MASTER OF INFORMATION AND COMMUNICATION STUDIES

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UNIFIED BARANGAY E-SERVICES SYSTEM WITH AUGMENTED ANALYTICS

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UNIFIED BARANGAY E-SERVICES SYSTEM WITH AUGMENTED ANALYTICS

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This paper prepared by **JERICO G. PASTORIL** with the title: **"UNIFIED BARANGAY E-SERVICES SYSTEM WITH AUGMENTED ANALYTICS"** is hereby accepted by the Faculty of Information and Communication Studies, U.P. Open University, in partial fulfillment of the requirements for the degree Course.

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The proponent had hoped that the Unified Barangay E-Services System would be adopted by the barangay to serve the community of Barangay Batasan Hills for many years to come and make a positive impact on the lives of its residents.

ABSTRACT

The Unified Barangay E-Services System is a platform designed to provide online services to the community of Barangay Batasan Hills. The system was developed with the goal of improving the efficiency and accessibility of government services for the community. The development process involved creating a user-friendly website, integrating various government services, and training staff to support the platform's use. The key feature of the system is the use of augmented analytics to analyze and present data generated by the platform. This technology allows the government to make data-driven decisions about how to improve and expand the services offered through the platform. For example, it can identify which services are most frequently used by residents or identify areas where there may be a need for additional resources or support. Additionally, it can provide personalized recommendations to residents based on their usage history, improving their experience with the platform. The system received a very good interpretation from a survey of residents using it and reduced the time and effort required to access government services. The system can be a model for other communities looking to improve the delivery of government services to their residents and it is recommended that other communities implement similar platforms and incorporate augmented analytics to improve the accessibility and efficiency of government services. Furthermore, it is recommended that the Unified Barangay E-Services System continue to be updated and maintained to ensure its effectiveness.

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Dedicated to:
Pastoril Family, Mrs. Judy G. Pastoril and Mrs. Liwanag V. Pastoril

Chapter I

INTRODUCTION

Barangay Batasan Hills was one of the most significant local government units in Quezon City, its population as determined by the 2020 census was 166,572 [1]. This represented 5.6% of the city's total population [15]. The barangay catered a variety of services to its constituents such as Barangay Identification Card, Barangay Clearance, Barangay Endorsement, Barangay Indigency, General Social Services, Sangguniang Kabataan Services, Barangay Council for the Protection of Children Services, Barangay Pacification and Conciliation Services, Barangay Disaster Risk Management Services, and Barangay Business Permit.

To ensure that the barangay could achieve its mission, the barangay had to be at par with the city’s standards and excellence. As mandated in their duties and functions (An Act Providing for a Local Government Code of 1991 Book III also known as RA 7160) [2]. With the considerable diversity of services given by the barangay and the enormous population, the efficiency of the services could be lessened. Barangay Batasan Hills was founded in 1983. Since then, the barangay had difficulty in adopting and integrating technology into its services.

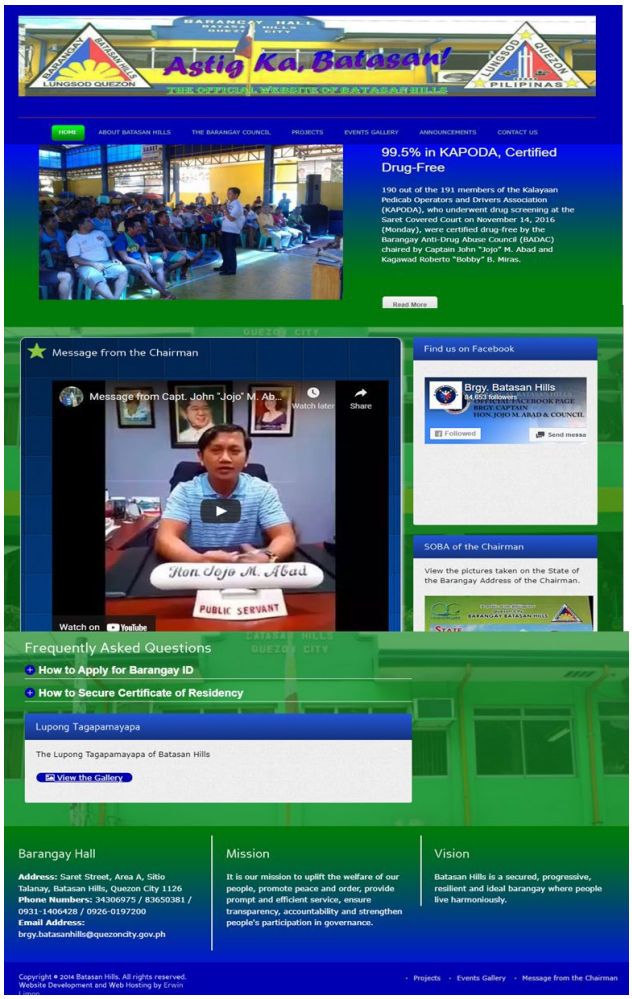
The operation was still done manually, by both sectors (Barangay Staff and Citizens). A manual system put pressure on people to be accurate in all details of their work at all times, moreover, the level of services was dependent on the individual, and this put a requirement on management to train the staff to keep them motivated and to ensure they were following the correct procedures.

Therefore, with this procedure, the beneficiaries encountered difficulties in getting the needed services from the barangay, such as time-consuming, inaccurate and inconsistencies of data or information, delayed process, difficulty in data archiving and retrieval, lack of security and control, less accessible information, low speed in data entry and others.

Specifically, the Barangay Batasan Hills did not efficiently execute barangay services. When residents requested a document such as certification like indigency certification, Barangay ID, or even find contact details for an emergency, it took a lot of time and there was no centralized bulletin information. Social Media like Facebook was the only way to reach out to the Barangay. Most of the time, there was no response to the inquiries sent on social media and the people tended to go to the barangay physically. No booking system could cater to barangay services, there was no data capturing that could save a resident's details and validation whether the residents were legitimate residents. To process any Barangay Documents, the resident needed to ask for a manual letter of endorsement from the Purok Leader or Cluster Head. Payments for some of the documents didn’t have any official receipt and they were just encoded on an excel file as well as manually written in a logbook. These Manual Operations led to a bulk of work on the resources and disrupted the prompt of service. Barangay leaders tended to just rely on the present data or situation they had and just thought about a program without a substantial basis or data to proceed with a project. Projects to execute and release budget.

The Barangay had a website [1] that had outdated features and could not cater to services. The website functioned only as a bulletin, but the information was still outdated.

Figure 1. Existing Website of Barangay Batasan Hills (www.barangaybatasan.com)



After an in-depth analysis of the current situation of the respondents in the barangay, the proponent had identified a possible solution to the problem, this is where the researcher came up with the proposed research study entitled “unified barangay e-services system with augmented analytics”, this efficiently gave adequate service, data-driven decisions, speeded up the decision-making process, improved data organization, automatic data profiling, auto-detection for less repetition, and streamlined data harmonization.

Furthermore, barangay constituents would have had a faster, easier, and more efficient way of accessing the services offered by the barangay. To reiterate, the proposed system would provide a virtual bulletin board wherein all the announcements and updates within the barangay areas were displayed, provide an online barangay health center system that may handle different health services, provide an online document request system that would be responsible for barangay-issued documents, utilize a scheduling system such as requesting public documents, face-to-face, and online health consultations, using Google Calendar to remind the users of their scheduled appointments, using Zoom or Google Meet for online consultations, providing a virtual front desk for Violence Against Women and their Children (VAWC) that would specifically handle residents' issues/concerns regarding women and/or children, providing a complaint management system that handles all the complaints that the constituents would report. Moreover, a customized data analytics module that could augment organizations' data for being smart and assists the systems' insight generation and insight explanation for the user to explore, analyze, interpret data, and share findings from those insights, and the goal was to help decision-makers decide based on the data presented.

To further strengthen the research and the enlightenment of the study, it was essential for the readers to read this document to have a comprehensive, relevant, and broad understanding of a barangay system. The proponent had identified, analyzed, and interpreted the processes involving barangay operations. How did the proponent design the architectural procedure or requirements to be developed in an online and mobile platform. And lastly, the acceptability of the proposed study by the barangay.

Chapter II

REVIEW OF EXISTING ALTERNATIVES

The Barangay Officers of Barangay Batasan Hills used several software applications in monitoring their operations and projects. While Barangay Officials had limited license to Microsoft Office Essentials to process documents and had their printed form and filed it on a physical cabinet. The cost of a license for the Office 365 version which is USD 30.00 [17] per user per month with annual commitment according to Microsoft's website, was expensive given that the Barangays Officials and Officers would not be the only resource in the company that would be using the said product. They also had a website and hosting that cost about ₱2,500 – ₱10,000 /yr. ($30 – $200 /yr.) [18] for portfolio and posting details and the website didn't have a content management system to easily update the content of the website and didn't cater any services to the constituents.

Some of the Officers and Officials of the Barangay used several Microsoft Office applications such as Word, Excel, and PowerPoint to deliver and execute services. While some officers found it more useful, but it was still an ineffective way of producing output to cater to their services. Office applications were also prone to human mistakes, such as unintentionally saving a file with incorrect information, which was difficult to recover without suitable backup procedures, and they were vulnerable to data corruption that could cause delays.

While there were other Barangay Management Systems that were present in the market today, upon doing an in-depth analysis of the existing system, it lacked data preparation, organization, and dissemination information, Such as:

1. Manual Filing of Services given by the barangay.
2. No interaction between the resident and the barangay. The website only contained information regarding the programs such as livelihood, announcements, ordinances, etc., this did not include residents' participation (a resident registering specific program/s to the barangay).
3. Incomplete Access to Services on the website such as Barangay Health Care Services, Disaster and Risk Management, Sangguniang Kabataan Services, Barangay Pacification and Conciliation Services, and others.
4. Providing the best services was the primary objective of the barangay. Achieving an appropriate program must be determined by the barangay officials. The question here was HOW? How do the officials formulate suitable programs for their constituents?
5. and determined the effectiveness of the program/s.

The proposed system aimed to develop a responsive progressive web application that could act as a native application called Unified Barangay Services System with Augmented Analytics. Incorporating augmented analytics into the proposed system helped in modifying and preparing the organization's data for being smart. This could be achieved by a one-time registration process. In automating the necessary data, the data set needed was the unique ID number given by the barangay. That data was used to transact the needed services of the citizen.

Data Analysis and Interpretation helped the barangay officials to develop a strategic plan that would strengthen the services of the barangay and address community issues based on the data presented by the system. This could be achieved by comparing the data analytics shown in the different services offered by the barangay. Barangay Indigency, Sangguniang Kabataan Services, Barangay Pacification and Conciliation Services, and Barangay Disaster Risk Management Services. With the insight findings, a strong program could be formulated, and the old programs could be enhanced.

The proposed capstone project benefited Barangay Batasan Hills by efficiently giving adequate service, and data-driven decisions, speeding up the decision-making process, improving data organization, automatic data profiling, auto-detection for less repetition, and streamlining data harmonization. Furthermore, barangay constituents had a faster, easier, and more efficient way of accessing the services offered by the barangay.

Chapter III

PROJECT DETAILS

A. Overview

The concept of the system was developed using Content Management System or WordPress as a progressive web application. Upon opening the website, the user saw the whole home page where they could see the latest news and bulletins from the barangay and city. Log-in was displayed for the user to input their credentials, on successful login, the main dashboard of the system was presented.

Depending on the logged user, the System Administrator had the whole overview of the system. Barangay Officials and Barangay Officers had their login credentials for their user access depending on what module they were assigned. Resident users could easily register and input their data based on the requested service. A logout feature was also available to log out users into the system and terminate the current session.

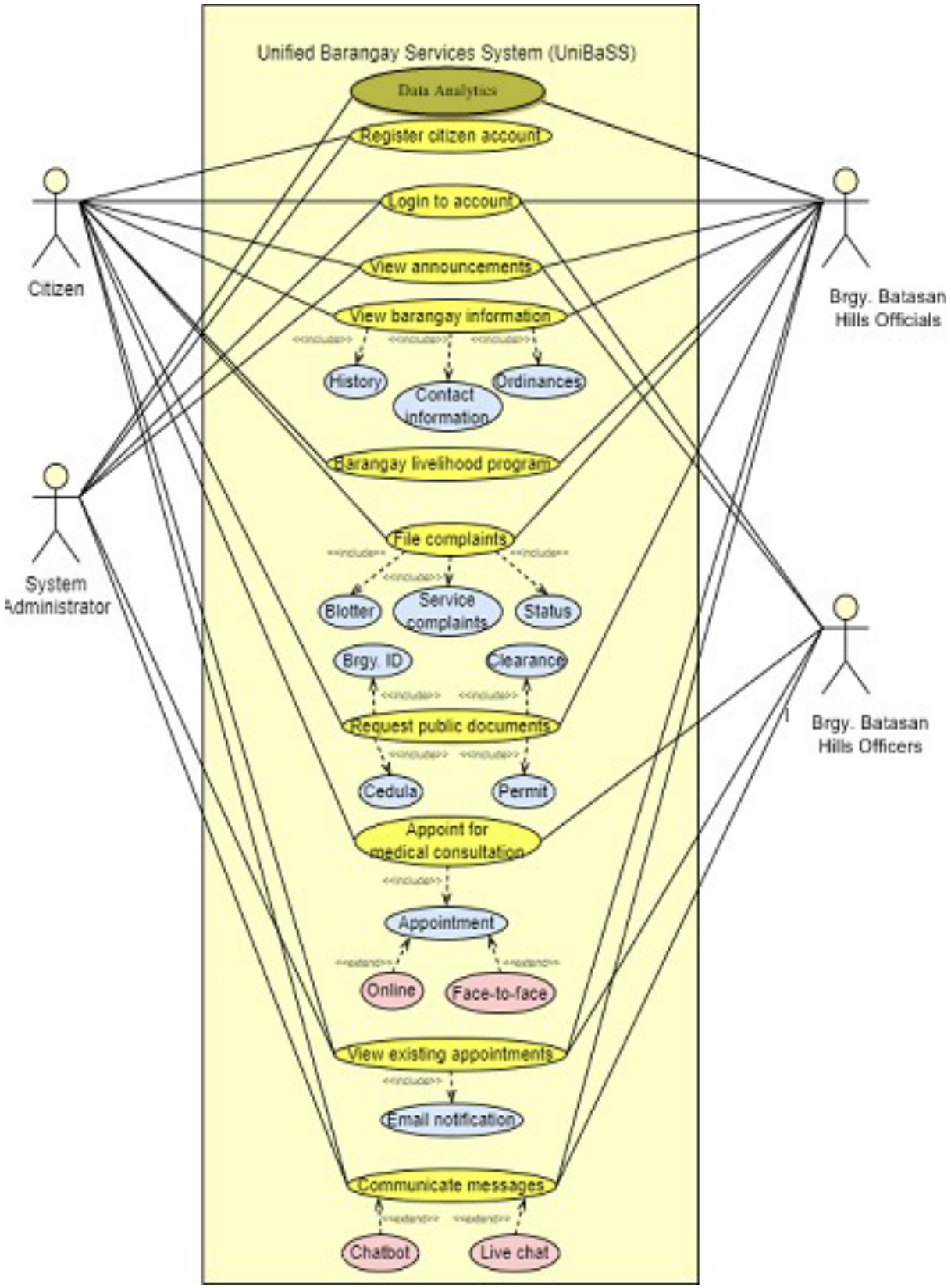
Software Key Features:

Online Barangay Service Processing. The proposed system allowed residents to request barangay-issued documents like certificates, clearances, cedulas, and barangay IDs for administrative services. The proposed system had an online booking feature with the integration of StartBooking for efficient handling of available schedules. It had an integration with Gmail and Google Calendar that was used mainly for communication and reminder purposes.

Chatbot for Inquiries. It also featured a chatbot made specifically for two main functions: (1) It had a bank of questions and answers for frequently asked questions (FAQs) to serve residents' information without going to the facility. (2) If there was an urgent matter that needed to be addressed, the chatbot could also connect the resident using a “Live Help” option to the barangay staff to answer their concerns.

Data Analytics. This incorporated augmented analytics into the proposed system that helped in modifying and preparing the organization's data for being smart. This could be achieved by a one-time registration process. In automating the necessary data, the data set needed was the unique ID number given by the barangay. Data analysis and interpretation helped the barangay officials to develop a strategic plan that strengthened the services of the barangay and addressed community issues based on the data presented by the system. This could be achieved by comparing the data analytics shown in the different services offered by the barangay.

Figure 2. The Use Case Model of the system. It illustrates that there are four (4) groups of people involved in the system and what actions can be done by each group.



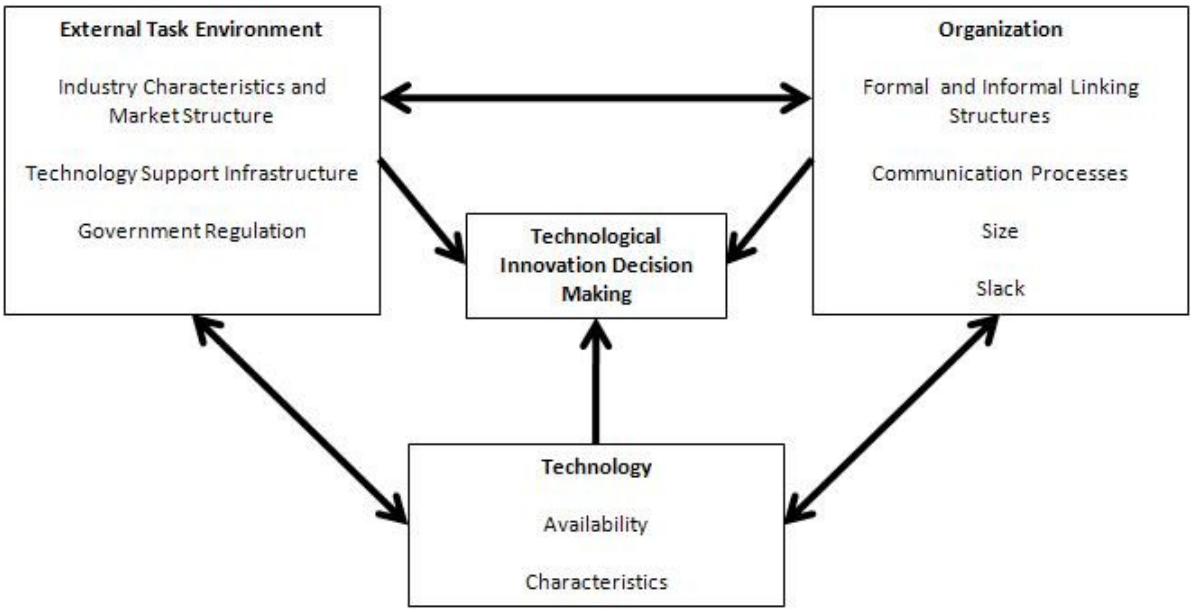
B. Theoretical Framework

The proponent considered using the Technology-Organization- Environment (TEO) framework based on Rocco DePietro, Edith Wierda, and Mitchell Fleischer [10]. The framework characterized the process from innovation development by engineers and entrepreneurs to acceptance and implementation of innovations by users within the setting of the organization.

The Technology-Organization-Environment Framework explained how the three components of a firm's setting affected adoption decisions. The Technological Context covered all technologies in use at the organization as well as those available on the market but not already in use. The Organizational Context referred to the organization's features and resources, such as employee linkage structures, intra-firm communication methods, firm size, and the number of spare resources. The Environmental Context encompassed the industry's structure, the presence or absence of technical service providers, and the regulatory environment. The maturity of an organization was also important in implementing technological breakthroughs and was affected by the Technology-Organization-Environment Framework.

The proposed theoretical framework was inspired by the Technology-Organization-Environment Framework. The proposed system was planned and developed in response to the demand for technological innovation. The proposed system, with its innovations and simplicity, aimed to fill gaps in the management of services in Barangay Batasan Hills.

Figure 3. Technology-Organization-Environmental Framework. (Source: https://is.theorizeit.org/wiki/Technologyorganization-environment_framework)



The Technology-Organization-Environment Framework diagram shows the significance of technology to the company The organization's existing technology, even though not completely utilized, would be beneficial once properly set up. The programming language that may be used to construct the system and the database applications that can be set to store the information generated by the system are examples of this.

The administration of projects was greatly enhanced with the involvement of the proponent and Barangay Batasan Hills Officials and Officers. Barangay Officers will be able to monitor their projects' progress, hazards, and resource allocations more properly.

C. Technologies Used

This refers to the various software development techniques, languages for programming, and tools that can be employed to support them.

Application Layer

This shows the software requirements of the study. It refers to the set standard of software needed for the system to run efficiently while in the development and implementation phase.

- **Content Management System:** WordPress - A system used for easy composition of websites.
- **Programming Tool:** PHP - A general-purpose programming language known as PHP (Hypertext Preprocessor) can be used to create dynamic and interactive webpages. It was one of the first server-side languages that HTML could incorporate, making it simpler to add functionality without having to call outside files for information.
- **Video Conferencing Application:** Zoom - A video conferencing system that enables users to communicate via video/audio call.
- **Email Service:** Gmail - Enables users to interact privately via mailing.
- **Calendar: Google Calendar -** A system used for displaying the current date on the calendar on the website.
- **Maps:** Google Maps - A system used to mark the geographical location of the barangay hall.
- **Booking system:** StartBooking - A system used for efficient scheduling.

Database layer

This layer shows the connection between a computer application and databases is unified by a database layer, which is an API.

- **Database tool:** The MySQL database, an open-source Relational Database Management System (RDBMS) that makes use of the SQL language, supports the creation of PHP MySQL web applications and aids in automating data retrieval.

Client layer

This layer refers to the technology used by the client to run certain applications that would run and display the content of the system.

- **Web Browser:** Google Chrome, Microsoft Edge, Mozilla Firefox - A program where a user can access the internet.
- **Operating System:** Windows 10 - An operating system that is generally common nowadays that is flexible with any program.
- **Hardware Development and Implementation Requirements:** This shows the hardware requirements of the study. It refers to the set standard of hardware needed for the system to run efficiently while in the development and implementation phase.
    - **Processor:** Intel Core i5 - It is a logic circuit that processes basic computer instructions.
    - **Memory: 4GB -** It is the component within the computer that allows for short-term data access.

D. System Design

The process of defining the architecture, interfaces, and data for a system that complies with requirements is known as system design. Your business or organization's needs are met via system design, which uses effective and cohesive systems.

Figure 4. The Contextual Data Flow Diagram (Level 0) of the system

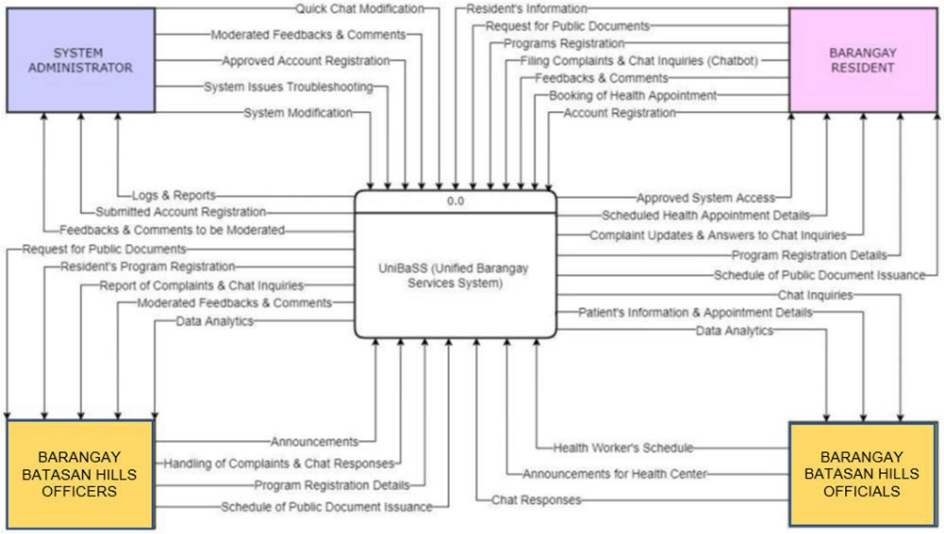
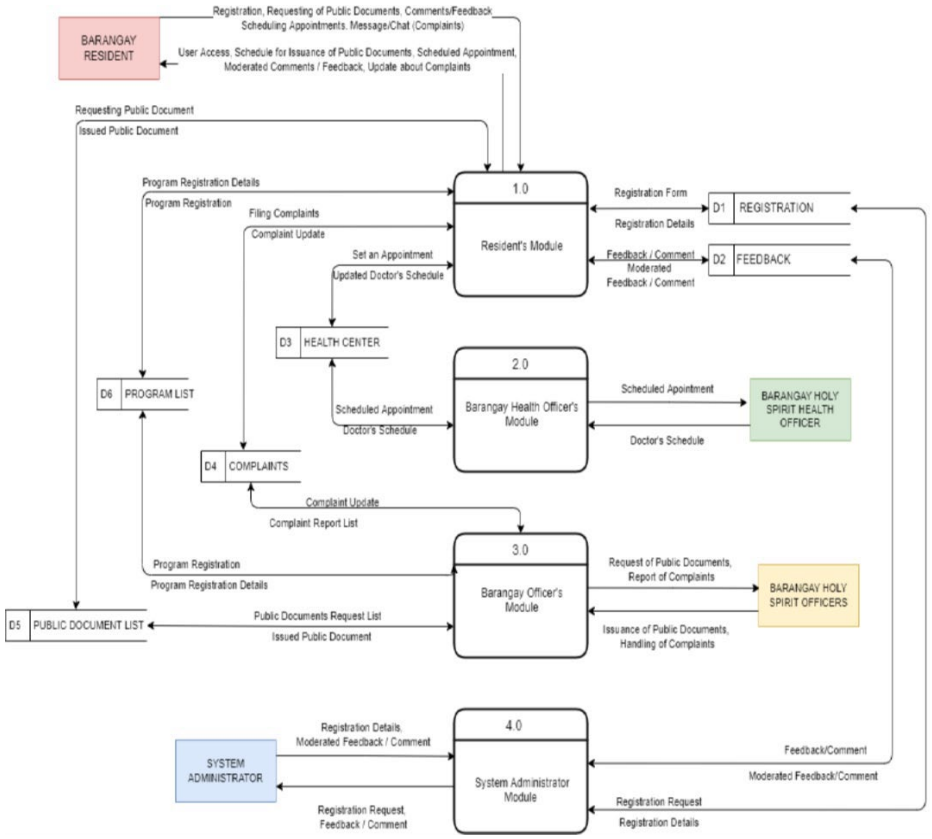


Figure 5. The exploded (level 1) Data Flow Diagram of the system



a. System Features

The "tools" you employ to execute a set of activities or actions within a system are called features. Functionality is the way in which those features really perform their intended function for you. For instance, the capacity to customize leave kinds is a fundamental requirement for most boarding institutions.

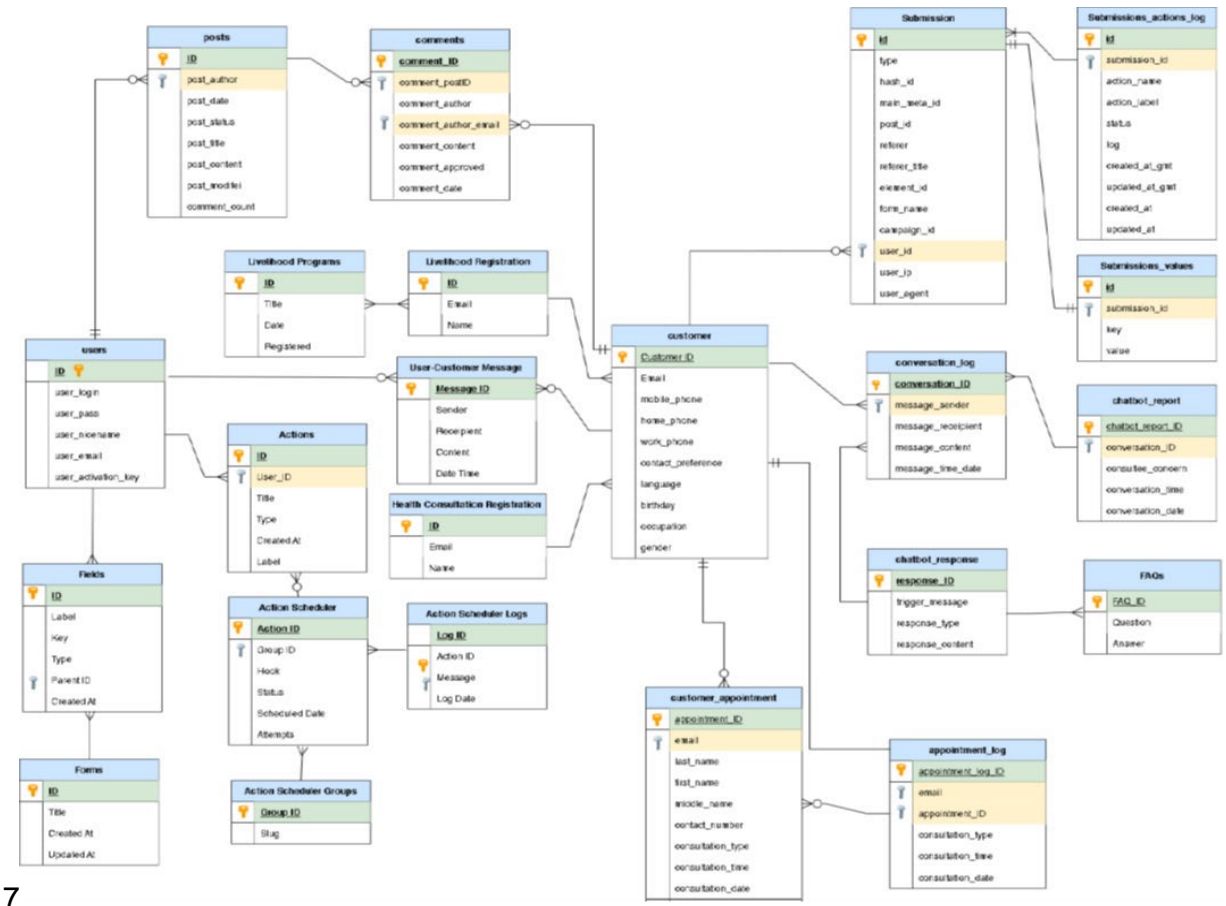
- ***Online Barangay Service Processing.*** The proposed system allows residents to request barangay-issued documents like certificates, clearances, cedula, and barangay ID for administrative services. The proposed system has an online booking feature with the integration of StartBooking for efficient handling of available schedules. It has an integration with Gmail and Google Calendar that will be used mainly for communication and reminder purposes.
- ***Chatbot for Inquiries.*** It also features a chatbot made specifically for two main functions: (1) It has a bank of questions and answers for frequently asked questions (FAQs) to serve residents' information without going to the facility. (2) If there is an urgent matter that needs to be addressed, the chatbot can also connect the resident using a “Live Help” option to the barangay staff to answer their concerns.
- ***Data Analytics.*** The augmented analytics function was incorporated into the proposed system to help in modifying and preparing the organization's data for being smart. This was achieved through a one-time registration process, automating the necessary data with the unique ID number given by the barangay. Data analysis and interpretation helped the barangay officials to develop a strategic plan that

strengthened the services of the barangay and addressed community issues based on the data presented by the system. This was achieved by comparing the data analytics shown in the different services offered by the barangay.

b. Database Design

The arrangement of data was done in accordance with a database model. The relationships between the data pieces were decided by the designer. With this knowledge, they were able to fit the data into the database model. The database management system handled the data appropriately.

Figure 6. The Entity Relationship Diagram or Proposed system Major Database Schema



E. Implementation

The completed system was transferred to Barangay Batasan Hills and shown to the intended users. If the barangay decided to use the system, the researchers gave it to them along with the documentation. It acted as a guide for the administrator who was in charge of updating and maintaining the system. There was a letter of agreement stating that the system was freely given to the barangay and that the researchers would no longer be responsible for its upkeep and maintenance. If the system was built, the research employed a variety of methods.

Table 1. Implementation Plan. The table shows the Implementation plan for the proposed study.

STRATEGY	ACTIVITIES	PERSON INVOLVED	DURATION
Approval from the Barangay Batasan Hills	Letters for the Administrator	Proponents and Administrator	7-15 Days
System's Installations	Installation of the system required hardware and software	Proponents and Administrator	4-5 Days
Information Distribution	Flyers	Administrator Barangay Residents	5-7 Days
	Posters	Administrator, Barangay Residents	
	Social Media	Administrator, Barangay Residents	
System Training	Hands-on Training and Lectures	Administrator and Barangay Officers	5 - 7 Days

F. Resulting System

Figure 7. Home Page of the Website www.barangaybatasanhills.online

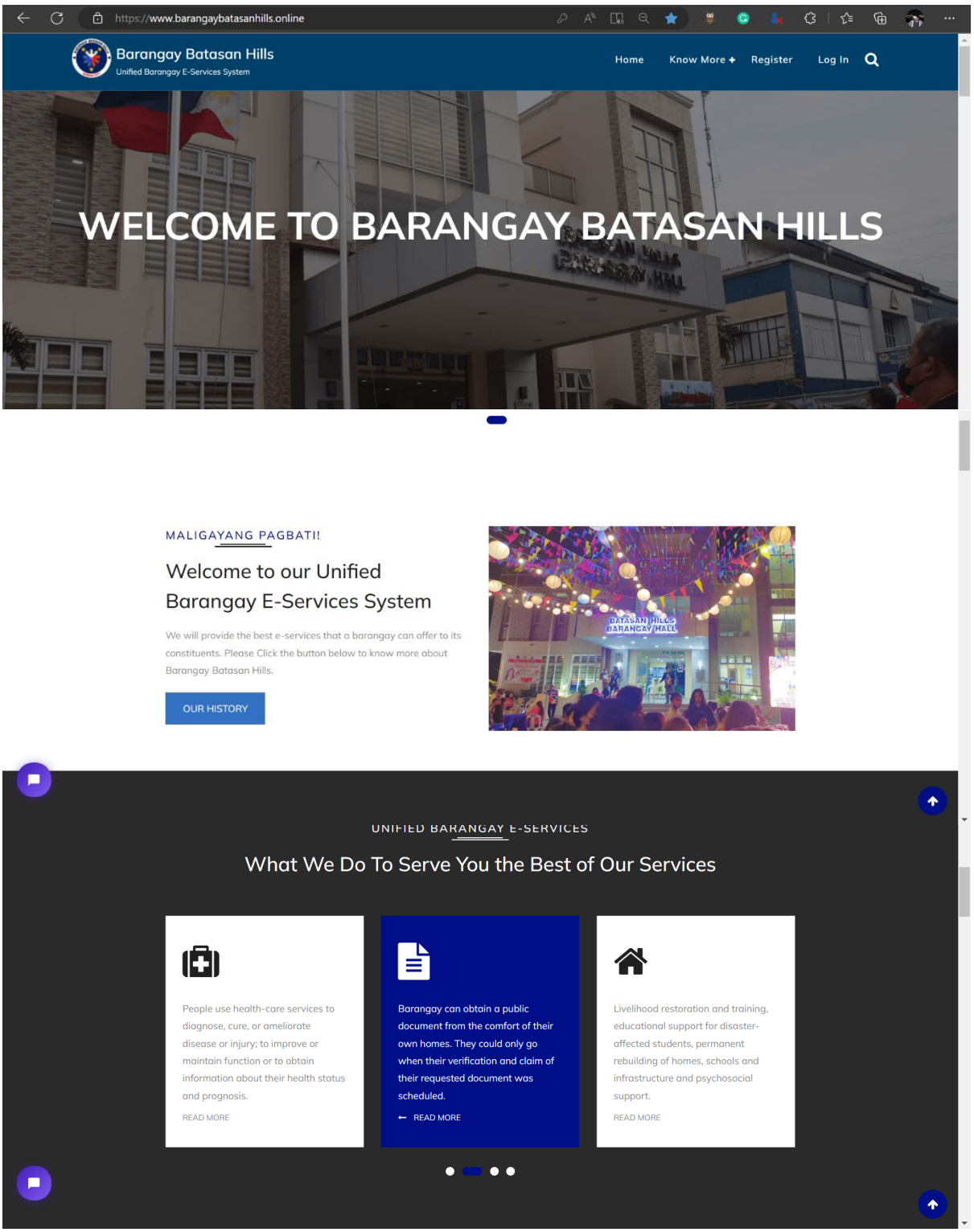


Figure 8. Registration Page of the Website www.barangaybatasanhills.online

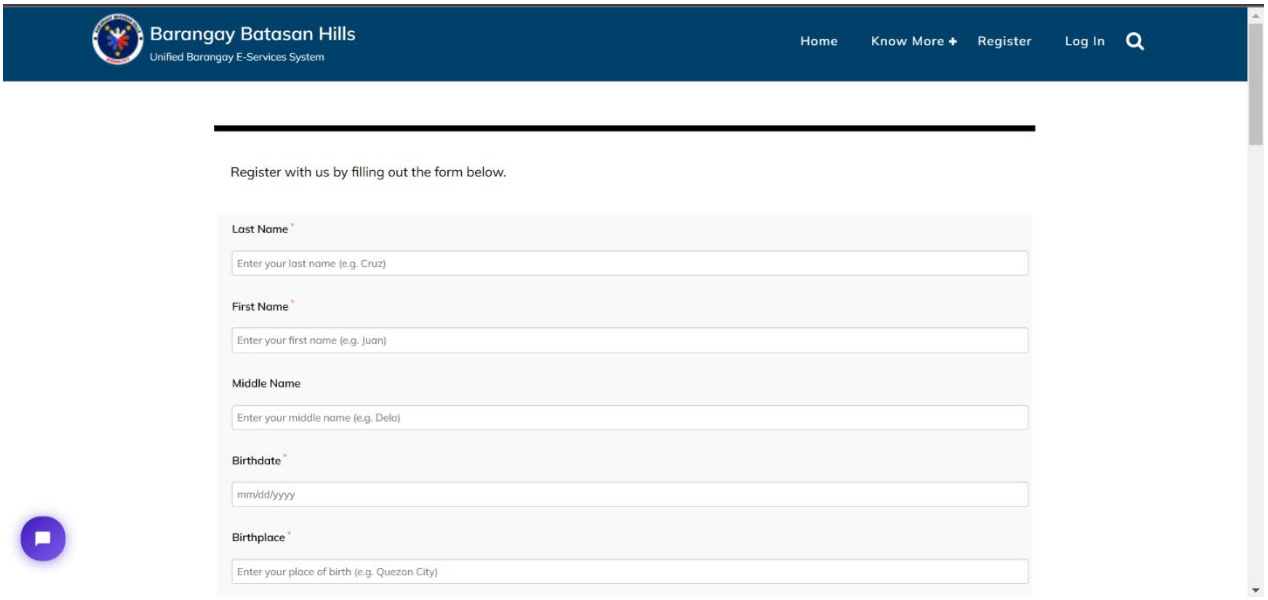


Figure 9. Data Analytics Page of the Website www.barangaybatasanhills.online

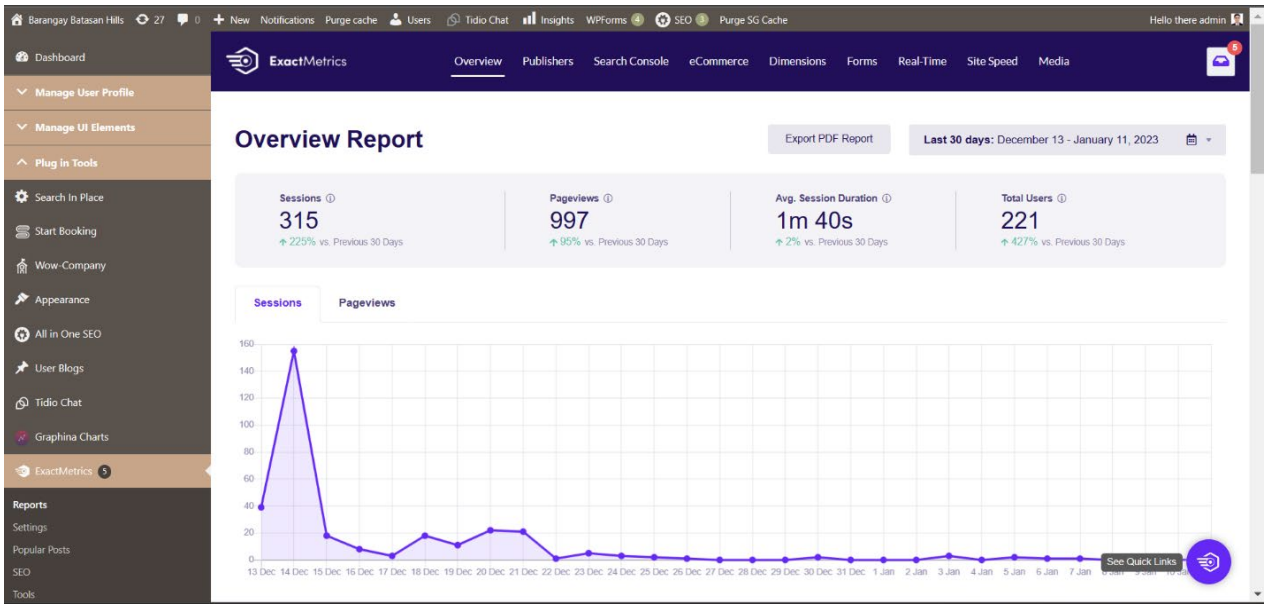


Figure 10. Registration Manager Page of the Website www.barangaybatasanhills.online

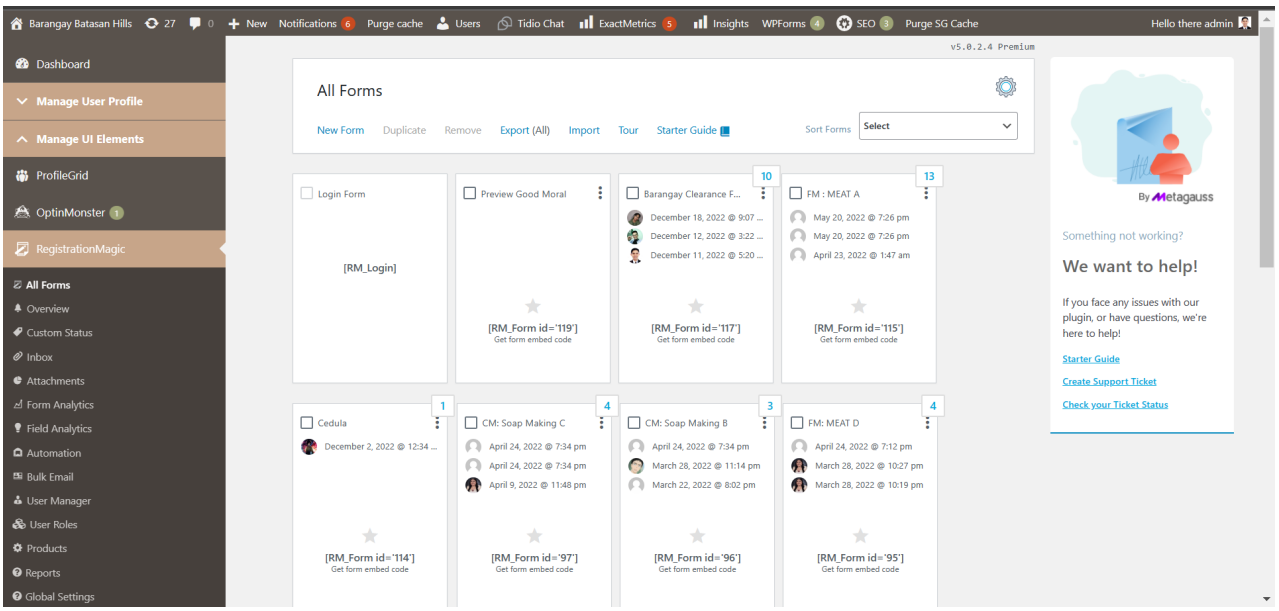


Figure 11. StartBooking Manager Page of the Website www.barangaybatasanhills.online

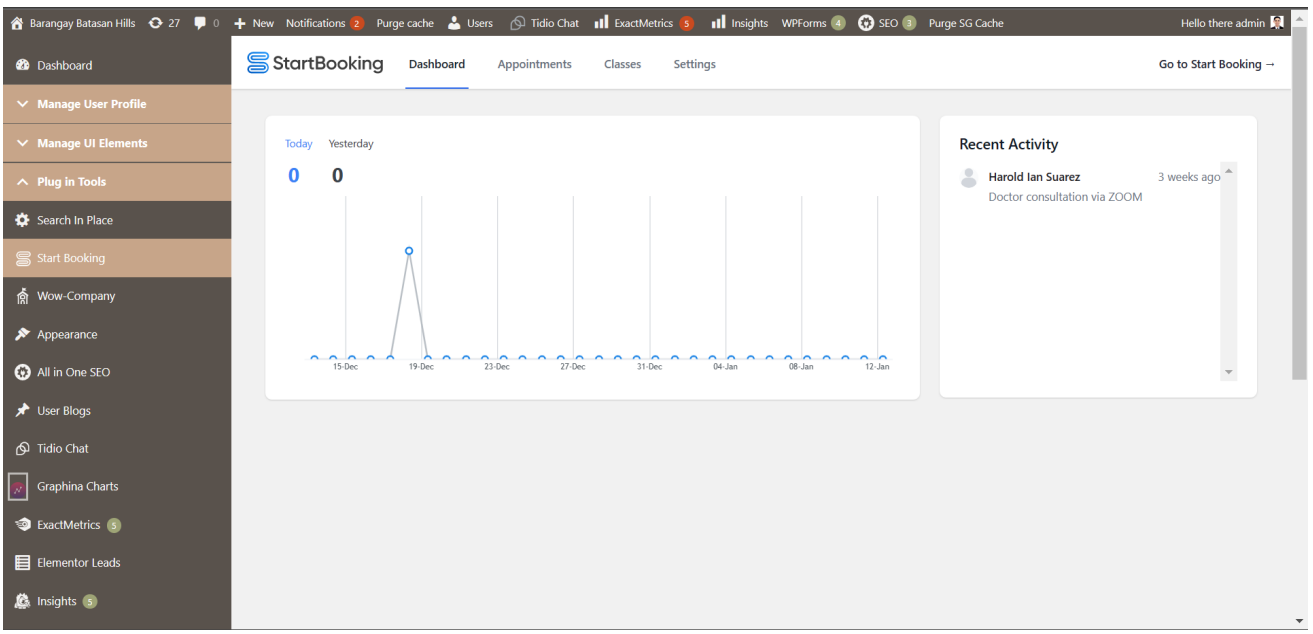


Figure 12. Live Chat Manager Page of the Website

www.barangaybatasanhills.online

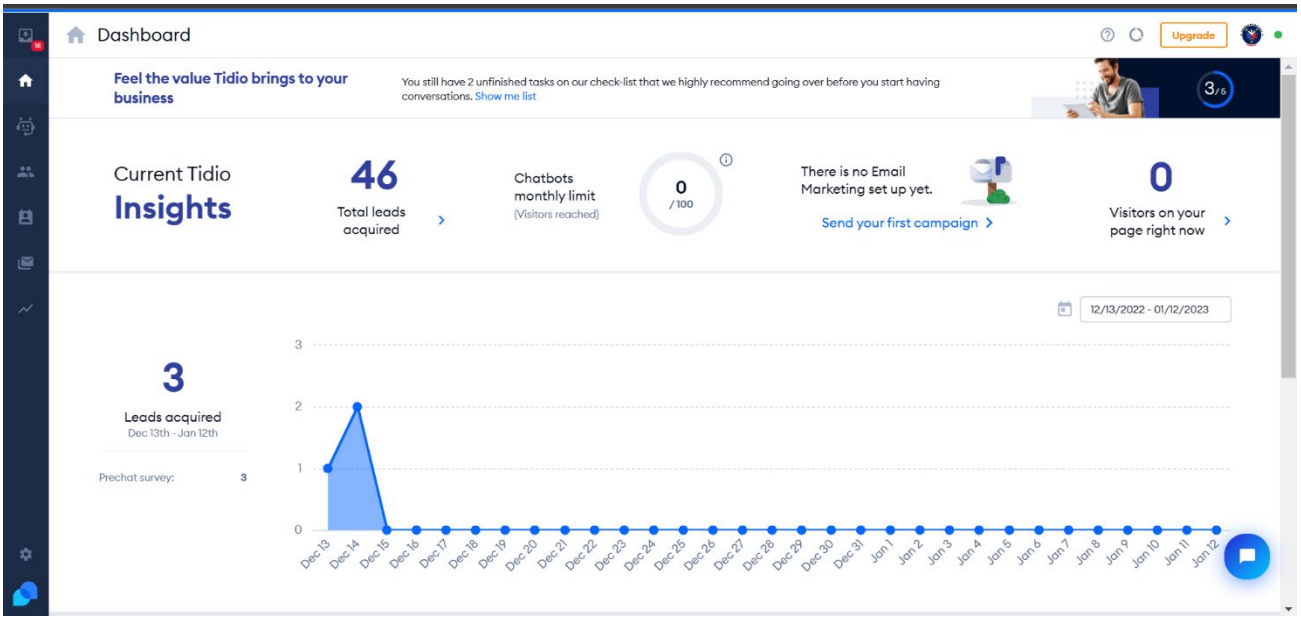
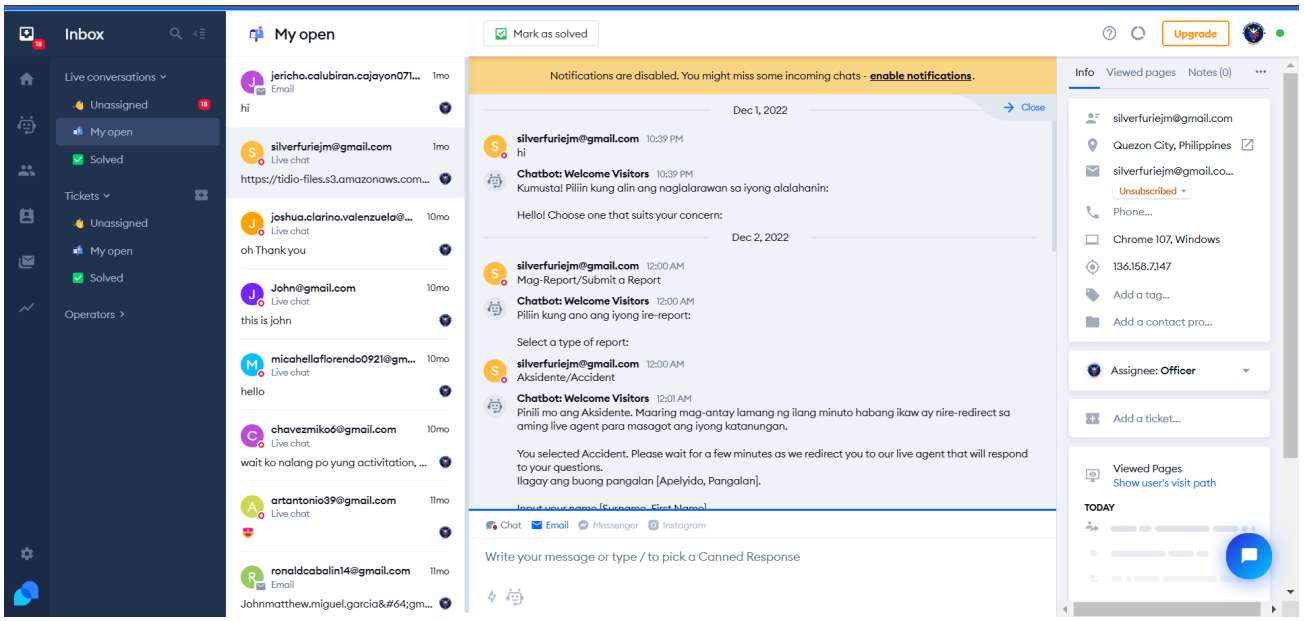


Figure 13. Live Chat Page of the Website

www.barangaybatasanhills.online



Chapter IV

PROJECT ASSESSMENT

A. User Testing

The proponent had tested the system through the interface, making sure it was in sync with the features and functions of the website by having real users perform specific tasks in realistic conditions.

Application Testing

This ensures that all types of user input produce the desired output across the application. The system undergoes usability testing which actual users focus groups, should be used to test the website, and genuine user feedback and suggestions should be used to make changes.

General Search Engine Optimization examines proponents' website's Search Engine Optimization to see if there are any broken links or missing metadata. The system underwent usability testing, where actual users in focus groups tested the website and provided genuine user feedback and suggestions to make changes. The proponent also performed general Search Engine Optimization to check for any broken links or missing metadata, security testing to ensure the website protected users' data and was not vulnerable to attacks, and performance testing to assess the website's efficiency in terms of loading times and performance.

The proponent used tools such as Browser Stack’s SpeedLab to measure website speed across a variety of browsers and devices and provide a comprehensive picture of website performance.

The evaluation testing was conducted to determine the acceptability of the system to the respondents. Based on Philippine Statistics Authority data recorded in 2015, the population of Barangay Batasan Hills was 161,409. A margin of error of 5% was set for the statistical metric that accounts for the difference between actual and projected survey results in a random sample. A 95% confidence level was set, indicating how frequently the true percentage of the population who would choose an answer fall within the margin of error.

Therefore, the proponent determined that 384 respondents were needed to evaluate the criteria used in ISO 25010:

- **Functional Suitability:** refers to the ability of a product or system to provide functions that meet stated and implied needs in terms of its Functional Completeness, Functional Correctness, and Functional Appropriateness.

- **Performance Efficiency:** refers to the performance of a system in relation to the number of resources used in terms of Time Behavior, Resource Utilization, and Capacity.

- **Compatibility:** refers to how well a product, system, or component can exchange information as well as perform its required functions while sharing the same hardware or software environment in terms of Co- existence and Interoperability.

- **Usability:** refers to how well a product or system can be used to achieve specified goals effectively, efficiently, and satisfactorily in terms of Appropriateness Recognizability, Learnability, Operability, User Error Protection, User Interface Aesthetics, and Accessibility.

- **Reliability:** this refers to how well a system, product, or component performs specified functions under specified conditions in terms of Maturity, Availability, Fault Tolerance, and Recoverability.

- **Security:** this refers to how well a product or system protects information and data from security vulnerabilities in terms of Confidentiality and Integrity

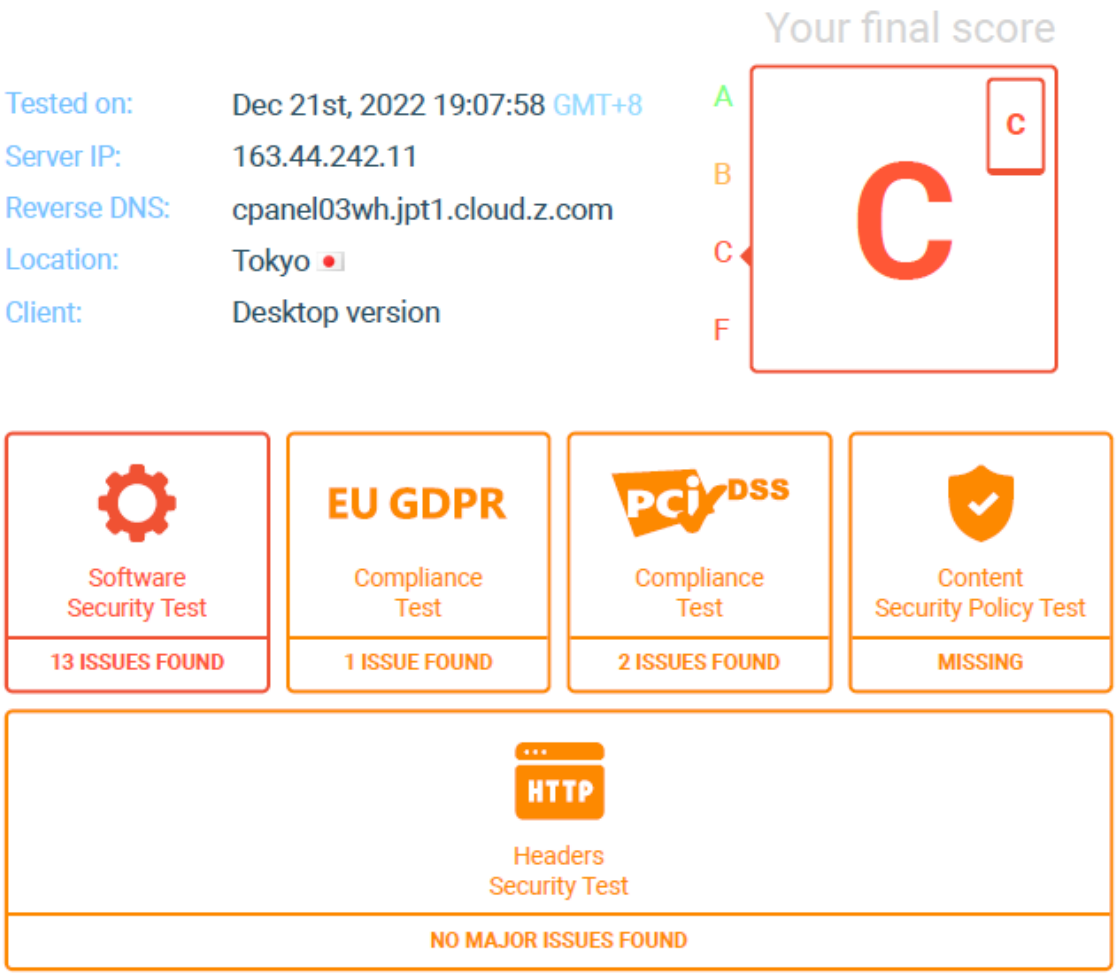
- **Portability:** this refers to how well a system, product, or component can be transferred from one environment to another in terms of Adaptability, Durability, and Affordability.

- **Maintainability:** this refers to how well a product or system can be modified to improve, correct, or adapt to changes in the environment as well as requirements this refers to Modularity, Reusability, Analyzability, and Modifiability.

B. Security Testing

Based on the results of the ImmuniWeb Website Security Test, the overall grade of the website was C, indicating that most of the plugins used on the website needed to be upgraded to premium subscriptions. The website's privacy policy was compliant with the standard, and HTTPS encryption was present on the web server. The external contents of the website were also analyzed and were found to be compliant with the standards for external content privacy and security.

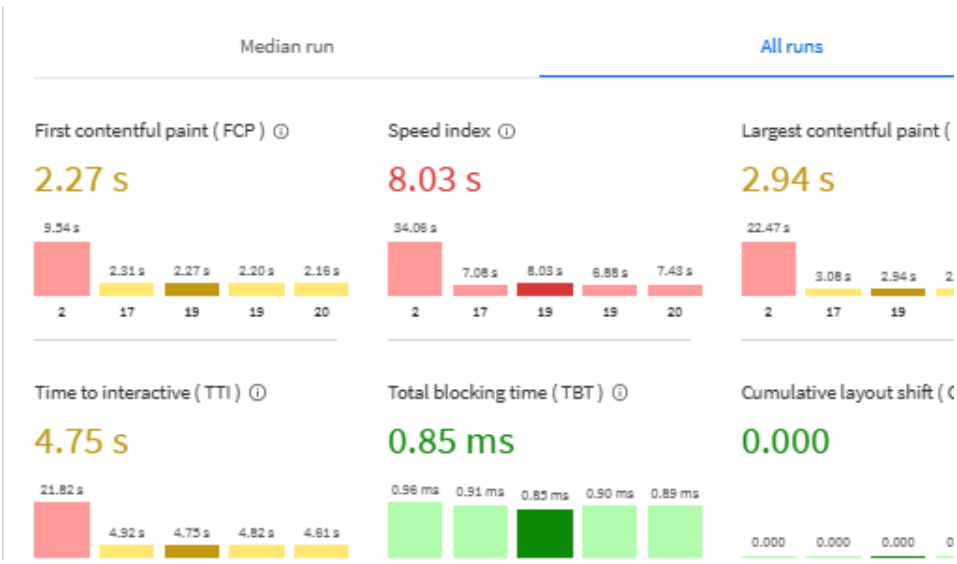
Figure 14. ImmuniWeb Website Security Test Results for the Website www.barangaybatasanhills.online.



Testing Results

The SpeedLab criteria used the First Contentful paint (FCP) with a result of 2.27 sec., which is the time it takes for the first text or image to be fully rendered. The Speed Index with a result of 8.03 sec., is a metric that measures how quickly the visual elements of a page are rendered in the browser viewport. The Largest Contentful Paint (LCP) with a result of 8.03 sec., is the time it takes to fully render the largest image/text block. Time to Interactive (TTI) with a result of 4.75 sec., is the time it takes for all of the page's assets to be loaded and the page to be consistently interactive to the user. Total Blocking Time (TBT) with the result of 0.85 ms., is the amount of time a page is prevented from responding to user input. Lastly, the Cumulative Layout Shift (CLS) result is 0.000 ms., a visual stability metric that measures how much the layout changes when the user does not expect it. The speed lab includes reports and Performance Scores, Screenshots, Performance Insights, Competitor comparison, and as well as Recommendations.

Figure 15. SpeedLab Performance Score



Evaluation Testing

System testing is a type of testing that verifies a fully integrated and finished piece of software. A system test is used to evaluate the end-to-end system specifications. Typically, the software is just one component of a larger computer-based system. Finally, the software is linked to other software/hardware systems. System testing is defined as a series of tests designed solely to exercise the entire computer-based system.

The survey questionnaire. The evaluation served as the main instrument of the study. The proponent will use weighted arithmetic mean as the statistical tool of the study. It is used in the study to test the significant difference between the Evaluation Results from the Barangay Employees and Residents of the Barangay Batasan Hills, and the proposed system entitled “Unified Barangay E-Services System”.

Statistical Tools. The proponent used the following statistical tools and their formula for the evaluation of the system.

Weighted Arithmetic Mean. It is used because the options for evaluation are based on the Likert Scale illustrated in Table 2. It is used to determine the effectiveness of the system utilizing the respondent’s rating of the system. This

formula is as follows:

Formula Used for Weighted Arithmetic Mean

$$\bar{x} = \frac{f_1 x_1 + f_2 x_2 + \ldots . f_k x_k}{f_1 + f_2 + \ldots . f_k} \qquad \textbf{Or} \qquad \bar{x} = \frac{\sum fx}{f}$$

Where:

$\bar{x}$ **- Weighted Arithmetic Mean**

$\sum fx$ **- Sum of all the products of f and x; where f is the frequency of each weight and x is the weight**

$\sum f$ **- Sum of all the frequency/subjects**

Table 2. Likert Scale

RATING	RANGE	EQUIVALENT
5	4.5 – 5.0	Excellent
4	3.5 – 4.49	Very Good
3	2.5 – 3.49	Good
2	1.5 – 2.49	Fair
1	1.0 – 1.49	Poor

A type of psychometric response scale in which respondents indicate their level of agreement with a statement in five points: (1) strongly disagree; (2) disagree; (3) neither agree nor disagree; (4) agree; and (5) strongly agree. The Likert scale was used by the proponent to determine the verbal interpretation of the results given to the respondents. Therefore, this entails the acceptability of the proposed system to the barangay employees and residents.

Table 3. The acceptability of the proposed system to the Barangay Batasan Hills in terms of ISO 25010.

Criteria	Brgy. Employees Mean (20 Respondents)	Residents Mean (364 Respondents)	Mean (384 All Respondents)	Verbal Interpretation
Functional Suitability	4.20	4.32	4.26	**Very Good**
Performance Efficiency	4.25	4.26	4.26	**Very Good**
Compatibility	4.17	4.29	4.23	**Very Good**
Usability	4.18	4.34	4.26	**Very Good**
Reliability	4.18	4.32	4.25	**Very Good**
Security	4.17	4.39	4.28	**Very Good**
Portability	4.25	4.32	4.29	**Very Good**
Maintainability	4.25	4.31	4.28	**Very Good**
Weighted Mean	**4.21**	**4.32**	**4.26**	**Very Good**

Table 3 glimpse that out of 384 respondents, who answer the evaluation form, there were 20 barangay employees and 364 residents, both agreed that the highest result of the criteria used is Portability with a mean of 4.29 with a verbal interpretation of Very Good. Furthermore, the least on the criteria used was Compatibility with a mean of 4.23 with a verbal interpretation of Very Good. Based on the weighted mean of the criteria used for both barangay employees and barangay residents is 4.26 with a verbal interpretation of Very Good.

After the careful deliberation of the proposed system by the barangay employees and residents using a survey questionnaire entails the acceptability of the proposed system to the target beneficiaries that all the criteria used have a verbal interpretation of Very Good. Therefore, this shows that the proposed system is ready for implementation.

Chapter V

DISCUSSIONS

Developing a capstone project like the Unified Barangay E-Services System for Barangay Batasan Hills can provide valuable insights and learning opportunities for students and professionals involved in the project. Some of the things that were learned during the development of a project like the Unified Barangay E-Services System for Barangay Batasan Hills included:

- The importance of conducting thorough research and planning in order to understand the needs and preferences of the target community and to identify the most relevant and useful services to offer through the platform. This may involve gathering data and feedback from residents, as well as engaging with government officials and other stakeholders to understand their goals and priorities.
- The value of designing a user-friendly and intuitive interface to make the platform accessible and easy to use for all residents, regardless of their level of technical proficiency. This may involve considering factors such as layout, navigation, and the use of graphics and other visual elements.
- The benefits of incorporating augmented analytics and other technologies to help analyze and interpret data generated by the platform, and to identify trends and patterns that can inform decision-making and improve the effectiveness of the services offered. This may involve learning about and applying various data analysis techniques and tools.

- The importance of working closely with the local government and other stakeholders to ensure that the platform aligns with their goals and priorities, and to obtain their support and buy-in for the project. This may involve building relationships and developing a strong understanding of the needs and challenges faced by the community.

Some of the possible challenges that might be encountered in developing a capstone project like the Unified Barangay E-Services System for Barangay Batasan Hills could include:

- Ensuring that the platform is secure and protects the privacy of users' personal and financial information. This may require complying with relevant laws and regulations, as well as implementing technical measures to safeguard data.
- Obtaining the necessary funding and resources to develop and maintain the platform over time. This may involve identifying potential sources of funding, such as grants or sponsorships, and developing a budget and resource plan.
- Educating and training staff and residents on how to use the platform effectively. This may involve developing training materials and programs, as well as providing ongoing support and assistance to users.
- Overcoming resistance to change and convincing residents and government officials to adopt and use the platform. This may involve addressing concerns or objections and demonstrating the value and benefits of the platform through pilot programs or other initiatives.

- Staying up to date with technological advancements and adapting the platform as needed to remain relevant and useful to the community. This may involve ongoing maintenance and updates to the platform, as well as ongoing research and learning about new technologies and best practices.

Maintenance Plan

The maintenance phase began after a new system was installed. The system was in use by the organization and was in production. Even though the system was no longer actively developed, changes had to be made when bugs were discovered, or new features were requested. During the maintenance phase, IT management ensured that the system remained aligned with business priorities and ran smoothly. Documentation was essential at this and other stages so that there was information to refer to regarding the changes made. Feedback was also important for driving future development. This took place in identifying an impact analysis. After a study had been done, a system release plan was formulated, under this section, 3 categories in line took place. Perfective Maintenance, which involved improving the quality of programs. Moreover, Adaptive Maintenance entailed that their management must ensure that the improvements or evolution made to the system met the needs of the barangay employees and residents, and Corrective Maintenance focused on fixing failures in terms of coding, designs, and other requirements. After the system release had been carefully planned, the next step was implementing the changes. This phase included design changes, coding, and tests. And finally, a system release to the respondents was implemented, this included documentation, training, hardware changes, data conversions, and the updated system. A system maintenance plan for the capstone

project Unified Barangay E-Services System for Barangay Batasan Hills might include the following elements:

- Regular backups: The system should be backed up regularly to ensure that all data is preserved in the event of a hardware or software failure.
- Security monitoring: The system should be monitored for security threats and vulnerabilities, and any identified issues should be addressed promptly.
- Software updates: The system should be kept up to date with the latest software versions to ensure that it is secure and performs optimally.
- Hardware maintenance: The system's hardware should be regularly checked and maintained to ensure that it is functioning properly.
- User support: A support team should be available to assist users with any issues or questions they may have about the system.
- Performance monitoring: The system's performance should be monitored regularly to identify any issues or bottlenecks that may need to be addressed.
- Disaster recovery: A disaster recovery plan should be in place to ensure that the system can be quickly restored in the event of a major failure or disaster.
- Training: Users should be provided with training on how to use the system effectively and efficiently.

By following a systematic maintenance plan like this, the Unified Barangay E-Services System for Barangay Batasan Hills can be kept running smoothly and reliably.

Chapter VI

CONCLUSION

Based on the objectives of the study that the following conclusions were drawn:

1. **To determine the operation and problems encountered by Barangay Batasan Hills in giving services to its constituents.** The results showed that both residents and barangay employees faced difficulties such as time-consuming processes, inaccurate and inconsistent data or information, delayed processes, difficulty in data archiving and retrieval, lack of security and control, less accessible information, and slow data entry. The manual system also put pressure on residents and barangay employees to be accurate at all times, and the level of services was dependent on the individual. This necessitated management to provide training to keep staff motivated and to ensure they were following the correct procedures.
2. **To evaluate the Unified Barangay E-Services System to determine its compliance with ISO 25010.** The study found that all of the criteria evaluated by the respondents were interpreted as Very Good, indicating that the quality of the features and functions of the proposed system were suitable as an alternative way to provide service to the community.
3. **To prepare an implementation plan for the deployment of the Unified Barangay E-Services System.**

Chapter VII

FUTURE WORK

The following recommendations were formulated and advanced in answer to the problem issues raise.

1. to address the issue in determining the process and problems encountered, it is recommended for every barangay employee and resident adopt the Unified Barangay E-Services System.
2. through the gathered data, compatibility in a desktop to a mobile platform in terms of the graphic user interface needs to further improves the interactive and responsiveness of the system also, reliability in terms of its recoverability we're recommended for enhancement in terms of interruption or failure.

A future work conclusion for the capstone project Unified Barangay E-Services System for Barangay Batasan Hills might include the following points:

1. The system has demonstrated its effectiveness in streamlining and improving the delivery of e-services to residents of Barangay Batasan Hills.
2. However, there is still room for improvement and further development of the system. Some potential areas for future work include:
    - Expanding the range of e-services offered by the system
    - Integrating the system with other government systems and databases to improve efficiency
    - Adding new features and functionality to the system, such as mobile access or online payment capabilities
    - Improving the user interface and user experience to make the system more accessible and user-friendly
    - Adding additional security measures to protect sensitive user data.

3. The capstone project proponent believes that the Unified Barangay E-Services System for Barangay Batasan Hills has the potential to serve as a model for other barangays looking to improve their e-services offerings.
4. Further development and refinement of the system could lead to significant benefits for both the residents of Barangay Batasan Hills and the local government.
5. The proponent recommends that the system be maintained and supported on an ongoing basis to ensure that it continues to meet the needs of the community and to take advantage of new opportunities for improvement and innovation.

Overall, the Unified Barangay E-Services System for Barangay Batasan Hills has the potential to be a valuable resource for the community for many years to come.

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APPENDICES

1. **Complete the Program Listing Source code:**

   https://github.com/jericopastoril/unifiedbarangayeservicessystem.git

2. **Technical Reference**

   Final system specifications

   - Hardware: Processor: Intel Core i5 - It is a logic circuit that processes basic computer instructions. Memory: 4GB - It is the component within the computer that allows for short-term data access.
   - Operating Systems: Windows Operating System (Windows 10 or higher) or Mac Operating System
   - Programming Language: The MySQL Database, an open-source Relational Database Management System (RDBMS) that makes use of the SQL language, supports the creation of PHP MySQL web applications and aids in automating data retrieval. PHP (Hypertext Preprocessor) It is especially suited for server-side programming, meaning that it is run on a web server rather than in a user's web browser.
   - Server applications used: z.com for hosting and server

   Maintenance plan for the software system

   A system maintenance plan for the capstone project Unified Barangay E-Services System for Barangay Batasan Hills might include the following elements:

   - Regular backups: The system should be backed up regularly to ensure that all data is preserved in the event of a hardware or software failure.

- Security monitoring: The system should be monitored for security threats and vulnerabilities, and any identified issues should be addressed promptly.
- Software updates: The system should be kept up-to-date with the latest software versions to ensure that it is secure and performs optimally.
- Hardware maintenance: The system's hardware should be regularly checked and maintained to ensure that it is functioning properly.
- User support: A support team should be available to assist users with any issues or questions they may have about the system.
- Performance monitoring: The system's performance should be monitored regularly to identify any issues or bottlenecks that may need to be addressed.
- Disaster recovery: A disaster recovery plan should be in place to ensure that the system can be quickly restored in the event of a major failure or disaster.
- Training: Users should be provided with training on how to use the system effectively and efficiently.

By following a systematic maintenance plan like this, the Unified Barangay E-Services System for Barangay Batasan Hills can be kept running smoothly and reliably.

List of the location and content of all relevant files and instructions for installing, compiling, and configuring the software:

- **Content Management System:** WordPress - A system used for easy composition of websites.

- **Video Conferencing Application:** Zoom - A video conferencing system that enables users to communicate via video/audio call.
- **Email Service:** Gmail - Enables users to interact privately via mailing.
- **Calendar:** Google Calendar - A system used for displaying the current date on the calendar on the website.
- **Maps:** Google Maps - A system used to mark the geographical location of the barangay hall.
- **Booking system:** StartBooking - A system used for efficient scheduling.
- **Web Browser:** Google Chrome, Microsoft Edge, Mozilla Firefox - A program where a user can access the internet.

3. **User Manual**

   You may access the User Manual through this link:

   https://drive.google.com/file/d/1hT6sUvFWHC1puCu97jlQ1v452h48UwLD/view?usp=share_link

4. Tables and Figures

LIST IOF TABLES

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