College of Computer Studies

ENHANCING PUBLIC ENGAGEMENT AND SATISFACTION USING AI-CONVERSATIONAL SUPPORT WITH SENTIMENT ANALYSIS IN QUEZON CITY HALL ENVIRONMENTAL SANITATION DIVISION (QCHD-ESD)

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APPROVAL SHEET

This capstone project paper entitled "**ENHANCING PUBLIC ENGAGEMENT AND SATISFACTION USING AI-CONVERSATIONAL SUPPORT WITH SENTIMENT ANALYSIS IN QUEZON CITY HALL ENVIRONMENTAL SANITATION DIVISION (QCHD-ESD)**", prepared and submitted by Espiritu, Timothy R., Rosales, Charls Justine, Orenza, Duane A. in partial fulfillment of the course requirements for the degree of Bachelor of Science in Information Technology, has been examined and recommended for acceptance and approval for Oral Examination.

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Acknowledgment

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Abstract

Definition of Terms

Enhancing Public Engagement - This refers to tactics and tools designed to raise community participation and contact with QCHD-ESD programs. The intention is to facilitate the communication of residents' issues, their feedback, and their information requests.

Health Certificate - An official document from the QCHD-ESD attesting to a person's compliance with certain health standards and absence of certain infectious diseases, frequently required for employment or participation in certain city activities.

Sanitary Permit - A formal permit given to companies by the QCHD-ESD guaranteeing that they adhere to regional sanitation and hygiene regulations. Businesses that serve the public, such as hotels and restaurants, must have it in order to operate legally.

Ai-Conversational Support – A virtual assistant driven by artificial intelligence that the QCHD-ESD uses to have natural language discussions with the public. The chatbot may respond to questions, direct customers through procedures, and offer details on services like sanitization permits and health certificates.

Complaint - A formal complaint submitted by the public regarding the QCHD-ESD's activities or services. There are a number of ways to file a complaint, which may assist with the reporting process and provide status updates on the resolution.

E-payment - Online payment for permits, certificates, and other payments is made possible by an electronic payment system that is incorporated into the services offered by the QCHD-ESD. Users' convenience is increased and transactions are streamlined by this approach.

Admin - Refers to the administrative personnel or officials working for the QCHD-ESD who are in charge of managing operations, supervising services, and guaranteeing adherence to rules. Administrators can also monitor public interactions.

Employee - Employees of the QCHD-ESD who perform a range of tasks, such as processing applications for sanitary per and health certificates, upholding public health standards, and supporting the handling of complaints. The AI chatbot can be used by staff members to increase service effectiveness.

HTML – It is a standard markup language for documents designed to be displayed in browser information.

CSS (Cascading Style Sheets) – It is a computer language for laying out and structuring web pages (HTML or XML).

Adminer Evo – It is a web-based database management interface, with a focus on security, user experience, performance, functionality and size.

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CHAPTER 1

Project and Its Background

Project Context

One of the biggest and most populated cities in Metro Manila, the Philippines, is Quezon City, and the QCHD-ESD is essential to maintaining the cleanliness and sanitation of the city. Notwithstanding the division's best efforts, it continues to be difficult to interact with people in an efficient manner, respond to their issues in a timely manner, and determine how satisfied they are with the sanitation services.

Accessibility, responsiveness, and scalability are constraints of traditional communication methods including emails, hotlines, and physical queries. When residents attempt to report problems or look for information about environmental cleanliness, they frequently encounter lengthy wait periods, cumbersome procedures, and a dearth of feedback tools. Furthermore, one of the biggest challenges facing the QCHD-ESD is continuing to comprehend the attitudes and preferences of Quezon City's diverse population with relation to sanitation services. It is challenging for the division to modify its services to fit the unique requirements and expectations of people without precise knowledge of public opinion.

The proposed project seeks to improve public involvement and satisfaction within the QCHD-ESD by utilizing advances in artificial intelligence (AI) and natural language processing (NLP) technology. The division hopes to transform its

channels of communication and decision-making by putting in place an AI-conversational assistance system with sentiment analysis capabilities.

Residents will be able to communicate with the QCHD-ESD via a variety of digital channels, including, mobile applications, and websites, due to the AI-conversational support system. The system will be able to comprehend and react in real-time to residents' reports, feedback, and queries using natural language understanding algorithms, greatly enhancing accessibility and responsiveness.

This project is a big step toward encouraging a more responsive and inclusive governing structure and improving public service delivery in Quezon City. The QCHD-ESD seeks to empower citizens, enhance transparency, and foster trust between the government and the community it serves by embracing based on artificial intelligence technology.

Purpose and Description

The Quezon City Hall Environmental Sanitation Division (QCHD-ESD) is introducing AI-conversational support with sentiment analysis to improve public involvement and satisfaction with sanitation services, as well as to transform the division's interactions with the community. A strategic investment in modernizing public service delivery, enhancing citizen-government interactions, and promoting a more inclusive and responsive governance framework in Quezon City is represented by the installation of AI-Conversational Support with Sentiment

Analysis in the QCHD-ESD. The system uses Natural Programming Language, PHP, ###, ### for programming, Designing, database managing E-payment. It has a user friendly interface via Website which can be.

Objectives of the Study

The aim of this research is to conduct a thorough evaluation of the effects of sentiment analysis and AI-conversational support on improving public satisfaction and participation in the QCHD-ESD. The study intends to support evidence-based decision-making and promote continuous improvement in the provision of sanitation services in Quezon City by assessing the implementation process, examining sentiment patterns, gauging involvement levels, and pinpointing areas for improvement. Specifically, the study aims to achieve the following objective:

1. Evaluate the AI conversational support in QCHD-ESD for comments on the usability of sanitation services, information, and issue reporting.

2. With AI support, use sentiment analysis algorithms to comprehend the feelings, desires, and worries of the local population around sanitation services.

3. Analyze how the public is using AI to help with sanitation. Examine resident-QCHD-ESD relations through the use of digital platforms. Evaluate the efficacy of AI.

4. Analyze QCHD-ESD's responsiveness to resident questions through AI-conversational support channels, taking into account the efficiency with which problems are resolved.

Significance of the Study

The significance of this study lies in its potential to improve the operations of employing sentiment analysis and AI-conversational support for greater public engagement and satisfaction in the ecology and sanitation division of Quezon city hall by developing this system will engage with the public through chatbots along with other AI-driven conversational assistance. Sentiment analysis will be used to gauge and improve public satisfaction.

Administrator This study is essential for QCHD-ESD administrators since it provides a thorough tool for developing public satisfaction and dedication. The AI-conversational support system ensures precise and consistent presentation of details by simplifying public communication. Sentiment analysis helps administrators make data-driven decisions to enhance policies and services by helping them understand the sentiment of the community. Moreover, the analytics dashboard provides administrators with fast feedback, enabling them to successfully supervise performance and execute innovations.

Employee For the workers (QCHD-ESD), this study proves highly useful. Employee workloads can be reduced by introducing AI-driven conversational help, especially for routine and repetitive requests. This frees them up to concentrate on more difficult jobs that call for judgment and human involvement. In addition, the sentiment analysis feature gives staff members useful information about public opinion and satisfaction, allowing them to handle issues more effectively and intelligently.

Customers The clients, or those who live in Quezon City, are the main winners of this study. Their questions and concerns about environmental sanitation services will be answered promptly and accurately thanks to the installation of an AI conversational assistance system. This system offers a user-friendly communication platform, which improves their entire experience and pleasure. Additionally, sentiment analysis guarantees that their opinions are acknowledged and taken into consideration, which enhances the services they receive. That is why this study supports a more open and responsive public-QCHD-ESD connection.

Future Researchers Researchers in the future with an interest in sentiment analysis, public administration, and artificial intelligence will find this work to be a useful resource. It is an informative example on how AI is being used to improve public service efficiency and satisfaction. Expanding on this work, future researchers can investigate other developments in artificial intelligence (AI), the usefulness of sentiment analysis in public sector services, and the wider effects of these advances on public trust and satisfaction in the government. Furthermore, this study adds to the body of information by describing problems, repairs, and guidelines, which will direct more investigation and deployment.

Scope and Limitations of the Study

This research project aims to develop a web-based management system specifically tailored for the Quezon City Hall Environmental Sanitation Division (QCHD-ESD). The system will encompass various modules, Fill up forms, Upload of Requirements, Concern of Person via AI Conversation, Email Confirmation/Notification, and a E-payment The primary objective is to create a user-friendly and easily navigable system that meets the specific needs of the Quezon City citizens. restaurant. However, there are inherent limitations to this study. It does not extend to the actual implementation of the system, requiring additional resources and time. Also,

staff training on system usage is also beyond its scope. Furthermore, it does not account for the cost associated with implementing the system, as this is dependent upon specific organizational requirements.

CHAPTER II

Related Literature

This chapter presents the research literature and studies includes foreign and local. It helps to establish the context and background of the current study. It also aims to establish the foundation for the research and provides a basis for interpreting the results. By reviewing these researches, the proponents' can identify gaps in previous research, which can help to guide the focus and direction of their own research.

Foreign Literature

In the book entitled *"Voice Marketing: Harnessing the Power of Conversational AI to Drive Customer Engagement" (2023), by Larry Minsky, Scott Westwater, and Chris Fahey* explores how businesses can utilize conversational AI to enhance customer interactions and satisfaction. By leveraging technologies like AI-powered chatbots and virtual assistants, companies can offer personalized, efficient, and round-the-clock support to their customers. The book provides practical examples and case studies demonstrating how conversational AI can be used to automate routine inquiries, deliver tailored customer experiences, and gather valuable insights from user interactions. This approach not only improves customer engagement but also reduces operational costs and boosts overall service quality.

Relating this to the study "Enhancing Public Engagement and Satisfaction using AI-conversational support with Sentiment Analysis in Quezon City Hall Environmental Sanitation Division (QCHD-ESD)," the principles outlined in the book can be directly applied. By implementing AI conversational support in QCHD-ESD, the division can provide residents with instant, personalized responses to their queries about environmental sanitation issues. This can improve public satisfaction by making information more accessible and the resolution process more efficient. Furthermore, sentiment analysis can help the division understand common concerns and areas needing improvement, leading to better service delivery and increased public trust. By embracing these advanced technologies, QCHD-ESD can enhance its engagement with the community, making government services more responsive and user-friendly.

In the book entitled *"Voice Marketing: Harnessing the Power of Conversational AI to Drive Customer Engagement" (2023), by Larry Minsky, Scott Westwater, and Chris Fahey* explores how businesses can utilize conversational AI to enhance customer interactions and satisfaction. By leveraging technologies like AI-powered chatbots and virtual assistants, companies can offer personalized, efficient, and round-the-clock support to their customers. The book provides practical examples and case studies demonstrating how conversational AI can be used to automate routine inquiries, deliver tailored customer experiences,

and gather valuable insights from user interactions. This approach not only improves customer engagement but also reduces operational costs and boosts overall service quality.

At the Quezon City Hall Environmental Sanitation Division (QCHD-ESD), integrating AI-driven conversational support and sentiment analysis aims to elevate public engagement and satisfaction. By harnessing AI's strengths, QCHD-ESD strives to make interactions with the community more efficient, personalized, and accessible. This initiative reflects broader trends in AI advancements, emphasizing the importance of ethical, user-centered applications to enhance communication quality and foster stronger community relationships in the public sector.

In the book entitled *"Sentiment Analysis: A Fascinating Problem" (2012), by Liu, Bing,* sentiment analysis also known as opinion mining, involves studying people's opinions, sentiments, evaluations, attitudes, and emotions towards various entities like products, services, organizations, and topics. This field, which includes tasks such as opinion extraction and emotion analysis, has grown significantly since the early 2000s, driven by the availability of vast amounts of opinionated data from social media. The rise of social media has made sentiment analysis central to understanding public opinion, impacting fields like NLP, management, political science, and social sciences.

Businesses and organizations now rely on sentiment analysis to gauge consumer feedback and public opinion, moving away from traditional surveys and polls to analyzing online content. This shift has highlighted the need for automated systems to handle the large volumes of data and provide actionable insights.

Incorporating sentiment analysis into the Quezon City Hall Environmental Sanitation Division (QCHD-ESD) can enhance public engagement and satisfaction. By using AI-driven sentiment analysis, the division can efficiently gauge public opinion and respond to community needs more effectively. AI conversational tools can offer real-time, personalized interactions, addressing public queries and concerns promptly. This approach not only improves operational efficiency but also builds a more transparent and responsive relationship with the community, ultimately fostering greater public trust and satisfaction.

In the book *entitled "Sentiment Analysis: Mining Opinions, Sentiments, and Emotions" (2016), by hao, Jun, Kang Liu, and Liheng Xu,* delves into the burgeoning field of sentiment analysis, which has gained prominence with the rise of Web 2.0, social media, and online businesses. This comprehensive text explores the intricate task of analyzing opinions, attitudes, and emotions expressed in text. Liu, a leading figure in this domain, meticulously defines key concepts such as sentiment, opinion target, and emotion, and provides an in-depth look at core sentiment analysis tasks like sentiment classification, opinion summarization, and sentiment retrieval.

The book is particularly valuable for its balanced discussion of both linguistic and machine learning approaches, offering practical insights and the latest methodologies in the field. With its structured approach, the book serves as both an introductory text and a detailed survey, catering to a wide range of readers from students to industry practitioners. Liu's work not only clarifies the theoretical underpinnings of sentiment analysis but also demonstrates its practical applications, making it a crucial resource for anyone interested in the intersection of language and technology.

The book's insights into sentiment analysis can greatly benefit the Quezon City Hall Environmental Sanitation Division (QCHD-ESD) by enhancing public engagement and satisfaction through AI-driven conversational support. By implementing sentiment analysis, QCHD-ESD can effectively gauge public opinion and emotions expressed in various communication channels, enabling them to respond more empathetically and efficiently. AI conversational tools can provide real-time, personalized responses to public queries, improving transparency and trust. This approach not only streamlines the division's operations but also ensures that the community feels heard and valued, fostering a more positive relationship between the public and the QCHD-ESD.

The paper entitled *"Understanding Public Perceptions of AI Conversational Agents: A Cross-Cultural Analysis" (May 2024) by Zihan Liu, Han Li, Anfan Chen, Renwen Zhang, and Yi-Chieh Lee*, examines how cultural differences shape public perceptions of AI conversational agents (CAs) in the US and China. By analyzing about a million social media posts, the study reveals that Chinese users tend to view CAs more positively, focusing on their hedonic and functional attributes, whereas US users exhibit a more ambivalent attitude, emphasizing fairness, accountability, and transparency. The study identifies key dimensions such as warmth, competence, and emotional valence to assess these perceptions, finding that warmth is a critical factor influencing positive emotions toward CAs in both cultures. The research underscores the importance of designing contextually sensitive and user-centric CAs to meet diverse user needs and preferences.

The insights from this study can be related to the project on "Enhancing Public Engagement and Satisfaction using AI-conversational support with Sentiment Analysis in Quezon City Hall Environmental Sanitation Division (QCHD-ESD)". In Quezon City, leveraging AI conversational agents to improve public engagement requires understanding local cultural and emotional nuances. Just as the cross-cultural study highlights the importance of warmth and user-centric design, applying these principles in Quezon City can ensure that AI tools are not only effective but also well-received by the public, enhancing satisfaction and trust in the

Environmental Sanitation Division's services. Integrating sentiment analysis can help tailor interactions to be more empathetic and responsive, addressing community-specific concerns and fostering a positive user experience.

Local Literature

In the article entitled *"Artificial Intelligence in the Philippine Educational Context: Circumspection and Future Inquiries" (May 2023), by Carie Justine P. Estrellado, and John Christian Miranda* investigates into the integration of AI in the Philippine education system, highlighting its benefits and challenges. It explores how AI can enhance learning experiences through personalized learning systems, intelligent tutoring, and adaptive assessments tailored to individual student needs. Additionally, AI's role in automating administrative tasks, improving efficiency, and enabling data-driven decision-making in educational institutions is emphasized. However, successful AI integration requires robust technological infrastructure, addressing data privacy concerns, bridging the digital divide, and providing continuous faculty training.

It stresses the importance of collaboration among educators, administrators, students, and policymakers to ensure the ethical use of AI in education. It highlights AI's potential to improve access for remote and underprivileged communities while recognizing the risk of exacerbating socio-economic disparities.

The paper calls for ongoing evaluation of AI initiatives, the creation of ethical guidelines, and efforts to address the skills gap in the AI field. Ultimately, the study presents a balanced perspective on AI's transformative potential and the critical considerations necessary for its responsible implementation in the Philippine educational system.

The article is closely related to the study "Enhancing Public Engagement and Satisfaction using AI-conversational support with Sentiment Analysis in Quezon City Hall Environmental Sanitation Division (QCHD-ESD)." Both explore how AI can significantly improve various systems and services. In education, AI enhances learning through personalized systems, intelligent tutoring, and adaptive assessments tailored to individual needs. Similarly, in public service, AI-driven conversational support and sentiment analysis can greatly increase public engagement and satisfaction. Both studies emphasize the importance of having a strong technological foundation, addressing data privacy concerns, and ensuring continuous training for effective and ethical AI use. They highlight the need for collaboration among all stakeholders to fully realize AI's benefits while managing its risks, ultimately aiming for better efficiency, accessibility, and satisfaction in both educational and public service sectors.

In the article entitled "Customer Sentiment Analysis for Business Growth" (June 2024), by Inspiro. (n.d.) is crucial for staying competitive in today's market. This advanced approach goes beyond just gathering feedback; it delves into understanding the reasons behind customers' feelings. By analyzing emotions, opinions, and attitudes, businesses gain valuable insights that help refine strategies, innovate products, and enhance customer experiences. AI-driven sentiment analysis allows companies to efficiently process large amounts of data from various sources, such as online reviews, social media, and customer service interactions, categorizing feedback as positive, negative, or neutral. This in-depth understanding helps businesses create precise marketing campaigns, guide product development, and improve customer service.

Sentiment analysis significantly influences business decision-making. It helps companies fine-tune marketing strategies, align product development with customer expectations, and address common complaints to enhance customer service. Additionally, sentiment analysis is vital for brand reputation management by monitoring online conversations, identifying brand advocates and detractors, and enabling quick responses to negative feedback. While there are challenges like data complexity and ensuring accuracy, businesses can overcome these by choosing the right tools, continuously training AI models, integrating insights into workflows, and prioritizing data privacy. Following these best practices allows businesses to

effectively use sentiment analysis, driving growth, innovation, and customer satisfaction.

The principles of Customer Sentiment Analysis can be effectively applied to public services, as shown in the study "Enhancing Public Engagement and Satisfaction using AI-conversational support with Sentiment Analysis in Quezon City Hall Environmental Sanitation Division (QCHD-ESD)." By using AI-driven conversational tools and sentiment analysis, QCHD-ESD can gain deeper insights into the public's concerns and sentiments. This allows them to address issues more effectively and improve communication with the community. Just as businesses use these tools to refine their strategies and enhance customer experiences, QCHD-ESD can use them to provide more personalized and responsive public services. Understanding and responding to the emotions and opinions of citizens helps build trust and engagement, leading to better service delivery and higher satisfaction among the residents of Quezon City. This approach ensures that public services are not only efficient but also closely aligned with the needs and expectations of the community.

In the article entitled *"Like, Comment, and Share: Analyzing Public Sentiments of Government Policies in Social Media" (December 2023), by Jana Flor V. Vizmanos, Sheila V. Siar, Jose Ramon G. Albert, Janina Luz C. Sarmiento, and Angelo C. Hernandez* explores how social media, specifically the Philippine Institute for Development Studies (PIDS) Facebook page, can be a powerful tool for understanding public opinion. By analyzing comments on popular posts about education, the middle class, and social protection policies, the research captures a range of public views and the challenges faced by different groups. An online survey of PIDS' followers further reveals the demographics and preferences of those engaging with development research online. This dual approach shows that social media analytics can provide authentic, real-time insights into public sentiment, which can help refine government policies to be more responsive and inclusive. The study emphasizes the importance of enhancing analytics capabilities, protecting data privacy, and continually updating strategies to keep pace with evolving public opinions.

In summary, the research highlights how social media can inform policy-making by reflecting genuine public concerns and preferences. It suggests that the government invest in advanced sentiment analysis tools and train personnel to use social media data effectively. By systematically incorporating these insights into the policy-making process and ensuring data privacy, the government can create more

effective and inclusive policies. This approach underscores the value of social media in making governance more dynamic and responsive to the needs of the populace.

It can be closely related to the initiative of enhancing public engagement and satisfaction using AI-conversational support with sentiment analysis in the Quezon City Hall Environmental Sanitation Division (QCHD-ESD). Both efforts harness the power of social media and advanced analytics to capture and understand public opinion in real-time. For QCHD-ESD, integrating AI to monitor and analyze sentiments about environmental sanitation issues can provide immediate feedback and identify areas of public concern. This mirrors how PIDS uses social media to gather insights on development policies, suggesting that both initiatives can significantly improve responsiveness and inclusivity in their respective domains. By leveraging these technologies, government bodies can make data-driven decisions that reflect the genuine needs and preferences of the community, thereby enhancing public engagement and overall satisfaction.

In the article entitled "Conversational AI - A Complete Guide for [2024]" (February 2024), by Yellow.ai. Conversational AI is transforming how businesses interact with customers, offering a more personalized and efficient experience. This technology leverages advancements in natural language processing (NLP), machine learning, and dialogue management to create intelligent virtual assistants

and chatbots that can engage in human-like conversations. These AI agents can handle customer queries, provide support, and even drive sales across various channels such as websites, mobile apps, and social media. For instance, businesses can now offer 24/7 customer service without the need for additional staff, ensuring that customers receive instant, tailored responses at any time. Moreover, by analyzing user interactions, conversational AI helps companies gain valuable insights into customer behavior, enabling them to refine their strategies and improve overall satisfaction.

Integrating conversational AI into the Quezon City Hall Environmental Sanitation Division (QCHD-ESD) could revolutionize public engagement. By using AI-powered chatbots and virtual assistants, QCHD-ESD can provide residents with immediate responses to their inquiries about environmental sanitation issues, report problems, and access information efficiently. This technology not only enhances the user experience by reducing wait times and providing personalized assistance but also helps the division gather data on common concerns and feedback, which can be used to improve services. Ultimately, conversational AI offers a powerful tool for making government interactions more responsive and user-friendly, fostering a more engaged and satisfied community.

In the article entitled "The platformization of the news*" (2022), by Giuliander Carpes da Silva*, particularly in light of Facebook's algorithmic changes from late 2016 to early 2018, which diminished traffic to news websites. This shift pushed publishers towards messaging apps like WhatsApp for news distribution. However, the relationship between news organizations and these platforms has been fraught with challenges. The frustration with Facebook has spread globally, affecting publishers' willingness to adopt messaging apps for news dissemination, despite the popularity of these tools, especially WhatsApp.

WhatsApp's connection to Facebook has been a significant deterrent for many publishers. While Facebook still drives substantial traffic, WhatsApp presents several technical and structural limitations that hinder its effectiveness for news distribution. These include manual efforts for message delivery, lack of automation, bugs, inadequate analytics tools, and limited support from the platform. As a result, publishers in different regions, particularly in Brazil, Spain, and Hispanic Latin America, show varied levels of adoption and experimentation with WhatsApp. Local news publishers and fact-checking organizations are more inclined to use these tools to engage audiences and combat misinformation, although the broader media industry remains cautious due to dependency concerns and operational challenges.

Foreign Studies

In the journal entitled *"Increasing customer service efficiency through artificial intelligence chatbot" (2022), by Ivan Martins De Andrade and Cleonir Tumelero*, looked at how artificial intelligence (AI) can make customer service more efficient, especially through innovations in process management, which is still a growing area in research. The research was conducted at a Brazilian bank's Analytical Intelligence Unit, which uses IBM's Watson AI system. Using data analysis with Atlas.ti software, the study found that AI advancements enabled 181 million interactions and 7.6 million service attendances in 2020, greatly improving efficiency. One key finding was the impact of chatbots, which helped reduce call center and relationship center queues, freeing up human attendants for more complex tasks.

Even with some limitations in the study's scope and participant selection, the results were striking: virtual assistant interactions increased by over 1,000% from 2019 to 2020, showing the bank's readiness to handle the challenges posed by the Covid-19 pandemic. The study concluded that AI's growth brings significant benefits to customer service and business process management, with chatbots playing a crucial role in these improvements. This underscores the value of establishing AIUs to centralize and streamline AI projects in research, cognitive computing, and

analytics.

This study on how AI improves customer service, especially with chatbots, is very relevant for the Quezon City Hall Environmental Sanitation Division (QCHD-ESD). By using AI chatbots with sentiment analysis, QCHD-ESD can make its services much better, just like the Brazilian bank did. The bank's chatbots helped reduce wait times and allowed human staff to handle more complicated tasks. The success seen at the bank suggests that QCHD-ESD could also see big improvements in efficiency, responsiveness, and public satisfaction by using similar AI strategies. This would enhance overall service management and the experience for citizens.

In the journal entitled *"Understanding the user satisfaction and loyalty of customer service chatbots" (March 2023) by Chin-Lung Hsu and Judy Chuan-Chuan Lin*, AI chatbots are becoming vital in customer service for many companies, helping them save money and work more efficiently. However, there's still not much research on how well these chatbots serve customers. This study explores how the quality of AI chatbot conversations affects how satisfied and loyal users are. By surveying 219 people, the study found that chatbots that can handle service issues well and have good conversational skills make users happier. Additionally, good overall service quality and user satisfaction are crucial for building loyalty to these chatbots. These insights are valuable for improving AI chatbot services by focusing

on both basic service aspects and human-like conversation abilities.

AI chatbots are increasingly used in customer service, with nearly 25% of organizations using them, and the market is expected to grow to over $142 billion by 2024. In retail and eCommerce, chatbots enhance the shopping experience, boost sales, and collect customer data. For example, Lego's chatbot, Ralph, drove 25% of social media sales and reduced conversion costs by over 70%. However, some users still find chatbots less effective than human agents. This study highlights the need to evaluate chatbots' conversational quality to meet user expectations better. Doing so can improve the customer experience and build loyalty through AI-driven chatbots.

This research is also relevant for improving public engagement and satisfaction at the Quezon City Hall Environmental Sanitation Division (QCHD-ESD). By using AI chatbots with sentiment analysis, QCHD-ESD can improve service delivery, similar to the improvements seen in corporate settings. Chatbots with good conversational skills can help QCHD-ESD handle public inquiries more effectively, reduce wait times, and allow human staff to address more complex issues. This approach can lead to greater citizen satisfaction and loyalty, showcasing the potential of AI chatbots to enhance public service interactions.

In the study entitled *"Conversational agents in online organization–stakeholder interactions: a state-of-the-art analysis and implications for further research" (2020) by Syvänen, S., & Valentini, C.*, delves into how chatbots are used to communicate between organizations and their stakeholders. By reviewing 62 peer-reviewed articles, the researchers aimed to uncover trends and highlight areas that need more attention. They found that while there's a lot of focus on the technical side of chatbots, there's a significant gap in understanding how they can be used effectively in organizational communication and stakeholder engagement. Most studies look at chatbots from a technical perspective, but there's a need to explore their broader impacts on organizations and society. The researchers call for more contributions from communication scholars to understand how chatbots can enhance corporate communication strategies.

The review also sheds light on the various roles chatbots play, such as providing services, performing logical tasks, and operating autonomously. Chatbots are becoming common in customer service across many industries, and generally, people have a positive view of them. However, most research so far has focused on the details of how chatbots communicate, without looking at the bigger picture of their effects on organizations and their relationships with stakeholders. The study

suggests future research should look into the ethical aspects of using chatbots, how they can improve corporate communication, and their impact on organizational structures and stakeholder relationships.

In the study entitled *"The AI enabled Chatbot Framework for Intelligent Citizen-Government Interaction for Delivery of Services " (2021) by Iqbal Hasan; Sam Rizvi; Sandeep Jain; Sakshi Huria Semantic* modeling of domain knowledge for natural language question-answering has become increasingly popular with the rise of chatbots and voice assistants. These AI-based interactive technologies are assisting organizations and governments in handling tasks like question answering, instant messaging, and promoting services. As government services are often delivered through manual or electronic interactions, there is a significant workload on various departments, leading to many citizen queries going unresolved. Modern intelligent chatbots can simulate human interactions, aiding users unfamiliar with technology to get answers to their specific questions. However, effectively providing domain-specific answers remains a significant challenge.

This paper presents the design of a conversational assistant aimed at addressing user queries and providing administrative support. Developed using Google Dialogflow, the assistant is trained on a domain-specific semantic model, enabling it to intelligently answer queries and process service requests. Analysis

showed that the chatbot operates with approximately 95% accuracy in responding to inquiries. The chatbot has been deployed at the National Informatics Centre (NIC) to assist users with queries related to e-District services, demonstrating its practical application and effectiveness in real-world scenarios.

Enhancing public engagement and satisfaction within the Quezon City Hall Environmental Sanitation Division (QCHD-ESD) can be significantly advanced through the integration of AI conversational support with sentiment analysis. By deploying AI-powered chatbots, QCHD-ESD can efficiently manage and respond to a large volume of public inquiries, providing timely and accurate information. Sentiment analysis further refines this interaction by detecting public sentiment from user inputs, enabling the system to address negative feedback swiftly and effectively. This combination not only streamlines communication but also fosters a more responsive and user-centric service, ultimately improving public satisfaction and engagement with the division's initiatives and services.

In the study entitled "Challenges, opportunities, and innovations for effective solid waste management during and post COVID-19 pandemic" (Nov 2020), by Hari Bhakta Sharma a, Kumar Raja Vanapalli b, VR Shankar Cheela a e, Ved Prakash Ranjan a, Amit Kumar Jaglan c, Brajesh Dubey a b, Sudha Goel a b, Jayanta Bhattacharya b, The COVID-19 pandemic has significantly impacted global

waste generation, necessitating special attention and a dynamic response from policymakers. The unexpected changes in both the composition and quantity of waste have posed unique challenges to the solid waste management sector, revealing critical areas that need improvement.

This study explores the difficulties faced during the pandemic, particularly focusing on biomedical, plastic, and food waste management. These types of waste have become major concerns, requiring innovative solutions to address the emerging issues. The study emphasizes that without active citizen participation and cooperation, the mingling of virus-laden biomedical waste with regular solid waste poses severe health and safety risks to sanitation workers.The pandemic has also led to a resurgence in the use of single-use plastics due to heightened hygiene concerns, especially in personal protection and healthcare. While household food waste might decrease due to more conscious purchasing of non-perishable items during lockdowns, supply chain disruptions could lead to increased food waste from items stuck in transit or lacking proper handling. The study underlines the importance of building resilient, localized supply chains to mitigate such issues in future crises. By highlighting these challenges and offering innovative solutions, the study provides key recommendations for policymakers to better handle potential future pandemics comprehensively. In the study *entitled*

"Cheerbot: A Customer Service AI Chatbot for Foam-Pom Pangasinan "(2021) by Fillian Janine G. Marcelino; Mayumi T. Escubio; Joshua Piolo M. Ocampo; Melinda A. Beninsig Businesses increasingly rely on digital channels to handle customer inquiries, yet customers often face long response times or no response at all.

Foam-Pom Pangasinan's customers frequently experience these issues with inquiry and customer service responses. This study focuses on identifying and analyzing the design elements, features, architectural model, and usability of an AI chatbot application designed for the business. Key features for users and administrators were developed, including a product list, appointment scheduling, an AI chatbot, and feedback collection. The chatbot employs a retrieval-based architectural model to efficiently address user inquiries, selecting the most appropriate response from a pool of candidates. It uses Dialogflow to rank the best response from predefined options. FPreliminary testing with 130 respondents, using USE Questionnaires, indicated above-average scores and positive customer perception of the chatbot. Future research could focus on creating a dynamic application with additional design features, incorporating more regional dialects, adding voice-generated responses and speech-to-text transcription, experimenting with other architectural models, and testing the system with a larger group of respondents

Local Studies In the study entitled *"Adoption of Artificial Intelligence (AI) in Local Governments: An Exploratory Study on the Attitudes and Perceptions of Officials in a Municipal Government in the Philippines" (January 2023), by Charmaine Distor, Odkhuu Khaltar, and M. Jae Moon* Artificial intelligence (AI) is revolutionizing how governments operate around the world, prompting many to integrate AI into their governance strategies. In the Philippines, this potential was recognized with the launch of a national AI roadmap in 2021. This study delved into how AI is being adopted in local governments, specifically in the Municipality of Carmona, Cavite. By surveying local executives and department heads using frameworks from the Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT), the study found that there are generally positive attitudes and intentions toward using AI in government operations. Most factors that influence AI acceptance and adoption were positively linked to these attitudes and intentions, although anxiety about AI had a negative impact. The study's thematic analysis provided deeper insights into the practical challenges and implications of adopting AI in local governance. These findings add to the growing research on AI in government, offering valuable lessons for other municipalities looking to adopt similar technologies.

The insights from the Manila Manor Hotel study on customer satisfaction and sentiment reviews can be really useful for the Quezon City Hall Environmental Sanitation Division (QCHD-ESD). Just as the hotel learned the importance of updating their facilities and being truthful in their online descriptions to make guests happier, the QCHD-ESD can use AI conversational support and sentiment analysis to better understand and engage with the public. By listening to feedback and identifying specific concerns, they can make targeted improvements that directly address public needs. This not only improves the quality of their services but also builds trust and satisfaction among the community.

In the study entitled *"A Chatbot Application and Complaints Management System for the Bangko Sentral ng Pilipinas (BSP)" (2018),by di Castri, S., Grasser, M., & Kulenkampff, A.,* the "RegTech for Regulators Accelerator (R2A)" project partnered with Bangko Sentral ng Pilipinas (BSP) to create a chatbot application and complaints management system. This initiative aimed to address the inefficiencies of BSP's traditional consumer complaints process, which relied heavily on manual methods and outdated technologies. By leveraging AI and big data, the new system automated many aspects of the complaints process, improving speed, accuracy, and accessibility.

The chatbot can handle consumer queries through multiple digital channels like Facebook Messenger and SMS, providing real-time support in both English and Tagalog. This solution not only streamlined BSP's operations but also enhanced their ability to monitor and analyze consumer data for better regulatory oversight. The development process involved several stages, including inception, design sprints, and iterative testing. The collaboration between BSP and R2A ensured that the chatbot was tailored to meet the specific needs of the Philippine financial sector. successful implementation of this prototype demonstrated the potential of regulatory technology (RegTech) to transform traditional financial supervision methods, making them more efficient and responsive to consumer needs. The project also highlighted the importance of embracing innovation and digital transformation in regulatory frameworks to keep pace with the evolving financial landscape In a similar vein to the BSP's chatbot initiative, the study "Enhancing Public Engagement and Satisfaction using AI-conversational support with Sentiment Analysis in Quezon City Hall Environmental Sanitation Division (QCHD-ESD)" explores how AI can revolutionize public services. By implementing AI-driven conversational support, combined with sentiment analysis, QCHD-ESD aims to improve communication with residents regarding environmental sanitation issues. This technology not only allows for real-time, personalized responses but –

also gauges public sentiment to better understand and address community concerns. The ultimate goal is to enhance public satisfaction by making the division's services more responsive and efficient, echoing the broader trend of integrating advanced digital tools to foster better public engagement and operational efficiency in government services.

in the study *entitled "Sentiment Analysis in Customer Experience in Philippine Courier Delivery Services using VADER Algorithm Thru Chatbot Interviews" (2022). by Gandhi, U., Madiwale, H., Mohan, P., & Borse, S.* The study explores the potential of sentiment analysis to gauge customer emotions regarding courier delivery services. By evaluating customer insights, the research aims to link emotional feedback with reviews to measure product performance and customer satisfaction. The process involves three main steps: data collection, data pre-processing, and sentiment analysis. Utilizing the VADER algorithm, emotional data are analyzed, with a chatbot serving as the intermediary for data collection. The sentiment is measured by calculating a compound score, which aggregates and normalizes the valence scores of each word in the dataset. This score helps to categorize customer sentiments as negative, neutral, or positive. The results indicate a high accuracy of 93.33% in sentiment analysis, demonstrating the system's effectiveness. This innovative approach offers a valuable method for understanding customer perceptions

of products and services in the market. Similar to the study on courier delivery services, the Quezon City Hall Environmental Sanitation Division (QCHD-ESD) is leveraging AI-driven conversational support and sentiment analysis to enhance public engagement and satisfaction. By using a chatbot to interact with residents, QCHD-ESD can efficiently gather emotional feedback on sanitation services. This feedback is analyzed to gauge public sentiment, allowing the division to understand and address community concerns more effectively. The approach not only improves communication but also helps tailor services to meet the residents' needs, ultimately fostering a more responsive and satisfactory public service experience.

In the study *entitled "Cheerbot: A Customer Service AI Chatbot for Foam-Pom Pangasinan" (2021) by Fillian Janine G. Marcelino; Mayumi T. Escubio; Joshua Piolo M. Ocampo; Melinda A. Beninsig* Businesses increasingly rely on digital channels to handle customer inquiries, yet customers often face long response times or no response at all. Foam-Pom Pangasinan's customers frequently experience these issues with inquiry and customer service responses. This study focuses on identifying and analyzing the design elements, features, architectural model, and usability of an AI chatbot application designed for the business. Key features for users and administrators were developed, including a product list, appointment

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Synthesis

The Review of local and Foreign Literature by "Voice Marketing: Harnessing the Power of Conversational AI to Drive Customer Engagement" (2023), by Larry Minsky, Scott Westwater, and Chris Fahey "The Rise of Thinking Machines: A Review of Artificial Intelligence in Contemporary Communication" (2024), by Mohammad Javad Gholami and Taqi Al Abdwani "Sentiment Analysis: A Fascinating Problem" (2012), by Liu, Bing In the book entitled "Sentiment Analysis: Mining Opinions, Sentiments, and Emotions" (2016), by hao, Jun, Kang Liu, and Liheng Xu "Understanding Public Perceptions of AI Conversational Agents: A

Cross-Cultural Analysis" (May 2024) by Zihan Liu, Han Li, Anfan Chen, Renwen Zhang, and Yi-Chieh Lee, In the article entitled "Artificial Intelligence in the Philippine Educational Context: Circumspection and Future Inquiries" (May 2023), by Carie Justine P. Estrellado, and John Christian Miranda In the article entitled "Customer Sentiment Analysis for Business Growth" (June 2024), by Inspiro. "Like, Comment, and Share: Analyzing Public Sentiments of Government Policies in Social Media" (December 2023), by Jana Flor V. Vizmanos, Sheila V. Siar, Jose Ramon G. Albert, Janina Luz C. Sarmiento, and Angelo C. Hernandez "Conversational AI - A Complete Guide for [2024]" (February 2024), by Yellow.ai. In the study "In the article entitled "The platformization of the news" by Giuliander Carpes da Silva, will help us to have a better and deeper understanding about this project in developing a management system for Enhancing Public Engagement and Satisfaction using AI-conversational support with Sentiment Analysis in Quezon City Hall Environmental Sanitation Division (QCHD-ESD). The Review of Local and Foreign studies by Increasing customer service efficiency through artificial intelligence chatbot" (2022), by Ivan Martins De Andrade and Cleonir Tumelero "Understanding the user satisfaction and loyalty of customer service chatbots" (March 2023) by Chin-Lung Hsu and Judy Chuan-Chuan Lin, AI In the study entitled "Conversational agents in online organization–stakeholder interactions: a state-of-the-art analysis and implications for further research" (2020)

by Syvänen, S., & Valentini, C. "The AI enabled Chatbot Framework for Intelligent Citizen-Government Interaction for Delivery of Services " (2021) by Iqbal Hasan; Sam Rizvi; Sandeep Jain; Sakshi Huria "Challenges, opportunities, and innovations for effective solid waste management during and post COVID-19 pandemic" (Nov 2020), by Hari Bhakta Sharma a, Kumar Raja Vanapalli b, VR Shankar Cheela a e, Ved Prakash Ranjan a, Amit Kumar Jaglan c, Brajesh Dubey a b, Sudha Goel a b, Jayanta Bhattacharya b In the study entitled "Cheerbot: A Customer Service AI Chatbot for Foam-Pom Pangasinan "(2021) by Fillian Janine G. Marcelino; Mayumi T. Escubio; Joshua Piolo M. Ocampo; Melinda A "Adoption of Artificial Intelligence (AI) in Local Governments: An Exploratory Study on the Attitudes and Perceptions of Officials in a Municipal Government in the Philippines"

Technical Background

The proponents' proposed system is Web-based Application and Requesting of Sanitary permit and Health Certificate for Quezon City Hall Environmental Sanitation Division (QCHD-ESD). The proposed system consists of full authority in transactions. At the same time, the employee will handle the website's user account with assist in Chatbot Conversation but will not have a authority to enter in admin account. And as for the applicant, they will create or connect and email account for them to use the site, ask, raise concern and use-

the AI Chatbot for quick answer in questions.

CHAPTER III

Methodology Results and Discussion

The strategies, tactics, and procedures that the proponents will employ for their research will be covered in the upcoming chapter, providing summary and enough understanding This chapter will discuss the Software Design and Processes, System Architecture, Conceptual Design, Cost-Benefit Analysis, Requirement Analysis, System Flow, and Block Diagrams of the system for Quezon City Hall Environmental Sanitation Division (QCHD-ESD).

System Design, Products, and/or Processes

A web-based Application and Requesting system could be a powerful tool for streamlining the Quezon City Hall Environmental Sanitation Division operations and

Improving applicant engagement. Here are some of the features that such a system might include.

Online Management: The web-based system could allow applicant to request online, which would streamline the requesting process and reduce waiting time on-site

AI Conversation Management: The system could lessen work in answering the queued concerns, making it easier for the employee. They will serve as reserve if the Chatbot can't answer the concern of client.

Complain Management: The Sentiment analysis will track the complain of people how negative the message is. This will range from 1-5.

E-payment Management: The e-payment system serves as innovation for cashless payment and less hassle in paying at Quezon City Hall.

Menu Management: Both systems enable restaurants to manage their menu items, pricing, and descriptions. This can help ensure consistency across online and in-person ordering channels.

Research Design

Agile Application Development is a dynamic and iterative process emphasizing collaboration, flexibility and customer feedback to deliver exceptional software products. Unlike traditional methods,

agile embraces change and allows businesses to respond quickly to market demands ensuring a seamless alignment between development teams and stakeholders. The Agile Software Development process is a flexible and collaborative approach to creating software solutions. Unlike traditional, linear development methodologies, Agile emphasizes adaptability, customer feedback, and incremental progress. The process is centered around small, iterative cycles called “sprints”, where development team work on specific features or functionalities.

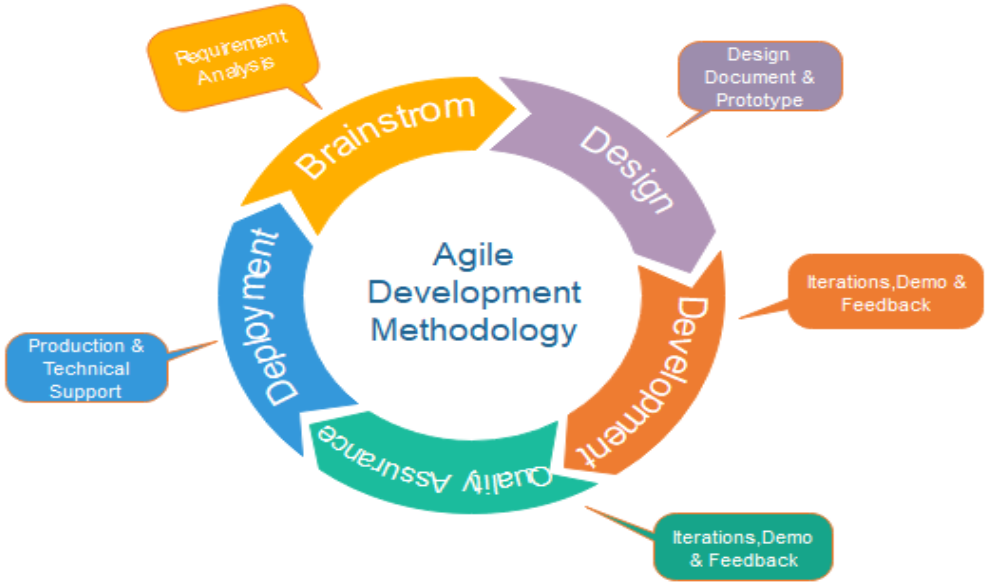


Fig. Agile Model

Figure 1 Agile Methodology

Instrumentation

We are writing to formally ask permission to conduct a comprehensive study on the Quezon City Division of Health (QCDH) to analyze and improve the strategies for getting health certificates and sanitary permits. On February 13, 2024, we conducted an beginning interview with Dr.of M.D and agents from the IT Health Department. This starting discussion allowed us to gain preparatory understanding of the current operations and challenges faced by QCDH in processing health certificates and sanitary permits. In this way, on February 16, 2024, we conducted a follow-up interview. During this session, we were granted permission to observe the continuous operations at QCDH. This observation aimed to identify specific issues within the existing processes and to gather detailed requirements for the proposed improvements. The insights obtained from these interviews and observations are significant for the successful execution of our study. We believe that our findings will contribute altogether to enhancing the effectiveness and effectiveness of QCDH's services.

System Architecture

This section will show the overall behavior of the application. Displaying the blueprints needed in developing the system, this is the core structure from front-end to back-end. The GoDaddy Plan is efficient for webhosting as it offers cheaper monthly payment. As for the front-end and back-end, the proponents chose HTML, CSS, PHP, and Word Press on operating the system.

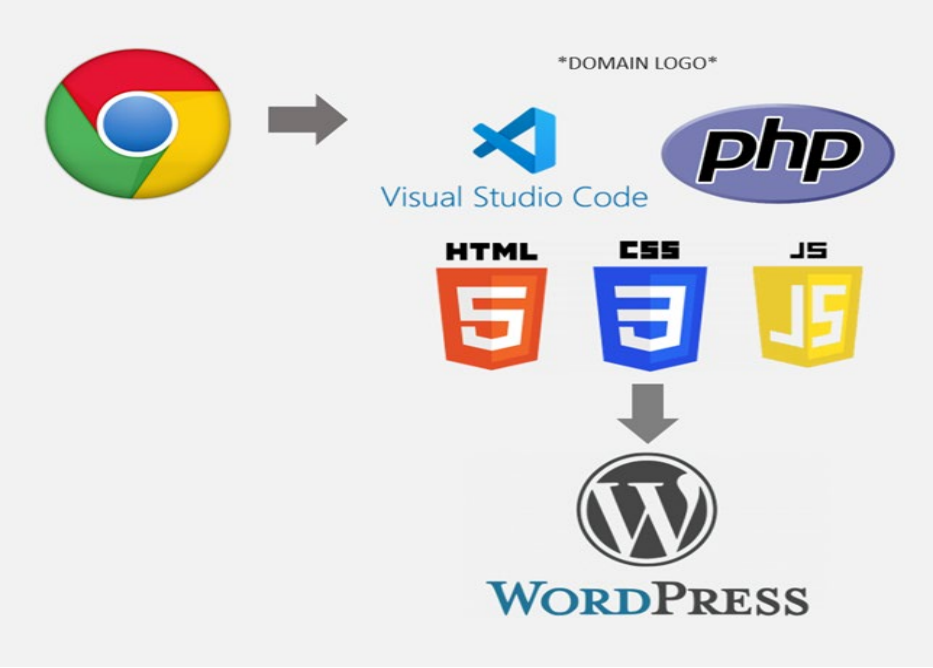


Figure 2 System Architecture

Conceptual Design

The advocates will discuss the proposed system as an Input Output show. This will provide exact and detailed data to back up the validity of the database. In addition, this will help in understanding the models, database structures, classes, processes and strategies. Input Process Output (IPO) – is a design to understand the structure of an information processing program. This segment will show the IPO charts that will describe the modules and information processes of the proposed system

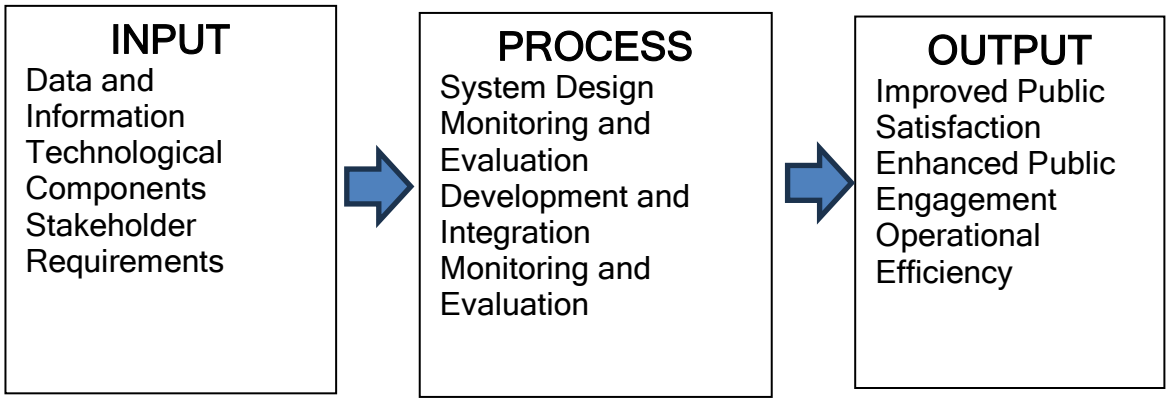


Figure 3 Conceptual Design

Cost Benefit Analysis

This section will involve the cost for the software, hardware that needed in developing the system. The cost-benefit analysis can help the proponents and the beneficiary to determine whether a particular intervention or policy is worth implementing.

SOFTWARE	COST
Visual Studio Code	Free
HTML, CSS	Free
PHP, Word Press	Free
Domain	---------

Table 2 Hardware Cost

Requirement Analysis

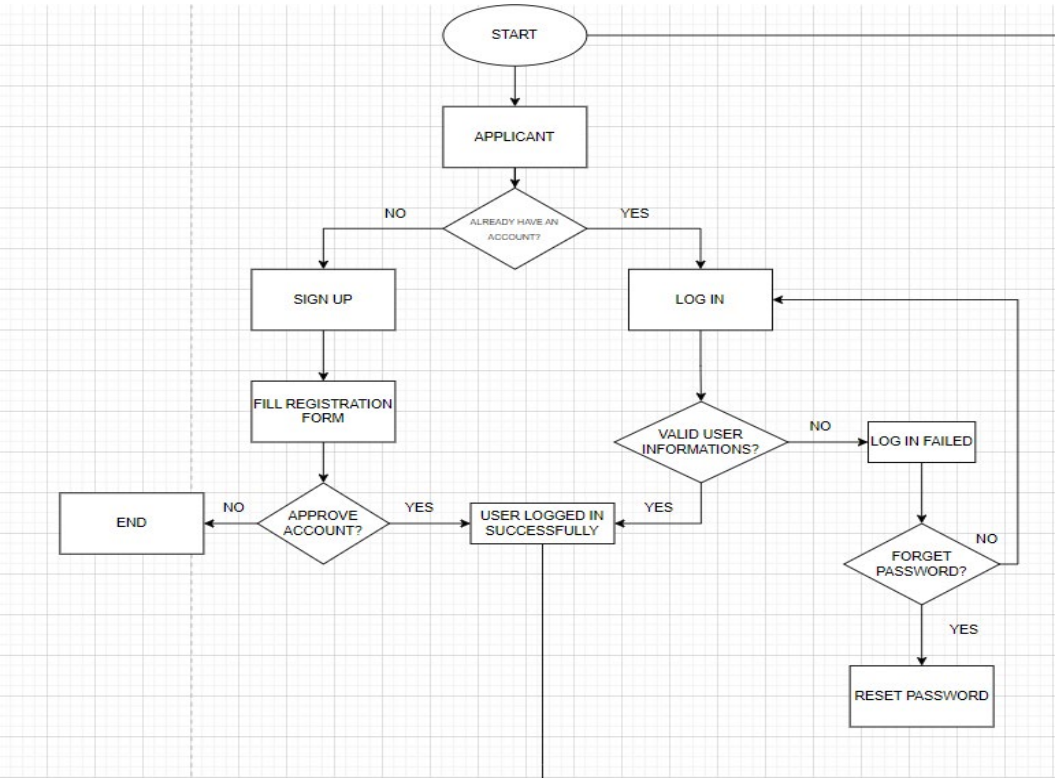
Hardware	CPU	Processor Ryzen 5 5600g 5th gen
	RAM	16GB ddr4 ram
Software	Browser	Latest Version of any Browser
	OS	Windows 10

Table 3 Requirement Analysis

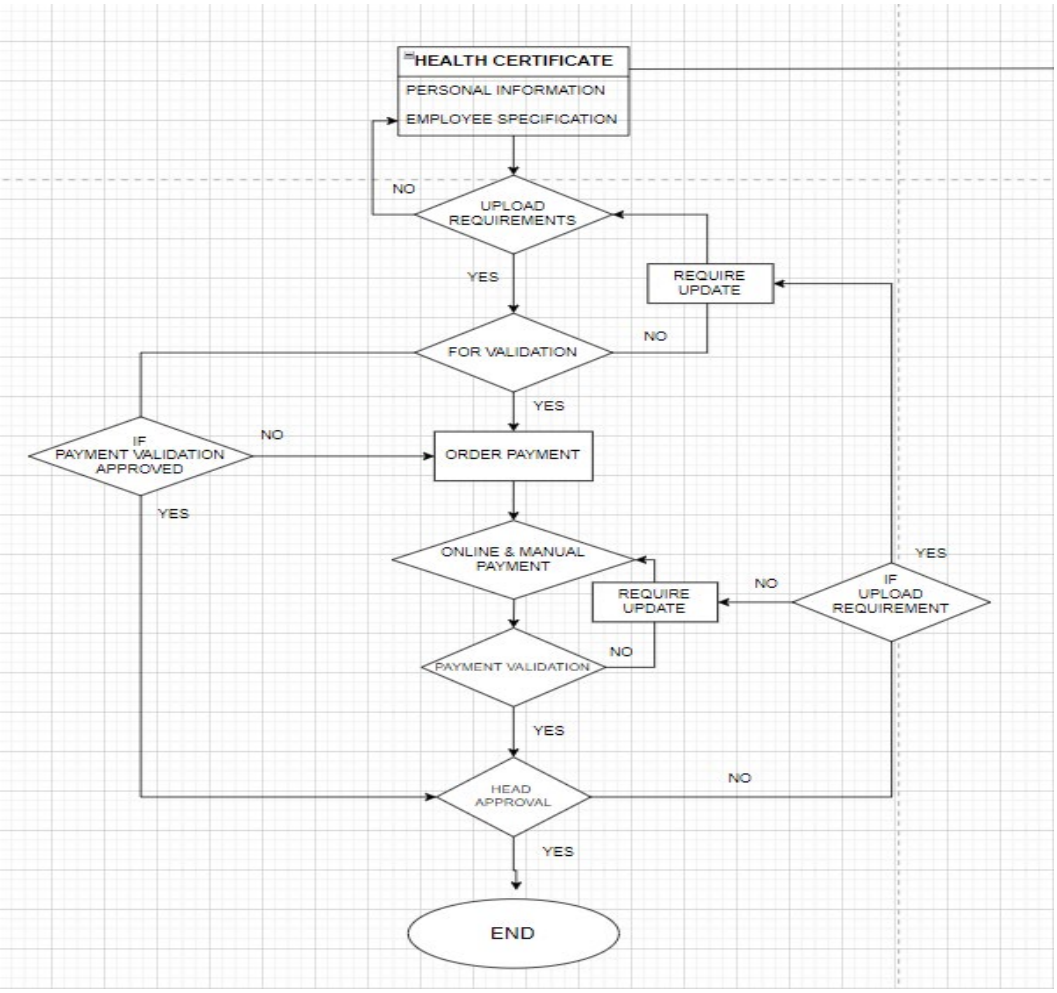
System Architecture/System Flow

This shows the process flow of the system to easily visualize and to understand how the system interacts.

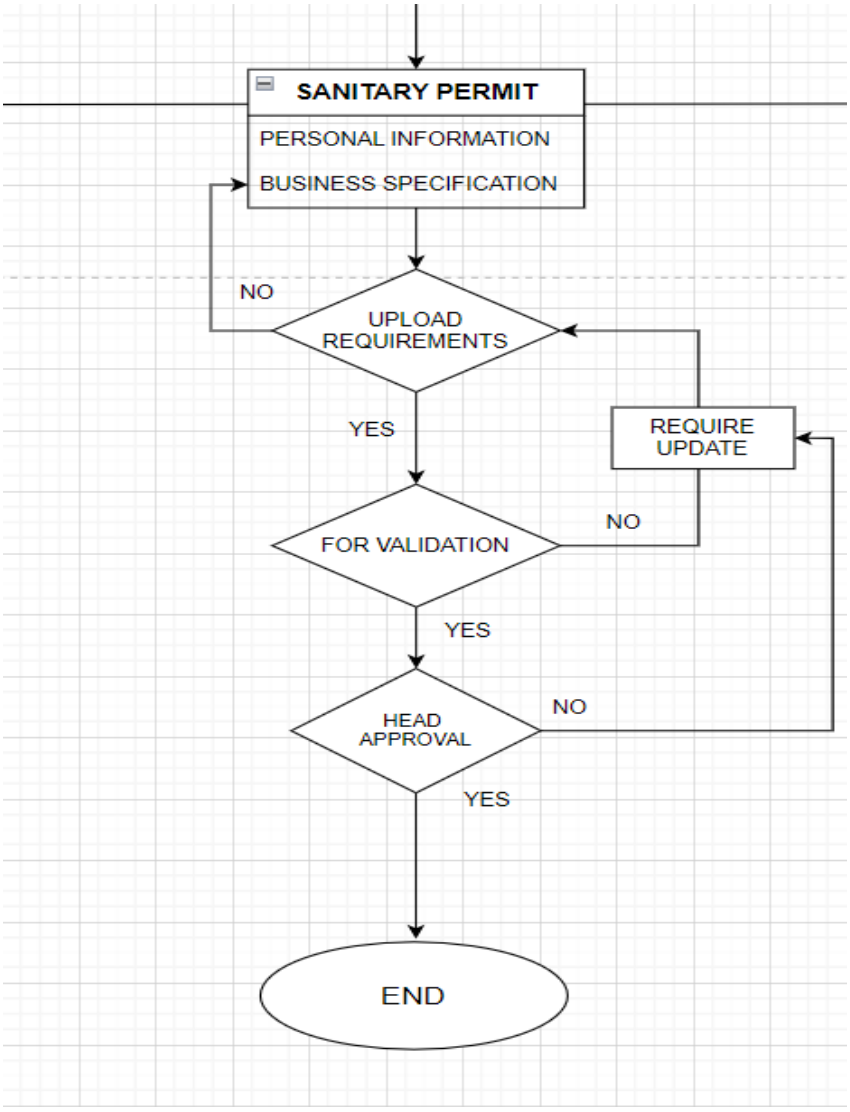
A. User log-in and sign-up



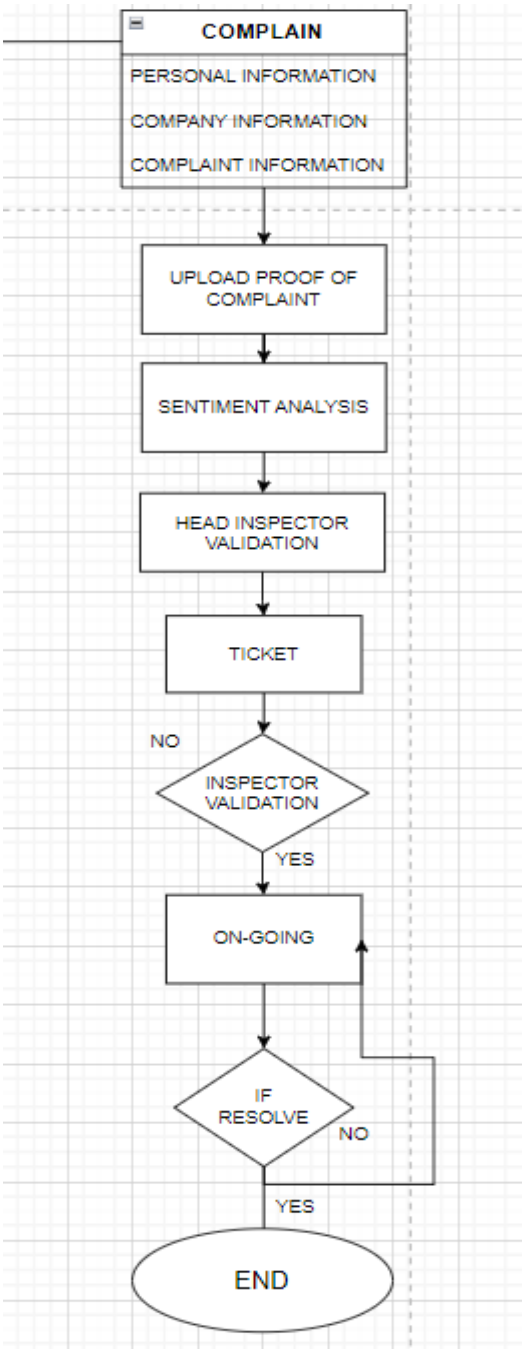
A.1 Health Certificate



A.2 Sanitary Permit



A.3 Complain


COMPLAIN
PERSONAL INFORMATION
COMPANY INFORMATION
COMPLAINT INFORMATION
UPLOAD PROOF OF COMPLAINT
SENTIMENT ANALYSIS
HEAD INSPECTOR VALIDATION
TICKET
NO
INSPECTOR VALIDATION
YES
ON-GOING
IF RESOLVE
NO
YES
END

B. Admin

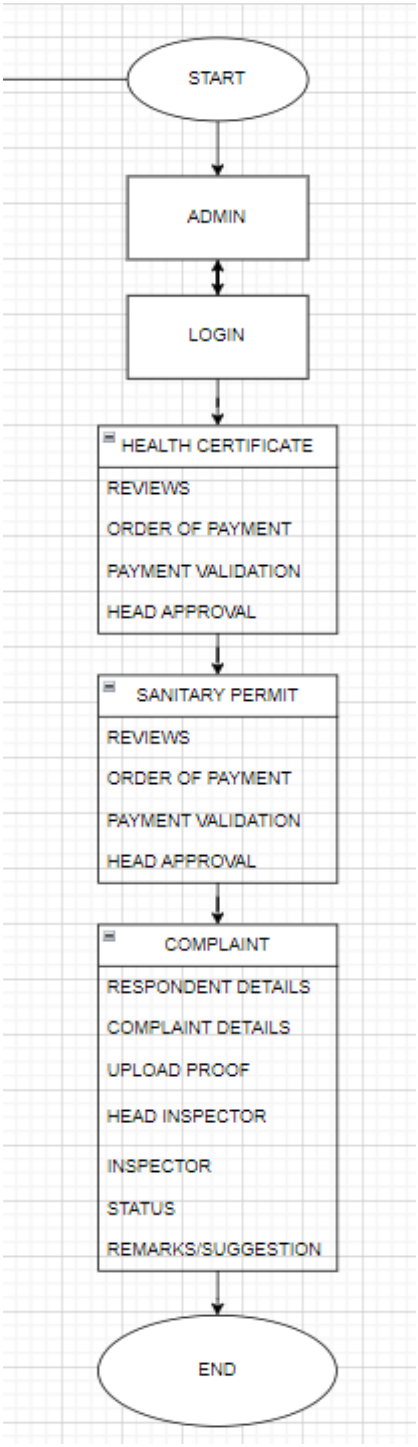
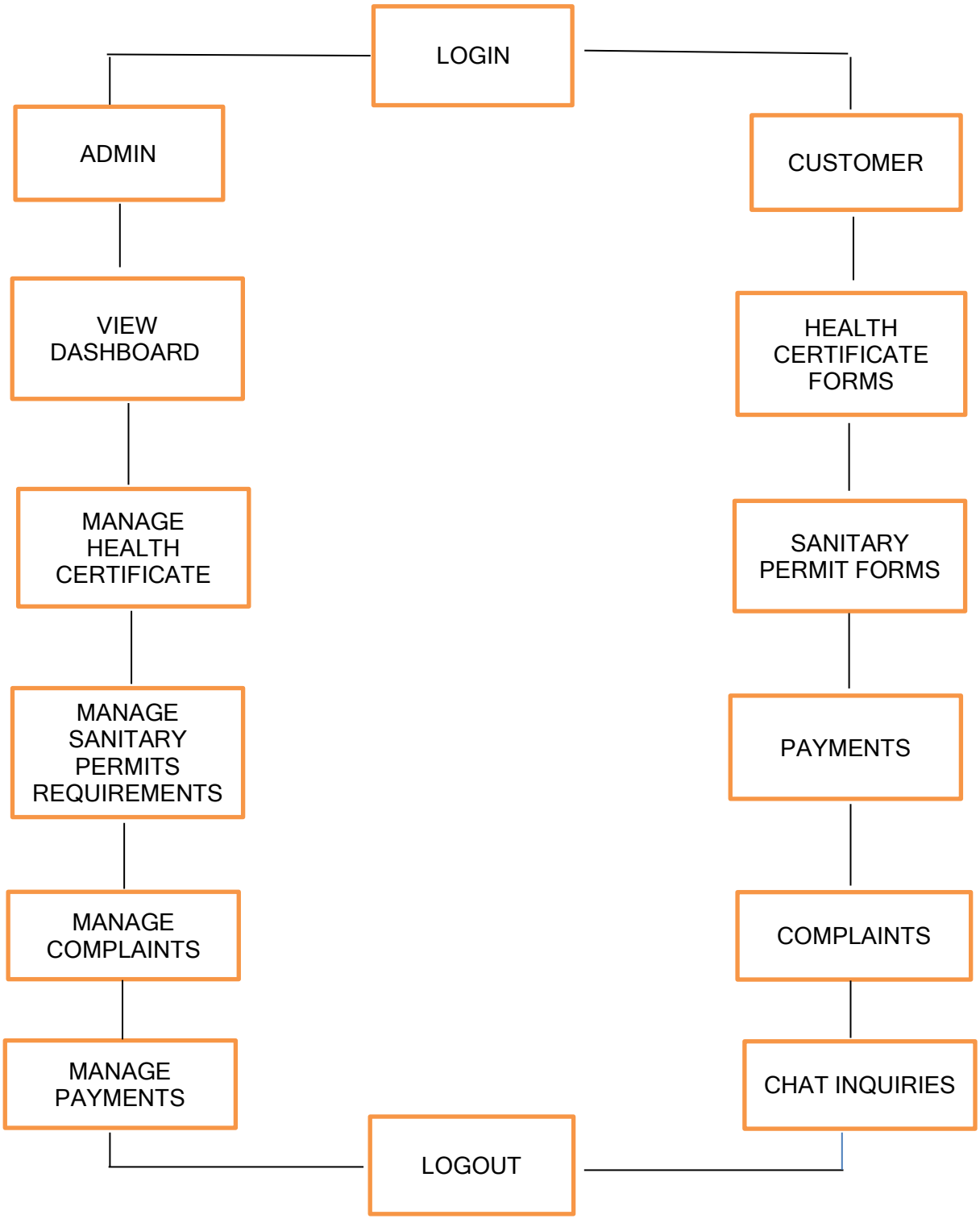

START
ADMIN
LOGIN
HEALTH CERTIFICATE
REVIEWS
ORDER OF PAYMENT
PAYMENT VALIDATION
HEAD APPROVAL
SANITARY PERMIT
REVIEWS
ORDER OF PAYMENT
PAYMENT VALIDATION
HEAD APPROVAL
COMPLAINT
RESPONDENT DETAILS
COMPLAINT DETAILS
UPLOAD PROOF
HEAD INSPECTOR
INSPECTOR
STATUS
REMARKS/SUGGESTION
END

Figure 3 System Architecture/System Flow

Block Diagrams

A Block Diagram can help to clarify complex concepts and to provide an overview of the system. By using a block diagram, the proponents can easily explain the system's features and functionalities. It can also help the proponents to focus their research on the most important features of the system, ensuring that their research is relevant and useful.

Figure 4 Block Diagram


LOGIN
ADMIN
VIEW DASHBOARD
MANAGE HEALTH CERTIFICATE
MANAGE SANITARY PERMITS REQUIREMENTS
MANAGE COMPLAINTS
MANAGE PAYMENTS
CUSTOMER
HEALTH CERTIFICATE FORMS
SANITARY PERMIT FORMS
PAYMENTS
COMPLAINTS
CHAT INQUIRIES
LOGOUT