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Enhancing the Barangay Information System by Integrating Geolocation Technology and Tagalog Chatbot using NLP Algorithm for Efficient Community Engagement and Service

Abstract: **-** This research aims to address the need for improved efficiency and accessibility of a local government constitution which is the barangay services in the Philippines through the integration of an English – Tagalog Chatbot using NLP Algorithm into a Progressive Web-Application based Barangay Information System and Geolocation Technology which detects the location of the affected residents and nearest evacuation centers. The specific objectives include developing an information system for efficient resident data management, training an AI chatbot to handle both English and Tagalog inquiries, and integrating geolocation technology for disaster risk reduction monitoring. The study's significance lies in enhancing the service provided by barangays, which are often the most accessible government agencies to the public. The system benefits the public by increasing transparency and providing convenient access to services, barangay officials by streamlining transactions and reducing their workload and future researchers by laying the groundwork for further technological advancements in governance. The overall acceptance of the system based on user's feedback falls within the satisfactory category, which indicates its potential to improve barangay operations. The Barangay Information System, as demonstrated in this study, efficiently manages resident information, streamlines the delivery of certificates, enhances user experience, and ultimately contributes to more effective and efficient community service delivery.

Keywords: barangay information system, geolocation technology, NLP algorithm, progressive web-application

I. INTRODUCTION

The world of computers and technology is very important and should not be ignored especially in contemporary times. Computers have evolved from computing basic arithmetic to providing information that may be accessible to anyone, anywhere, anytime. In recent years, the Philippines has come to understand the need of using technology to improve public administration and service delivery. The former president of the Philippines, Rodrigo Duterte, showed strong support to the Information and Communications Technology (ICT) industry, believing that it would improve the quality life of Filipinos and make government transactions easier, simpler, and more transparent (Alani, 2018) [3]. This aligns with the findings of multiple studies emphasizing the importance of computers and technology in public service. According to Abiad & Khatiwada (2018) [2], new technologies have a lot of potential to make public services more effective and competent. Furthermore, automation of government processes increases work efficiency and, most importantly, enhances the citizen experience. As of today, Barangay is the smallest unit of government in the Philippines, faces difficulties and challenges in the organization and management of incoming and outgoing data due to its lack of a system and manual processes of storing resident information (Jamis et al., 2022) [4]. The lack of system and manual processes done by the barangays may lead to mishandling and result in data breaches. The proponents propose a centralized system where barangay officials can have a safe centralized system to store resident information and where residents can remotely avail of the in-person services of the barangay from the comfort of their home. As the smallest unit of government, the barangay and the barangay officials are at the forefront of public service and is the closest sector to the people (Panadero, 2018) [3] therefore, the barangay is the first mediator and responder to the happenings in the barangay. The barangay has other duties and responsibilities mandated by the Local Government Code and

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other laws (Trovela, 2018) [4]. Because of this the barangay is always busy and may not be able to accommodate everyone all the time (Lagos & Adorio-Arce, 2017) [3]. To lessen the load of the barangay and be able to accommodate everyone, the proponents propose the creation of a virtual assistant that can answer barangay related questions and receive reports from residents without human intervention. According to the World Risk Report 2022 by Bündnis Entwicklung Hilft and the Institute for International Law of Peace and Armed Conflict (IFHV) (2022), the Philippines is the number one country in the world with the highest disaster risk with a WorldRiskIndex of 46.82. Among all the countries in the world, the Philippines was also ranked 4th with the highest exposure to disasters. After disasters occur, multiple barangays in the Philippines are greatly affected due to the lack of proper information dissemination and disaster risk management plans. The City of Manila is one of the cities in the Philippines of High Flood Risk. The occurrence of floods in Manila has resulted in injuries, loss of lives, and extreme damage to properties (World Bank, 2017) [7]. To help the local government monitor and assess which areas in their barangay most likely need help with the use of geolocation technology and safety check polls.

OBJECTIVES OF THE STUDY

1. To design and develop an information system where the admin can efficiently store, manage, and extract resident information of the barangay residents.

2. To train and develop a chatbot that can answer both English and Tagalog barangay-related questions and upcoming events, accept certificate requests and incident reports, and disseminate information to reduce foot traffic in the barangay. Integration of notification to the information system which informs the resident regarding the status of his/her account and requested document.

3. To integrate geolocation technology in the barangay information system to locate unsafe areas that need assistance using safety check polls during and after a disaster.

II. RELATED WORKS

Barangay Management System as a web-based management system was developed to transform traditional Barangay management into a more inclusive and citizen-oriented approach. The system focuses on streamlining administrative processes such as document requests, complaint filing, and generating accurate local statistics. The researcher has adopted a prototype methodology in developing the system, which involves creating and testing system features and graphical user interface through iterative development. This approach ensures the effectiveness, efficiency, and reliability of the system. Data from the target local government unit is used to conceptualize the system. Additionally, the researcher recommends integrating fiscal processes into the system and translating system contents into local dialects to enhance user understanding and engagement [4].

The adoption of Artificial Intelligence in local governments of Carmona in the Philippines using Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT) which is a study that collects perception data from local executives and department administrators. The findings reveal a favorable attitude and behavioral intention toward the use of AI in government operations. Correlation analysis indicates positive relationships between acceptance and adoption factors and the attitude and behavioral intent to use AI, except for the anxiety factor, which shows a negative correlation with attitude.

Crisis Information Dashboard System using Feedback-Based Text Classification contributes to social media analytics literature by incorporating user feedback towards improving Tweet classification of code-switch data. The proponents integrate this modern technology in a crisis information dashboard system to consolidate significant information. The instantaneous nature of data obtained from social media makes it an ideal medium in emergency situations. Using a multiclass SVM with categories (1) Announcement, (2) Casualty and Damage, and (3) Call for Help [1].

III. RESEARCH METHODOLOGY

Chatbots are conversational software agents that use natural language processing which is a branch of machine learning that allows computers to understand and generate human language (Bulla et al., 2020; O'Brien, 2022) [5]. According to Kamri & Mariga (2021) [5], machine learning is mainly quantitative. Machine learning requires data modeling as well as the use of statistical tools and formulations to make sense of the data.

In this study, quantitative approach was utilized as the survey design which serves as the primary data collection method for evaluating the overall functional stability, usability, reliability, security, maintainability and

portability of the barangay information system, the proponents will use the ISO 25010 software product quality model as the basis of evaluation while for the evaluation of the overall usability of the chatbot, the proponents will use an adapted chatbot-specific usability metric, the Chatbot Usability Questionnaire. 150 is the total number of respondents which are composed of residents and barangay personnels that will be asked to interact with the chatbot and explore the features of the modernized barangay information system.

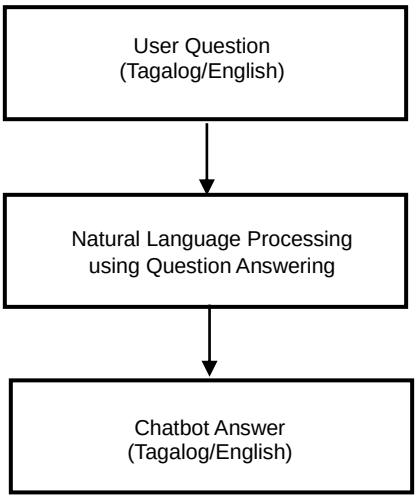

Fig. 1: Chatbot Conversion Model

Using the model above, it will illustrate the process of how the chatbot understands and responds to the user questions. The user can ask FAQs such as the process of requesting a certificate, information and location of evacuation center, upcoming events in the barangay etc. using either Tagalog or English Language. Once the user has sent a message through the API integrated from GPT which is the question answering service that will find the accurate and relevant answer to the user question and after the correct answer has been generated, the question answering service will now send it as a response through the API.

3.1 System Development

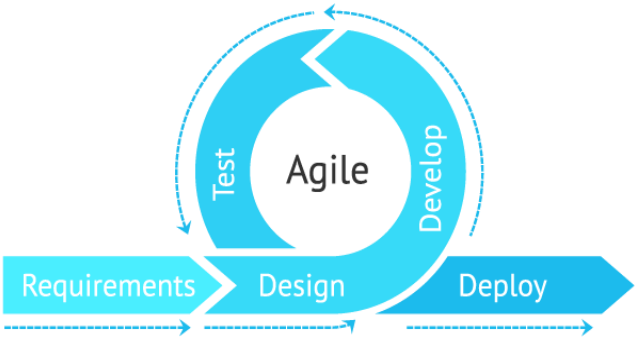

Fig. 2: Agile Software Development Model

The proponents utilized Agile Software Development Model, comprised of five (5) different phases which includes the following: system planning, system design, system development, system testing and system deployment.

1. **System Planning** - In this phase, a preliminary developing system has been conducted. Knowing the needs of the clients and the purpose of the system as well as the software requirements needed to develop the system.
2. **System Designing** - The developers will now establish the design and specifications for the system once the requirements have been determined. The developers will create a mood board to maintain complexity by adding grids, frames, texts, and labels. Design phase falls on Graphical User Interface (GUI). This

shows case buttons, toolbars, icons, and dashboard. The developers used Figma as a UX/UI designing tool mainly for collaboration purposes.

3. **System Development -** The process of constructing the information system through programming is included in this step. The developers used JavaScript to improve the user experience and overall functionality, PHP, and XML to build the system's structure. To provide support for database manipulation, the developers use XAMPP as the local host web server, and MySQL to cater data security and transactional processing support.
4. **System Testing -** For the application to perform in accordance with the end user's needs, testing is the process of identifying errors in a software application or program and evaluating a system with the goal of identifying any gaps.
5. **System Deployment -** The system will be deployed once all the steps have been completed. It entails transferring to the end users the fully operational system. Following a series of tests, the software's quality was improved to raise the system's overall quality.

3.1.1 Chatbot Development Process

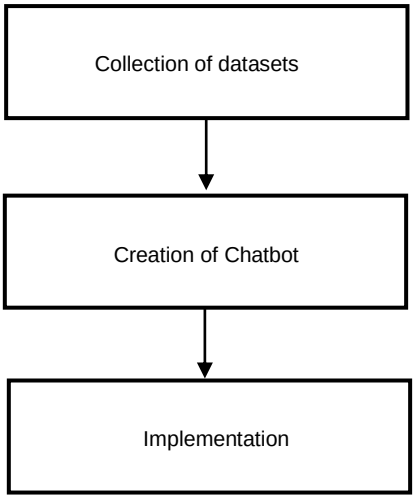

Fig. 3: Process of Chatbot Development

There are three (3) important stages involved in developing a chatbot. Figure 3 shows the chatbot development processes starting with the Dataset Collection, Creation of Chatbot and Implementation.

1. The datasets were initially gathered to establish a knowledge base of frequently asked questions through inquiries to barangay personnel and the compilation of existing FAQs from public webpages.
2. Essential components for GPT Language Services, along with the bot framework were built to create the chatbot, the generated knowledge base was integrated into the Question Answering resource and built-in chitchat knowledge bases were also used for the chatbot to have a friendly and professional personality.
3. The last stage is chatbot will be implemented through the direct line API integrating it into the progressive web application using SvelkeKit and Tailwind CSS for the evaluation of end users.

3.2 Sampling Techniques

The sampling technique for the study is a combination of purposive and random sampling. Purposive sampling is a sampling technique where participants are selected based on specific criteria that align with the objectives of the study. This sampling technique is targeted at the barangay officials who are directly involved in the barangay processes.

Random sampling is a sampling technique that involves selecting participants randomly from the population of interest. This sampling technique encompasses the residents of the selected barangay. By using random sampling every resident in the barangay has an equal chance of being selected to participate in the survey.

3.3 Data Analysis and Procedures

The collected data will be subjected to different data analytical techniques to gain insights into the implementation of a geolocation technology and tagalog chatbot to a modern barangay information system. The data analytic technique that will be used in this study is descriptive statistics. Descriptive statistics include measuring the mean and standard deviation to summarize the quantitative data.

Data collection procedures will be collected through surveys. The researcher will develop structured questionnaires to gather relevant information from barangay officials, residents, and other stakeholders. The analyzed data will then be interpreted by examining the patterns. The findings will be related to the research questions and objectives to derive meaningful insights and draw conclusions.

Formula of Mean:

$$\mu = \frac{\sum_{i=1}^{N} x_i}{N} = \frac{x_1 + x_2 + x_3 + \ldots + x_N}{N}$$

Where: μ = population mean
N = number of data points
$\sum x_i$ = sum of all data points

Formula of Standard Deviation:

$$\sigma = \sqrt{\frac{\sum(X_i - \mu)^2}{N}}$$

Where: σ = population standard deviation
μ = population mean
N = number of data points
$\sum x_i$ = each value from the population

3.4 Evaluation

The focus of this study is the integration of a Tagalog chatbot using NLP Algorithm to the barangay information system therefore the evaluation shall be split into two parts. The first part of the evaluation will use the Chatbot Usability Questionnaire (CUQ) tool to identify its overall usability and ease of use and a total of 100 participants to be evaluated.

The evaluation of the system will be in terms of functional stability, usability, reliability, security, maintainability, and portability based on the standards from the ISO 25010 software product quality model and a total of 150 participants to be evaluated.

A. Chatbot Usability Questionnaire (CUQ) Tool

Figure 4 shows the tool that the proponents used to evaluate the Tagalog Chatbot. This questionnaire was adapted from (Holmes et al., 2019) [] to identify its overall usability. It was derived from the most used System Usability Scale also known as (SUS). CUQ is a chatbot-specific usability questionnaire made specifically for chatbot systems with the metrics range of 0-100 and different interpretations. It consists of sixteen (16) fair questions which all the odd-numbered questions are the positive aspects of the chatbot while even-numbered questions relate to negative aspects. Covering a range of chatbot usage topics, including effectiveness and satisfaction.

	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5
The chatbot's personality was realistic and engaging	○	○	○	○	○
The chatbot seemed too robotic	○	○	○	○	○
The chatbot was welcoming during initial setup	○	○	○	○	○
The chatbot seemed very unfriendly	○	○	○	○	○
The chatbot explained its scope and purpose well	○	○	○	○	○
The chatbot gave no indication as to its purpose	○	○	○	○	○
The chatbot was easy to navigate	○	○	○	○	○
It would be easy to get confused when using the chatbot	○	○	○	○	○
The chatbot understood me well	○	○	○	○	○
The chatbot failed to recognise a lot of my inputs	○	○	○	○	○
Chatbot responses were useful, appropriate and informative	○	○	○	○	○
Chatbot responses were irrelevant	○	○	○	○	○
The chatbot coped well with any errors or mistakes	○	○	○	○	○
The chatbot seemed unable to handle any errors	○	○	○	○	○
The chatbot was very easy to use	○	○	○	○	○
The chatbot was very complex	○	○	○	○	○

Fig. 4: Chatbot Usability Questionnaire

B. Evaluation using ISO 25010 Software Product Quality Model

Fig. 5: ISO 25010:2011

In this section, the proponents present objective data that they have collected after deploying their developed system. These questions are classified based on the criteria used from the ISO 25010:2011.

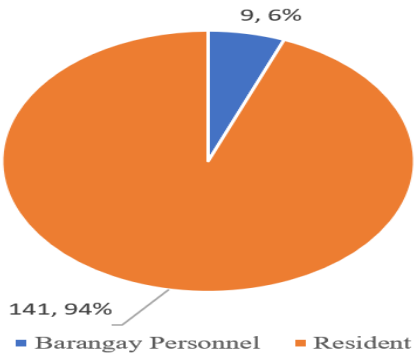

Fig. 6: Evaluation - Demographic Profile of the Respondents

Figure 6 shows the demographic of the respondents for the evaluation. A total of 150 people responded to the given evaluation form. Out of the 150 people, there were 9 barangay personnel, and 141 were residents.

C. System Evaluation

Mean / Overall Mean Range	Mean Verbal Interpretation	Overall Mean Verbal Interpretation
4.51 – 5.0	Strongly Agree	Excellent
3.51 – 4.50	Agree	Satisfactory
2.51 – 3.50	Moderately Agree	Good
1.51 – 2.50	Disagree	Fair
1.00 – 1.50	Strongly Disagree	Poor

Table 1: System Evaluation of its Mean, Overall Mean Range and it's Verbal Interpretation

Table 1 displays the evaluation mean and overall mean range, and its verbal interpretation. This will be used to gauge the level of agreement and satisfaction of the respondents with the system.

Mean scores falling within the Strongly Agree, Agree, and Moderately Agree category, conveys a varying level of positive sentiment with the statement and believes that the statement is true. Mean scores categorized as Strongly Disagree and Disagree suggests a varying level of negative sentiment or disagreement with the statement and believes that the statement is not fully accurate.

Overall mean scores falling within Excellent and Satisfactory indicate a high level of user satisfaction and system effectiveness. Overall mean scores categorized as" Good" imply that the system is generally acceptable but may have areas for improvement. Overall means scores in the "Fair" range suggest that there are notable issues or challenges that need to be addressed. Overall mean scores categorized as "Poor" indicate a low level of acceptability and signify important shortcomings in the performance of the system.

D. Level of Agreement with the Chatbot Usability Questions

Score	Level of Agreement
5	Strongly Agree
4	Agree
3	Neutral
2	Disagree
1	Strongly Disagree

Table 2: 5-point Likert Scale of Agreement and its interpretation

Using the 5-point Likert scale of agreement seen in table 2, the respondents were able to answer sixteen (16) questions covering a range of chatbot usage including effectiveness and satisfaction of usage.

IV. RESULTS AND DISCUSSION

A. Functional Suitability of System

FUNCTIONAL SUITABILITY			
Indicators	Population Size (N)	Mean	Verbal Interpretation
Functional Completeness			
The website includes all the designated tasks and user goals.	150	3.67	Agree
Functional Correctness			
The website provides correct and accurate information.	150	4.01	Agree
Functional Appropriateness			
The functions of registration page, chatbot and set of functions of the barangay website are appropriate and according to the specified tasks and objectives.	150	4.03	Agree
	Overall Mean:	3.91	Satisfactory

Table 3: Functional Suitability of the System based on Barangay Personnels and Resident's Evaluation

Table 3 shows a concise overview of the system's functional suitability evaluation by 150 participants, including barangay personnel and residents. The assessment focused on sub-criteria, with mean scores of 3.67 for Functional Completeness, 4.01 for Functional Correctness, and 4.03 for Functional Appropriateness. The overall mean of 3.91 indicates a "Satisfactory" verdict, affirming general agreement among respondents regarding the system's functional suitability.

B. Usability of System

USABILITY			
Indicators	Population Size (N)	Mean	Verbal Interpretation
Appropriate Recognizability			
The website enables users to determine if it is suitable for what they need.	150	3.87	Agree
Learnability			
The website can be used by specific users to learn how to use the application in a way that is effective, efficient, safe, and satisfying, based on their specific goals and	150	3.83	Agree

the context in which they are using it.			
Operability			
The website is easy to learn and maneuver in an effective, efficient, less risky, and satisfying manner of navigation	150	3.98	Agree
User Error Protection			
The website protects users against making errors.	150	3.97	Agree
User Interface Aesthetics			
The website user interface allows users to have a pleasant and satisfying experience when using it.	150	4.01	Agree
Accessibility			
The system can be used by barangay personnels and residents and achieve its goal.	150	4.06	Agree
	Overall Mean:	3.95	Satisfactory

Table 4: Usability of the System based on Barangay Personnels and Resident's Evaluation

As seen on Table 4, Appropriate Recognizability was evaluated using one question with a mean score of 3.87 which indicates that they agree with the first statement. Similarly, Learnability was also evaluated using one question and its mean score is 3.98 which means that they also agree with the 2nd statement. As for Operability which its mean yielded a score of 3.97 that indicates agreement with the 3rd statement. While User Error Protection has also a mean score of 3.97 that shows agreement with the 4th statement. On the other hand, User Interface Aesthetics has a mean score of 4.01 which signifies agreement. Lastly, Accessibility was evaluated using one question with a mean score of 4.06 and denotes agreement with the last statement. Overall, the evaluation of Barangay Personnel and Residents regarding the system's usability had an overall mean of 3.95 and a verbal interpretation of "Satisfactory".

C. Security of the System

SECURITY			
Indicators	Population Size (N)	Mean	Verbal Interpretation
Integrity			
The website ensures that data is accessible only to those authorized to have access.	150	3.85	Agree
Confidentiality			
The website maintains data consistency and integrity across different features.	150	3.87	Agree
Authenticity			

The website adequately protects sensitive barangay and residents' data.	150	4.04	Agree
Accountability			
The website requires strong authentication measures for administrator access. (uses strong passwords).	150	4.23	Agree
	Overall Mean:	4.00	Satisfactory

Table 5: Security of the System based on Barangay Personnels and Resident's Evaluation

Table 5 shows the evaluation questions for both Barangay Personnel and Residents, assessing the system's security through its sub criteria. Integrity was evaluated using one question with a score of 3.85 which indicates that they agree with the first statement. Similarly, Confidentiality was also evaluated its mean score is 3.87 which shows agreement with the 2nd statement. As for the Authenticity which was also evaluated using one question, it yielded a mean score of 4.04 On the other hand, Accountability was also evaluated with a mean score of 4.23 which indicates agreement with the last statement. Overall, the evaluation of Barangay Personnel and Residents regarding the system's security had an overall mean of 4.00 and a verbal interpretation of "Satisfactory".

D. Reliability of the System

RELIABILITY			
Indicators	Population Size (N)	Mean	Verbal Interpretation
Fault Tolerance			
The website can continue functioning properly despite encountering faults or errors.	150	3.66	Agree
Availability			
The website is operational and accessible when in demand of usage.	150	3.68	Agree
Maturity			
The website provides clear and concise order information.	150	3.82	Agree
Recoverability			
The website can retrieve and restore the affected data to its desired state.	150	3.85	Agree
	Overall Mean:	3.75	Satisfactory

Table 6: Reliability of the System based on Barangay Personnels and Resident's Evaluation

Table 6 shows the system's reliability through its sub criteria. Fault Tolerance was evaluated using one question with a mean score of 3.66 which indicates that they agree with the first statement. Similarly, Availability was also evaluated using one question and its mean score is 3.68. As for Maturity, which have a mean score of 3.82 indicating agreement with the 3rd statement. On the other hand, Recoverability was also evaluated with a mean score of 3.85 which indicates agreement with the last statement. Overall, the evaluation of Barangay Personnel

and Residents regarding the system's reliability had an overall mean of 3.75 and a verbal interpretation of "Satisfactory".

E. Maintainability of the System

MAINTAINABILITY			
Indicators	Population Size (N)	Mean	Verbal Interpretation
Modularity			
The website is easily maintained through modular construction of its design.	150	3.63	Agree
Reusability			
The website's different functions can be reused once reconstructed/modified.	150	3.69	Agree
Analysability			
The faults and errors on the functions of the website are easily diagnosed.	150	3.82	Agree
Modifiability			
The faults and errors on the functions of the website are easily diagnosed.	150	3.77	Agree
Testability			
The website can be effectively and efficiently modified without introducing defects or degrading existing quality.	150	3.89	Agree
	Overall Mean:	3.76	Satisfactory

Table 7: Maintainability of the System based on Barangay Personnels and Resident's Evaluation

Table 7 shows the system's maintainability through its sub criteria. Modularity was evaluated using one question with a mean score of 3.63 which indicates agreement with the first statement. Similarly, Reusability was also evaluated, and its mean score is 3.69 which means that they also agree with the 2nd statement. As for the Analysability, yielded a mean score of 3.82 which denotes agreement with the 3rd statement. While Modifiability has a mean score of 3.77. Lastly, Testability was evaluated using one question, resulting in a mean score of 3.89 which shows agreement with the last statement. Overall, the evaluation of respondents regarding the system's maintainability had an overall mean of 3.76 and a verbal interpretation of "Satisfactory".

F. Portability of the System

PORTABILITY			
Indicators	Population Size (N)	Mean	Verbal Interpretation
Adaptability			
This website can effectively and efficiently be adopted for different hardware and software.	150	3.80	Agree
Installability			

This website can be installed and uninstalled in different barangays.	150	3.94	Agree
Replaceability			
This website can replace the software for the same purpose in barangays.	150	4.11	Agree
	Overall Mean:	3.95	Satisfactory

Table 8: Portability of the System based on Barangay Personnels and Resident's Evaluation

Table 8 shows the evaluation questions for both Barangay Personnel and Residents, assessing the system's portability through its sub criteria. Adaptability was evaluated using one question with a mean score of 3.80 which indicates that they agree with the first statement. Similarly, Installability was also evaluated, and its mean score is 3.94 which shows agreement with the 2nd statement. As for the Replaceability, it yielded a mean score of 4.11 and denotes agreement with the 3rd statement. Overall, the evaluation of Barangay Personnel and Residents regarding the system's portability had an overall mean of 3.95 and a verbal interpretation of "Satisfactory".

Overall Acceptance of the System

The developers conducted an evaluation through an online survey. The web system was evaluated by the following criteria: Functional Suitability, Usability, Reliability, Security, Maintainability, and Portability. The results were tallied, rated, and interpreted using the 5-point Likert Scale of Satisfaction as illustrated in table 5.

Overall Acceptance of the System		
Criteria	Mean	Verbal Interpretation
Functional Suitability	3.91	Satisfactory
Usability	3.95	Satisfactory
Reliability	3.75	Satisfactory
Security	4.00	Satisfactory
Maintainability	3.76	Satisfactory
Portability	3.95	Satisfactory
Overall Mean	3.89	Satisfactory

Table 9: Overall Acceptance of the System

Table 9 shows the overall acceptance of the system based on the cumulative ratings from the barangay personnel and residents. Security yields the highest overall mean of 4.00, which falls within the 'Satisfactory' category. With a mean of 3.95, both Usability and Portability also fall under the 'Satisfactory' category. Functional Suitability, with a mean of 3.91, falls in the same category. However, Maintainability and Reliability, yielding overall mean scores of 3.76 and 3.75, respectively, also fall within the 'Satisfactory' category. The system's overall acceptance, receiving an average of 3.89, falls under the 'Satisfactory' category.

Chatbot Usability Questionnaire Results

Scale items	Respondents, n/N (%)	Mean	Standard Deviation
Positive scale items (Strongly Agree or Agree)			
The chatbot was easy to navigate	97/100 (97%)	4.7	0.6
The chatbot was easy to use	85/100 (85%)	4.4	1.1
The chatbot was welcoming during initial	69/100 (69%)	3.8	0.9

setup			
Chatbot responses were useful, appropriate, and informative	96/100 (96%)	4.7	0.7
That chatbot explained its scope and purpose well	73/100 (73%)	3.4	1.2
The chatbot's personality was realistic and engaging	100/100 (100%)	4.5	0.5
The chatbot understood me well	80/100 (80%)	4.1	1.4
The chatbot coped well with any error or mistakes	78/100 (78%)	3.1	1.2
Negative scale items (Strongly Disagree or Disagree)			
The chatbot seemed unfriendly	57/100 (57%)	2.1	1.1
The chatbot was very complex	25/100 (25%)	1.6	1.1
The chatbot gave no indication as to its purpose	49/100 (49%)	2.3	1.2
Chatbot responses were irrelevant	74/100 (74%)	1.7	1.2
It would be easy to get confused when using the chatbot	82/100 (82%)	1.6	1.1
The chatbot was unable to handle any errors	52/100 (52%)	2.4	1.1
The chatbot failed to recognize a lot of my inputs	68/100 (68%)	1.7	1.2
The chatbot seemed too robotic	76/100 (76%)	1.8	1.1

Table 10: Evaluation of Chatbot Usability Questionnaire

The proponents assessed the functionality or ease of navigation of the chatbot using the CUQ, Illustrated in Table 10, indicates that most of the respondents or participants agreed with the statement that the chatbot was "easy to navigate (97/100, 97%) and "easy to use" (85/100, 85%), with its corresponding counterpart statement disagreed that it was "very complex" 25% and 57% of the participants said it was "unfriendly". While 69% said that "chatbot was welcoming during initial setup and 96% said that "Chatbot responses were useful, appropriate, and informative". Additionally, 73% of the participants said that "chatbot explained its scope and purpose well", 100% also agreed with
"chatbot's personality was realistic and engaging and 78% of them said that "chatbot coped well with any error or mistakes." but 68% of them also disagreed with the statement that "chatbot failed to recognize a lot of my inputs" Finally, 76% of the respondents disagreed that "the chatbot seemed too robotic."

V. CONCLUSIONS

1. The proponents successfully addressed the absence of a secure, computerized database system for managing resident information. They developed a secured database system that can store and manage information of barangay residents which can be used in generating automated certificates.
2. The development of a bilingual chatbot proficient in managing both English and Tagalog barangay-related queries and events, handling certificate requests, and disseminating information serves as a crucial enhancement to barangay information system.

3. The integration of geolocation technology into the barangay information system, specifically for the purpose of identifying unsafe areas requiring assistance through safety check polls during and after a disaster, represents a significant advancement in disaster response capabilities. This integration enhances the barangay's overall disaster management strategy, promoting efficiency and effectiveness in addressing critical safety concerns within the community.

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