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Web-Based Crime Information Management System for Selected Barangay in the Municipality of Norzagaray, Bulacan

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Abstract

Law enforcers play a vital role in combatting such crimes and providing safety to citizens. The accurate and correct information provided by the people to our law enforcers a lot in apprehending the criminals who try to spoil the peaceful environment of the community. The system is a centralized web-based application that helps to record all incidents in the Municipality. System users must input the information correctly and often update the system's data. All input data will be added to the centralized database to enhance the data analytics learning. It assists in transforming criminal data into relevant and valuable insights that may be utilized to improve decision-making. It will also reveal new information or patterns useful in law enforcement's future operations. The project is suitable for addition if it has a focused scope read the objectives are well-defined and narrow. The project is ideal for Agile Development if a small number can make users' decisions. The project produces a fundamental approach to generating an idea that will benefit the community. The testing and evaluation result with an efficient weighted mean of 3.87 and an Acceptability rating of 3.80 of mean with a verbal interpretation of a highly accepted rating. With these excellent results, the developers conclude that the Web-based Crime Information Management System for selected Barangays in the

Municipality of Norzagaray, Bulacan, is entirely functional and dynamic and will improve the intended user's performance in documenting and recording incidents in the community.

Introduction

The Municipality of Norzagaray, Bulacan, has a population of one hundred thirty-six thousand and sixty-four (136,064) people to the 2020 census of the Philippine Statistics Authority. It is politically subdivided into 13 Barangays with a total land area of three hundred-nine-point seventy-seven square kilometers (309.77 km2). The process of tracking crime in each barangay is a challenging task. As a rule, victims or complaints should be reported to the barangay office or police authorities. Moreover, one should secure a barangay blotter and police blotter report for future reference and as legal evidence in court. It is still necessary to read the previous records by hand to gather data for the past connection of a suspect or the defendant. Indeed, it consumes a lot of time and human resources. 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 Web-Based Crime, Information Management System, applies to Norzagaray Municipal Police Station (NMPS) and Barangay Peacekeeping Action Teams (BPATs), explicitly investigating crime detection.

As civil wars, terrorism, and rising violence have gained more prominence over the past ten years, there has been a continuous drop in the level of peace on Earth. Due to the adverse

effects of violence on the Global Economy, these costs are enormous. 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. The developers identified the following issues and concerns that need to be addressed. The lack of data-gathering tools resulted in unsystematically retrieving crime information from the blotter book in the different Barangays. 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 only enforce data entry restrictions if specifically instructed.

This study's main objective is to design 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. Specifically, the developers created a module to 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 losing or forgetting physical copies. 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. The developed module will generate

reports about the crime incident reports with data analytics. Monitoring crime incidents, reports should be 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. Developers conducted a manual test case scenario and applied an ISO Software Evaluation Criteria System based on ISO-25010-2010. Testing and evaluation are systematic processes for examining a program, practice, intervention, or initiative to determine how well it accomplishes its objectives. Testing and evaluations assist in deciding what aspects of a program or effort operate well and what factors could be improved.

For the user's BPAT and NMPS modules, 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, numbers, symbols, or upper case. A user's name provides the administrator for the new user, while the system defaults the password with a specific format. The Dashboard Module is essential for 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. 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 shares the information and work with the centralized database to quickly check if the person has a derogatory record or is clear about the result. The Blotter Report Module is where all the crime-related information is encoded. Under Create Entry submodule is the information about the reporting person, suspect, and victim's 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. 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. 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. 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. The User maintenance module manages user information and the personal data associated with the Barangay user's type. Finally, there is 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.

Review of Related Literature

Real-Time Monitoring

One research was 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 the case of an emergency, location, problem, and all possible difficulties can be determined comparatively less time by concerned authorities like the 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. Their system aims to use surveillance and smartphones to accomplish the entire surveillance task automatically. (Rayte, Bhamare, Barhate, & Sonawane, 2015)

A crime Information Management System is a 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

According to Pratibha Mishra and other Indian colleagues' research titled "Online Criminal Record Management System," the research indicates that 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 Systems 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 information encoding for an ideal crime prevention and resolution transaction solution.

Cloud-Based Monitoring

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 are not part of the organization's servers and workstations.

Web Application

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 precious 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), the Police, other security officials, and the general public (E, O, A, & F, 2015).

Web-based applications 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 the Internet. Users can use a regular browser to access the application from any computer connected to the internet.

Centralized Monitoring

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 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 fewer human resources and maintenance, the centralized database is less expensive than other databases. All the consolidated database data can be viewed simultaneously and from the exact location.

Data Analytics

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 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 attempted by Philippine society nowadays, and it is a requirement to understand that a lot 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 the 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).

Framework

A Journal Article entitled "Public Management Information Systems: Theory and Prescription" by Barry Bozeman and Stuart Bretschneider converses that 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 one 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 to determine whether people should relocate to a new city and which locations should be avoided when traveling. With these crimes rising, law enforcement agencies press for advanced geographic information systems and novel data mining methodologies to improve crime analytics and safeguard their communities.

Figure 1

Conceptual Model of the Study
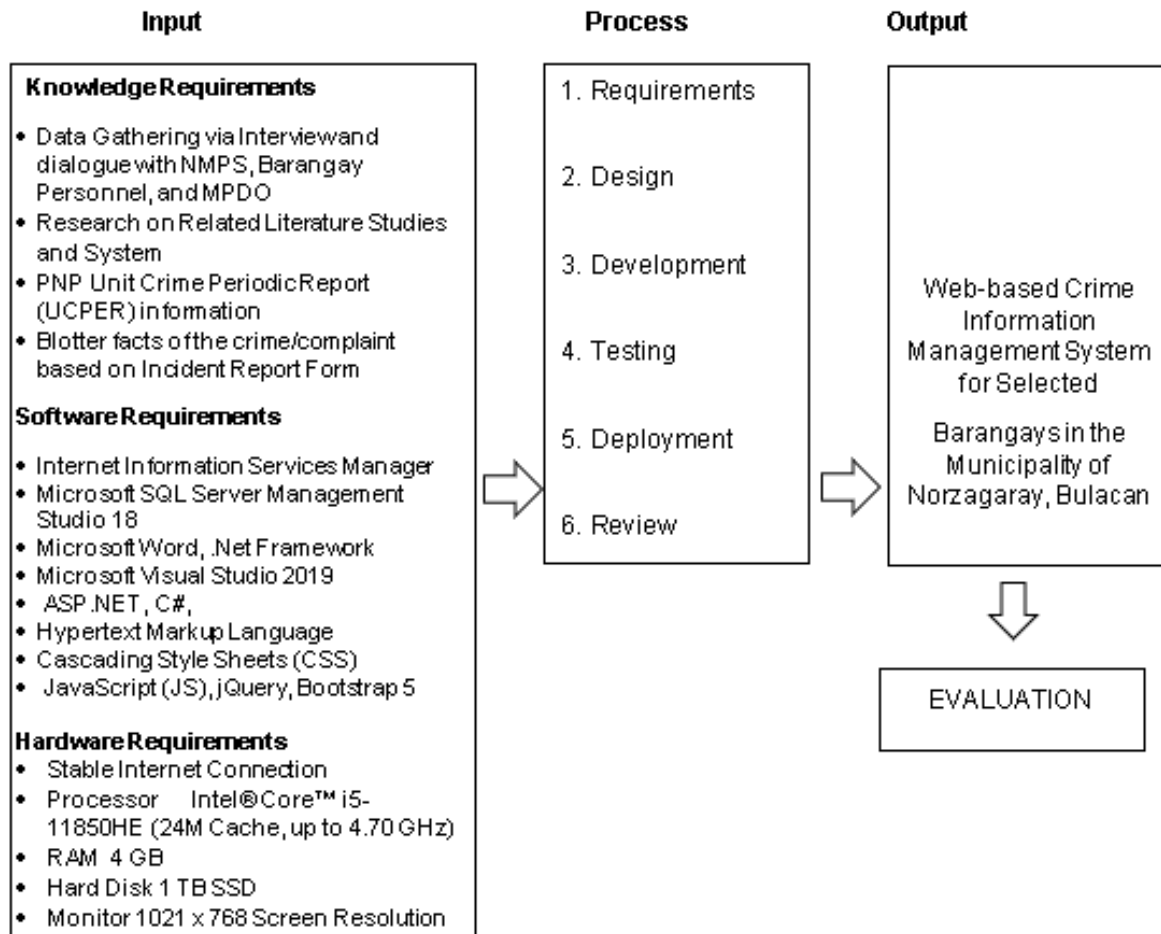
In the IPO Model, the inputs represent the data flow into the process to output. Knowledge requirements are based on the data gathering via Interviews and dialogue with NMPS, Barangay Personnel, and MPDO. The research on Related Literature and Studies helps the developers conceptualize the idea needed 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 and 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 aligns 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.

Methodology

The developers performed open-ended interview questions and visual observation at the Norzagaray Municipal Police Station (NMPS). They selected the Barangay Peace Action Team (BPATS) members to capture their genuine operations and reveal real concerns. When a crime is reported, the centralized blotter system records vital information. The system development methodology developed to respond to the need for the delivery system is very fast. The project is suitable for addition if it has a focused scope read the objectives are well-defined and narrow. The scheme is appropriate for Agile Development if a small number can make the decisions of users.

In planning and requirements, developers determine a reasonable timeframe and action plan for the system by identifying and defining the project scope in this step. The developers need to analyze the gathered information and satisfy the objectives of the requirements in the design phase. After conceiving it, the developers began building the suggested solution using the Agile Development technique after the implementation and development. 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 developers employed

prototyping to demonstrate the notion to the intended users, which necessitated commitment from both the developers and the user. 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 developers will conduct unit tests to test individual components, followed by integration tests to test all integrated features, such as the connections between each module, and system tests to test the entire system. In deploying this technique, user satisfaction is the prime concern; hence, it emphasizes the valuable requirements of the user's feedback. Finally, review and maintenance of the cycle begin the stage of continual maintenance once the program is tested and released. The system is continually tested for bugs and errors to be modified.

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. To help the NMPS and the BPAT 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 losing or forgetting paper copies. 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. 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. NMPS and

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

Discussion of Results

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 developers conducted unit testing and thoroughly examined each web application module, including the user's login page, dashboard, search module, blotter module, data analytics, patrol, messages, and reports. This stage is critical for the developers because it allows them to understand the system's functionality better. Any errors or bugs can be easily identified and corrected at this level, as each module is checked individually. The developers begin integration testing specific interactions for each module during this phase, ensuring that clicking on the dashboard module takes the user to the appropriate page, not elsewhere, or sets an announcement and creates a message that syncs with the user's side. The integration testing phase determines the system's overall functionality rather than the functionality of individual components. The System testing phase, typically conducted by a test team and frequently referred to as "End-to-End" testing, is where the fully functional and integrated system is tested. This final system testing stage is referred to as acceptance testing. In this case, testing will be conducted by actual system end-users. Acceptance testing is crucial since it determines whether the client has approved the application or program.

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
SA	=	Strongly Agree
A	=	Agree
D	=	Disagree
SD	=	Strongly Disagree
TNR	=	Total Number of Respondents

The developers used an ISO Software Evaluation Criteria system based on the ISO-25010-2010 for a 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. Calculate 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 1 shows the web application performs under heavy workloads. The web application impacts the performance of the hardware device. The web application performs smoothly under critical conditions. The respondents highly acknowledged the overall mean of Acceptability with a mean of 3.80.

Table 1. Summary Table of Level of Acceptability of CRIMS

#	Indicators	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	4.00	Highly Accepted
5	System's Compatibility	3.83	Highly Accepted
	Overall Mean	3.80	Highly Accepted

Legend

3.50 – 4.00 Highly Accepted
2.50 – 3.49 Accepted
1.50 – 2.49 Less Accepted
0 – 1.49 Lease Accepted

Table 2. Summary Table of Level of Efficiency of CRIMS

#	Indicators	Weighted Mean	Verbal Interpretation
1	Functionality	3.80	Highly Accepted
2	Reliability	4.00	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

Legend

3.50 – 4.00 Highly Accepted
2.50 – 3.49 Accepted
1.50 – 2.49 Less Accepted
0 – 1.49 Lease Accepted

Table 2 reveals the functionality, reliability, usability, efficiency, satisfaction, and maintainability. CRIMS is highly accepted, with an overall mean of 3.87.

Table 3. IT Specialist Evaluation Table

Indicators	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

Legend
3.50 – 4.00 Highly Accepted
2.50 – 3.49 Accepted
1.50 – 2.49 Less Accepted
0 – 1.49 Lease Accepted

Table 3 summarizes the evaluation result of five (5) IT Specialists. Overall, the IT specialist evaluation in the CRIMS is positively carried with a mean of 3.84 because of the simplicity of the source code and functionality of the web application.

The need for data-gathering tools and techniques results in unsystematically retrieving crime information from the blotter book from selected Barangays in the Municipality of Norzagaray, Bulacan. The developers' created a module that will manage and process the information about different crimes committed in the Municipality. The developers believed the answer to this objective is the designed centralized blotter system that captures vital information about a reported crime. 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. 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 developers is the create modules 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 will now analyze the Municipality's current crime situation. 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.

Based on the testing and evaluation results, in terms of performance, functionality, Usability, Security, and Compatibility, the system's Acceptability achieved an exceptional mean of 3.80. The reliability and accuracy of the system satisfy the needs and concerns of the intended user. The system received an overall mean score of 3.84, which was excellent after being reviewed by the IT Specialist. The system's functionality, reliability, Usability, efficiency, satisfaction, and maintainability received a satisfactory rating from the respondents, with an overall mean of 3.87, which is highly accepted after the user's review. The developers are confident that the data is reliable, and upon release, the system is fully functional regarding maturity, faulty tolerance, and recoverability.

The project produces a fundamental approach for generating an idea that will benefit the community in the Municipality of Norzagaray. The testing and evaluation result with an efficient weighted mean of 3.87 and an Acceptability rating of 3.80 of mean with a verbal interpretation of a highly accepted rating. With these excellent results, the developer concludes that the 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 and recording incidents in the community. 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 Municipality, Bulacan.

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 and recording incidents in the community.

Limitations and Recommendations for Future Research

The limitation 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 from 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 if Government agencies do not

approve it. The Web-based Crime Information Management System with data analytics will be limited to Norzagaray Municipality, Bulacan.

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.

References

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

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*.

Appendix

Appendix A: System Architecture
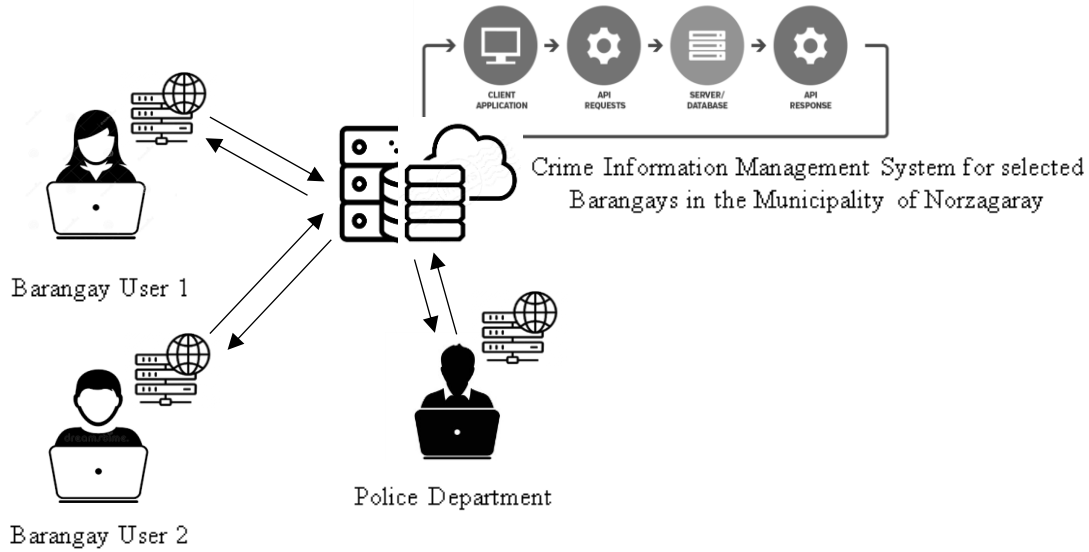
Figure 2. System Architecture

Appendix B: System Screenshot
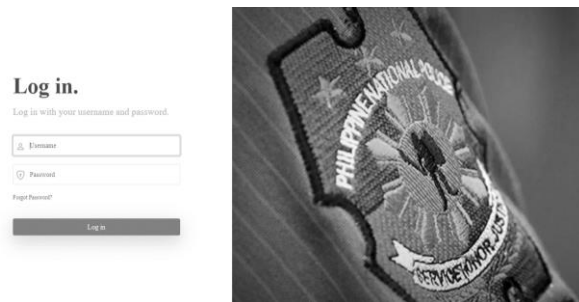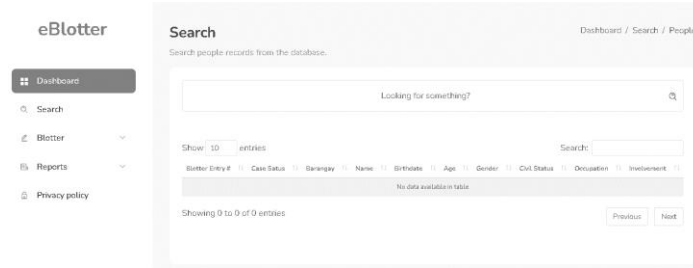

Figure 3. Log in Page
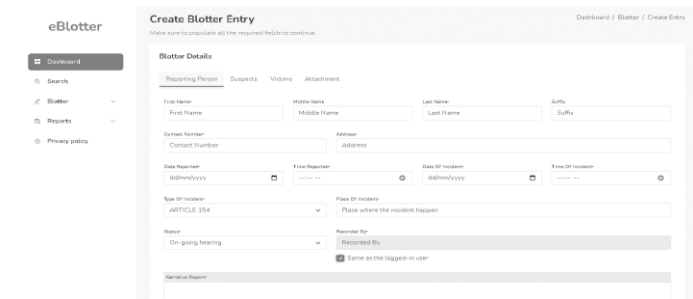
Figure 4. Search Module

Figure 5. Blotter Module
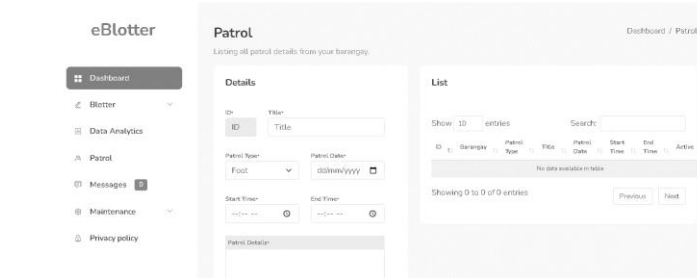

Figure 6. Data Analytics Module/ Dashboard
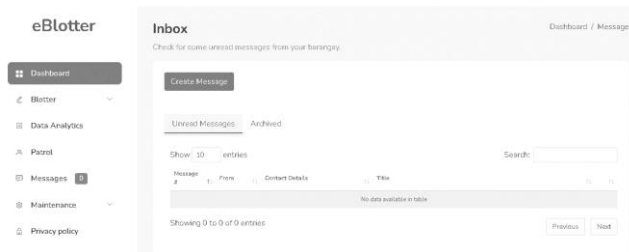
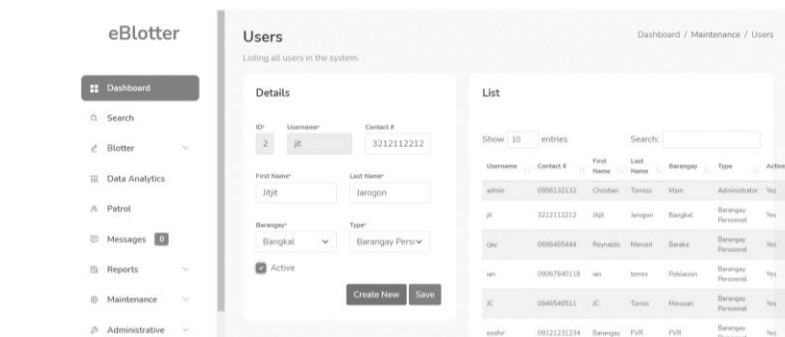Figure 7. Patrol Module
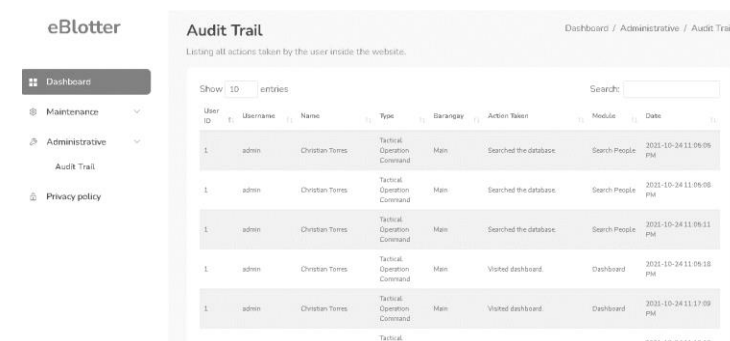

Figure 8. Message Module

Figure 9. Maintenance (User's) Module

Figure 10. Administrative (Audit Trail) Module