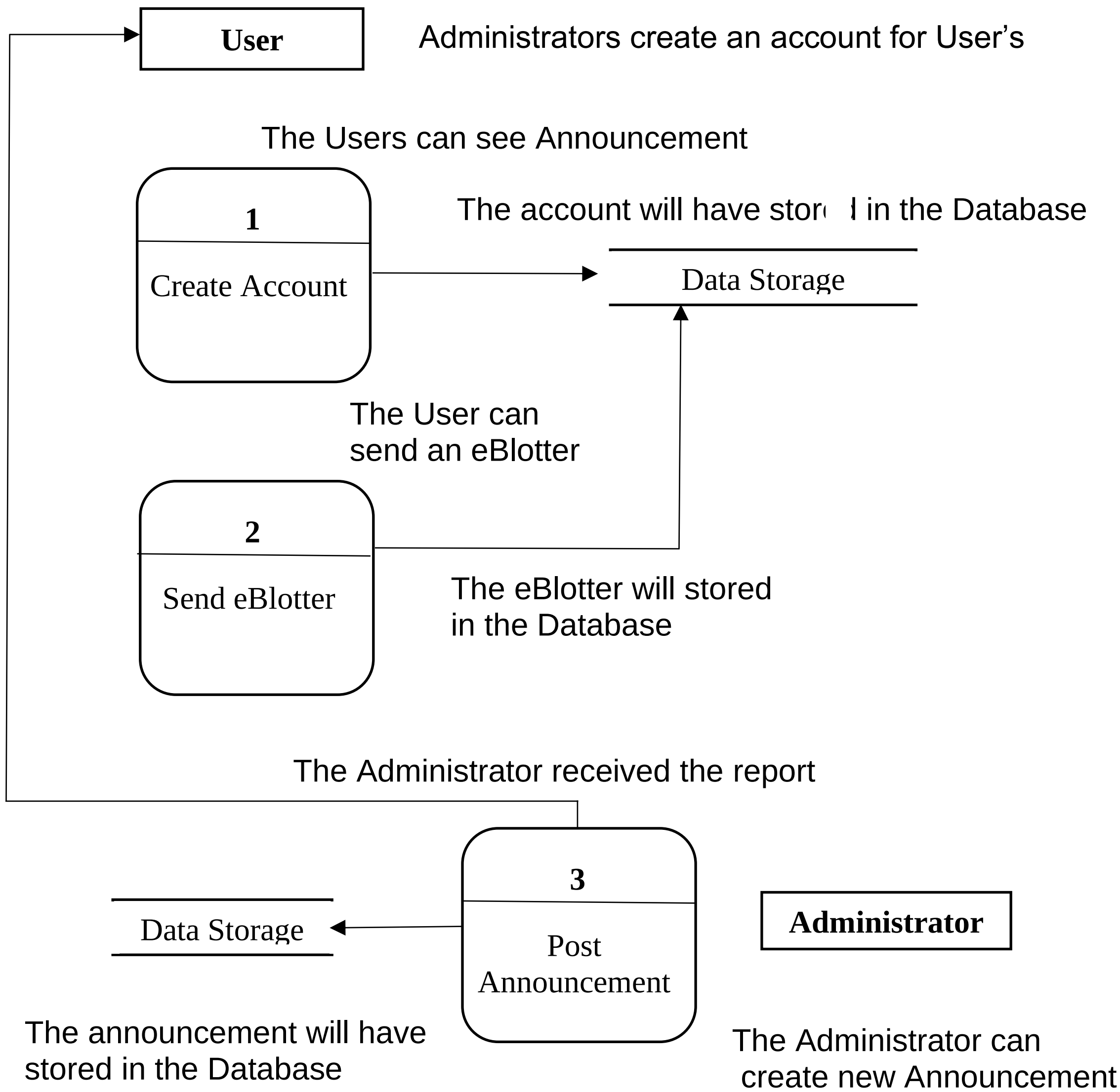


Figure 10. Data Flow Diagram (Level 1)

APPENDIX 4
Program Screenshots

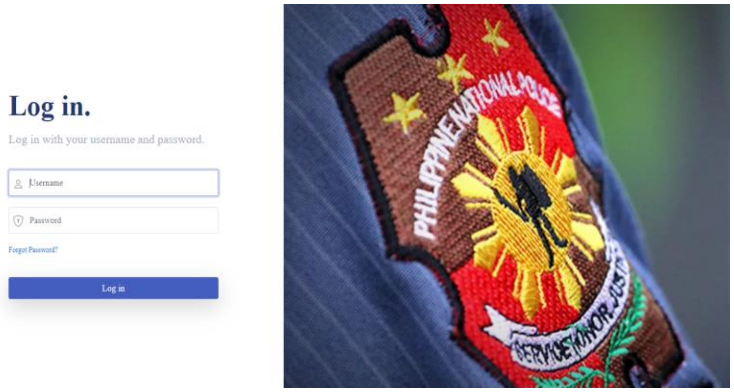


Figure 11. Log in Page

The user must already have a registered account on the system. To log in, simply enter your username and password. If you forget your password, simply click "Forgot Password?" and the system will reset the password to the default setting.

Figure 12. Dashboard

The system will display the dashboard module after you log in. The Dashboard module contains the system's most essential features, including the number of crimes recorded (solved and unsolved), announcements, and recent blotter entries.

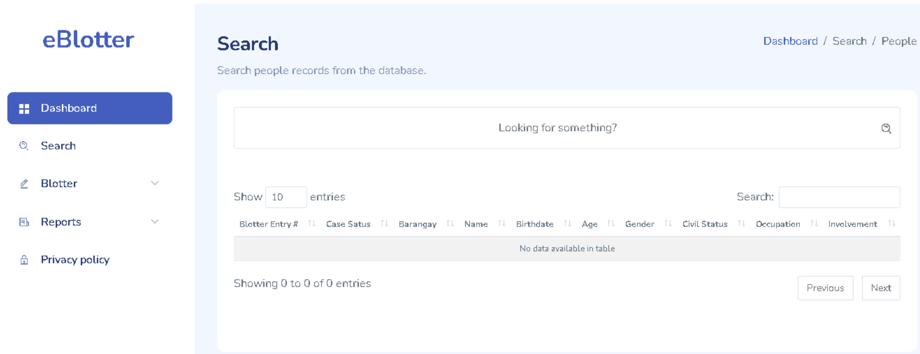


Figure 13. Search Module

The user can quickly locate a blotter entry by searching for it in the search module. Simply type the Blotter entry number into the search tab, and the data will be shown.

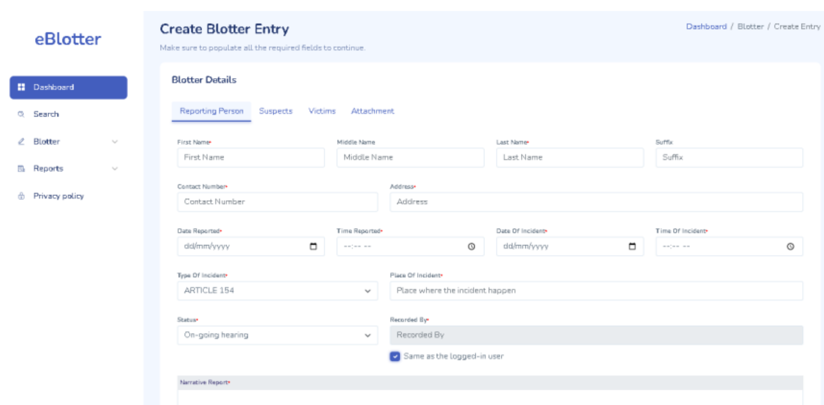


Figure 14. Blotter Mod ule

In the blotter module, there are three options for the user to choose from. "Create Blotter entry," "Active," and "Archived." Blotter entry is for encoding a blotter into the system. Active is for viewing data that is still ongoing and archived is for data that has already been solved.

Figure 15. Data Analytics Module

The data analytics module allows you to see all the data that has been encoded. The collected data was visualized using graphs, and this information can be used to design an implementation plan.

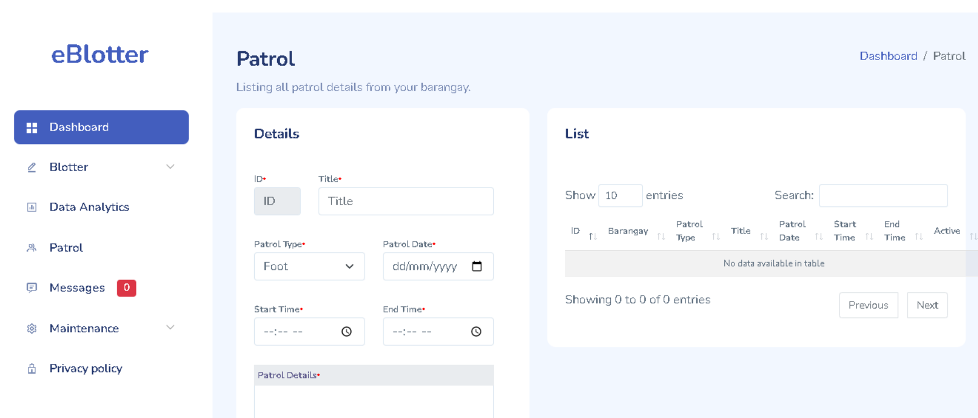


Figure 16. Patrol Module

The system will display the recorded patrol activity in the patrol module. The user can also save information about their recent patrols, such as their vehicle and other details.

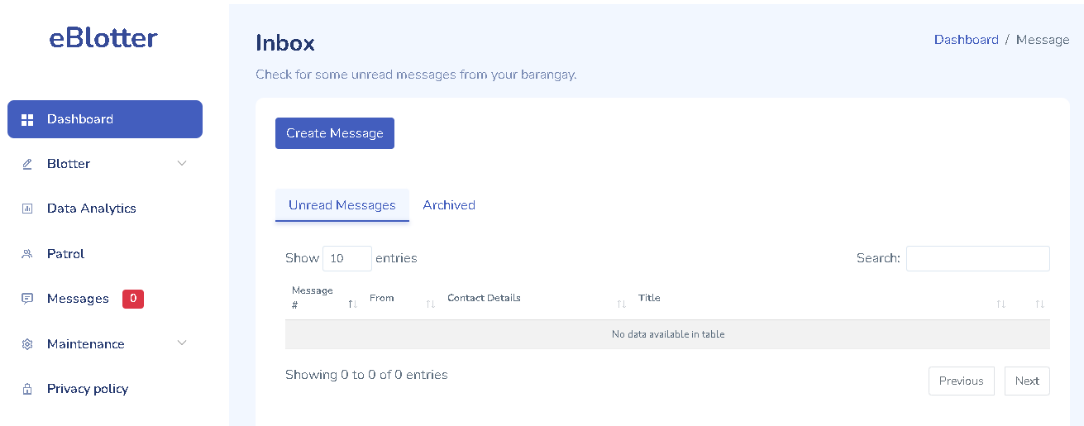


Figure 17. Message Module

The user can send a message to other users in the message module. Unread and archived messages can be viewed in this tab.

Figure 18. Report Module

The Blotter, Crime, Case, and Patrolling reports are among the four options available in the Cases Report module. Each of them can provide printable information that the user will find beneficial.

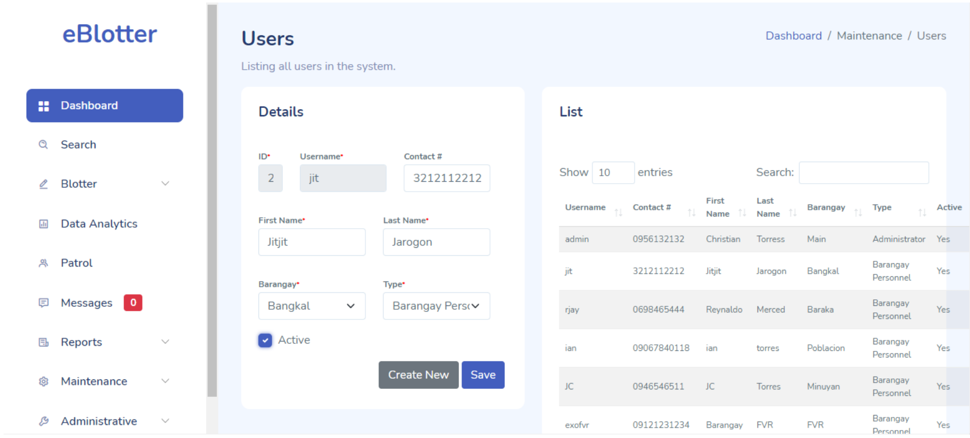


Figure 19. Maintenance (User's) Module

The Users tab from the Maintenance module can add users and update existing data in the list. This system function is only accessible by the administrator.

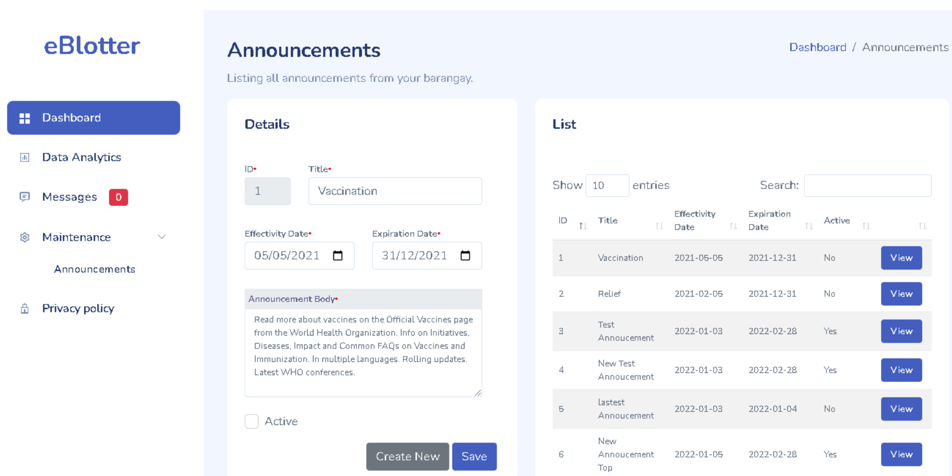


Figure 20. Maintenance (Announcement) Module

Under the maintenance module, there is an announcement tab. A user can only post an announcement from the Norzagaray Municipal Police Station (NMPS), while users can receive it from all the Barangays.

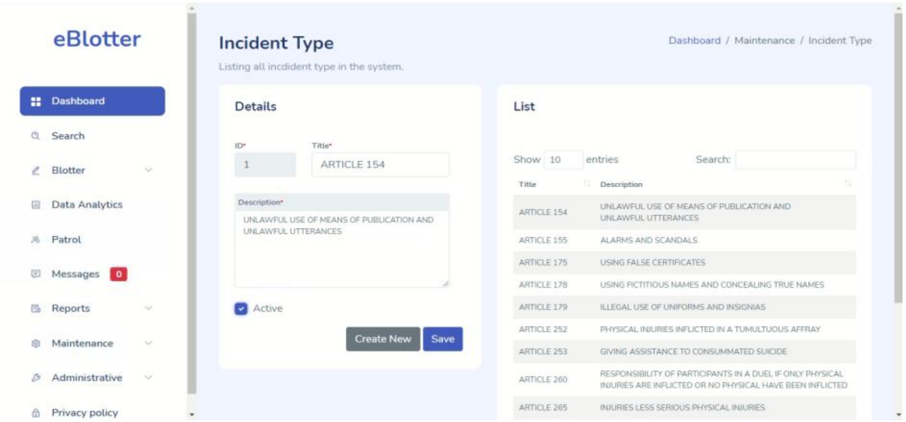


Figure 21. Maintenance (Incident type) Module

If a new Barangay Ordinance is created, the incident type maintenance will handle it. It will also show the listing of all incident types in the system.

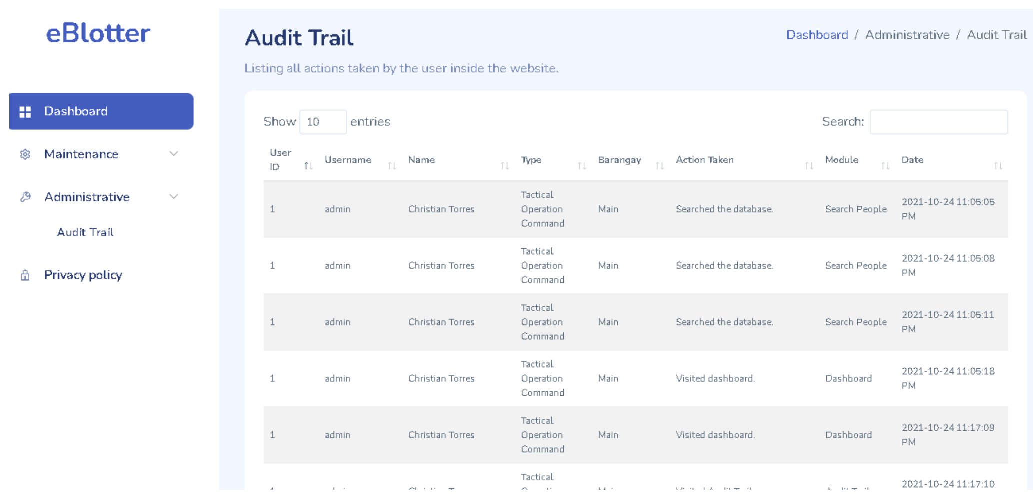


Figure 22. Administrative (Audit Trail) Module

The system has an audit trail in the system under the administrative module. This feature enables the administrator to monitor and track every data and activity recorded in the system.

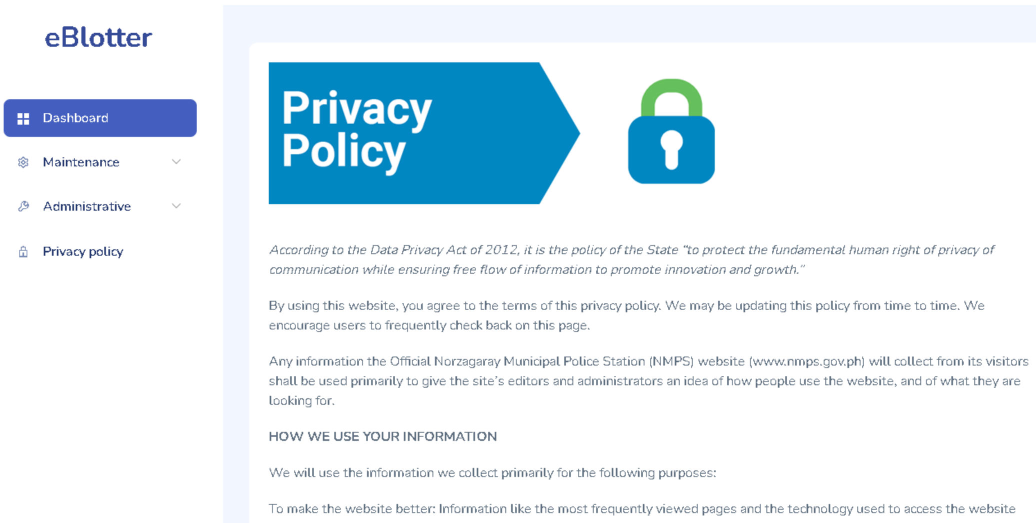


Figure 23. Data Privacy Module

In the Privacy Policy module. The system will display content that meets the standards of the Data Privacy Act of 2012. This was done to ensure that the data gathered

APPENDIX 5
Manual Test Case Scenario

Project Name	DEVELOPMENT OF A WEB-BASED CRIME INFORMATION MANAGEMENT SYSTEM FOR SELECTED BARANGAY IN THE MUNICIPALITY OF NORZAGARAY, BULACAN
Module Name	
Created By	Christian C. Torres
Creation Date	October 10, 2021
Reviewed By	Jennlyn P. Silva
Reviewed Date	October 2021 to January 2021

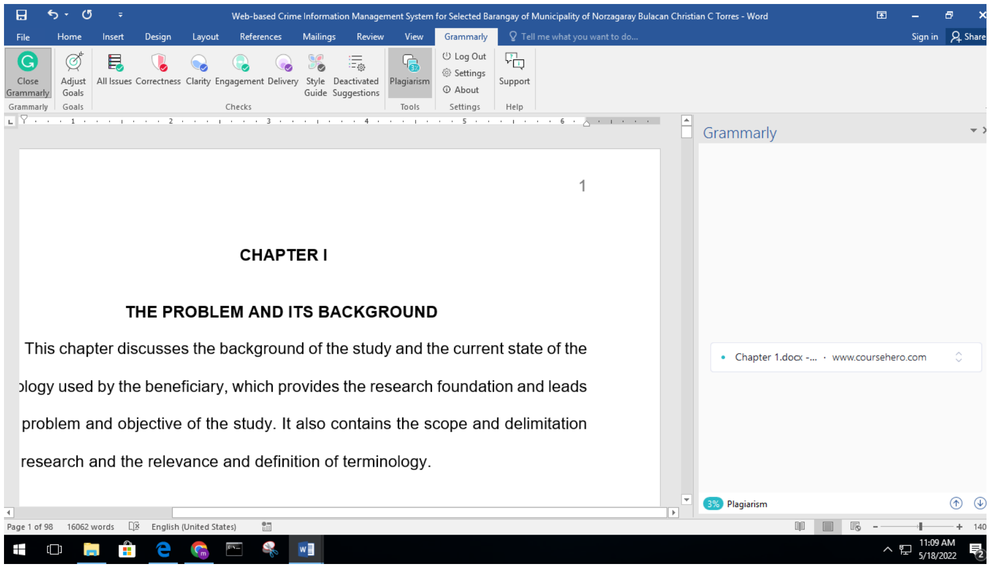
Test Scenario ID	Test Scenario Description	Test Case ID	Test Case Description	Test Steps	Preconditions	Test Data	Post Conditions	Expected Result	Actual Result	Status	Executed By	Executed Date	Comments(if any)
TS_eBLOTTER_001	Verify the opening the eBLOTTER web application at the browser	TC_OPEN_001	Enter the valid link for eBLOTTER	1. Type the link at the search box	Valid URL	<Valid URL>	User should land to the login page	Successful		Pass	Tester_001	10-20-2021	
TS_eBLOTTER_001	Verify the opening the eBLOTTER web application at the browser	TC_OPEN_002	Enter the invalid link for eBLOTTER	1. Type the invalid link at the search box	Valid URL	<Inalid URL>	Error message or other website will be shown	Error message or other website will be shown		Pass	Tester_001	10-20-2021	
TS_eBLOTTER_002	Verify the login functionality of eBLOTTER login page	TC_LOGIN_001	Enter a valid username and valid password	1. Enter a valid username 2. Enter a valid password 3. Click the login button	Valid URL Test Data	<Valid Username> <Valid Password>	User should land to dashboard	Successful Login		Pass	Tester_001	10-20-2021	
TS_eBLOTTER_002	Verify the login functionality of eBLOTTER login page	TC_LOGIN_002	Enter a valid username and invalid password	1. Enter a valid username 2. Enter an invalid password 3. Click the login button	Valid URL Test Data	<Valid Username> <Valid Password>	Error message "invalid username or password"	A message "The email and password you entered don't match" is shown		Pass	Tester_001	10-20-2021	
TS_eBLOTTER_002	Verify the login functionality of eBLOTTER login page	TC_LOGIN_003	Enter an invalid username and valid password	1. Enter an invalid username 2. Enter a valid password 3. Click the login button	Valid URL Test Data	<Invalid Username> <Valid Password>	Error message "invalid username or password"	A message "The email and password you entered don't match" is shown		Pass	Tester_001	10-20-2021	
TS_eBLOTTER_002	Verify the login functionality of eBLOTTER login page	TC_LOGIN_004	Enter an invalid username and invalid password	1. Enter an invalid username 2. Enter an invalid password 3. Click the login button	Valid URL Test Data	<Invalid Username> <Valid Password>	Error message "invalid username or password"	A message "The email and password you entered don't match" is shown		Pass	Tester_001	10-20-2021	
TS_eBLOTTER_003	Verify the change of temporary password to new password	TC_LOGIN_005	Enter a valid username and valid temporary password	1. Enter a valid username 2. Enter a valid temporary password 3. Click the login button	Valid URL Test Data	<valid username> <valid temporary password>	A modal will pop-up to change the temporary password to desire password	Successful		Pass	Tester_001	10-20-2021	
TS_eBLOTTER_003	Verify the change of temporary password to new password	TC_LOGIN_006	Enter a invalid username and valid temporary password	1. Enter an invalid username 2. Enter a valid temporary password 3. Click the login button	Valid URL Test Data	<invalid username> <valid temporary password>	Error message "invalid username or password"	A message "The email and password you entered don't match" is shown		Pass	Tester_001	10-20-2021	
TS_eBLOTTER_003	Verify the change of temporary password to new password	TC_LOGIN_007	Enter a valid username and invalid temporary password	1. Enter a valid username 2. Enter an invalid temporary password 3. Click the login button	Valid URL Test Data	<valid username> <invalid temporary password>	Error message "invalid username or password"	A message "The email and password you entered don't match" is shown		Pass	Tester_001	10-20-2021	
TS_eBLOTTER_003	Verify the change of temporary password to new password	TC_LOGIN_008	Enter an invalid username and invalid temporary password	1. Enter an invalid username 2. Enter an invalid temporary password 3. Click the login button	Valid URL Test Data	<invalid username> <invalid temporary password>	Error message "invalid username or password"	A message "The email and password you entered don't match" is shown		Pass	Tester_001	10-20-2021	
TS_eBLOTTER_004	Verify the functionality of Dashboard	TC_ADMIN_003	The recent Blotter entry and Annoucement and Data Analytics updated result	1. Click Dashboard 2. Scroll down and check if the information is correct	Valid URL Test Data	recent encoded data	nothing change in the dashboard	the Dashboard must be updated		Pass	Tester_001	11-15-2021	
TS_eBLOTTER_005	Verify the functionality of Dashboard	TC_BRGY_003	The recent Blotter entry and Annoucement and Data Analytics updated result	1. Click Dashboard 2. Scroll down and check if the information is correct	Valid URL Test Data	recent encoded data	nothing change in the dashboard	the Dashboard must be updated		Pass	Tester_001	11-15-2021	
TS_eBLOTTER_006	Verify the functionality of Blotter transaction	TC_BRGY_006	Test the Blotter Transaction	1. Click Blotter Module 2. Click Creat Entry 3. Make sure to populate all the required fields to continue	Valid URL Test Data	Required Fields must be populated	recent blotter report display in the Blotter Module	new blotter report information will display in the Blotter Module		Pass	Tester_001	12-15-2021	check the database
TS_eBLOTTER_007	Verify the functionality of Search the transaction	TC_ADMIN_007	Search function	1. Click Search Module 2. Type Name of the person that you to check the record	Valid URL Test Data	Name of a Person	no search found	if the name if found in the system will display the information		Pass	Tester_001	11-15-2021	
TS_eBLOTTER_007	Verify the functionality of Search the transaction	TC_BRGY_007	Search function	1. Click Search Module 2. Type Name of the person that you to check the record	Valid URL Test Data	Name of a Person	no search found	if the name if found in the system will display the information		Pass	Tester_001	11-15-2021	
TS_eBLOTTER_008	Verify the fucntionality of Data Analytics	TC_ADMIN_008	Data Analytics Function	1. Click Data Analytics 2. Scroll down and check if the information is correct	Valid URL Test Data	recent encoded data	nothing change in the dashboard	the Data Analytics must be updated		Pass	Tester_001	12-15-2021	check the database
TS_eBLOTTER_008	Verify the fucntionality of Data Analytics	TC_BRGY_008	Data Analytics Function	1. Click Data Analytics 2. Scroll down and check if the information is correct	Valid URL Test Data	recent encoded data	nothing change in the dashboard	the Data Analytics must be updated		Pass	Tester_001	12-15-2021	check the database
TS_eBLOTTER_009	Verify the functionality of Patrol module	TC_ADMIN_009	Patrol Module Function	1. Click Data Patrol Module 2. Scroll down and check if the information is correct	Valid URL Test Data	recent encoded data	nothing change in the dashboard	the Patrol Report and Data Analytics must be updated		Pass	Tester_001	11-25-2021	
TS_eBLOTTER_009	Verify the functionality of Patrol module	TC_BRGY_009	Patrol Module Function	1. Click Data Patrol Module 2. Scroll down and check if the information is correct	Valid URL Test Data	recent encoded data	nothing change in the dashboard	the Patrol Report and Data Analytics must be updated		Pass	Tester_001	11-25-2021	

Project Name	DEVELOPMENT OF A WEB-BASED CRIME INFORMATION MANAGEMENT SYSTEM FOR SELECTED BARANGAY IN THE MUNICIPALITY OF NORZAGARAY, BULACAN
Module Name	
Created By	Christian C. Torres
Creation Date	October 10, 2021
Reviewed By	Jennlyn P. Silva
Reviewed Date	October 2021 to Junuary 2021

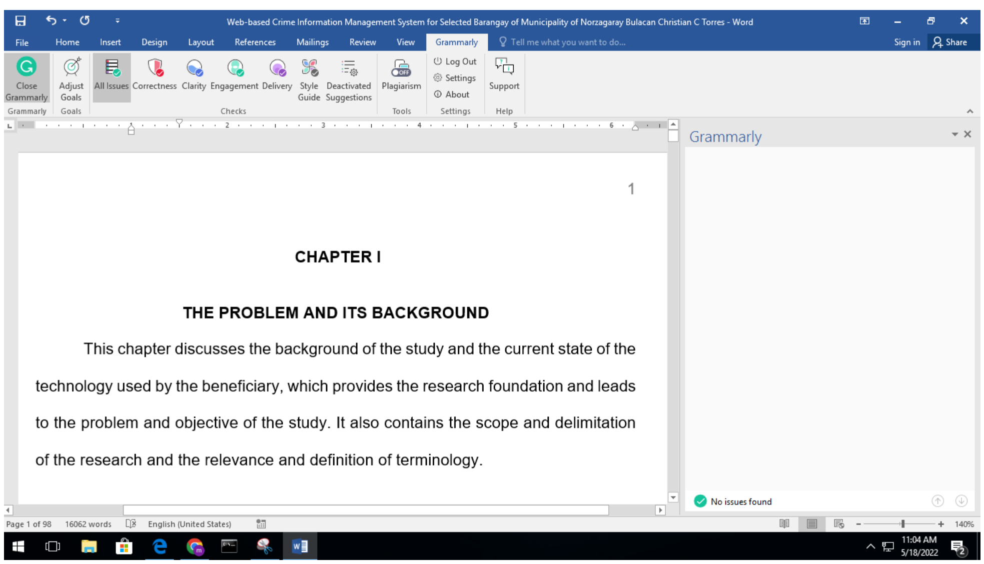
Test Scenario ID	Test Scenario Description	Test Case ID	Test Case Description	Test Steps	Preconditions	Test Data	Post Conditions	Expected Result	Actual Result	Status	Executed By	Executed Date	Comments(if any)
TS_eBLOTTER_010	Verify the functionality of Message module	TC_ADMIN_010	the Admin will send a message to the Barangay	1. Click Message module 2. Click create message then send to selected Barangay 3. Click Send	Valid URL Test Data	Test Message	No Message and Notification	new message and notication		Pass	Tester_001	11-25-2021	
TS_eBLOTTER_010	Verify the functionality of Message module	TC_BRGY_010	the Baragany will reply a message to the Admin	1. Click Message module 2. Click new message then create message then reply to Admin 3. Click Send	Valid URL Test Data	Test Message	No Message and Notification	new message and notication		Pass	Tester_001	11-25-2021	
TS_eBLOTTER_011	Verify the functionality of Report module	TC_ADMIN_011	Check if the Last data is encoded	1. Go to my Report module 2. Enter a Blotter report number 3. Click Search	Valid URL Test Data	Valid Blotter number	no record found	found new record		Pass	Tester_001	12-28-2021	
TS_eBLOTTER_011	Verify the functionality of Report module	TC_BRGY_011	Check if the Last data is encoded	1. Go to my Report module 2. Enter a Blotter report number 3. Click Search	Valid URL Test Data	Valid Blotter number	no record found	found new record		Pass	Tester_001	12-28-2021	
TS_eBLOTTER_012	Verify the functionality of Maintenance module	TC_ADMIN_012	Admin can add new User	1. Click Maintenance Module 2. Click add User, 3. Populate the information needed to create new user 5. Save the created user	Valid URL Test Data	new User	No new User	New user must be add on the list of user's		Pass	Tester_001	12-28-2021	
TS_eBLOTTER_012	Verify the functionality of Maintenance module	TC_ADMIN_012	Admin can add new Annoucement	1. Click Maintenance Module 2. Click add Annoucement 3. Populate the information needed to create new user 5. Save the created annoucement	Valid URL Test Data	new Annoucement	No new Annoucement	New annoucement must be add on the list of annoucement		Pass	Tester_001	12-28-2021	
TS_eBLOTTER_012	Verify the functionality of Maintenance module	TC_ADMIN_012	Admin can add new Incident Type	1. Click Maintenance Module 2. Click add Incident Type 3. Populate the information needed to create new user 5. Save the create Incident Type	Valid URL Test Data	new Incident Type	No new Incident Type	New Incident Type must be add on the list of Incident Type		Pass	Tester_001	12-28-2021	
TS_eBLOTTER_013	Verify the functionality of Administrative module	TC_ADMIN_012	Admin can check the activity of the Users	1. Click Administrative Module 2. Click Audit Trail	Valid URL Test Data	new activity logs found	No new activity logss	New activity log found		Pass	Tester_001	12-28-2021	

APPENDIX 6
Grammarly and Proofread Certification

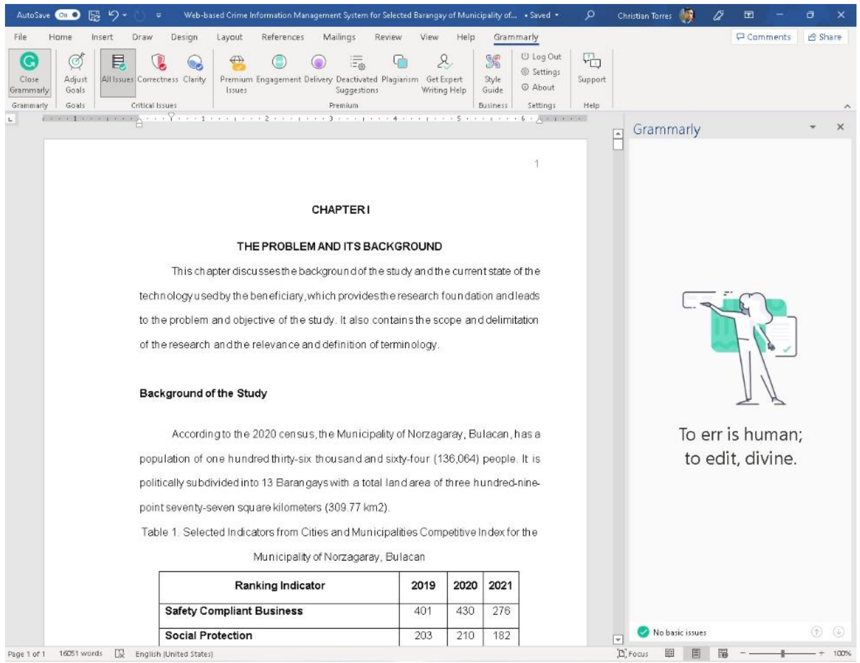
Grammarly Plagiarism Test Result



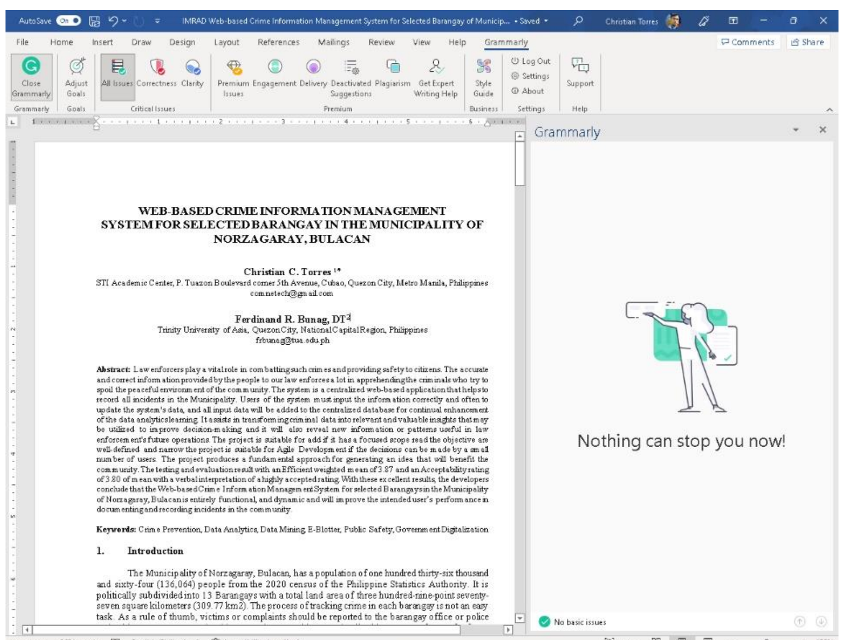
Grammarly Test Result (a)



Grammarly Test Result (b)



Grammarly Test Result (c)



GRAMMARIAN'S CERTIFICATE

This is to certify that the undersigned has reviewed carefully the thesis presented for the Faculty of the Graduate Program STI College Cubao entitled **Web-Based Crime Information Management System for Selected Barangay in The Municipality of Norzagaray, Bulacan** of Christian C. Torres, as against the set of structural rules that govern the composition of sentences, phrases, and words in the English language.

It was issued this 18th day of May 2022.

MRS. MARINETTE PORTUGUES-BUGTONG
Grammarian

RESEARCHER'S PROFILE

Christian C. Torres, HCAI

Assistant Professor / ICT Department

STI College Sta. Maria

www.linkedin.com/in/christiantorres31