DESIGN AND IMPLEMENTATION OF A WEB-BASED CRM PLATFORM TO ENHANCE COMMUNICATION AND CUSTOMER INCLUSION IN WASTE MANAGEMENT.

BY

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EDO STATE, NIGERIA.

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A PROJECT REPORT SUBMITTED TO THE DEPARTMENT OF COMPUTER SCIENCE, FACULTY OF COMPUTING, UNIVERSITY OF BENIN, BENIN CITY, IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF A BACHELOR OF SCIENCE (B.Sc.) DEGREE IN COMPUTER SCIENCE

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CERTIFICATION

This is to certify that this project work was carried out by **PURITY E. USIEMWANTA** with Matriculation Number **PSC2105414** under my supervision. It is adequate and satisfactory, both in scope and content, for the award of the Bachelor of Science (B.Sc.) Degree in Computer Science from the University of Benin.

DATE

DR. MAXWELL S. U. OSAGIE
Project Supervisor

APPROVAL

This project work is hereby approved in partial fulfillment of the requirements for the award of Bachelor of Science (B.Sc.) Degree in Computer Science from the University of Benin.

DATE

DR. (MRS.) A. R. USIOBAFO
Head of Department

DEDICATION

This project is dedicated first to God Almighty, whose grace, wisdom, and strength have guided me through every stage of this work and my years at the University of Benin. I also dedicate it to my parents, Mr. and Mrs. Chief S. O. Usiemwanta, for their unwavering love, prayers, and encouragement, and to my wonderful siblings for always believing in me. To my friends and well-wishers who stood by me with their support, motivation, and kind words, you made this journey lighter and more meaningful.

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ABSTRACT

Waste management in Edo State suffers from poor communication, irregular service delivery, and weak accountability due to manual record-keeping and fragmented reporting systems. This study developed a web-based Customer Relationship Management (CRM) platform to improve communication, transparency, and citizen participation in waste management. Using the Waterfall methodology, data were collected through interviews and literature review, guiding the design and implementation of the system with ASP.NET Core MVC, C#, Razor Pages, Tailwind CSS, and Microsoft SQL Server. The platform includes a customer interface for registration, request tracking, real-time chat, and announcements, and a waste manager interface for zone management, complaint resolution, and information sharing. Security measures such as Argon2 password hashing and role-based access control were implemented. Testing confirmed full functionality and reliability. The system enhances service delivery by centralizing communication, standardizing complaint tracking, and promoting citizen engagement, offering a scalable model for technology-driven waste management across Edo State.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Waste management has become one of the pressing environmental challenges facing many developing countries, including Nigeria. The rising population, rapid urbanization, and increase in consumer activities have led to a surge in the volume of solid waste generated daily. Managing this waste effectively remains a major difficulty for government agencies, not only because of the volume involved but also due to weak structures of communication, limited resources, and poor compliance from residents. When waste is not properly managed, the consequences are evident in blocked drainage systems, flooding, outbreaks of diseases, and general environmental degradation. This situation calls for innovative approaches that can strengthen accountability, improve service delivery, and actively involve residents in the waste management process.

In Edo State, the responsibility for waste management falls under the Edo State Waste Management Board (EWMB). The board is tasked with coordinating the collection, transportation, and disposal of waste across the state. The board does not directly collect waste but works through registered private waste managers who are tasked with handling collection at the community level. Residents are expected to pay their waste bills to the government, which in turn compensates the managers, while the board focuses on setting policies, enforcing compliance, and intervening when there are cases of resistance or default. This arrangement, however, often creates a top–down system that leaves residents disconnected from the decision-making process. There is a noticeable gap between the board and the residents it is meant to serve. This gap is reflected in poor communication, irregular collection schedules, and a lack of transparency in service delivery. Many residents often feel isolated from the decision-making process, while the board struggles with enforcement and feedback. As a result, waste collection is inconsistent, and public trust in the system remains low. The purpose of EWMB is to ensure a clean and healthy environment, but the absence of a systematic and interactive platform to connect waste managers directly with residents has weakened coordination and service effectiveness.

Evidence from research in Benin City shows clear inequalities in the performance of waste management across different local government areas. For instance, Agbebaku (2021) found that Oredo Local Government had the highest frequency of waste evacuation compared to

Egor and Ikpoba-Okha. This difference was linked to stronger administrative coordination, better sensitization, and more functional services in Oredo, which also led to residents in that area having a more positive perception of environmental quality. In contrast, Egor and Ikpoba-Okha lagged behind, with irregular collections and lower satisfaction. Some residents in Egor were still engaged in harmful practices such as dumping refuse in floodwaters, which worsens pollution and increases the risk of water-borne diseases. The findings highlight not only the lack of uniformity in service delivery but also the urgent need for better education, timely communication, and structured coordination across the state.

Similar patterns have been observed in other parts of Nigeria. For example, the Rivers State Waste Management Agency (RIWAMA) was found to have very high levels of public awareness about its campaigns, yet this awareness did not translate into high compliance with waste disposal rules (Obuah & Okon, 2017). One reason identified was the lack of strong enforcement, since many offenders were not prosecuted. Another reason was the weakness of interpersonal communication, as the agency's messages often did not pass through trusted community leaders, religious heads, or traditional rulers. These gaps show that while information dissemination through radio and television is useful, behaviour change often requires closer, two-way communication. As Usua (2016), as cited in Okeke et al. (2024), pointed out, interpersonal and participatory communication remains crucial for building lasting awareness and changing harmful practices.

Communication is central to effective waste management. It is not enough to simply provide trucks and bins; residents must be properly informed, guided, and involved in the system. As studies by Ezeah et al. (2013) and Adeniran (2017), as cited in Okeke et al. (2024) note, waste management communication strategies aim to raise awareness, shape behaviour, and promote participation. This involves not just telling people what to do, but also listening to them, engaging them through community meetings, campaigns, and digital platforms, and building trust. When communication is open and reliable, residents are more likely to comply, while agencies gain credibility and accountability.

One approach that has been shown to improve communication and accountability is the use of Customer Relationship Management (CRM) systems. Traditionally used in the private sector to manage customer interactions, CRM tools are now being explored in the public sector as a way to enhance service delivery. A CRM platform is basically a digital system that allows organisations to keep track of their customers, their needs, their complaints, and their

satisfaction levels. Mai and Reicher (2021) note that although CRM has not been widely adopted by governments due to complexity, it holds great potential to bridge gaps between citizens and public institutions. In waste management, a CRM system could enable residents to receive timely updates about collection schedules, report missed pickups, get quick responses to complaints, and access important information such as policy changes, state announcements, and other updates the waste managers may wish to share. For the waste managers, it provides a structured way to monitor performance, gather data, sustain constant communication with their customers, and make informed decisions.

Furthermore, lessons from Public-Private Partnerships (PPPs) in waste management across countries (Okeke et al., 2024) show the benefits of combining communication with innovation. In Lagos, partnerships between LAWMA and private companies used billboards, jingles, and social media to raise awareness. In Accra, town hall meetings and mobile applications were used to engage residents directly. In Mumbai, street plays and school programs formed part of education campaigns, while in New York and Sydney, mobile apps allowed residents to check schedules and report issues. Despite challenges like language barriers, resistance, or infrastructure gaps, these initiatives show that effective communication and technology can improve participation and build trust.

In Edo State, such innovations are urgently needed. The irregularities in waste collection, the persistence of harmful practices, and the unequal distribution of services across LGAs reveal a broken communication chain between residents and managers. Recent reports highlight that even the Edo State Government has expressed dissatisfaction with the operations of waste managers, issuing warnings over poor performance and irregular service delivery (Vanguard, 2025). This public reprimand underscores the urgent need for stronger systems of accountability and communication between the state board, service providers, and residents. While Oredo may serve as an example of better coordination, other LGAs remain left behind. In response, a digital CRM platform tailored to Edo's waste management sector could help close this gap by improving interaction between residents and private waste managers operating under the supervision of the Edo State Waste Management Board. Through notifications, reminders, educational tips, and a space for feedback, the system can promote greater transparency, improve accountability, and encourage compliance.

The background of this study, therefore, rests on the intersection of three realities: (1) the urgent need to improve waste management in Edo State, (2) the central role of

communication and community participation in achieving sustainable practices, and (3) the potential of CRM technology to bridge gaps and transform the relationship between government agencies and the public. By exploring these issues, this research aims to provide a pathway towards a cleaner and more sustainable Edo State, where waste management is not just a government duty but a shared responsibility supported by trust, accountability, and effective communication.

1.2 Problem Statement

In Edo State, waste management is unreliable due to delayed collections, poor responsiveness, and little involvement of residents in the process. There is no proper system for communication between waste managers and the community, leaving people without channels to report issues, request services, or follow up on complaints. This weakens accountability, harms the environment, and reduces public trust. At the same time, many residents lack awareness of proper waste practices and government policies, which leads to misinformation and harmful disposal habits. Overall, the absence of a customer-centered digital system makes waste management operations one-sided, with little transparency or feedback from the people it serves.

1.5 Motivation

The motivation for this study comes from a personal concern about how poor waste management continues to affect both people and the environment in Edo State. Seeing the irregular collections, weak communication, and lack of accountability among waste managers has shown how much residents are left out of a system that is supposed to serve them. I am motivated to contribute a solution that makes waste management more inclusive by placing residents at the center through a digital Customer Relationship Management (CRM) platform. This system will not only help managers improve service delivery but also give residents a stronger voice, build trust, and promote a cleaner and healthier state for everyone.

1.4 Aim and Objectives

Aim:

The aim of this project is to design and implement a web-based Customer Relationship Management (CRM) platform that enhances communication, accountability, customer involvement, and public awareness in the waste management process in Edo State.

Objectives:

To achieve the stated aim, the project is guided by the following specific objectives:

1. To examine the existing challenges in communication and service accountability between waste managers and customers in Edo State.
2. To develop a CRM platform that enables customers to submit complaints, service requests, and feedback digitally.
3. To implement a CRM with timely information and educational content on waste management policies, updates, and best practices that will promote customer engagement and service transparency.
4. To evaluate and test the usability, performance, and potential impact of the CRM platform on communication, accountability, and customer participation in waste management.

1.5 Research Questions

This project seeks to answer the following research questions:

1. What are the current communication and accountability gaps between waste managers and customers in Edo State?
2. How can a CRM platform improve customer involvement and responsiveness in the waste management process?
3. What features are necessary to service request reporting, complaint handling, and performance monitoring?
4. How can digital tools be used to educate customers on waste policies, procedures, and best practices?
5. What effect does timely access to information have on customer participation and service quality?
6. How effective is the developed CRM platform in improving transparency, feedback, public awareness, and service delivery?

1.6 Significance of the Study

This study is significant because it addresses two major problems in Edo State's waste management system: poor communication and weak accountability between residents and waste managers. Many residents do not know how to report problems, get feedback, or access reliable information about proper waste disposal and policies. This gap reduces public participation and weakens trust in the system.

By introducing a web-based CRM platform, the study provides a structured way for residents to report complaints, follow up on service requests, and receive timely updates and educational content. The system connects residents and waste managers directly, creating an easier and more transparent communication process.

The study benefits different groups:

1. Residents and Businesses: Gain a reliable channel to report issues, follow up on complaints, and receive updates, which helps them stay informed and involved.
2. Waste Management Companies: Improve service delivery, track requests efficiently, and strengthen accountability and customer satisfaction.

3. Software Developers and Researchers: The project serves as a case study on how technology can be used to solve social and local environmental problems, while also contributing to studies on civic technology and smart city systems.

Overall, this study promotes accountability, improves communication, and shows how digital technology can be used to strengthen community participation and environmental responsibility in Edo State.

1.7 Scope of the Study

This study focuses on developing and testing a web-based Customer Relationship Management (CRM) system designed to improve communication, transparency, and public awareness in Edo State's waste management sector. The system connects residents and businesses directly with waste managers, allowing them to report issues, follow up on complaints, and access accurate information about waste policies and proper disposal practices. It serves two main user groups: customers and waste managers. The platform's core functions include submitting feedback, tracking service requests, receiving updates, and providing waste managers with a dashboard to manage reports and monitor their performance.

The study is limited to Edo State and focuses mainly on areas facing challenges with irregular waste collection. Although the system is designed to be scalable, this version does not include features such as payment integration, physical waste tracking, or route optimization. The platform is implemented as a working prototype that can be accessed through standard web browsers. While it is not a standalone mobile app, the customer interface and dashboard are mobile responsive, allowing users to access the system easily on smartphones and other devices.

1.8 Limitations of the Study

This study is limited to Edo State, with a particular focus on Benin City, and may not fully capture the waste management challenges of other states in Nigeria. Although data were collected through interviews with a small number of residents and waste managers, the sample size was not large enough to represent the entire population. Therefore, the findings should be viewed as indicative rather than conclusive.

The research also makes use of secondary data such as reports and publications, which may not reflect recent developments in waste management operations. Technically, the CRM platform developed is a working prototype designed within the limits of time and available

resources. Its full-scale deployment would require further funding, field testing, and collaboration with relevant authorities.

In addition, practical challenges such as poor internet access, limited digital literacy among users, and resistance to adopting new systems may affect the platform's real-world application. Despite these limitations, the study provides valuable insight into how technology can improve accountability and communication between residents and waste managers in Edo State.

CHAPTER 2

LITERATURE REVIEW

2.1 Review of Related Works

Waste management has remained a persistent challenge in many developing countries, and several studies have attempted to explore the issue from different angles, ranging from environmental perception to communication strategies, digital engagement, and customer relationship management (CRM) applications in the public sector. This section reviews related works in order to situate the present study within existing academic discussions.

What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050 is the World Bank's comprehensive global report, which provides one of the most authoritative baselines for understanding the scale of solid waste management challenges worldwide. The study synthesizes data from over 200 countries and projects that global waste generation will increase by 70% from 2016 to 2050, reaching 3.4 billion tonnes annually (World Bank, 2018). The report highlights that low-income countries currently generate about 93% of waste that is openly dumped, compared to only 2% in high-income countries. This disparity underscores how structural inequalities, weak waste management systems, and inadequate funding perpetuate environmental degradation and public health risks in developing regions. Importantly, the report emphasizes the role of effective governance, citizen engagement, and accountability in ensuring sustainable waste systems. The World Bank further stresses that solutions cannot be purely technical but must integrate financial sustainability, institutional coordination, and social awareness. This global perspective is highly relevant for Nigeria, where ineffective waste collection and disposal practices mirror the broader challenges identified in the report. The findings create a foundation for situating this research within the global discourse, while also pointing to the urgent need for local innovation in communication, accountability, and stakeholder engagement.

Agbebaku (2021), Perception of Residents on the Menace of Solid Waste in Benin City, Edo State, examines the unequal treatment and differences in waste collection services across three Local Government Areas in Benin City through a survey of 1,781 residents from Oredo, Egor, and Ikpoba-Okha council areas. The study shows clear discrimination in service delivery, with Oredo LGA (the government headquarters area) receiving more regular weekly and fortnightly waste collections compared to Egor and Ikpoba-Okha, which experience irregular and delayed services. The research reveals that while 23.3% of residents understand

the link between waste disposal and environmental quality, poor waste disposal methods like open dumping (61.5%) and open burning (26.7%) still dominate across the city. Economic and spatial inequalities are evident in waste storage practices, as Ikpoba-Okha residents mainly use cheaper baskets and sack bags (43 and 390 respondents, respectively) because they cannot afford better options, while Oredo residents use more permanent block structures (209 respondents). Environmental quality ratings also reflect this discrimination - 61.3% of residents perceive clean air quality, 29.9% notice clean water, and only 8.8% report clean land, with wealthy areas like GRA and Legislative Quarters in Oredo enjoying "very good" to "good" ratings while poorer communities like Aduwawa, Okhoro, Gorretti, and Idogbo receive "poor" ratings. The study exposes how government presence determines service quality, as areas near government offices get priority treatment while neglected neighborhoods suffer from heaps of uncollected garbage, blocked drainage channels, bad smells, ugly surroundings, and health risks, creating unfair environmental conditions that threaten the health and safety of residents in marginalized communities.

Aliu (2025) reports in the article, *"Edo government reads the riot act to waste managers over operations"*, that the Edo State Government, through the Edo State Waste Management Board (ESWMB), issued a stern warning to waste managers over poor operational performance, including irregular collections and failure to meet contractual obligations. The article highlights ongoing inefficiencies and accountability challenges in Edo State's waste management sector, where several contractors have failed to meet required service standards despite prior government interventions. This situation underscores the persistent lack of structured monitoring and communication systems between waste managers, government authorities, and residents. While the government's directive emphasizes enforcement, the report reveals that regulatory measures alone are insufficient to ensure effective waste management. Sustainable improvement requires digital tools that can facilitate communication, track performance, and document service outcomes.

The issues described in the article strengthen the case for developing a Customer Relationship Management (CRM) platform tailored to waste management. Such a system would enhance transparency, allow residents to report service issues directly, and enable waste managers to provide timely responses and updates, thereby bridging the accountability gap highlighted in the report.

In *The Potentials of CRM Application in the Public Sector,* Mai and Reicher (2021) examined the evolution of Customer Relationship Management (CRM) systems and how they have shifted from traditional customer databases to interactive, technology-driven tools that promote two-way communication. The study explains that modern CRM systems now emphasize customer engagement and data-driven decision-making rather than just record-keeping. This transition, often described as "social CRM," shows how digital tools can strengthen relationships between organizations and their users through transparency, participation, and feedback. Mai and Reicher (2021) also note that CRM platforms are no longer limited to businesses but can be applied in broader contexts where communication and trust are key to success. This insight strongly supports the idea of using a CRM platform for waste management, where residents act as customers and active participants. By creating a structured system that allows feedback, complaint tracking, and access to updates, the proposed CRM for waste management mirrors the interactive principles discussed by Mai and Reicher (2021).

Overall, the paper strengthens this project by showing that CRM technology can go beyond commercial use to build stronger relationships between service providers and the public. It confirms that effective CRM systems must combine communication, participation, and data analysis, all of which are central to the proposed waste management platform.

Perez-Vega et al. (2022) in *From CRM to social CRM: A bibliometric review and research agenda for consumer research explored the shift from traditional Customer Relationship Management (CRM) systems to Social CRM*, showing how digital technologies and social media have transformed the relationship between organizations and their customers. The study highlights that modern CRM systems are no longer limited to storing and managing customer data; instead, they support real-time engagement, interaction, and relationship building. This evolution encourages transparency, responsiveness, and continuous feedback between service providers and users. The paper emphasizes that effective CRM systems rely on two-way communication, where customers are not just recipients of information but active participants in shaping service delivery. This idea strongly supports the aim of this project, which focuses on improving communication and accountability in waste management through a web-based CRM platform. Furthermore, Perez-Vega et al. (2022) underline the importance of integrating customer feedback into organizational processes to build trust and satisfaction, which is an approach that can enhance citizen inclusion and service responsiveness in Edo State's waste management sector.

The study, *Evaluation of Communication Interventions for Improved Waste Management System in Nigeria,* examines how effective communication strategies within Public-Private Partnerships (PPPs) can improve waste management and reduce unsafe scavenging practices. Using Social Marketing Theory, the authors reviewed twelve international case studies from cities such as Lagos, Accra, Mumbai, and New York. They found that successful waste management relies on strong communication through public campaigns, social media feedback, mobile apps for scheduling, and community education.

In Nigeria, rapid urbanization and weak infrastructure have worsened waste problems and encouraged risky scavenging for recyclables. The study highlights that communication plays a key role in changing behavior and promoting collaboration between residents, private firms, and government agencies. Lagos's use of radio, billboards, and community programs shows how awareness can boost participation, though challenges like language barriers and weak enforcement persist.

Okeke et al., (2025) conclude that many communication efforts in Nigeria fail due to corruption and poor governance. They recommend adopting Social Marketing Theory principles to tailor messages to local audiences, strengthen PPPs, create safer jobs for waste pickers, and promote citizen involvement in decision-making to achieve sustainable waste management.

Obuah & Okon (2017) in *Environmental communication strategies of the Rivers State Waste Management Agency (RIWAMA): Implications for sustainable waste management in Nigeria,* examine the effectiveness of RIWAMA's communication methods through a survey of 158 agency staff and 362 Port Harcourt residents, revealing a critical gap between awareness and action. While 87% of residents know about RIWAMA and its programs (weighted mean score of 4.33), actual compliance with waste disposal instructions remains very low (WMS 2.24), showing that awareness alone does not lead to behavior change. The study exposes major weaknesses in RIWAMA's approach, including heavy reliance on radio (WMS 4.21) and television (WMS 3.74) while neglecting interpersonal channels like traditional rulers, religious leaders, and community elders (WMS 1.89), limiting messages to only English and Pidgin while ignoring local languages like Kalabari, Ikwerre, Ogoni, Igbo, Yoruba, and Hausa, poor awareness of digital platforms and mobile apps (WMS 1.97), and absence of fear appeals or prosecution threats despite residents acknowledging that people rarely comply because offenders are hardly punished (WMS 3.21). The research shows RIWAMA's strength

in message clarity (WMS 4.29) but highlights that high awareness without compliance indicates deeper communication failures. The authors recommend prioritizing interpersonal communication through community and religious leaders for better attitude change, incorporating fear appeals and prosecution warnings into messages, developing multilingual campaigns reflecting Port Harcourt's linguistic diversity, increasing message frequency beyond weekly patterns, and strengthening enforcement by actually prosecuting offenders to create deterrent effects and demonstrate seriousness about environmental laws.

Oke et al., (2022), *Designing Effective Waste Management Practices in Developing Economies: The Case of Suriname*, explores waste management challenges through interviews with 15 key informants, revealing that Suriname, like Nigeria, lacks a formal waste management system with open dumping and uncontrolled burning as dominant practices. The study exposes critical gaps in government commitment, showing that while villages maintain cleaner environments due to residents' strong connection to nature and altruistic values, city dwellers engage in littering and illegal dumping despite higher education levels, proving that formal education alone cannot drive behaviour change without proper facilities and government support. Major barriers include government preference for temporary solutions over sustainable strategies, ineffective collection services forcing residents to pay expensive private collectors (special yellow garbage bags cost SRD 12.50 per bundle which many families cannot afford), absence of waste separation systems, lack of enforcement despite existing anti-littering laws, and limited collaboration between government and NGOs. The authors recommend that the government must demonstrate commitment through effective policies and enforcement, strengthen partnerships between government, NGOs, and private companies, involve citizens in designing locally appropriate waste schemes, introduce financial instruments to fund collection services, and implement monitoring systems for continuous evaluation rather than temporary fixes.

Nwafor & Okamgba, (2024) *Communicating Solid Waste Management Information through Social Media Platforms for Sustainable Development in Nigeria: A Review of Anambra Broadcasting Service Facebook Messages* examines how Anambra Broadcasting Service (ABS) uses Facebook to share solid waste management information, revealing that social media platforms offer powerful opportunities for reaching diverse audiences and creating environmental awareness in Nigeria where improper waste disposal causes pollution, health problems, and economic losses. The study shows ABS employs multiple communication formats on Facebook, including audio messages (news, jingles, and announcements in Igbo

and English), video content showing cleanup activities like the Okpoko slum cleaning in Onitsha, pictorial messages documenting monthly environmental sanitation exercises and arrests of violators, and textual posts primarily in English sharing news and government announcements about waste management. Key findings emphasize that effective social media communication requires understanding target audiences, selecting appropriate channels and tools, creating visually engaging content, tailoring messages to local contexts, and developing strategic plans for sustained communication efforts. The authors highlight that social media provides advantages including responsive global access (with Facebook waste management accounts having over 180,000 members), immediate contact and feedback opportunities for addressing public concerns, and the ability to encourage environmentally friendly attitudes through continuous engagement, making it more sustainable than traditional publicity methods like posters and newspapers for promoting awareness and behavioural change toward sustainable waste management practices.

The study by Shofiana et al., (2025) focuses on developing a *Public Complaints Information System in Government to Improve Website-Based Public Services* in service delivery in Lahar Village, Indonesia. The research highlights how digitizing the complaint process enhances transparency, accountability, and responsiveness within local governance. Using the Waterfall development model, the system was designed with user-friendly features such as online complaint submission, real-time status tracking, and report generation. These tools ensure that residents can monitor how their issues are handled, promoting trust and participation.

This research strongly supports the idea of applying digital platforms, such as Customer Relationship Management (CRM) systems, to improve communication between service providers and citizens. Its emphasis on feedback loops, efficient record-keeping, and data accessibility aligns with the goals of enhancing accountability and inclusion in public service systems which is similar to what a waste management CRM platform seeks to achieve. The study demonstrates that web-based solutions can simplify administrative processes, strengthen government–citizen relationships, and ensure timely responses to complaints, thereby improving overall service quality.

2.2 Critical Analysis of the Studies

Global and Regional Perspectives

The reviewed literature establishes that waste management is a global challenge, but its effects are more critical in developing countries due to poor governance structures, lack of

enforcement, and minimal citizen participation. The World Bank (2018) report presents alarming statistics that highlight the imbalance between high-income and low-income nations, showing that poorer regions contribute significantly to open dumping and environmental degradation. The report emphasizes that solving waste problems requires more than just technical improvements; it demands community involvement, public accountability, and transparent communication systems. This global insight aligns with the Nigerian context, where waste management is still largely informal and inconsistent.

Similarly, Oke et al. (2022) in their study on Suriname reveal parallels between developing economies: weak institutional commitment, limited coordination between government and citizens, and preference for temporary fixes rather than long-term strategies. Both studies suggest that technology-driven systems that promote transparency, accountability, and inclusion can support effective waste management. These findings provide a solid theoretical foundation for this research, which proposes a CRM platform as a structured digital framework for managing communication and accountability between residents and waste managers.

Communication and Behavioural Change Studies

Several scholars have explored the influence of communication in promoting sustainable waste management practices. Obuah and Okon (2017) examined the operations of the Rivers State Waste Management Agency and discovered that although residents were aware of the agency's campaigns, this awareness did not translate into compliance. Their research indicates that communication through mass media such as radio and television often fails to drive behavioural change because it lacks personalization and feedback. In contrast, interpersonal communication and participatory dialogue tend to yield stronger community involvement.

Similarly, Okeke et al. (2025) examined communication interventions in waste management under Public–Private Partnerships and concluded that ineffective communication, especially one-way campaigns, hinders collaboration between citizens and service providers. The authors recommend applying Social Marketing Theory to tailor messages to community needs, emphasizing sustained engagement and behavioural reinforcement.

Additionally, Nwafor and Okamgba (2024) highlight the growing potential of social media platforms like Facebook in shaping public attitudes. They argue that digital channels allow for more responsive, interactive communication that can promote continuous engagement

between waste agencies and residents. Collectively, these studies support the need for a participatory and technology-enabled platform such as a CRM system that encourages dialogue, feedback, and accountability in waste management.

Edo State–Specific Studies

At the state level, Agbebaku (2021) and Aliu (2025) offer direct insight into the waste management realities in Edo State. Agbebaku's empirical study identifies spatial inequalities in service delivery across Benin City's local government areas. Oredo LGA, where government offices are concentrated, receives more consistent waste collection than Egor and Ikpoba-Okha, where residents experience irregular pickups and poor sanitation. This imbalance exposes governance gaps and the absence of mechanisms that ensure equitable service delivery.

Complementing this, Aliu (2025) reports that the Edo State Government has repeatedly issued warnings to waste contractors over inefficiencies, signaling a persistent accountability crisis within the system. Despite these interventions, the lack of a structured monitoring or reporting framework prevents consistent performance evaluation. The findings from these studies highlight the communication and accountability voids within Edo State's waste management structure, underscoring the need for a system that connects waste managers directly with residents. A digital CRM-based platform would help bridge this gap by providing transparency, feedback tracking, and equitable access to information.

Governance, Accountability, and Technology

Technology is widely recognized as a driver of accountability and transparency in public management. Mai and Reicher (2021) emphasize that modern CRM systems have evolved from basic customer databases into interactive tools that support two-way communication and relationship management. Their study shows that CRM applications can enhance service delivery in both private and public organizations by improving responsiveness and information flow. Similarly, Perez-Vega et al. (2022) demonstrate that the transformation from traditional CRM to social CRM introduces participatory features that allow customers, or in public contexts, citizens to co-create value and actively engage in decision-making processes.

In the same line, Shofiana et al. (2025) show how web-based complaint systems in local government improve communication, transparency, and responsiveness by enabling users to

submit, track, and review complaints online. These findings collectively establish that digital solutions can foster accountability and strengthen institutional relationships with the public. For waste management in Edo State, applying CRM technology provides an opportunity to modernize service communication, ensure timely response to citizen requests, and maintain digital records for performance evaluation.

Digital Participation and ICT-Based Studies

The reviewed ICT-based studies reveal that digital participation significantly enhances service delivery by allowing users to engage directly with institutions through online platforms. Perez-Vega et al. (2022) highlight how social CRM transforms passive consumers into active contributors by integrating interactive and real-time communication features. Similarly, Shofiana et al. (2025) demonstrate that digitized complaint systems in governance not only promote accountability but also build trust by keeping citizens informed about how their concerns are being handled.

In the Nigerian context, Nwafor and Okamgba (2024) show that social media offers a cost-effective and wide-reaching channel for communicating waste management information, yet institutional adoption remains limited. This points to an untapped opportunity for ICT-driven innovation. For Edo State, implementing a web-based CRM system designed with mobile-responsive interfaces aligns with global trends in digital governance and can significantly improve user inclusion, feedback collection, and operational efficiency in the waste management sector.

2.3 Research Gaps

Although several studies have examined waste management, communication strategies, and digital engagement, there are still significant gaps in both practice and research that justify this study. Most global and regional studies, such as those by the World Bank (2018) and Oke et al. (2022), emphasize the importance of governance and accountability but do not provide specific frameworks for implementing citizen-centered communication systems within local waste management contexts. Their focus is primarily on policy and institutional reform rather than on digital tools that support real-time interaction between service providers and users.

In Nigeria, studies such as Obuah and Okon (2017) and Okeke et al. (2025) reveal that while communication has been recognized as essential for effective waste management, there is limited exploration of structured digital platforms that enable two-way communication and

continuous feedback. Most interventions rely heavily on one-directional mass media campaigns that raise awareness but fail to sustain behavioural change or accountability.

At the state level, Agbebaku (2021) and Aliu (2025) highlight Edo State's persistent waste management challenges, including unequal service delivery, poor monitoring, and lack of transparency. However, no existing research in Edo State has proposed or implemented a Customer Relationship Management (CRM) system that directly connects residents with waste managers. This gap leaves a missing link between the need for improved accountability and the tools that can enable it.

Furthermore, although technological studies such as Mai and Reicher (2021), Perez-Vega et al. (2022), and Shofiana et al. (2025) demonstrate that CRM systems and web-based platforms can enhance communication and public participation, their applications have mostly been explored in business or general public service contexts rather than in waste management. The adaptation of CRM principles to the waste management sector remains under-researched in developing countries like Nigeria.

Therefore, this study fills these gaps by designing and implementing a web-based CRM platform that integrates feedback mechanisms, communication tracking, and educational features to promote accountability, transparency, and citizen inclusion in waste management within Edo State.

2.4 Justification of Approach

The reviewed studies highlight that most waste management problems in developing countries, including Nigeria, are not caused by a lack of technology but by weak communication, poor accountability, and low public involvement. Reports such as What a Waste 2.0 (World Bank, 2018) and Agbebaku (2021) show that inefficiency in service delivery and unequal access to waste collection are linked to poor coordination and limited resident feedback channels. Similarly, Okeke et al. (2025) and Obuah and Okon (2017) demonstrate that awareness alone does not guarantee responsible waste behaviour unless communication is consistent, participatory, and supported by transparent systems.

These gaps justify the adoption of a Customer Relationship Management (CRM)–based approach for this project. Unlike traditional administrative systems, CRM platforms enable real-time interaction, feedback management, and service tracking between users and service providers. Studies by Mai and Reicher (2021), Perez-Vega et al. (2022), and Shofiana et al.

(2025) affirm that CRM systems can enhance transparency and accountability in public services by simplifying communication and record-keeping.

By integrating CRM principles into waste management, this project creates a platform that allows residents to report issues, track progress, and access accurate updates while enabling waste managers to respond efficiently. This approach ensures that communication, responsiveness, and accountability, identified as critical weaknesses in the literature, are directly addressed through digital innovation tailored to local needs.

2.4 Literature Summary Table

Table 2.1: Literature Summary

S/N	Authors	Article Title	Contribution/Findings	Limitations
1.	World Bank (2018)	What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050	Provides a global overview of solid waste management challenges, emphasizing governance, financial sustainability, and citizen engagement as keys to effective waste systems.	Focuses on global statistics without detailing localized technological interventions.
2.	Agbebaku, H. U. (2021)	Perception of Residents on the Menace of Solid Waste in Benin City, Edo State	Highlights inequality in waste collection among Edo LGAs and links poor service to weak government coordination and low citizen engagement.	Concentrates on perception and does not propose digital or communication-based solutions.
3.	Aliu, M. (2025)	Edo Government Reads the Riot Act to Waste Managers over Operations	Exposes inefficiencies and lack of accountability among Edo waste managers; stresses the need for structured monitoring and digital communication tools.	Limited to media reporting; lacks empirical data and detailed system recommendations.
4.	Mai, P., & Reicher, C. (2021)	The Potentials of CRM Application in the Public Sector	Demonstrates how CRM systems enhance communication and	The study remains conceptual, offering little focus on environmental or

			transparency beyond business settings, supporting adoption in public service contexts.	waste management applications.
5.	Perez-Vega, R., Hopkinson, P., Singhal, A, & Mariani, M. (2022)	From CRM to Social CRM: A Bibliometric Review and Research Agenda for Consumer Research	Explains the evolution of CRM into Social CRM emphasizing interaction, trust, and two-way communication; supports CRM use for public accountability.	Focuses on consumer industries rather than civic or environmental systems.
6.	Okeke, A. O., Mohammed, U., & Garba, S. (2025)	Evaluation of Communication Interventions for Improved Waste Management System in Nigeria	Shows how strong communication strategies and Public-Private Partnerships (PPPs) enhance participation and reduce unsafe waste practices.	Communication success depends on governance quality; lacks digital implementation analysis.
7.	Obuah, E., & Okon, G. (2017)	Environmental Communication Strategies of the Rivers State Waste Management Agency (RIWAMA)	Finds that high awareness does not lead to behavioural change due to weak interpersonal communication and lack of enforcement.	Does not explore digital or CRM-based approaches to improve compliance.
8.	Oke, P., Pinas, C., & Osobajo, O. (2022)	Designing Effective Waste Management Practices in Developing Economies: The Case of Suriname	Reveals challenges in waste policy, enforcement, and citizen involvement; calls for stronger institutional commitment and community participation.	Focused on Suriname; lacks technological or digital engagement perspective.
9.	Nwafor, C., & Okamgba, C. (2024)	Communicating Solid Waste Management Information through Social Media Platforms for Sustainable	Demonstrates how social media can raise environmental awareness, encourage feedback, and drive sustainable waste practices.	Emphasizes communication but not integrated CRM or structured data management.

		Development in Nigeria		
10.	Shofiana, D., et al. (2025)	Public Complaints Information System in Government to Improve Website-Based Public Services	Proposes a digital complaint system to enhance transparency, accountability, and responsiveness in governance, aligning with CRM principles.	Focused on the local Indonesian government; it does not address waste management specifically.

CHAPTER 3

METHODOLOGY

3.1 Introduction

The development of the web-based Customer Relationship Management (CRM) platform for waste management in Edo State is guided by a systematic process that integrates research and system design principles. The methodology adopted ensures that the system addresses practical challenges such as poor communication, weak accountability, limited citizen engagement, and inefficient data management within the existing waste management framework.

Through careful analysis and design, the CRM platform is structured to enhance interaction among residents, contractors, and waste management authorities. It supports features such as user registration, service request tracking, complaint resolution, and feedback reporting to strengthen transparency and responsiveness.

This section outlines the methodological approach used to gather relevant data, analyze system requirements, and translate them into a functional design. The aim is to produce a reliable, user-friendly, and sustainable system that improves service delivery and promotes citizen participation in waste management activities across Edo State.

3.2 Software Development Methodology

For the system development process, the Waterfall model was adopted. This choice was based on: (1) the well-defined requirements established through the research phase, (2) the need for comprehensive documentation required in academic projects, (3) the fixed timeline of the project cycle, and (4) its suitability for systems with clearly specified objectives. The Waterfall model's structured and sequential nature allows for systematic progress through each development stage. The phases include:

1. Requirement Analysis: Identification of system needs based on data collected from interviews and literature review.
2. System Design: Transformation of identified requirements into architectural, database, and interface designs.
3. Implementation: Development of the CRM platform using suitable web technologies and frameworks.

4. Testing and Evaluation: System verification, usability testing, and performance assessment to ensure the platform meets design specifications and user expectations.

The integration of qualitative research and systematic development ensures that the CRM system aligns with stakeholder expectations, enhances communication among waste management actors, and promotes efficiency, transparency, and citizen participation in waste management within Edo State.

3.3 System Analysis

3.3.1 Review of Existing System

System Overview and Institutional Framework

Waste management in Edo State operates under the regulatory oversight of the Edo State Waste Management Board (ESWMB), which establishes policies, sets service standards, and enforces compliance across the state. The ESWMB does not directly collect waste but instead licenses and supervises private waste management contractors who are assigned to specific geographical zones. With over 150 zones across Edo State and Benin City, each zone is serviced by designated waste managers responsible for household and commercial refuse collection within their assigned areas.

The system operates on a structured framework where the ESWMB handles regulatory functions, billing, and enforcement, while private waste managers handle operational activities such as customer registration, waste collection, and bill distribution. Payment collection is centralized through government-designated bank accounts specific to each zone, with the ESWMB coordinating with banking institutions and a dedicated billing agency to manage financial transactions and reconciliation. Figure 3.1 shows the system architecture of the existing waste management system in Edo State.

Current System Process Flow

The waste management system in Edo State follows a multi-stage process involving three primary stakeholders: residents (customers), waste managers (contractors), and the ESWMB (regulator).

Registration and Onboarding

When new residents require waste collection services, they are registered by the waste manager assigned to their zone. Waste managers conduct periodic enumerations to identify

new households and businesses within their coverage areas. Registration is formalized using standardized forms developed by the ESWMB, which capture resident details, property type, and applicable waste collection fees. Once enumeration is complete, waste managers submit the registration data to the billing agency, which updates the payment database and generates monthly bills.

New residents typically learn which waste manager serves their area through observation (by watching waste collection activities in their neighborhood) or through informal inquiries with neighbors. There is no centralized directory or public information system to guide residents to their designated waste manager.

Billing and Payment Process

The billing agency, working with the ESWMB, generates monthly waste bills based on property categories established by the government. Different rates apply to hostels, self-contained apartments, family houses, and commercial/industrial properties. Bills are printed monthly and distributed in bulk to waste managers, who then hand-deliver them to residents in their respective zones.

Residents make payments directly into government-designated bank accounts assigned to each zone. Payments can be made through multiple channels, including bank deposits, online bank transfers, and mobile money platforms. Upon payment, residents receive bank-generated receipts as proof of transaction. Subsequent monthly bills also serve as confirmation of previous payments, as they reflect outstanding balances or credits.

If a resident loses their bill or claims non-receipt, they contact their waste manager, who verifies payment status by checking the bank statement of account maintained by the billing agency. However, this verification process is manual and time-consuming.

Waste Collection Operations

Waste managers determine collection schedules in coordination with residents, within the guidelines set by the ESWMB. Collection frequency varies depending on area characteristics and customer agreements. Some zones operate on fixed collection days (e.g., Mondays and Thursdays), while others have flexible arrangements based on waste volume and accessibility. Residents are informed of collection schedules through verbal communication during initial registration or via phone calls from waste managers.

To verify service delivery, waste managers maintain physical logbooks in which residents sign after each waste pickup. These logbooks serve as the primary documentation for confirming that collection occurred and are submitted to the ESWMB upon request, particularly during enforcement actions or payment reconciliation.

When waste managers miss scheduled collections, residents are expected to call the waste manager directly to report the issue. However, many residents bypass waste managers and contact the ESWMB instead, especially if they are dissatisfied with service or reluctant to pay outstanding bills. According to interview findings, some residents use missed collection deadlines as leverage to avoid payment, which discourages waste managers from proactively communicating collection delays.

Complaint and Feedback Handling

The complaint resolution process operates informally without standardized tracking mechanisms. When residents encounter issues such as missed collections, billing errors, or service quality concerns, they are expected to contact their waste manager first via phone, WhatsApp, or in-person visits. Waste managers maintain individual customer files that include complaint logs, though there is no template or standardized format.

If the waste manager fails to respond or resolve the issue, residents escalate complaints to the ESWMB by visiting their office or calling the agency's phone line. ESWMB staff then contact the relevant waste manager to address the complaint. Resolution updates are communicated verbally to residents, with no written confirmation or follow-up documentation. This ad hoc approach leads to inconsistent service recovery and unresolved disputes.

Monitoring and Compliance Enforcement

The ESWMB monitors waste manager performance primarily through logbook inspections. Waste managers are required to submit logbooks showing resident signatures as evidence of service delivery, particularly when the ESWMB prepares enforcement actions against non-paying residents. Payment compliance is verified through bank records and billing agency reports, which indicate which residents have outstanding balances.

Enforcement actions are triggered when residents fail to pay bills or refuse to register for waste services. Waste managers compile lists of non-compliant residents and forward them to the ESWMB, which may initiate legal proceedings or issue compliance notices. However, the

lack of real-time data integration between waste managers, the billing agency, and the ESWMB creates delays in identifying and addressing non-compliance.

Payment Reconciliation and Contractor Compensation

Waste managers are compensated monthly based on a fixed percentage of total collections within their zone. The billing agency and partner banks provide the ESWMB with monthly statements showing payments received per zone. The ESWMB then calculates and disburses payments to waste managers according to predetermined contractual percentages. Waste managers do not need to submit separate documentation for payment; the bank statements serve as the sole basis for reconciliation.

Communication Channels

Communication among stakeholders occurs through multiple informal channels:

1. Residents to Waste Managers: Phone calls, WhatsApp messages, in-person visits to waste manager offices
2. Residents to ESWMB: Office visits, phone calls, occasionally email
3. Waste Managers to ESWMB: Phone calls, formal letters, in-person meetings
4. ESWMB to Residents: Public enlightenment campaigns, announcements through waste managers, and field visits during enforcement actions

There is no centralized digital platform or portal for information sharing, service requests, or complaint tracking.

Data and Record Management

All record-keeping is paper-based. The ESWMB maintains physical files for registered residents, enforcement cases, and waste manager contracts. Waste managers keep individual customer files containing registration forms, complaint logs, and service history. Both the ESWMB and waste managers store customer information in filing cabinets with no digital backup or database system. There is no use of spreadsheets, customer management software, or any form of digital data storage.

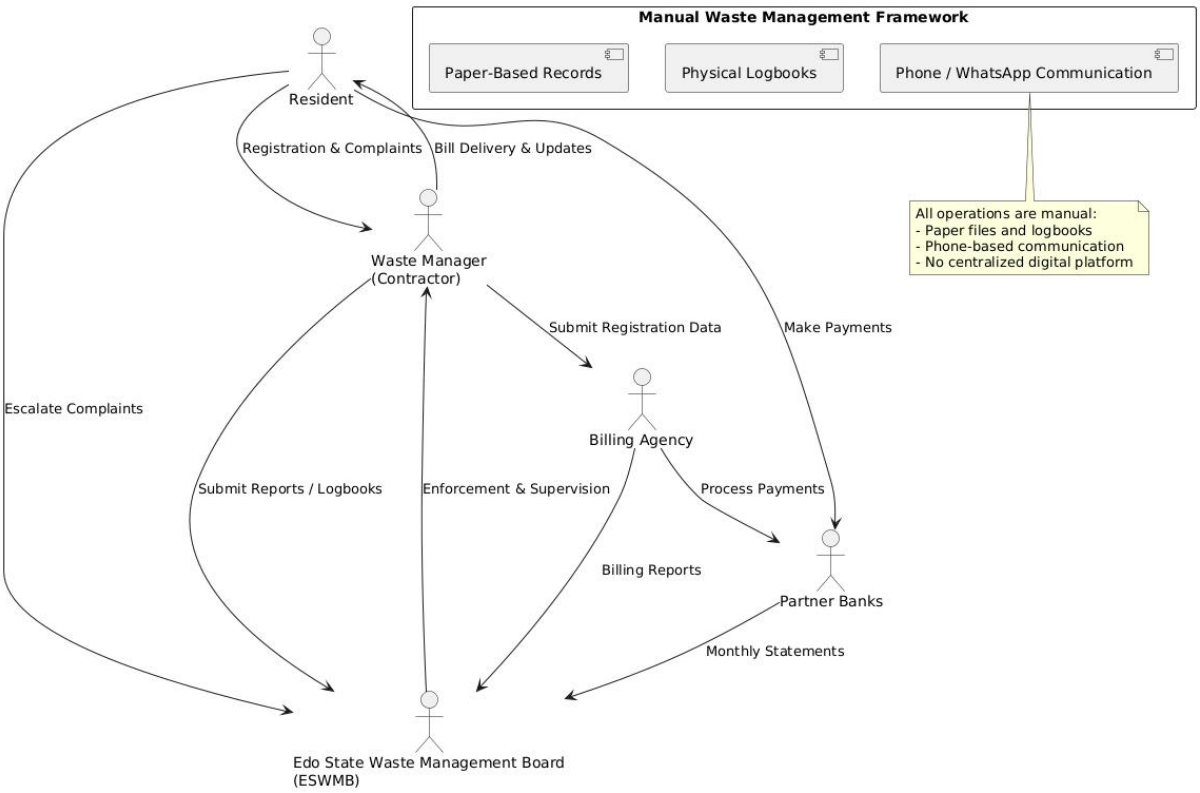


Figure 3.1: System Architecture of The Existing Waste Management System In Edo State

Critical System Limitations

Based on the system review and stakeholder interviews, the following limitations were identified:

1. Fragmented Communication Infrastructure: There is no unified platform linking residents, waste managers, and the ESWMB. Communication depends on personal phone calls, leading to delays, missed messages, and poor coordination.
2. Manual Data Management: All records: registrations, payments, and complaints, are paper-based, making retrieval slow, analysis difficult, and data loss likely.
3. Absence of Complaint Tracking and Accountability Mechanisms: Complaints are handled informally with no logging, tracking, or documentation, making accountability and performance measurement impossible.
4. Low Transparency and Citizen Participation: Residents lack access to collection schedules, billing policies, and updates. New users find waste managers through word of mouth, discouraging engagement.
5. Inefficient Payment Verification: Payment confirmation is manual and slow, requiring coordination between multiple parties and often causing billing disputes.

6. Weak Real-Time Monitoring and Enforcement: The ESWMB depends on periodic logbooks for performance checks, offering no real-time insight or proactive enforcement capability.
7. Operational Inefficiencies for Waste Managers: Waste managers struggle to manage large customer bases and track collections manually, increasing workload and errors.
8. Strategic Decision-Making Constraints for ESWMB: The lack of centralized data prevents ESWMB from analysing performance, tracking compliance, or planning policies effectively.

Justification for Proposed System

The identified limitations collectively demonstrate that the current waste management system in Edo State, while structurally defined, operates inefficiently due to reliance on manual processes, fragmented communication, and a lack of digital infrastructure. These challenges align with broader findings in Nigerian waste management systems, where weak communication frameworks and limited technological adoption hinder service delivery and accountability (Agbebaku, 2021; Okeke et al., 2024).

Studies in similar developing contexts show that digital platforms can significantly improve coordination, transparency, and citizen engagement. For instance, e-participation platforms implemented in South African municipalities enhanced responsiveness and feedback mechanisms (Molobela, 2023), while the application of CRM principles in public sector organizations improved service quality by treating citizens as active stakeholders (Reicher, 2021).

Given these gaps, there is a compelling need for a web-based Customer Relationship Management (CRM) platform that:

1. Centralizes communication among residents, waste managers, and the ESWMB
2. Digitizes operational data for real-time access and analysis
3. Provides standardized complaint tracking and resolution workflows
4. Enhances transparency through accessible information on services, schedules, and payments
5. Enables data-driven decision-making for regulatory and policy improvements
6. Promotes citizen participation through feedback mechanisms and service request features.

The proposed CRM system aims to address these limitations systematically, transforming waste management service delivery in Edo State from a fragmented, manual operation into an integrated, transparent, and accountable system.

3.3.2 Problem Definition

The assessment of the existing waste management framework in Edo State revealed several issues that hinder the efficiency, transparency, and inclusiveness of waste management operations. Findings from interviews with waste managers, government representatives, and residents show that communication gaps, poor data management, and the absence of a unified technological system have created significant barriers to effective service delivery. The proposed web-based Customer Relationship Management (CRM) platform seeks to address the following key problems:

1. Lack of Centralized Communication Platform: Currently, there is no unified platform for communication between residents, waste managers, and the Edo State Waste Management Board. Most complaints and service requests are made through informal channels such as phone calls, WhatsApp messages, or in-person reports. Communication is often inefficient, which leads to delays in resolving complaints. This can cause miscommunication or result in losing important information.
2. Manual and Disorganized Record Keeping: Records of customer details, service requests, and complaints are stored manually, either in logbooks or spreadsheets, with limited accessibility. This manual process increases the likelihood of data loss, makes record retrieval cumbersome, and reduces accountability in service follow-up and evaluation.
3. Delayed Response and Poor Complaint Management: Residents frequently experience slow or no response to complaints about waste collection. Because there is no automated system for logging and tracking these reports, issues remain unresolved for long periods, discouraging citizens from participating actively in maintaining environmental cleanliness.
4. Lack of Real-Time Monitoring and Feedback: Government agencies and waste contractors lack real-time insight into field operations. There is no digital mechanism for monitoring service requests, collection frequency, or complaint resolution. As a result, inefficiencies go unnoticed, and management decisions are often based on incomplete or outdated information.

5. Limited Citizen Engagement and Participation: The current system provides minimal opportunities for residents to participate in waste management beyond passive compliance. Many are unaware of proper complaint channels or service schedules, while others feel excluded from communication and decision-making processes that affect their communities.
6. Poor Data-Driven Decision-Making: The absence of an integrated digital database limits the ability of the government and contractors to make data-driven decisions. Without accurate and up-to-date information on waste generation patterns, complaint frequency, and service coverage, planning and policy formulation remain largely reactive rather than proactive.
7. Poor Transparency and Accountability: Due to the manual nature of reporting and the lack of real-time monitoring tools, it is difficult to hold contractors and officials accountable for non-performance. There is no clear visibility into which areas are underserved or how quickly complaints are addressed, which affects service quality and public trust.

The cumulative effect of these challenges is an inefficient, unresponsive, and poorly coordinated waste management system. The proposed CRM platform will address these issues by providing a centralized and interactive digital solution that enables users to submit complaints, monitor requests, receive notifications, and provide feedback. For administrators, it will offer tools for tracking performance, generating reports, and improving decision-making. By doing so, the system aims to enhance communication, accountability, and citizen participation in sustainable waste management practices across Edo State.

3.3.3 Requirements Analysis

The requirements analysis defines the features, behavior, and constraints of the proposed web-based Customer Relationship Management (CRM) system for waste management in Edo State. It translates user needs and organizational goals into specific system functionalities that will guide design and implementation. These requirements were derived from interviews with stakeholders, observation of the existing waste management process, and the logical structure of the proposed system, where customers provide personal details, submit requests or complaints, and administrators manage and respond to those submissions.

The requirements are categorized into functional and non-functional requirements.

3.3.3.1 Functional Requirements

Functional requirements describe the specific operations, features, and behaviors the system must perform to meet its intended objectives.

Customer (Resident) Requirements

1. User Registration and Authentication
    i. The system shall allow new customers to register by providing their full name, email address, phone number, and home address.
    ii. The system shall validate all inputs and securely store user credentials in the database using password hashing.
    iii. Returning users shall log in using their registered email and password.
2. Request and Complaint Submission
    i. The system shall allow customers to create new requests or complaints by entering a description and attaching relevant images.
    ii. Each request shall be linked to the customer's account and stored in the database.
    iii. The system shall automatically assign the request to the waste manager responsible for the customer's zone.
3. Request Tracking and Feedback
    i. The system shall allow customers to view the list of all their submitted requests.
    ii. Each request shall display its current status (Pending, In Progress, or Resolved) and assigned priority.
    iii. The system shall allow customers to view replies or messages from the waste manager related to each request.
4. Chat and Communication
    i. The system shall provide a chat interface that allows customers to communicate with their assigned waste manager regarding specific requests.
    ii. All chat messages shall be stored in the database and linked to the corresponding request.
5. Announcements and Notifications
    i. The system shall allow customers to view announcements or notifications from the waste manager.

ii. Announcements may include educational content, waste collection schedules, and policy updates.

Waste Manager (Administrator) Requirements

1. Account and Business Registration
    i. The system shall allow waste managers to register both their personal accounts and business details in a single process.
    ii. The system shall validate and store the business name, address, and contact details securely.
2. Zone and Customer Management
    i. The system shall allow waste managers to define and manage their assigned zones.
    ii. The system shall display a list of customers within each zone.
    iii. Waste managers shall be able to view, update, or remove a customer from their assigned area.
3. Request Management
    i. The system shall allow waste managers to view all customer requests and filter them by date, customer, or status.
    ii. Waste managers shall be able to update the status and priority of requests.
    iii. Waste managers shall be able to reply to customer messages through the chat interface.
4. Announcements and Content Management
    i. The system shall allow waste managers to create, edit, and delete announcements visible to customers within their zones.
    ii. Announcements shall be displayed in real time to all customers assigned to the waste manager's zone.
5. Reporting and Monitoring
    i. The system shall allow waste managers to track performance metrics such as the number of resolved requests and customer feedback.
    ii. ii. The system shall log all actions for administrative monitoring and evaluation.

3.3.3.2. Non-Functional Requirements

Non-functional requirements define the overall quality and performance standards that ensure the CRM system operates efficiently and reliably.

1. Usability: The system shall provide an intuitive interface designed with responsive layouts for easy navigation across devices.
2. Reliability: The system shall ensure accurate data storage and retrieval with minimal downtime.
3. Security
    i. All user passwords shall be securely hashed using the Argon2 algorithm.
    ii. Only authenticated users shall be able to access restricted modules.
    iii. Sensitive data shall be encrypted before storage.
4. Performance
    i. The system shall respond to standard user requests within five seconds.
    ii. The application shall handle multiple users simultaneously without performance degradation.
5. Scalability: The system shall support the addition of more users, zones, and businesses as adoption grows without affecting performance.
6. Maintainability: The system shall follow a modular structure, allowing developers to modify or extend components with minimal impact on existing modules.
7. Availability: The system shall be accessible to users 24 hours a day through any modern web browser.
8. Data Integrity: The system shall enforce referential integrity between tables to ensure consistency in user, request, and message records.

The defined functional and non-functional requirements form the foundation of the CRM platform. By satisfying these requirements, the system ensures improved communication, faster response to waste collection requests, enhanced transparency, and better inclusion of residents in waste management processes across Edo State.

3.3.4 Feasibility Study

The feasibility study evaluates the practicality of developing and deploying the proposed web-based Customer Relationship Management (CRM) system for waste management in Edo State. It examines the project from technical, economic, operational, legal, and schedule perspectives to determine its overall viability and sustainability.

1. Technical Feasibility: The proposed system is technically feasible given the availability of suitable and efficient web development technologies. The application will be built using ASP.NET Core (Razor Pages) for both the backend and frontend logic, enabling seamless integration between the user interface and server-side operations. The frontend design will be implemented with HTML for structure and Tailwind CSS for responsive, modern, and accessible styling.

   Data will be stored and managed using a relational database management system (such as SQL Server), which ensures reliable storage, fast retrieval, and integrity of records such as customer details, complaints, and service updates.

   ASP.NET Core provides robust features for authentication, security, and scalability, while Tailwind CSS ensures efficient user interface design without complex dependencies. These technologies are widely supported, easy to maintain, and compatible with most hosting environments, making implementation both practical and cost-effective.
2. Economic Feasibility: The system is economically viable as the benefits significantly outweigh the estimated development and maintenance costs. The use of open-source tools and frameworks (ASP.NET Core and Tailwind CSS) eliminates licensing costs. The main expenses will involve domain registration, web hosting, and minimal server maintenance. Once deployed, the system will reduce the administrative costs associated with manual record keeping, complaint handling, and paper documentation. It will also minimize the time spent on physical coordination, thereby improving operational efficiency and citizen satisfaction. The long-term benefits, such as better accountability, faster service response, and data-driven decision-making, justify the initial development investment.
3. Operational Feasibility: The proposed system aligns well with existing waste management operations in Edo State. It does not replace current workflows but enhances them through automation and centralized communication. The system's intuitive design and simple interface ensure that both administrative users and residents can operate it with minimal training. Residents will easily submit and track complaints, while administrators can manage requests, assign tasks, and monitor resolution progress. The ability to generate reports and visualize performance improves transparency and facilitates strategic planning. Given its usability and relevance to daily operations, the system is operationally feasible and likely to be adopted.

4. Legal Feasibility: The system complies with relevant legal and ethical frameworks, particularly the Nigeria Data Protection Regulation (NDPR, 2019), which governs the collection and handling of personal data. User information such as names, phone numbers, and addresses will be securely stored and used strictly for waste management purposes. Access to sensitive data will be restricted to authorized administrative users, ensuring compliance with privacy and data protection requirements. Transparency in complaint handling will also support government accountability and public trust.
5. Schedule Feasibility: The project is time-feasible within the academic timeframe for a final-year research and development project. The Waterfall model adopted divides the work into well-defined stages: requirement analysis, system design, implementation, testing, and deployment. Each phase will be executed sequentially with clear deliverables. To ensure timely completion, the Minimum Viable Product (MVP), a functional prototype containing the essential features of the system, will serve as the end product for this project. This MVP will include key functionalities such as user registration, complaint submission, administrative management, and reporting. It will demonstrate the core objectives of the proposed CRM platform while leaving room for further enhancements after evaluation.

3.4 System Design

3.4.1 Design Objectives

The design of the proposed CRM platform is guided by the following objectives, which directly address the limitations identified in the existing system:

1. Centralized Communication Infrastructure: Establish a unified digital platform that connects residents and waste managers, eliminating reliance on fragmented phone-based communication. The system ensures that all service requests, complaints, and inquiries are routed automatically to the appropriate waste manager based on geographical zoning.
2. Real-Time Request Tracking and Transparency: Enable residents to submit requests and track their status in real time through unique tracking identifiers. This provides visibility into service delivery progress and enhances accountability by documenting all interactions and status updates.
3. Simplified User Experience: Design an intuitive interface that requires minimal technical knowledge, ensuring accessibility for diverse user demographics. First-time

users complete a simple registration process, while returning users access the system using only their phone number, reducing barriers to participation.

4. Efficient Complaint Management: Implement a structured workflow for logging, categorizing, prioritizing, and resolving complaints. The system automatically assigns requests to responsible waste managers, tracks resolution timelines, and maintains a complete audit trail of all actions taken.
5. Data-Driven Decision Support: Provide waste managers with analytics dashboards showing request volumes, resolution rates, and performance metrics by zone. Enable data export for reporting and evidence-based service improvement planning.
6. Multi-Channel Notification System: Ensure residents receive timely updates on their requests through SMS, email, and in-app notifications, improving communication effectiveness and customer satisfaction.
7. Public Awareness and Education: Enable waste managers to publish educational content, policy updates, and service announcements, promoting environmental awareness and informed citizen participation in waste management.
8. Scalability and Security: Design a system architecture that can accommodate Edo State's 150+ zones and growing user base while ensuring data security, user privacy, and system reliability.

3.4.2 System Architecture

The system architecture defines the overall structure and organization of the web-based Customer Relationship Management (CRM) platform for waste management. It describes how various components interact to support functionality, performance, and scalability.

The system follows a three-tier architecture, as seen in Figure 3.2, which divides the entire application into the presentation layer, application (business logic) layer, and database layer to ensure modularity, maintainability, and easier debugging or updates in the future.

Architecture Components

1. Presentation Layer (Frontend)

   The presentation layer is the user interface where all interactions between the system and its users occur. It was implemented using Razor Pages, HTML, CSS, JavaScript, and Tailwind CSS.

   There are two main interfaces:

i. Customer Interface: Enables users to register, create requests or complaints, chat with waste managers, and view announcements or updates.
ii. Waste Manager (Admin) Interface: Allows waste managers to manage zones, handle customer requests, send messages, and post announcements.

In Figure 3.1, this layer communicates with the application layer through HTTP requests, sending user inputs and displaying processed results dynamically.

2. Application Logic Layer (Backend)

The application layer acts as the middle layer that processes all operations, decisions, and communication between the user interface and the database. It was implemented using ASP.NET Core MVC and C#. This layer handles core functionalities such as:

i. Managing authentication and authorization.
ii. Processing requests and routing data between models and views.
iii. Performing CRUD (Create, Read, Update, Delete) operations through controllers and repositories.
iv. Enforcing business rules such as linking requests to zones or updating request statuses.

The Repository Pattern was adopted to separate data access logic from business logic. This improves maintainability and promotes reusable code components across different modules. Figure 3.1 shows the connection of all modules in this layer.

3. Database Layer

The database layer handles all data storage, retrieval, and management tasks. It was implemented using Microsoft SQL Server, connected through Entity Framework Core as the Object-Relational Mapper (ORM).

This layer maintains relational tables that store information about users, waste managers, requests, messages, announcements, and zones. Foreign key relationships enforce data consistency between these entities.

The WasteManagementDbContext class defines the schema and relationships, enabling seamless interaction between the C# models and database tables.

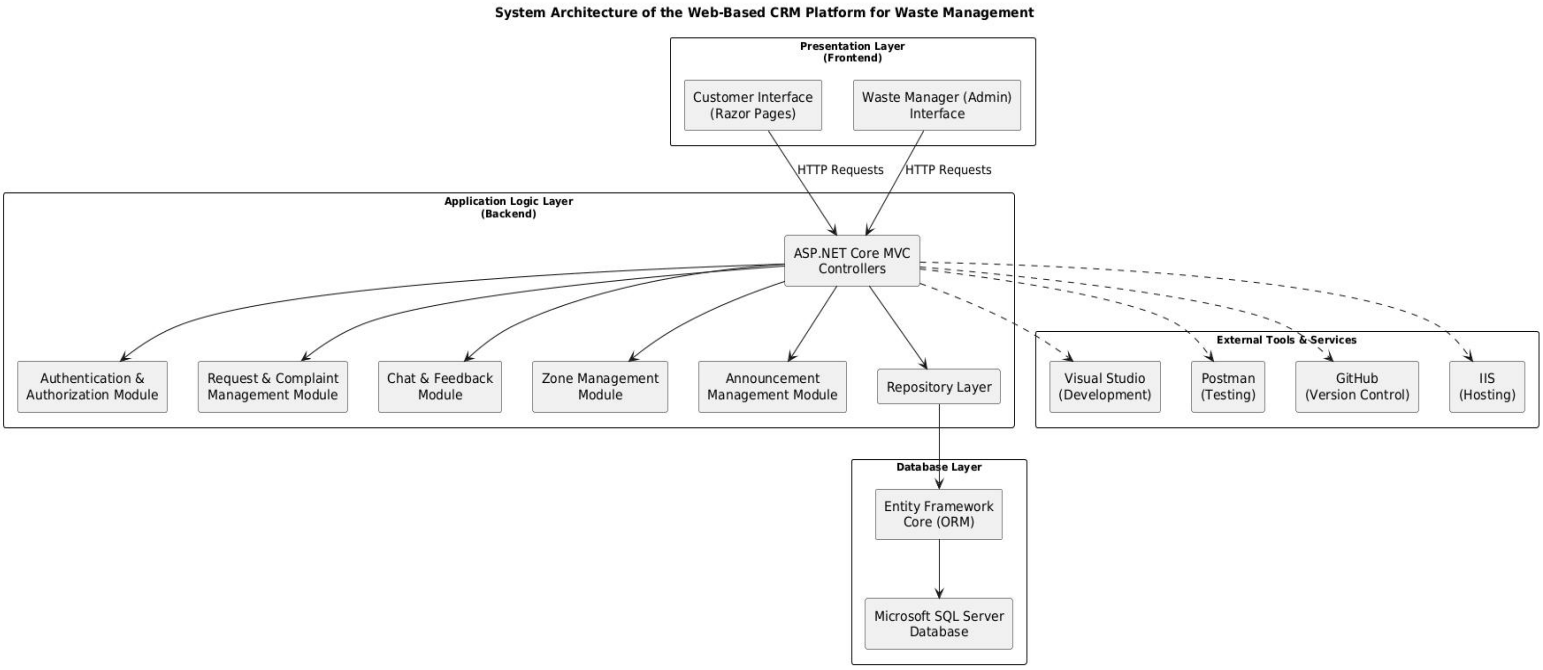


Figure 3.2: System Architecture for the Web-Based CRM Platform

3.4.2.1 Input Design

The input design defines how data are collected, validated, and transmitted within the web-based CRM platform. Table 3.1 shows the input design specification for this software. Each input form ensures that only accurate and relevant information is captured, improving communication between customers and waste managers.

Table 3.1: Input Design Specification for the CRM System

Input Type	User/Recipient	Description
Customer Registration Form	Customer (Resident)	Captures user details such as first name, last name, phone number, email, password, building type, and address. The selected zone is used to automatically assign a waste manager.

Input Type	User/Recipient	Description
Login Form	All registered users	Authenticates customers and waste managers through secure login credentials. Passwords are validated using the Argon2 hashing algorithm.
Request/Complaint Form	Customer	Allows customers to create new service requests or complaints by entering a description, uploading images, and selecting a priority level. Data is validated before submission.
Chat Input Box	Customer / Waste Manager	Enables two-way messaging between customers and waste managers within the chat interface for specific requests. Each message is linked to its corresponding request ID.
Zone Management Form	Waste Manager	Allows waste managers to add, update, or remove zones assigned to their business. Inputs include zone name and coverage details.
Announcement Form	Waste Manager	Enables waste managers to create and post new announcements or educational content for customers within their zone.
Administrative Management Form	Waste Manager (Admin Portal)	Used for managing registered customers, viewing their request history, and performing administrative operations within assigned zones.

3.4.2.2 Output Design

The output design specifies how processed data are presented to users through dashboards, pages, and notifications. Each output provides users with meaningful and actionable information based on their roles

Table 3.2 summarizes the key outputs, their intended recipients, and the type of information displayed.

Table 3.2: Output Design Specification for the CRM System

Output Type	**User/Recipient**	**Description**
Chat Interface	Customer / Waste Manager	Displays message threads for ongoing communication related to a specific request.
Notification Alerts	Customer / Waste Manager	Sends in-app alerts for new messages, status updates, and announcements.
Dashboard Summary	Waste Manager	Presents real-time analytics showing the number of total requests, resolved complaints, and pending tasks across assigned zones.
Customer List Page	Waste Manager	Displays all customers within a zone, with options to view requests, remove users, or manage related records.
Announcements Page	Customer / Waste Manager	Shows all educational materials, policy updates, and local waste collection notices posted by waste managers.

3.4.2.3 Database Design

The database design defines the logical structure and relationships between data entities in the CRM platform. It ensures efficient storage, retrieval, and management of information across both customer and waste manager interfaces. A relational database model was implemented using Microsoft SQL Server with Entity Framework Core as the Object-Relational Mapper (ORM).

The main entities include Users, Requests, Messages, Zones, and Announcements. Each entity has defined attributes and relationships that support key operations such as user registration, waste request submission, communication, and announcements.

Table 3.3: Database Design Specification for the CRM System

Table Name	Description	Key Fields / Attributes
Users	Stores all registered system users, including customers and waste managers.	UserID (PK), FullName, Email, PhoneNumber, PasswordHash, Role (Customer / WasteManager), DateCreated
Business	Represents registered waste management businesses managed by specific users.	RequestID (PK), CustomerID (FK), ZoneID (FK), Description, ImagePath, Priority (Low / Medium / High), Status (Pending /

		In Progress / Resolved), DateCreated
Customer	Contains resident user information and login credentials.	CustomerID (PK), FirstName, LastName, Email, Phone, PasswordHash, AddressID (FK), DateCreated
CustomerAddress	Stores detailed customer addresses and their zone mapping.	AddressID (PK), UID, CustomerID (FK), ZoneID (FK), Address, BuildingType (ENUM: Residential / Commercial / Institutional)
Zones	Defines operational areas for waste management.	ZoneID (PK), Name, ZoneAddressID (FK)
ZoneAddress	Contains detailed zone addresses and sub-areas.	ZoneAddressID (PK), UID, ZoneID (FK), Area (List/Text)
BusinessZoneManagement	Links businesses or managers to zones under their responsibility.	RecordID (PK), UID, ZoneID (FK), ManagerID (FK), AssignedDate
Feedback	Stores all service requests, complaints, and inquiries submitted by customers.	FeedbackID (PK), ZoneAddressID (FK), HomeAddress, Message, Priority (Low / Medium / High), CustomerID (FK), Status (Pending / In Progress / Resolved), DateCreated

RequestUpdate	Logs updates made by managers on each feedback or complaint.	UpdateID (PK), FeedbackID (FK), ManagerID (FK), Comment, Status, DateUpdated
Notification	Records system-generated messages for users.	NotificationID (PK), UserID (FK), Message, Channel (In-App), DateSent
Announcement	Contains educational posts and announcements made by administrators or managers.	AnnouncementID (PK), Title, Content, PostedBy (FK), DatePosted
BackupLog	Tracks database backup operations for data recovery.	BackupID (PK), BackupDate, BackupFilePath, Status

Database Relationships

1. One-to-Many Relationships:
    i. Each Zone can be managed by one waste manager and serve multiple customers.
    ii. Each Customer (User) can submit multiple Requests.
    iii. Each Request can contain multiple Messages exchanged between the customer and waste manager.
    iv. Each Waste Manager (User) can post multiple Announcements.
2. Referential Integrity:
    i. All foreign keys are enforced with cascading updates and deletions to maintain data consistency.
    ii. Constraints such as NOT NULL and UNIQUE ensure the accuracy and quality of stored data.

Backup and Security Measures

The database includes an automated backup system that performs daily backups, with logs stored in the BackupLog table for audit and recovery. Passwords are securely stored using hashing algorithms, and access rights are restricted based on user roles. The relational model also allows for scalability, supporting future expansion of zones, users, and operational modules.

3.4.3 Process Modeling

3.4.3.1 Use Case Diagram

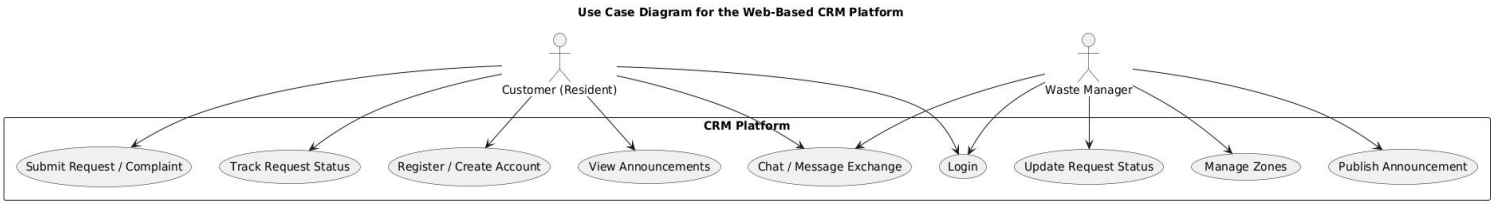
The use case diagram illustrates the major users of the web-based Customer Relationship Management (CRM) platform and the core functions they perform. It defines the system's operational boundaries and shows how customers (residents) and waste managers interact with the system to fulfill their tasks. In this CRM system, customers represent residents who register, log in, submit waste collection requests, communicate with waste managers, and view announcements. Waste managers, on the other hand, manage zones, handle customer requests, update their statuses, and post announcements for residents within their assigned areas.

These interactions, as summarized in Table 3.4, ensure efficient communication, improved accountability, and better service delivery in waste management operations. The overall interaction between actors and system functionalities is represented in Figure 3.2.

Figure 3.3: Use Case Diagram for the Web-based CRM

Table 3.4: Database Design Specification for the CRM System

Element	Description
Customer (Resident)	Represents residents who create accounts, log in, submit requests, chat with waste managers, track progress, and view announcements.
Waste Manager	Represents administrative users who manage zones, view and update requests, and post announcements.



Register / Create Account	Enables both customers and waste managers to create system accounts for authentication.
Register / Create Account	Enables residents and managers to create system accounts and gain access to the platform.
Login	Authenticates users and grants access to their respective dashboards.
Submit Request / Complaint	Allows customers to create and submit new waste collection requests or complaints.
Track Request Status	Displays the current progress and resolution status of submitted requests.
Chat / Message Exchange	Used by zone managers to modify the status of

Element	Description
	assigned Enables two-way communication between customers and waste managers for each request.
Update Request Status	Allows waste managers to update the status and priority of customer requests.
Manage Zones	Enables waste managers to add or modify zones under their responsibility.
Publish Announcement	Allows waste managers to post educational content, policy updates, or important pickup notices.
View Announcements	Displays all updates or notices posted by waste managers to customers.

3.4.3.2 Data Flow Diagram

The Data Flow Diagram (DFD) explains how information moves through the web-based CRM platform. It presents the major entities, processes, and data stores that interact to support system operations. Two levels are discussed in this section: the Level 0 (Context Diagram) and the Level 1 (System Decomposition Diagram). These diagrams collectively show the system's boundaries, external interactions, and internal data flow mechanisms.

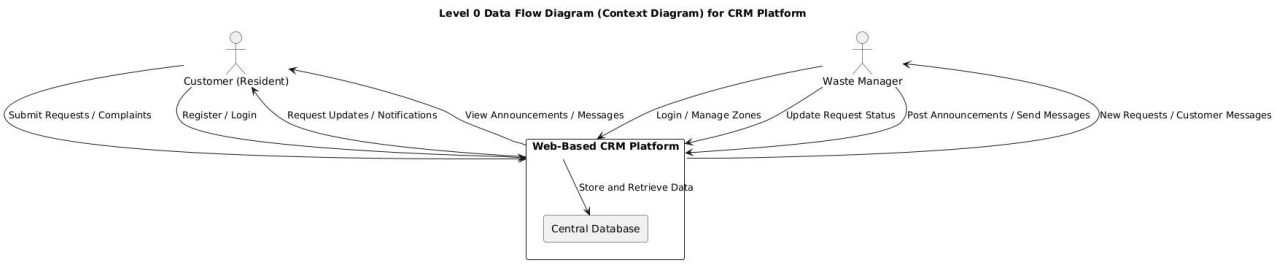


Figure 3.4: Level 0 Data Flow Diagram (Context Diagram).

At the Level 0 (Context Diagram), the CRM system is represented as a single process that interacts with external entities such as residents, zone managers, administrators. Residents

submit service requests or complaints, which are processed by the system and stored in the central database. The system then communicates responses and updates back to the users through in-app notifications. This level provides a high-level overview of the system boundary and its major data exchanges.

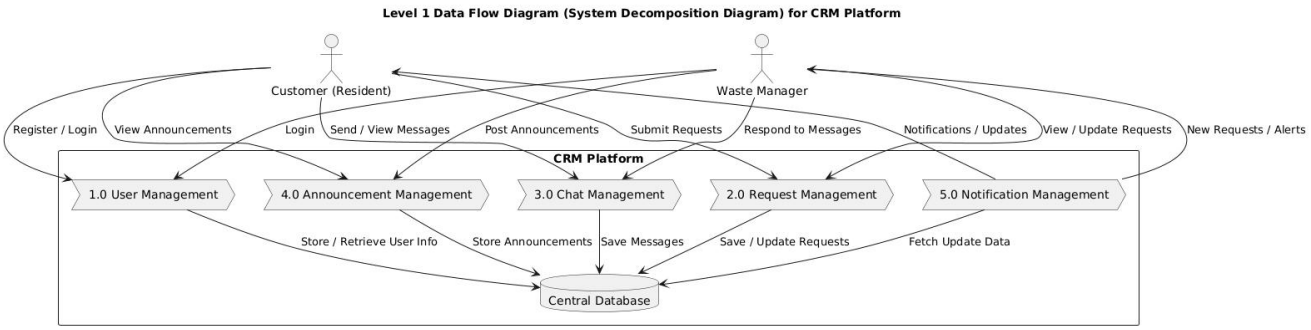


Figure 3.5: Level 1 Data Flow Diagram (System Decomposition)

The Level 1 Data Flow Diagram decomposes the system into five core processes: user management, request management, assignment and tracking, notification management, and reporting and analytics. User management handles registration and authentication, while request management records and validates complaints. Assignment and tracking automatically allocate requests to the appropriate waste manager and monitor their progress. Notification management sends alerts and updates to users, and reporting and analytics generate insights for decision-making. Together, these processes describe the internal logic of the CRM system and demonstrate how data flow contributes to efficient operations.

3.4.3.3 Activity Diagram

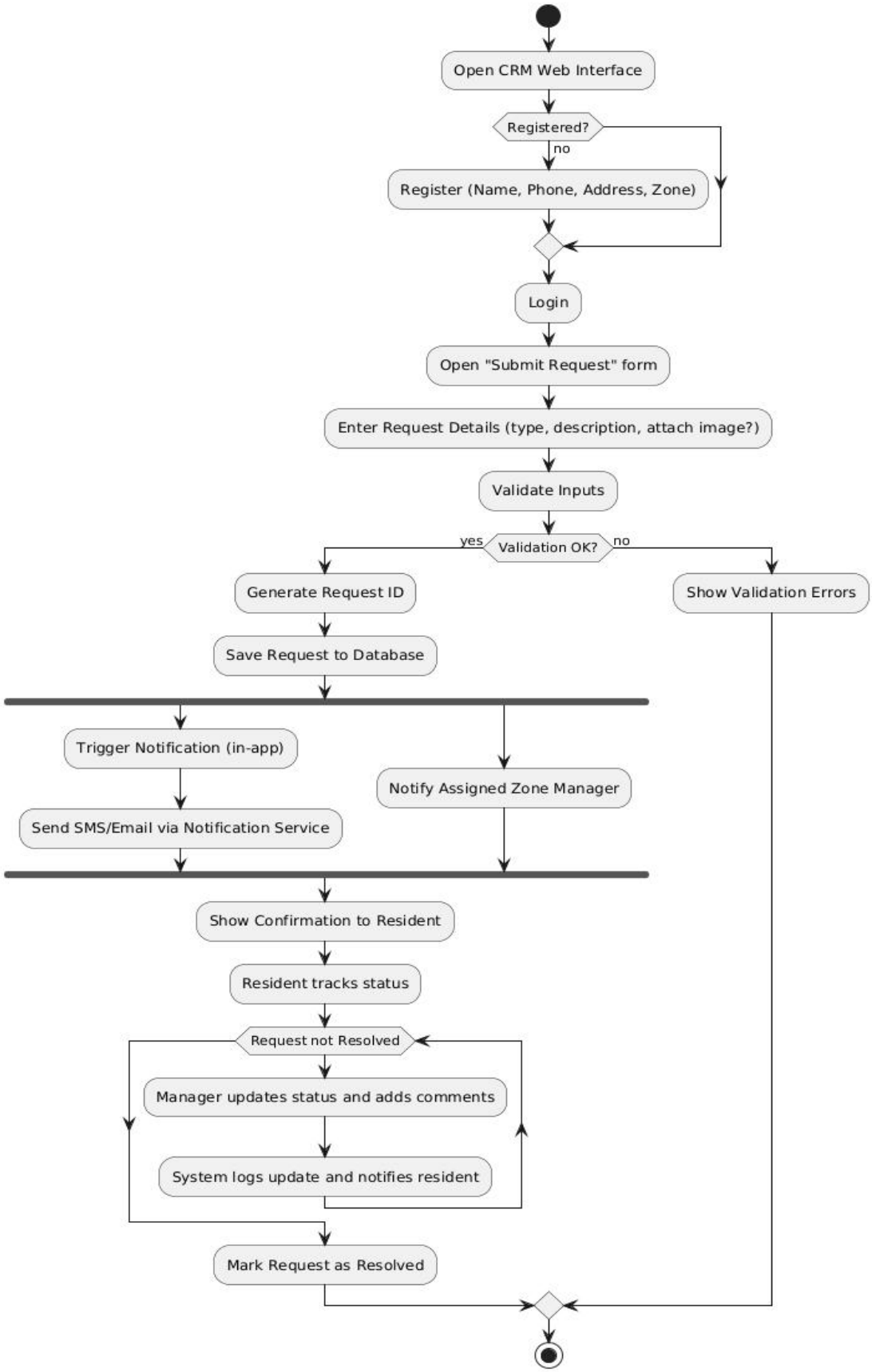


Figure 3.6: Activity Diagram for Request Submission and Resolution.

The activity diagram depicts the dynamic behaviour of the system, focusing on the flow of activities from the moment a resident submits a request to the point of resolution. The process begins when a resident accesses the CRM interface. If unregistered, the user completes the registration form and proceeds to log in. After authentication, the user submits a request by filling in required details such as request type, description, and priority.

The system then validates the inputs and, once confirmed, generates a unique request identifier. The request data are stored in the database, and notifications are sent to both the resident and the assigned zone manager. The zone manager reviews the request, updates its status as actions are taken, and marks it as resolved when completed. Finally, the resident is informed of the resolution, and the process ends. This flow illustrates how the system ensures continuous feedback and transparency throughout the service cycle.

3.4.3.4 Sequence Diagram

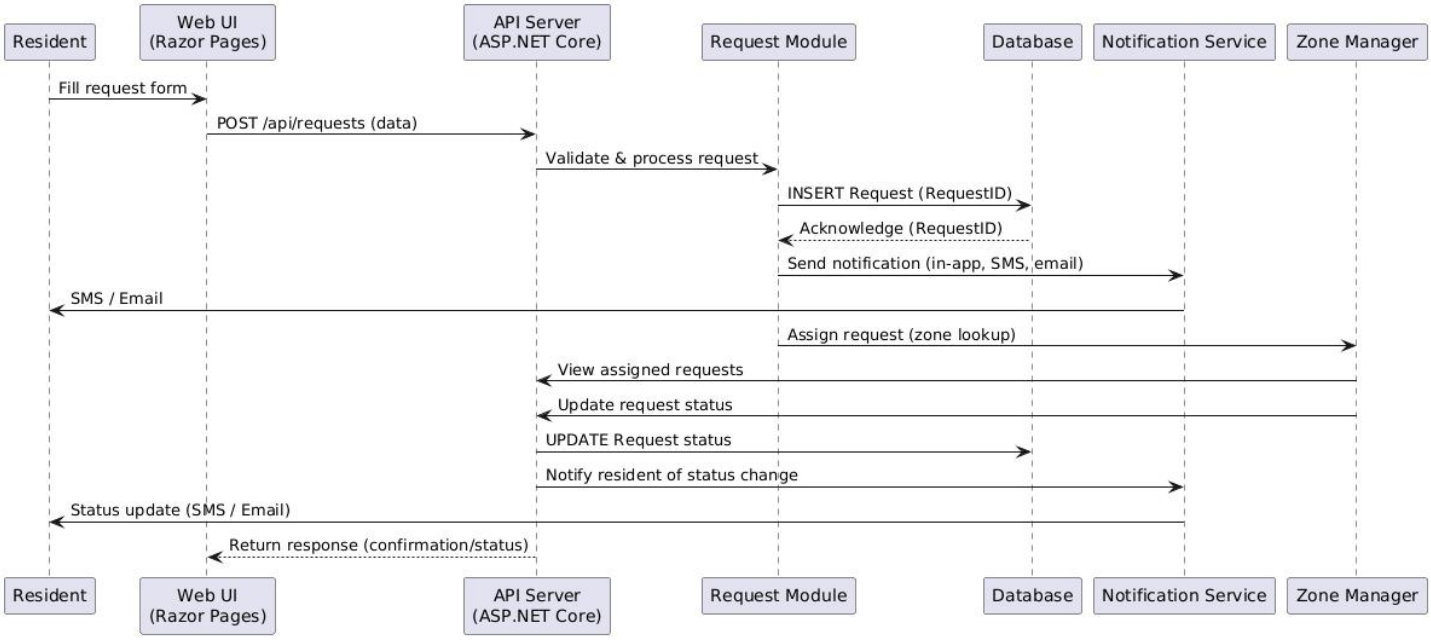


Figure 3.7: Sequence Diagram - Submit Request and Update

The sequence diagram describes how the various components of the CRM system interact over time during request submission and update processes. It begins when a resident submits a complaint through the web interface built with Razor Pages. The interface forwards the data to the API server, which processes the input, performs validation, and passes it to the request management module. The module records the request in the database and triggers the notification service.

The notification service then sends alerts through SMS, email, or in-app messages to both the resident and the responsible zone manager. The zone manager, upon receiving the assigned request, updates its status through the same system interface, and the updated information is stored in the database. This interaction continues until the request is resolved. The diagram demonstrates real-time coordination among system modules, emphasizing accountability and responsiveness in the waste management process.

CHAPTER 4

IMPLEMENTATION

4.0 Introduction

This chapter explains the implementation of the web-based Customer Relationship Management (CRM) platform developed to improve communication and customer inclusion in waste management. The system connects customers and waste managers through a single platform where requests, complaints, and announcements are managed efficiently. It also supports real-time messaging, request tracking, and information sharing. The chapter outlines the system's design, development environment, key modules, database structure, and user interfaces that make the platform functional and effective.

4.1 System Development Tools and Environments

This section describes the tools, equipment, and environment used in developing the web-based Customer Relationship Management (CRM) platform. The tools and environment were carefully selected to ensure reliability, scalability, and efficient communication between the customer and waste manager interfaces.

Software Tools

The software tools provided the necessary support for design, coding, database management, and testing. The main tools include:

1. ASP.NET Core MVC: Used for developing the backend logic and managing user interactions.
2. C# Programming Language: Used for implementing system functions and controls.
3. HTML5, CSS3, and JavaScript: Used for creating the structure, design, and interactive elements of the web interface.
4. Tailwind CSS: Used for building a responsive and clean user interface.
5. Microsoft SQL Server: Used for database management and data storage.
6. Entity Framework Core: Used for handling database operations through object-relational mapping.
7. Visual Studio 2022: Used as the main Integrated Development Environment (IDE) for coding and debugging.
8. GitHub: Used for version control and project collaboration.
9. Microsoft Edge: Used for running the webapp

4.1.2 Hardware Tools Used

The hardware tools include the devices and physical components used during development and testing.

Server Requirements:

1. Processor: Intel Core i5 or higher
2. RAM: 8 GB or more
3. Storage: 250 GB hard drive
4. Internet Connection: Stable broadband

Client Requirements:

1. Processor: Intel Core i3 or higher
2. RAM: Minimum of 4 GB
3. Storage: 50 GB free space
4. Display: 1024 × 768 screen resolution or higher
5. Web Browser: Any modern browser such as Chrome, Edge, or Firefox

4.1.3 System Requirements

The system was designed to run smoothly on both development and production environments.

1. Operating System: Windows 10 or higher
2. Database System: Microsoft SQL Server
3. Web Server: Internet Information Services (IIS) or any compatible hosting service
4. Browser Support: Compatible with major browsers (Chrome, Edge, Firefox, Opera)

4.1.4 System Development Environment Architecture

The environment integrates all the components necessary for developing and deploying the web-based CRM platform. The Razor-based frontend built with HTML, JS, CSS, and Tailwind interacts with the ASP.NET Core MVC backend through HTTP requests. The backend processes the logic and communicates with Microsoft SQL Server via Entity Framework Core to perform database operations such as creating requests, storing messages, updating statuses, and managing user records.

As illustrated in Figure 4.1, the architecture shows the flow of interaction between the client interface, the application server, and the database. GitHub is represented as an external

component for version control, while Visual Studio and Postman serve as the main development and testing environments.

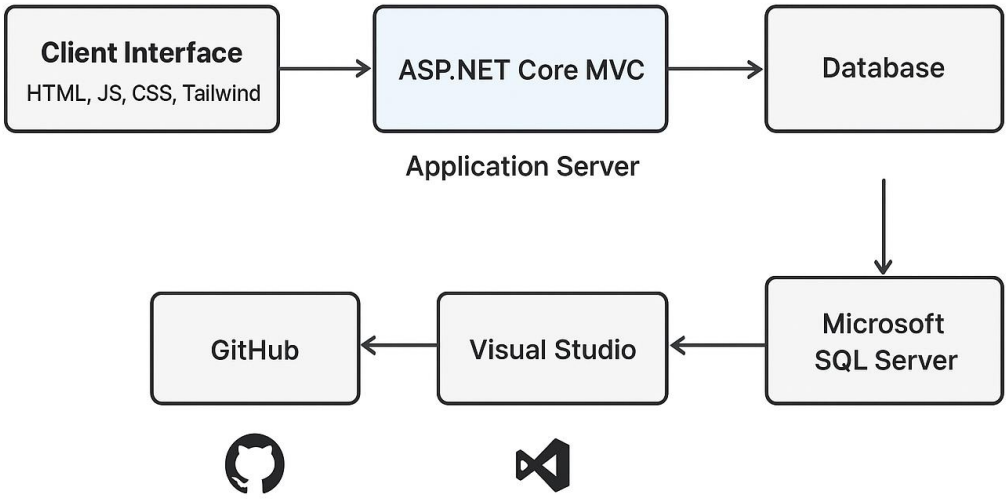


Figure 4.1: System Development Environment Architecture Diagram

4.2 System Implementation Phases

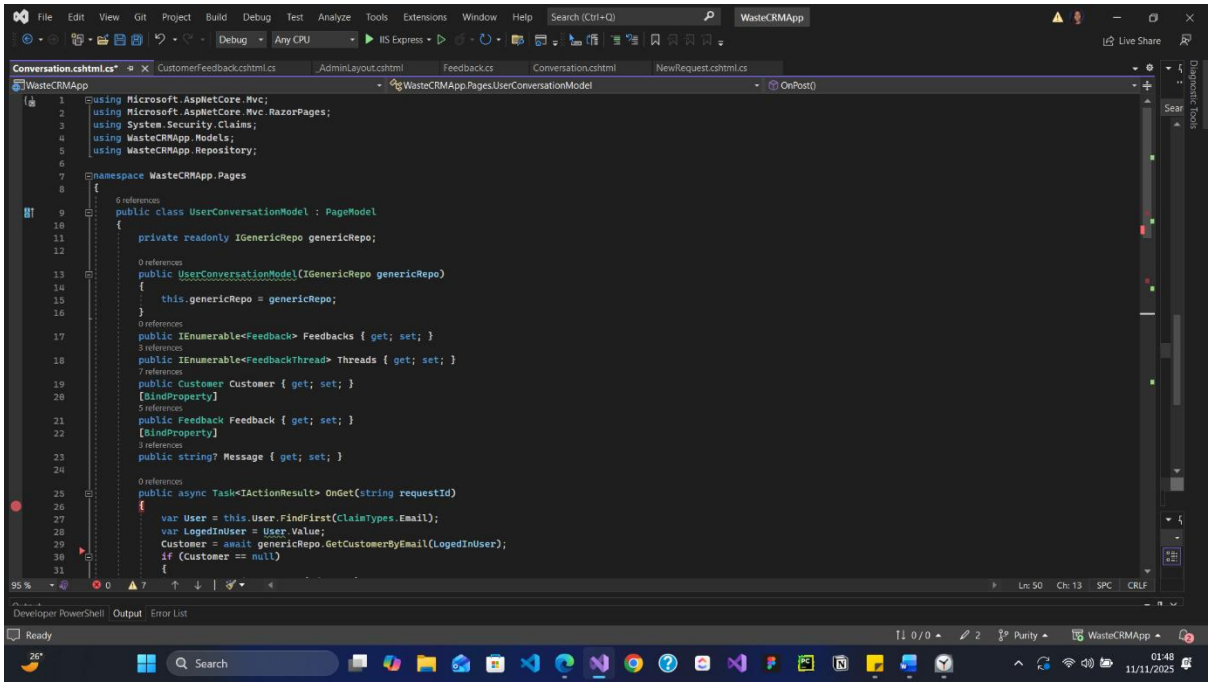
This section describes the major stages involved in the development of the web-based Customer Relationship Management (CRM) system for waste management. Each phase highlights how the system's logic, data, and user interfaces were implemented to ensure proper functionality and usability.

4.2.1 Coding and Programming

The coding and programming phase involved translating the system design into executable code using the ASP.NET Core MVC framework. The framework allowed for the separation of concerns between the presentation layer, the application logic, and the database.

Backend Implementation

The backend of the system was implemented in C#, as seen in Figure 4.2 and Figure 4.2.1, handling functions such as user authentication, request management, and communication between customers and waste managers. The MVC structure made it possible to manage data flow efficiently across controllers, views, and models.



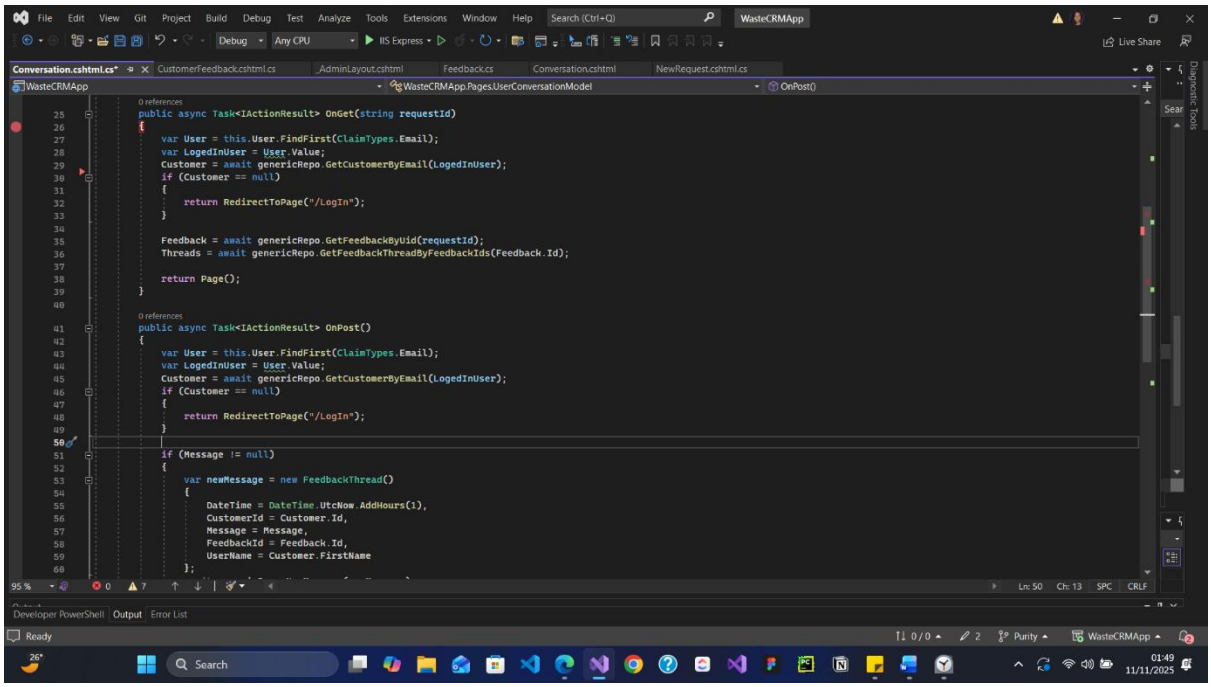
```
using Microsoft.AspNetCore.Mvc;
using Microsoft.AspNetCore.Mvc.RazorPages;
using System.Security.Claims;
using WasteCRMApp.Models;
using WasteCRMApp.Repository;

namespace WasteCRMApp.Pages
{
    6 references
    public class UserConversationModel : PageModel
    {
        private readonly IGenericRepo genericRepo;

        0 references
        public UserConversationModel(IGenericRepo genericRepo)
        {
            this.genericRepo = genericRepo;
        }
        0 references
        public IEnumerable<Feedback> Feedbacks { get; set; }
        3 references
        public IEnumerable<FeedbackThread> Threads { get; set; }
        7 references
        public Customer Customer { get; set; }
        [BindProperty]
        5 references
        public Feedback Feedback { get; set; }
        [BindProperty]
        3 references
        public string? Message { get; set; }

        0 references
        public async Task<IActionResult> OnGet(string requestId)
        {
            var User = this.User.FindFirst(ClaimTypes.Email);
            var LogedInUser = User.Value;
            Customer = await genericRepo.GetCustomerByEmail(LogedInUser);
            if (Customer == null)
            {
```

Figure 4.2: Page Model (backend code) of the user conversation page



```
        0 references
        public async Task<IActionResult> OnGet(string requestId)
        {
            var User = this.User.FindFirst(ClaimTypes.Email);
            var LogedInUser = User.Value;
            Customer = await genericRepo.GetCustomerByEmail(LogedInUser);
            if (Customer == null)
            {
                return RedirectToPage("/LogIn");
            }

            Feedback = await genericRepo.GetFeedbackByUid(requestId);
            Threads = await genericRepo.GetFeedbackThreadByFeedbackIds(Feedback.Id);

            return Page();
        }

        0 references
        public async Task<IActionResult> OnPost()
        {
            var User = this.User.FindFirst(ClaimTypes.Email);
            var LogedInUser = User.Value;
            Customer = await genericRepo.GetCustomerByEmail(LogedInUser);
            if (Customer == null)
            {
                return RedirectToPage("/LogIn");
            }

            if (Message != null)
            {
                var newMessage = new FeedbackThread()
                {
                    DateTime = DateTime.UtcNow.AddHours(1),
                    CustomerId = Customer.Id,
                    Message = Message,
                    FeedbackId = Feedback.Id,
                    UserName = Customer.FirstName
                };
```

Figure 4.3: Page Model (backend code) of the user conversation page

Frontend Implementation

The frontend was implemented using Razor pages, HTML, JavaScript, CSS, and Tailwind CSS, providing a clean and responsive layout for users. Razor pages, as seen in Figure 4.3 and Figure 4.4, were used to dynamically render content such as customer requests, announcements, and messages from the waste manager.

The project followed modular programming principles. Each module, such as customer registration, waste manager onboarding, and feedback communication, was implemented as an independent feature and later integrated to form the complete system.

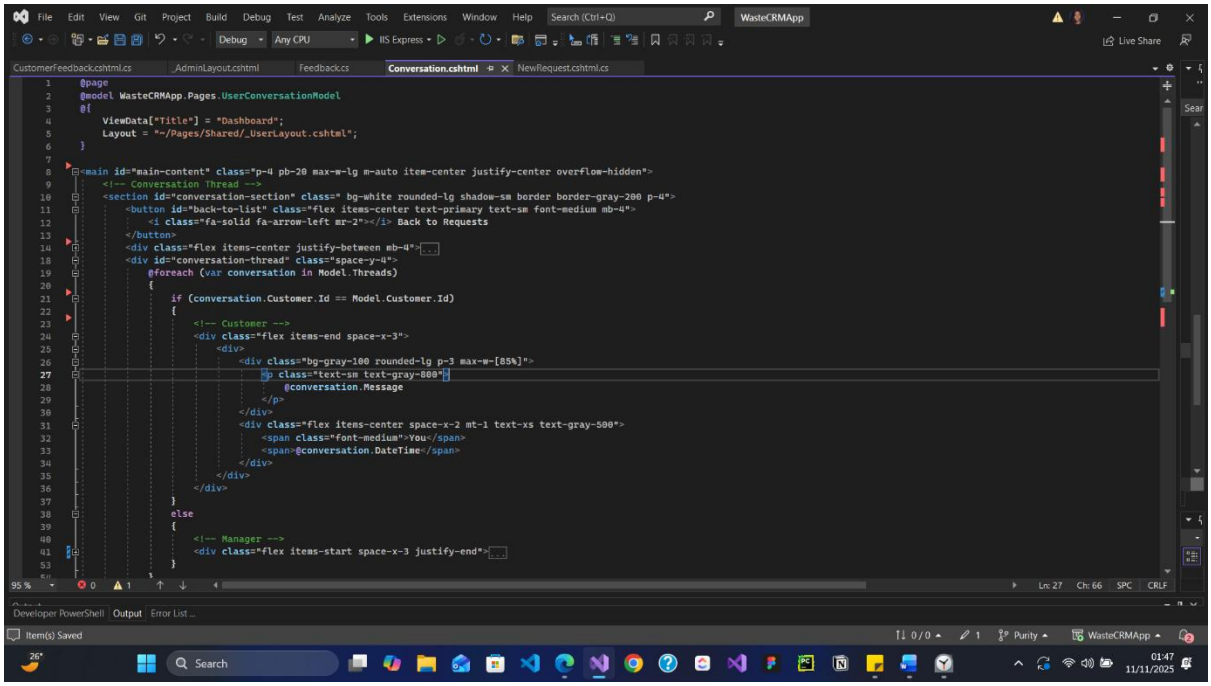


Figure 4.4: Frontend code of the user conversation page

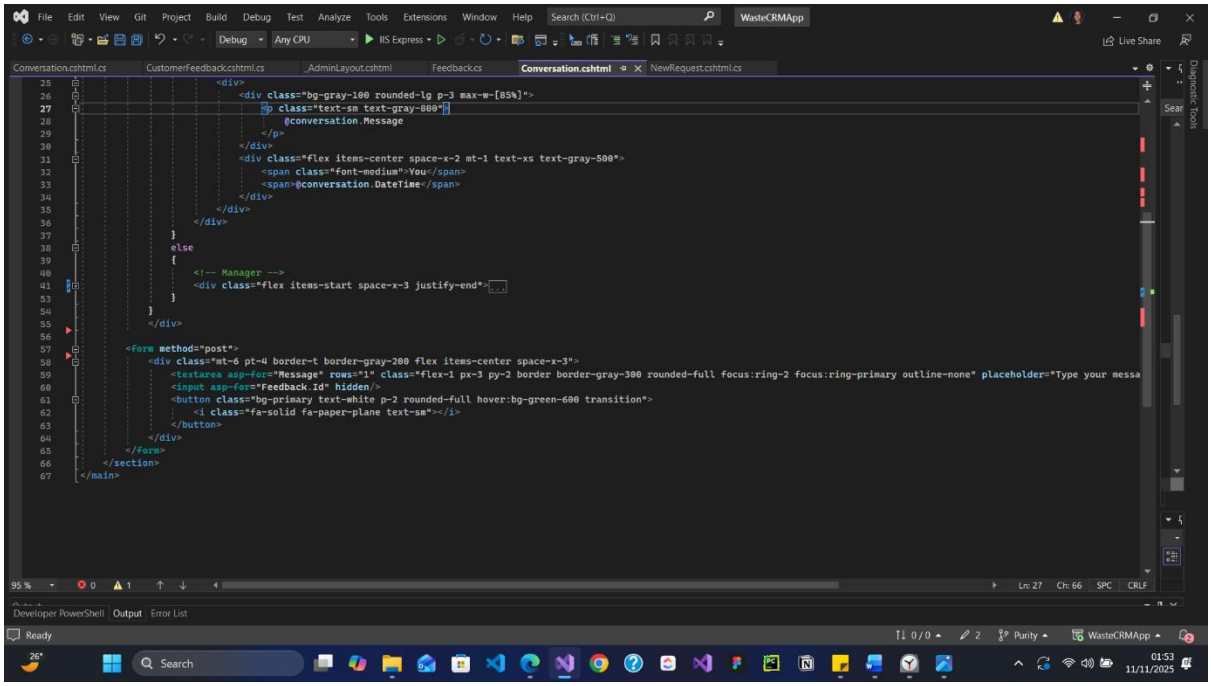


Figure 4.5: Frontend code of the user conversation page

4.2.2 Database Implementation

The database implementation was carried out using Microsoft SQL Server with Entity Framework Core as the Object-Relational Mapper (ORM). The ORM simplified data operations and ensured synchronization between the data models and database tables.

The WasteManagementDbContext class defined the entities and relationships that represent customers, waste managers, zones, requests, feedback threads, and announcements. The Generic Repository Pattern (implemented in GenericRepo.cs and IGenericRepo.cs) was adopted to streamline database operations such as data retrieval, insertion, and updates.

Foreign key relationships were used to maintain integrity between tables. For example:

i. Each customer belongs to a specific zone.
ii. Each request is linked to a customer and a waste manager.
iii. Each announcement is associated with a specific waste manager's business.

This design supports consistency and ensures that all system operations are traceable to the right users and locations.

4.2.3 Interface Implementation

The system's interface was designed with simplicity and accessibility in mind. There are two major interfaces in the presentation layer:

Customer Interface:

Customers can register, log in, create requests, and communicate with their waste managers, as seen in Figures 4.4, 4.5, 4.6, respectively. After submitting a request, they are redirected to the chat page, where they can view all conversations and track the progress of their requests. Customers can also view policy updates and waste collection announcements posted by their assigned waste managers.

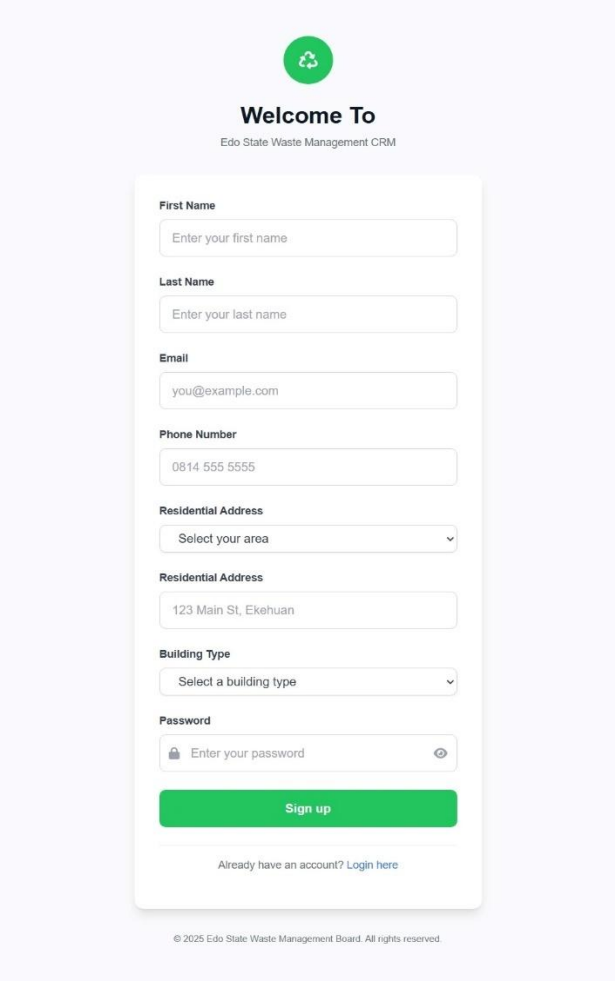


Figure 4.6: Customer Signup Page

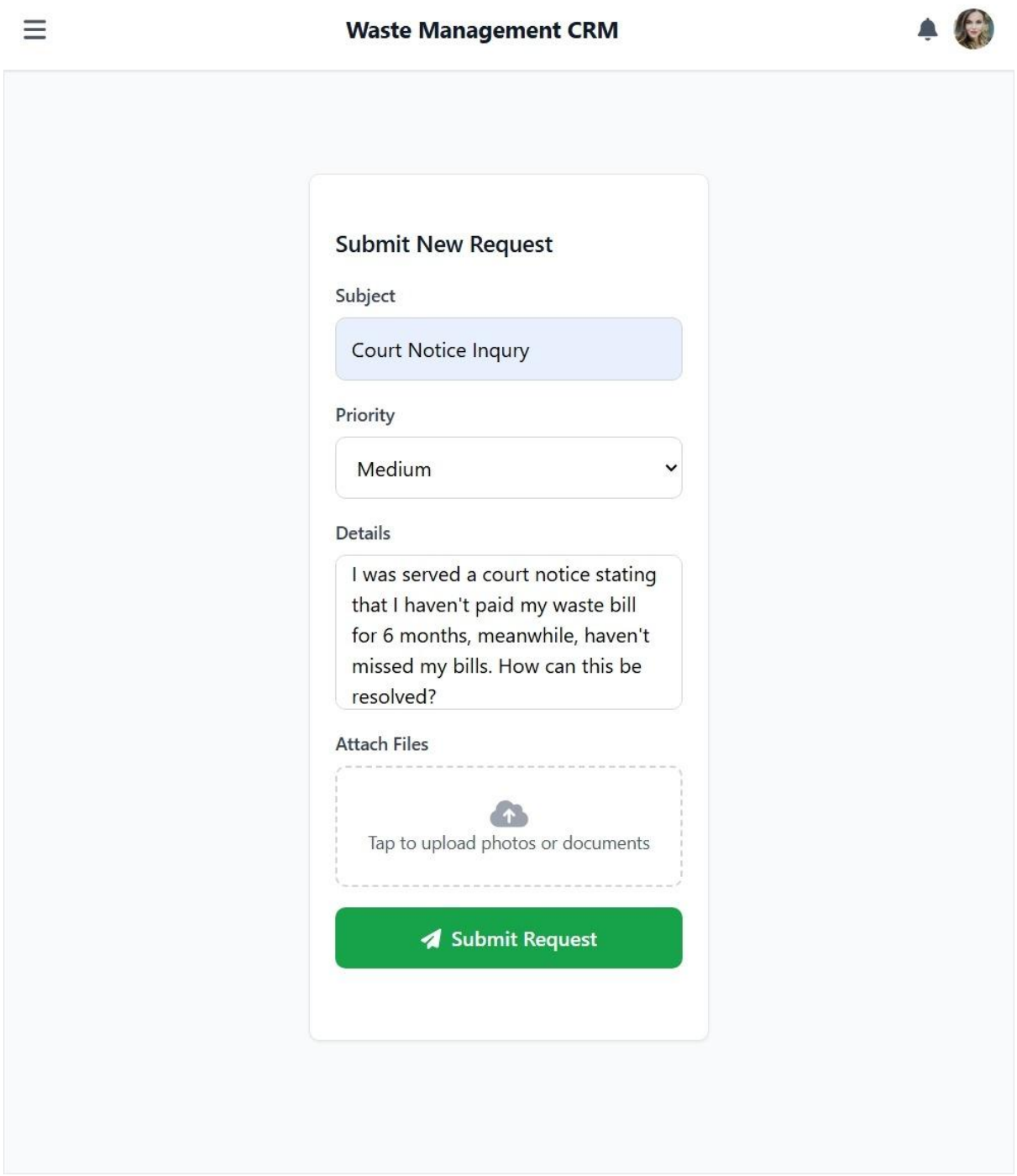


Figure 4.7: Request submission page

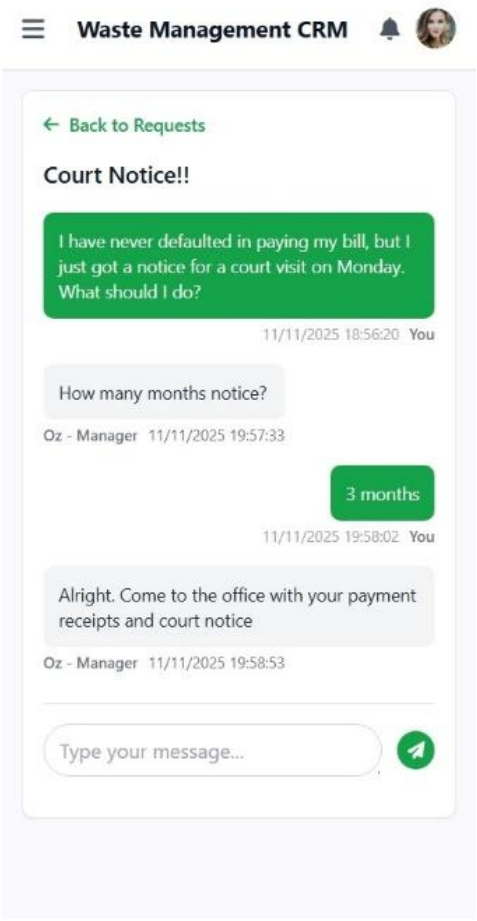


Figure 4.8: The Customer Chatroom Page

Waste Manager (Admin) Interface:

The waste manager dashboard allows the administrator to register their business, manage assigned zones, and view customers within those zones. They can view all customer requests, respond to messages, and create or delete announcements. The interface also provides options to remove inactive customers or modify zone details. These interfaces are shown in Figure 4.7, Figure 4.8, Figure 4.9, and Figure 4.10

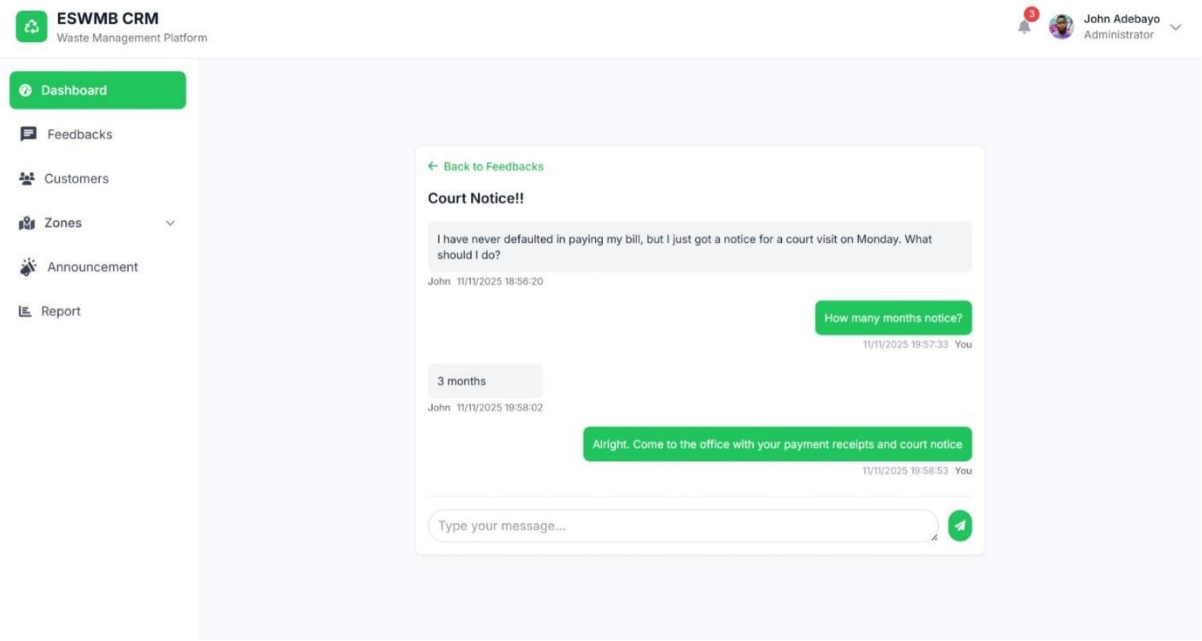


Figure 4.9: The Manager Chatroom

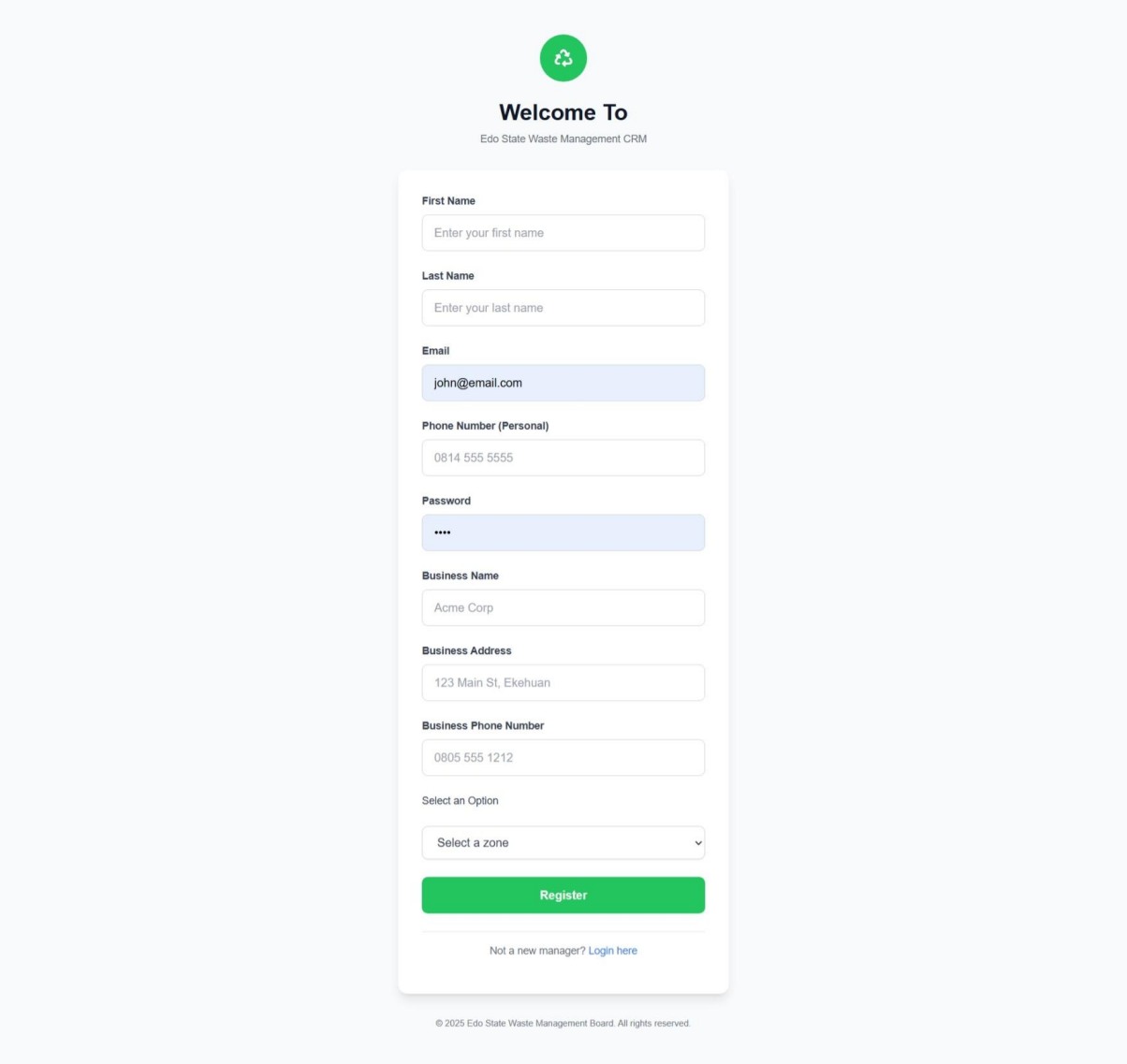


Figure 4.10: Waste manager registration page

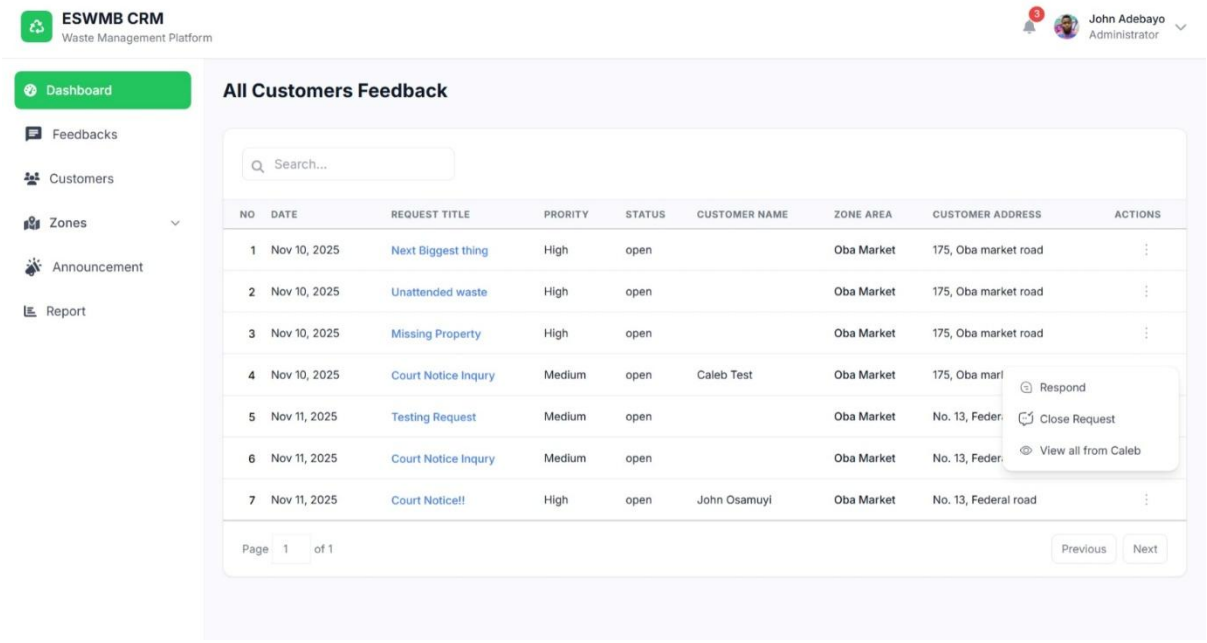


Figure 4.11: All Customers' Feedback page from the waste manager portal

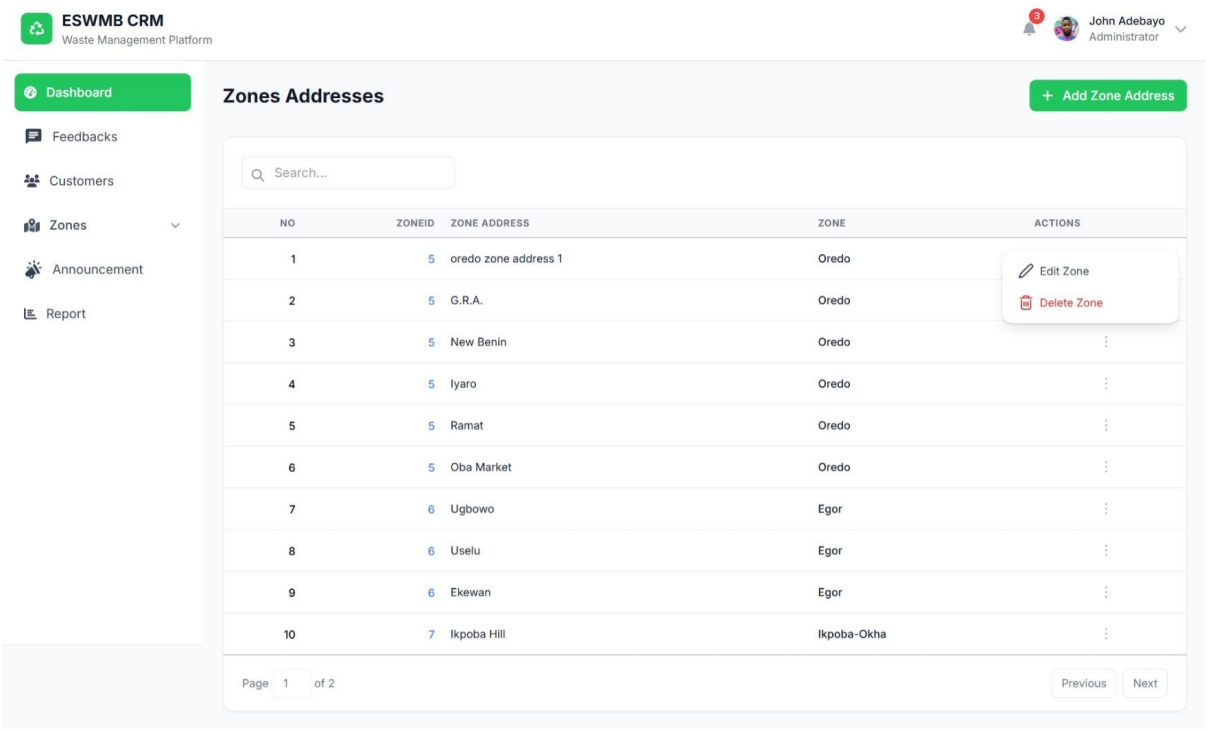


Figure 4.12: Waste Manager Zone allocation page

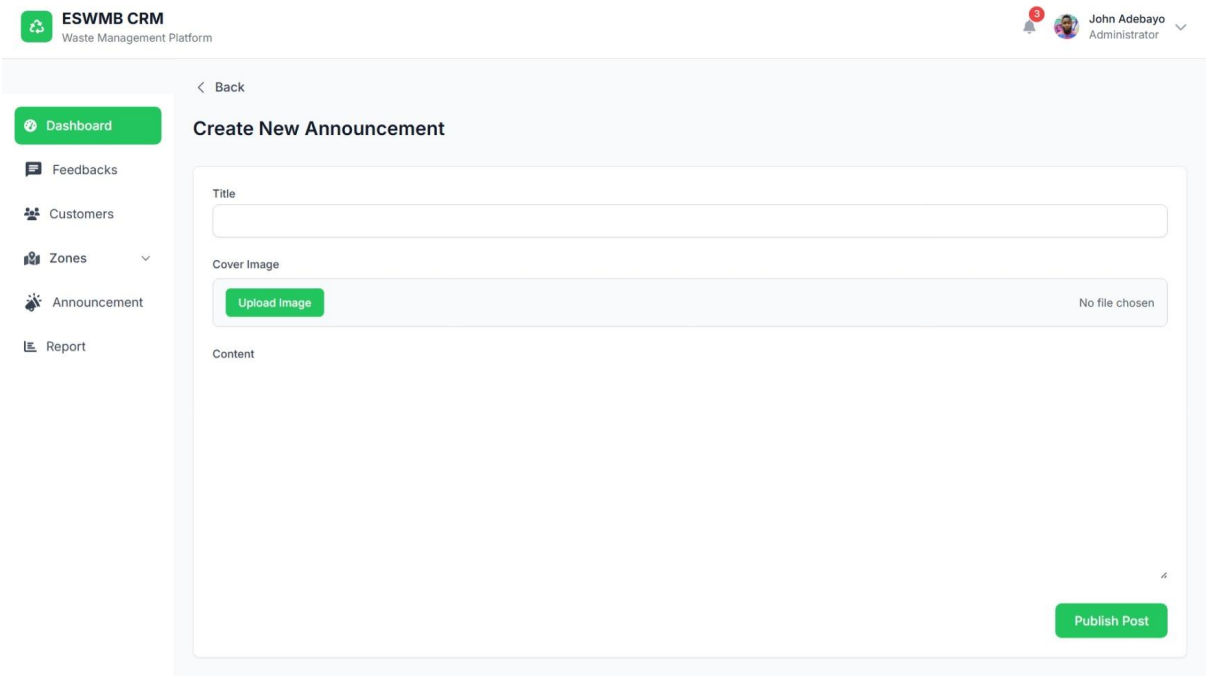


Figure 4.13: Add announcement page

Both interfaces were implemented using Razor pages for dynamic rendering and Tailwind CSS for visual consistency. The use of a responsive layout ensures smooth interaction across devices.

4.2.4 Security Features

Security was a critical consideration throughout implementation. The Security folder in the project includes several classes that ensure user data confidentiality and system integrity.

1. **Authentication and Password Management:** The Argon2PasswordService class was used for hashing and verifying user passwords, providing strong protection against brute-force attacks.
2. **Data Encryption:** The EncryptDecrypt class encrypts sensitive information before storage and decrypts it when retrieved.
3. **Access Control:** The SecurityManager class enforces role-based access control. This ensures that customers and waste managers can only access features permitted for their roles.
4. **Session Management and Input Validation:** Session control prevents unauthorized access after inactivity, and both server-side and client-side validation protect the system from SQL injection and cross-site scripting (XSS).

These combined security measures ensure that communication, authentication, and data management remain safe and reliable for all users.

4.3 System Testing and Evaluation

This section presents the testing and evaluation processes used to verify that the web-based Customer Relationship Management (CRM) platform functions correctly and meets the specified requirements. Testing was carried out at different stages of implementation to ensure that both the customer and waste manager interfaces operated as intended.

4.3.1 Testing Objectives

The main objectives of the testing phase were to:

1. Ensure that all modules function as designed.
2. Verify the accuracy of data flow between the customer and waste manager interfaces.
3. Confirm that the system met usability, reliability, and performance expectations.
4. Identify and correct any errors or inconsistencies before deployment.

4.3. 2 Testing Approach

The system was tested using three main approaches:

1. Unit Testing: Each function and class was tested individually to confirm that it performed correctly in isolation. For example, repository methods in GenericRepo.cs were tested to ensure that data could be inserted, retrieved, updated, and deleted successfully.
2. Integration Testing: The communication between modules, such as between the Feedback (customer request) and Post (announcement) modules, was tested to ensure seamless data exchange through the Entity Framework context.
3. User Acceptance Testing (UAT): The system was tested by a small group of users acting as customers and waste managers. They performed common tasks such as registration, request creation, and announcement posting. Feedback from this session guided final refinements.

Table 4.1 below summarizes several test cases that were executed and their outcomes.

Table 4.1: Summary of test cases

Test ID	Test Scenario	Expected Result	Actual Result	Status
T01	Customer registration with valid input	Account created successfully	Account created successfully	Passed
T02	Waste manager login with correct credentials	Redirects to admin dashboard	Redirect successful	Passed
T03	Create new waste request with image upload	Request saved and visible in chat	Request displayed correctly	Passed
T04	Send message in feedback chat	Message displayed instantly	Message displayed	Passed
T05	Post and delete announcement	Announcement added and deleted correctly	Operation successful	Passed
T06	Attempt login with invalid password	System displays error message	Error displayed	Passed

4.3.4 Evaluation

The evaluation focused on the system's usability, performance, and reliability:

1. Usability: Both interfaces were found to be intuitive. Users could easily navigate between sections such as requests, chats, and announcements.
2. Performance: The system responded quickly to user actions, with database operations and chat message retrieval.
3. Reliability: The system maintained consistent behavior during repeated tests. Data persisted correctly across multiple sessions and accounts.
4. Security: Password hashing and role-based access control worked effectively. Unauthorized users could not access restricted pages.

4.4 System Deployment

This section describes how the web-based Customer Relationship Management (CRM) platform was deployed after successful implementation and testing. The deployment phase involved setting up the environment in which the system would operate, configuring databases, and ensuring that users could access the system through a web browser.

4.4.1 Deployment Environment

The system was developed and initially tested on a local environment before being deployed to a live web server.

Development Environment

1. Operating System: Windows 10
2. Development IDE: Visual Studio 2022
3. Web Server: IIS Express (for local testing)
4. Database: Microsoft SQL Server

Production Environment

1. Hosting Server: IIS (Internet Information Services)
2. Database: Microsoft SQL Server hosted on the same server
3. Browser Compatibility: Chrome, Edge, and Firefox

The transition from development to production ensured that all configurations were replicated accurately to prevent errors after deployment.

4.4.2 Deployment Procedure

The deployment process followed these steps:

1. Publishing the Project: The project was published from Visual Studio using the "Folder Profile" option, which generated all the necessary compiled files.
2. Setting up IIS: Internet Information Services (IIS) was configured to host the application. A new website was created in IIS, and the published folder path was set as the application directory.
3. Database Configuration: The database was set up using SQL Server Management Studio (SSMS). Connection strings in the appsettings.json file were updated to match the live database credentials.

4. Testing the Deployment: The hosted application was tested through a web browser to confirm that all routes, pages, and database connections worked as expected.

4.4.3 Post-Deployment Activities

After deployment, several post-deployment checks were carried out to confirm stability and performance. These included:

1. Testing database connectivity and ensuring no data loss occurred during live operations.
2. Verifying user authentication and access control for both customers and waste managers.
3. Monitoring page load times and optimizing server response for better performance.

The successful deployment of the web-based CRM platform marked the completion of the system's implementation process. The platform is now accessible to registered users, providing a centralized and secure environment for waste management communication and operations.

CHAPTER FIVE

CONCLUSION

5.1 Summary of Findings

This study addressed the pressing challenges of poor communication, weak accountability, and limited citizen participation in waste management operations across Edo State. Through systematic research, design, and implementation, a functional web-based Customer Relationship Management (CRM) platform was developed to bridge the communication gap between residents and waste managers while promoting transparency and service efficiency.

The research revealed that Edo State's waste management system operates through a fragmented framework where the Edo State Waste Management Board (ESWMB) oversees policy and enforcement while private contractors handle operational activities across over 150 zones. However, the reliance on manual record-keeping, informal phone-based communication, and paper documentation created significant barriers to effective service delivery. Key problems identified included delayed complaint resolution, absence of real-time monitoring mechanisms, limited transparency in service operations, and inadequate channels for citizen feedback and participation.

Literature review established that similar challenges exist across Nigerian states and other developing economies, where weak communication infrastructure and limited technological adoption hinder sustainable waste management. Studies by Agbebaku (2021) and Okeke et al. (2025) demonstrated that spatial inequalities in service delivery, poor enforcement of compliance measures, and one-way communication campaigns contribute to low public participation and environmental degradation. International examples from Lagos, Accra, Mumbai, and New York showed that digital platforms, mobile applications, and community engagement tools significantly improve waste management outcomes when properly implemented.

The developed CRM platform successfully addressed these gaps by providing a centralized digital system that connects residents directly with waste managers assigned to their zones. The customer interface enables users to register accounts, submit service requests with image attachments, track complaint status in real time, communicate with waste managers through integrated chat functionality, and access educational content on waste policies and proper disposal practices. The waste manager interface facilitates efficient zone management,

customer relationship tracking, request prioritization and status updates, announcement publishing, and performance monitoring through dashboard analytics.

Technical implementation using ASP.NET Core MVC framework, C# programming language, Razor Pages for dynamic rendering, and Microsoft SQL Server for database management ensured system reliability, scalability, and security. The adoption of the Generic Repository Pattern streamlined data operations, while security features including Argon2 password hashing, role-based access control, and data encryption protected user information and system integrity.

System testing confirmed that all functional requirements were met successfully. Unit testing verified individual module functionality, integration testing validated seamless data flow between components, and user acceptance testing demonstrated strong usability and intuitive navigation for both customer and waste manager interfaces. Performance evaluation showed quick response times, consistent data persistence, and reliable operation across multiple sessions and user accounts.

The study demonstrated that technology-driven solutions can transform public service delivery in developing contexts when designed with attention to local challenges, user needs, and operational realities. The CRM platform represents a practical model for applying customer relationship management principles to environmental governance, promoting accountability, transparency, and citizen participation in waste management.

5.2 Conclusion

This research successfully designed and implemented a web-based Customer Relationship Management platform that enhances communication and customer inclusion in waste management operations across Edo State. The system addresses critical gaps in the existing framework by centralizing communication channels, digitizing operational records, standardizing complaint tracking procedures, and promoting transparent information sharing between residents and waste managers.

The study confirms that effective waste management requires more than just technical infrastructure and policy frameworks; it demands active citizen participation, reliable communication systems, and accountability mechanisms that build public trust. The developed CRM platform provides these essential elements through user-friendly interfaces, real-time interaction capabilities, and data-driven monitoring tools that empower both residents and service providers.

By implementing this digital solution, Edo State can move from a fragmented, manually operated waste management system toward an integrated, transparent, and accountable framework that treats residents as active stakeholders rather than passive recipients of services. The platform's modular architecture ensures scalability to accommodate the state's 150+ zones and growing urban population, while its security features protect user privacy and system integrity.

The research contributes to the growing body of knowledge on technology applications in environmental governance within developing economies. It demonstrates that locally designed digital platforms, when grounded in thorough stakeholder analysis and responsive to operational realities, can serve as effective tools for improving public service delivery and promoting sustainable development.

Beyond its immediate application in Edo State, this study provides a replicable model for other Nigerian states and developing regions facing similar waste management challenges. The principles of centralized communication, digital record-keeping, structured complaint management, and citizen participation embedded in the CRM platform can be adapted to various public service contexts where accountability and transparency remain critical concerns.

Ultimately, the success of this CRM platform depends not only on its technical capabilities but also on organizational commitment, user adoption, and continuous improvement based on feedback and performance evaluation. The system provides the foundation for transforming waste management service delivery, but sustained impact requires stakeholder collaboration, adequate training, ongoing support, and integration with broader environmental governance strategies.

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APPENDIX

SOURCE CODE

USER PORTAL

Sign Up Page

```
<div class="max-w-md w-full space-y-8">


        <div id="header-section" class="text-center">

          <div class="mx-auto h-16 w-16 bg-primary rounded-full flex items-center justify-center mb-6">

            <i class="text-white text-2xl" data-fa-i2svg=""><svg class="svg-inline--fa fa-recycle" aria-hidden="true" focusable="false" data-prefix="fas" data-icon="recycle" role="img" xmlns="http://www.w3.org/2000/svg" viewBox="0 0 512 512" data-fa-i2svg=""><path fill="currentColor" d="M174.7 45.1C192.2 17 223 0 256 0s63.8 17 81.3 45.1l38.6 61.7 27-15.6c8.4-4.9 18.9-4.2 26.6 1.7s11.1 15.9 8.6 25.3l-23.4 87.4c-3.4 12.8-16.6 20.4-29.4 17l-87.4-23.4c-9.4-2.5-16.3-10.4-17.6-20s3.4-19.1 11.8-23.9l28.4-16.4L283 79c-5.8-9.3-16-15-27-15s-21.2 5.7-27 15l-17.5 28c-9.2 14.8-28.6 19.5-43.6 10.5c-15.3-9.2-20.2-29.2-10.7-44.4l17.5-28zM429.5 251.9c15-9 34.4-4.3 43.6 10.5l24.4 39.1c9.4 15.1 14.4 32.4 14.6 50.2c.3 53.1-42.7 96.4-95.8 96.4L320 448v32c0 9.7-5.8 18.5-14.8 22.2s-19.3 1.7-26.2-5.2l-64-64c-9.4-9.4-9.4-24.6 0-33.9l64-64c6.9-6.9 17.2-8.9 26.2-5.2s14.8 12.5 14.8 22.2v32l96.2 0c17.6 0 31.9-14.4 31.8-32c0-5.9-1.7-11.7-4.8-16.7l-24.4-39.1c-9.5-15.2-4.7-35.2 10.7-44.4zm-364.6-31L36 204.2c-8.4-4.9-13.1-14.3-11.8-23.9s8.2-17.5 17.6-20l87.4-23.4c12.8-3.4 26 4.2 29.4 17L182 241.2c2.5 9.4-.9 19.3-8.6 25.3s-18.2 6.6-26.6 1.7l-26.5-15.3L68.8 335.3c-3.1 5-4.8 10.8-4.8 16.7c-.1 17.6 14.2 32 31.8 32l32.2 0c17.7 0 32 14.3 32 32s-14.3 32-32 32l-32.2 0C42.7 448-.3 404.8 0 351.6c.1-17.8 5.1-35.1 14.6-50.2l50.3-80.5z"></path></svg></i>

            </div>

            <h2 class="text-3xl font-bold text-gray-900 mb-2">Welcome To</h2>

            <p class="text-sm text-neutral mb-6">Edo State Waste Management CRM</p>

        </div>


        <div id="signup-form-card" class="bg-white rounded-xl shadow-lg p-8">

            <form method="post" class="space-y-6">

                <div id="fname-field">
```

```
                <label for="fname" class="block text-sm font-semibold text-gray-700 mb-2">First Name</label>

                <div class="relative">

                    <input id="fname" asp-for="Customer.FirstName" type="text" required="required" class="block w-full px-4 py-3 border border-gray-300 rounded-lg placeholder-gray-400 focus:outline-none focus:ring-2 focus:ring-primary focus:border-transparent text-base" placeholder="Enter your first name">

                </div>

            </div>

            <div id="lname-field">

                <label for="lname" class="block text-sm font-semibold text-gray-700 mb-2">Last Name</label>

                <div class="relative">

                    <input id="lname" asp-for="Customer.LastName" type="text" required="required" class="block w-full px-4 py-3 border border-gray-300 rounded-lg placeholder-gray-400 focus:outline-none focus:ring-2 focus:ring-primary focus:border-transparent text-base" placeholder="Enter your last name">

                </div>

            </div>

            <!-- EMAIL Field -->

            <div id="email-field">

                <label for="email" class="block text-sm font-semibold text-gray-700 mb-2">Email</label>

                <div class="relative">

                    <input id="email" asp-for="Customer.Email" type="email" required class="block w-full px-4 py-3 border border-gray-300 rounded-lg placeholder-gray-400 focus:outline-none focus:ring-2 focus:ring-primary focus:border-transparent text-base" placeholder="you@example.com">

                </div>

            </div>


            <!-- PERSONAL PHONE NUMBER Field -->

            <div id="phone-field">

                <label for="phone" class="block text-sm font-semibold text-gray-700 mb-2">Phone Number</label>
```

```
                <div class="relative">
                    <input id="phone" asp-for="Customer.Phone" type="tel" class="block w-full px-4 py-3 border border-gray-300 rounded-lg placeholder-gray-400 focus:outline-none focus:ring-2 focus:ring-primary focus:border-transparent text-base" placeholder="0814 555 5555">
                </div>
            </div>

            <div id="area-field">
                <label for="area" class="block text-sm font-semibold text-gray-700 mb-2">Residential Address</label>
                <div class="relative">
                    <select id="area" asp-for="Address.AddressZoneId" asp-items="@(new SelectList(Model?.ZoneAddress, "Id","Area"))" required="required"
                            class="block w-full rounded-lg border border-gray-300 bg-white pl-5 pr-3 py-2 text-base text-gray-700 shadow-sm focus:border-green-600 focus:ring-2 focus:ring-green-500 focus:outline-none">
                        <option value="">Select your area</option>
                    </select>
                </div>
            </div>

            <div id="residential-address-field">
                <label for="residentialAddress" class="block text-sm font-semibold text-gray-700 mb-2">Residential Address</label>
                <div class="relative">
                    <input id="residentialAddress" asp-for="Address.Address" type="text" class="block w-full px-4 py-3 border border-gray-300 rounded-lg placeholder-gray-400 focus:outline-none focus:ring-2 focus:ring-primary focus:border-transparent text-base" placeholder="123 Main St, Ekehuan">
                </div>
            </div>
```

```
<!-- building type -->
<div id="buildingType-field">
  <label for="btype" class="block text-sm font-semibold text-gray-700 mb-2">Building Type</label>
  <div class="relative">

    <select id="zone" asp-for="Address.BuildingType" asp-items="Html.GetEnumSelectList<BuildingType>()" required="required"
      class="block w-full rounded-lg border border-gray-300 bg-white pl-5 pr-3 py-2 text-base text-gray-700 shadow-sm focus:border-green-600 focus:ring-2 focus:ring-green-500 focus:outline-none">
      <option value="">Select a building type</option>
    </select>
  </div>
</div>

<!--Password-->
<div id="password-field">
  <label for="password" class="block text-sm font-semibold text-gray-700 mb-2">Password</label>
  <div class="relative">
    <div class="absolute inset-y-0 left-0 pl-3 flex items-center pointer-events-none">
      <i class="text-gray-400" data-fa-i2svg=""><svg class="svg-inline--fa fa-lock" aria-hidden="true" focusable="false" data-prefix="fas" data-icon="lock" role="img" xmlns="http://www.w3.org/2000/svg" viewBox="0 0 448 512" data-fa-i2svg=""><path fill="currentColor" d="M144 144v48H304V144c0-44.2-35.8-80-80-80s-80 35.8-80 80zM80 192V144C80 64.5 144.5 0 224 0s144 64.5 144 144v48h16c35.3 0 64 28.7 64 64V448c0 35.3-28.7 64-64 64H64c-35.3 0-64-28.7-64-64V256c0-35.3 28.7-64 64-64H80z"></path></svg></i>
    </div>
    <input id="password" asp-for="Customer.Password" type="password" required="" class="block w-full pl-10 pr-10 py-3 border border-gray-300 rounded-lg placeholder-gray-400 focus:outline-none focus:ring-2 focus:ring-primary focus:border-transparent text-base" placeholder="Enter your password">
```

<button type="button" class="text-gray-400 hover:text-gray-600" onclick="togglePassword()">

<svg class="svg-inline--fa fa-eye" aria-hidden="true" focusable="false" data-prefix="fas" data-icon="eye" role="img" xmlns="http://www.w3.org/2000/svg" viewBox="0 0 576 512" data-fa-i2svg=""><path fill="currentColor" d="M288 32c-80.8 0-145.5 36.8-192.6 80.6C48.6 156 17.3 208 2.5 243.7c-3.3 7.9-3.3 16.7 0 24.6C17.3 304 48.6 356 95.4 399.4C142.5 443.2 207.2 480 288 480s145.5-36.8 192.6-80.6c46.8-43.5 78.1-95.4 93-131.1c3.3-7.9 3.3-16.7 0-24.6c-14.9-35.7-46.2-87.7-93-131.1C433.5 68.8 368.8 32 288 32zM144 256a144 144 0 1 1 288 0 144 144 0 1 1 -288 0zm144-64c0 35.3-28.7 64-64 64c-7.1 0-13.9-1.2-20.3-3.3c-5.5-1.8-11.9 1.6-11.7 7.4c.3 6.9 1.3 13.8 3.2 20.7c13.7 51.2 66.4 81.6 117.6 67.9s81.6-66.4 67.9-117.6c-11.1-41.5-47.8-69.4-88.6-71.1c-5.8-.2-9.2 6.1-7.4 11.7c2.1 6.4 3.3 13.2 3.3 20.3z"></path></svg>

</button>

<button type="submit" class="group relative w-full flex justify-center py-3 px-4 border border-transparent text-base font-semibold rounded-lg text-white bg-primary hover:bg-green-700 focus:outline-none focus:ring-2 focus:ring-offset-2 focus:ring-primary transition-colors duration-200">

<svg class="svg-inline--fa fa-right-to-bracket" aria-hidden="true" focusable="false" data-prefix="fas" data-icon="right-to-bracket" role="img" xmlns="http://www.w3.org/2000/svg" viewBox="0 0 512 512" data-fa-i2svg=""><path fill="currentColor" d="M217.9 105.9L340.7 228.7c7.2 7.2 11.3 17.1 11.3 27.3s-4.1 20.1-11.3 27.3L217.9 406.1c-6.4 6.4-15 9.9-24 9.9c-18.7 0-33.9-15.2-33.9-33.9l0-62.1L32 320c-17.7 0-32-14.3-32-32l0-64c0-17.7 14.3-32 32-32l128 0 0-62.1c0-18.7 15.2-33.9 33.9-33.9c9 0 17.6 3.6 24 9.9zM352 416l64 0c17.7 0 32-14.3 32-32l0-256c0-17.7-14.3-32-32-32l-64 0c-17.7 0-32-14.3-32-32s14.3-32 32-32l64 0c53 0 96 43 96 96l0 256c0 53-43 96-96 96l-64 0c-17.7 0-32-14.3-32-32s14.3-32 32-32z"></path></svg>

Sign up

</button>

```
            </div>

            <div id="register-link" class="text-center pt-4 border-t border-gray-200">
              <p class="text-sm text-neutral">
                Already have an account?
                <a href="/Login" class="font-medium text-secondary hover:text-blue-800">Login here</a>
              </p>
            </div>

          </form>
        </div>

        <div id="footer-info" class="text-center">
          <p class="text-xs text-neutral">© 2025 Edo State Waste Management Board. All rights reserved.</p>
        </div>

      </div>
```

Login Page

Dashboard

```
<main id="main-content" class="p-4 pb-20 max-w-lg m-auto item-center justify-center overflow-hidden">

<!-- Request List -->

<div id="request-list-section" class="block max-w-sm">

  <div class="px-4 pb-4">

    <div class="my-5">

      <a href="/UserPortal/NewRequest" class="group relative w-full flex justify-center py-3 px-4 border border-transparent text-base font-semibold rounded-lg text-white bg-primary hover:bg-green-700 focus:outline-none focus:ring-2 focus:ring-offset-2 focus:ring-primary transition-colors duration-200">

        <span class="absolute left-0 inset-y-0 flex items-center pl-3">
```

<svg class="svg-inline--fa fa-right-to-bracket" aria-hidden="true" focusable="false" data-prefix="fas" data-icon="right-to-bracket" role="img" xmlns="http://www.w3.org/2000/svg" viewBox="0 0 512 512" data-fa-i2svg=""><path fill="currentColor" d="M217.9 105.9L340.7 228.7c7.2 7.2 11.3 17.1 11.3 27.3s-4.1 20.1-11.3 27.3L217.9 406.1c-6.4 6.4-15 9.9-24 9.9c-18.7 0-33.9-15.2-33.9-33.9l0-62.1L32 320c-17.7 0-32-14.3-32-32l0-64c0-17.7 14.3-32 32-32l128 0 0-62.1c0-18.7 15.2-33.9 33.9-33.9c9 0 17.6 3.6 24 9.9zM352 416l64 0c17.7 0 32-14.3 32-32l0-256c0-17.7-14.3-32-32-32l-64 0c-17.7 0-32-14.3-32-32s14.3-32 32-32l64 0c53 0 96 43 96 96l0 256c0 53-43 96-96 96l-64 0c-17.7 0-32-14.3-32-32s14.3-32 32-32z"></path></svg>

New Request

@if(Model.Feedbacks.Count() > 0)

{

@foreach (var request in Model.Feedbacks)

{

<**a** **asp-page**="/UserPortal/Conversation" **asp-route-requestId**="@request.Uid">

<div class="request-item bg-white border border-gray-200 rounded-lg p-3 cursor-pointer hover:border-primary transition-colors"

data-id="@request.Id">

@request.Subject

@request.Priority

@request.Uid.Substring(0,3)-@request.Id

Open

Nov 30, 2025

```
                    </div>
                </div>
                </a>
            }
        </div>

    }
    else
    {
        <p class="text-center">You haven't started any conversation with your manager yet. Make a request to get started</p>
    }
  </div>
</div>
```

Request Page

```
<main id="main-content" class="p-4 pb-20 flex min-h-screen item-center justify-center overflow-hidden">
  <!-- Request Form Section -->
  <section id="request-form-section" class="h-[fit-content] bg-white rounded-lg shadow-sm border border-gray-200 px-5 py-10 mb-6">
    <h2 class="text-lg font-semibold text-gray-900 mb-4">Submit New Request</h2>

    <form id="request-form" method="post" class="space-y-4">
      <div>
        <label class="block text-sm font-medium text-gray-700 mb-2">Subject</label>
        <input asp-for="Feedback.Subject" type="text" class="w-full px-3 py-3 border border-gray-300 rounded-lg focus:outline-none focus:ring-2 focus:ring-primary focus:border-transparent" placeholder="Brief description of your issue">
      </div>
```

<label class="block text-sm font-medium text-gray-700 mb-2">Priority</label>

<**select asp-for**="Feedback.Priority" class="w-full px-3 py-3 border border-gray-300 rounded-lg focus:outline-none focus:ring-2 focus:ring-primary focus:border-transparent">

<**option**>Select Priority</**option**>

<**option value**="Low">Low</**option**>

<**option value**="Medium">Medium</**option**>

<**option value**="High">High</**option**>

</**select**>

<label class="block text-sm font-medium text-gray-700 mb-2">Details</label>

<**textarea asp-for**="Feedback.Message" rows="4" class="w-full px-3 py-3 border border-gray-300 rounded-lg focus:outline-none focus:ring-2 focus:ring-primary focus:border-transparent resize-none" placeholder="Provide detailed information about your request"></**textarea**>

<label class="block text-sm font-medium text-gray-700 mb-2">Attach Files</label>

<svg class="svg-inline--fa fa-cloud-arrow-up" aria-hidden="true" focusable="false" data-prefix="fas" data-icon="cloud-arrow-up" role="img" xmlns="http://www.w3.org/2000/svg" viewBox="0 0 640 512" data-fa-i2svg=""><path fill="currentColor" d="M144 480C64.5 480 0 415.5 0 336c0-62.8 40.2-116.2 96.2-135.9c-.1-2.7-.2-5.4-.2-8.1c0-88.4 71.6-160 160-160c59.3 0 111 32.2 138.7 80.2C409.9 102 428.3 96 448 96c53 0 96 43 96 96c0 12.2-2.3 23.8-6.4 34.6C596 238.4 640 290.1 640 352c0 70.7-57.3 128-128 128H144zm79-217c-9.4 9.4-9.4 24.6 0 33.9s24.6 9.4 33.9 0l39-39V392c0 13.3 10.7 24 24 24s24-10.7 24-24V257.9l39 39c9.4 9.4 24.6 9.4 33.9 0s9.4-24.6 0-33.9l-80-80c-9.4-9.4-24.6-9.4-33.9 0l-80 80z"></path></svg>

Tap to upload photos or documents

<input type="file" asp-for="Image" class="hidden" accept="image/*,.pdf,.doc,.docx">

<button type="submit" class="w-full bg-primary text-white py-3 px-4 rounded-lg font-medium hover:bg-green-600 transition-colors">

<svg class="svg-inline--fa fa-paper-plane" aria-hidden="true" focusable="false" data-prefix="fas" data-icon="paper-plane" role="img" xmlns="http://www.w3.org/2000/svg" viewBox="0 0 512 512" data-fa-i2svg=""><path fill="currentColor" d="M498.1 5.6c10.1 7 15.4 19.1 13.5 31.2l-64 416c-1.5 9.7-7.4 18.2-16 23s-18.9 5.4-28 1.6L284 427.7l-68.5 74.1c-8.9 9.7-22.9 12.9-35.2 8.1S160 493.2 160 480V396.4c0-4 1.5-7.8 4.2-10.7L331.8 202.8c5.8-6.3 5.6-16-.4-22s-15.7-6.4-22-.7L106 360.8 17.7 316.6C7.1 311.3 .3 300.7 0 288.9s5.9-22.8 16.1-28.7l448-256c10.7-6.1 23.9-5.5 34 1.4z"></path></svg>Submit Request

</button>

</**form**>

</section>

</main>

Conversation Page

<main id="main-content" class="p-4 pb-20 max-w-lg m-auto item-center justify-center overflow-hidden">

<!-- Conversation Thread -->

<section id="conversation-section" class=" bg-white rounded-lg shadow-sm border border-gray-200 p-4">

 Back to Requests

<h2 class="text-lg font-semibold text-gray-900">@Model.Threads.First().Feedback.Subject</h2>

```
@foreach (var conversation in Model.Threads)
{
    if (conversation.CustomerId != Model.Customer.Id)
    {
        <!-- Manager -->
        <div class="flex items-start space-x-3">
            <div>
                <div class="bg-gray-100 rounded-lg p-3 min-w-[50%]">
                    <p class="text-sm text-gray-800">
                        @conversation.Message
                    </p>
                </div>
                <div class="flex items-center space-x-2 mt-1 text-xs text-gray-500">
                    <span class="font-medium">@conversation.User?.FirstName - Manager</span>
                    <span>@conversation.DateTime.ToString("MMM dd, yyyy")</span>
                </div>
            </div>
        </div>
    }
    else
    {
        <!-- Customer -->
        <div class="flex items-start space-x-3 justify-end">
            <div class="flex flex-col items-end">
                <div class="bg-primary text-white rounded-lg p-3 min-w-[50%]">
                    <p class="text-sm">@conversation.Message</p>
                </div>
                <div class="flex items-center space-x-2 mt-1 text-xs text-gray-400">
                    <span>@conversation.DateTime.ToString("MMM dd, yyyy")</span>
                    <span class="font-medium text-gray-500">You</span>
```

```
                </div>
            </div>
        </div>
    }
}
</div>

<form method="post">
    <div class="mt-6 pt-4 border-t border-gray-200 flex items-center space-x-3">
        <textarea asp-for="Message" rows="1" class="flex-1 px-3 py-2 border border-gray-300 rounded-full focus:ring-2 focus:ring-primary outline-none" placeholder="Type your message..."></textarea>
        <input asp-for="Feedback.Id" hidden/>
        <button class="bg-primary text-white p-2 rounded-full hover:bg-green-600 transition">
            <i class="fa-solid fa-paper-plane text-sm"></i>
        </button>
    </div>
</form>
</section>
</main>
```

WASTE MANAGER/ADMIN PAGES

Registration Page

```
<div id="login-container" class="min-h-screen flex items-center justify-center py-12 px-4 sm:px-6 lg:px-8">
    <div class="max-w-md w-full space-y-8">

        <div id="header-section" class="text-center">
            <div class="mx-auto h-16 w-16 bg-primary rounded-full flex items-center justify-center mb-6">
```

<svg class="svg-inline--fa fa-recycle" aria-hidden="true" focusable="false" data-prefix="fas" data-icon="recycle" role="img" xmlns="http://www.w3.org/2000/svg" viewBox="0 0 512 512" data-fa-i2svg=""><path fill="currentColor" d="M174.7 45.1C192.2 17 223 0 256 0s63.8 17 81.3 45.1l38.6 61.7 27-15.6c8.4-4.9 18.9-4.2 26.6 1.7s11.1 15.9 8.6 25.3l-23.4 87.4c-3.4 12.8-16.6 20.4-29.4 17l-87.4-23.4c-9.4-2.5-16.3-10.4-17.6-20s3.4-19.1 11.8-23.9l28.4-16.4L283 79c-5.8-9.3-16-15-27-15s-21.2 5.7-27 15l-17.5 28c-9.2 14.8-28.6 19.5-43.6 10.5c-15.3-9.2-20.2-29.2-10.7-44.4l17.5-28zM429.5 251.9c15-9 34.4-4.3 43.6 10.5l24.4 39.1c9.4 15.1 14.4 32.4 14.6 50.2c.3 53.1-42.7 96.4-95.8 96.4L320 448v32c0 9.7-5.8 18.5-14.8 22.2s-19.3 1.7-26.2-5.2l-64-64c-9.4-9.4-9.4-24.6 0-33.9l64-64c6.9-6.9 17.2-8.9 26.2-5.2s14.8 12.5 14.8 22.2v32l96.2 0c17.6 0 31.9-14.4 31.8-32c0-5.9-1.7-11.7-4.8-16.7l-24.4-39.1c-9.5-15.2-4.7-35.2 10.7-44.4zm-364.6-31L36 204.2c-8.4-4.9-13.1-14.3-11.8-23.9s8.2-17.5 17.6-20l87.4-23.4c12.8-3.4 26 4.2 29.4 17L182 241.2c2.5 9.4-.9 19.3-8.6 25.3s-18.2 6.6-26.6 1.7l-26.5-15.3L68.8 335.3c-3.1 5-4.8 10.8-4.8 16.7c-.1 17.6 14.2 32 31.8 32l32.2 0c17.7 0 32 14.3 32 32s-14.3 32-32 32l-32.2 0C42.7 448-.3 404.8 0 351.6c.1-17.8 5.1-35.1 14.6-50.2l50.3-80.5z"></path></svg>

<h2 class="text-3xl font-bold text-gray-900 mb-2">Welcome To</h2>

Edo State Waste Management CRM

<form method="post" class="space-y-6">

<label for="fname" class="block text-sm font-semibold text-gray-700 mb-2">First Name</label>

<input id="fname" asp-for="User.FirstName" type="text" required="required" class="block w-full px-4 py-3 border border-gray-300 rounded-lg placeholder-gray-400 focus:outline-none focus:ring-2 focus:ring-primary focus:border-transparent text-base" placeholder="Enter your first name">

<label for="lname" class="block text-sm font-semibold text-gray-700 mb-2">Last Name</label>

<input id="lname" asp-for="User.LastName" type="text" required="required" class="block w-full px-4 py-3 border border-gray-300 rounded-lg placeholder-gray-400 focus:outline-none focus:ring-2 focus:ring-primary focus:border-transparent text-base" placeholder="Enter your last name">

<!-- EMAIL Field -->

<label for="email" class="block text-sm font-semibold text-gray-700 mb-2">Email</label>

<input id="email" asp-for="User.Email" type="email" required class="block w-full px-4 py-3 border border-gray-300 rounded-lg placeholder-gray-400 focus:outline-none focus:ring-2 focus:ring-primary focus:border-transparent text-base" placeholder="you@example.com">

<!-- PERSONAL PHONE NUMBER Field -->

<label for="phone" class="block text-sm font-semibold text-gray-700 mb-2">Phone Number (Personal)</label>

<input id="phone" asp-for="User.Phone" type="tel" class="block w-full px-4 py-3 border border-gray-300 rounded-lg placeholder-gray-400 focus:outline-none focus:ring-2 focus:ring-primary focus:border-transparent text-base" placeholder="0814 555 5555">

<!-- PASSWORD Field -->

<label for="phone" class="block text-sm font-semibold text-gray-700 mb-2">Password</label>

```
                <div class="relative">
                    <input id="password" asp-for="User.Password" type="password" class="block w-full px-4 py-3 border border-gray-300 rounded-lg placeholder-gray-400 focus:outline-none focus:ring-2 focus:ring-primary focus:border-transparent text-base" placeholder="enter your user password">
                </div>
            </div>

            <!-- BUSINESS NAME Field -->
            <div id="business-name-field">
                <label for="businessName" class="block text-sm font-semibold text-gray-700 mb-2">Business Name</label>
                <div class="relative">
                    <input id="businessName" asp-for="Business.Name" type="text" required class="block w-full px-4 py-3 border border-gray-300 rounded-lg placeholder-gray-400 focus:outline-none focus:ring-2 focus:ring-primary focus:border-transparent text-base" placeholder="Acme Corp">
                </div>
            </div>

            <!-- BUSINESS ADDRESS Field -->
            <div id="business-address-field">
                <label for="businessAddress" class="block text-sm font-semibold text-gray-700 mb-2">Business Address</label>
                <div class="relative">
                    <input id="businessAddress" asp-for="Business.Address" type="text" class="block w-full px-4 py-3 border border-gray-300 rounded-lg placeholder-gray-400 focus:outline-none focus:ring-2 focus:ring-primary focus:border-transparent text-base" placeholder="123 Main St, Ekehuan">
                </div>
            </div>

            <!-- BUSINESS PHONE NUMBER Field -->
```

```
<div id="business-phone-field">
    <label for="businessPhone" class="block text-sm font-semibold text-gray-700 mb-2">Business Phone Number</label>
    <div class="relative">
        <input id="businessPhone" asp-for="Business.Phone" type="tel" class="block w-full px-4 py-3 border border-gray-300 rounded-lg placeholder-gray-400 focus:outline-none focus:ring-2 focus:ring-primary focus:border-transparent text-base" placeholder="0805 555 1212">
    </div>
</div>



<!--Dropdown selection-->



<label for="myDropdown" class="block text-sm font-medium text-gray-700 mb-2">Select an Option</label>
<select id="myDropdown"
    asp-for="BusinessZone.AddressZoneId"
    class="block w-full rounded-lg border border-gray-300 bg-white pl-4 pr-3 py-3 text-gray-700 shadow-sm focus:ring-2 focus:ring-primary focus:border-transparent focus:outline-none">

    <option value="">Select a zone</option>

    @if (Model.Zones != null && Model.ZoneAddresses != null)
    {
        @foreach (var item in Model.Zones)
        {
            var relatedSubs = Model.ZoneAddresses.Where(s => s.ZoneId == item.Id).ToList();

            if (relatedSubs.Any())
```

```
                {
                    <optgroup label="@item.Name">
                        @foreach (var sub in relatedSubs)
                        {
                            <option value="@sub.Id">@sub.Area</option>
                        }
                    </optgroup>
                }
                else
                {
                    <option value="@item.Id">@item.Name</option>
                }
            }
        }


    </select>


    <div id="login-button">
        <button type="submit" class="group relative w-full flex justify-center py-3 px-4 border border-transparent text-base font-semibold rounded-lg text-white bg-primary hover:bg-green-700 focus:outline-none focus:ring-2 focus:ring-offset-2 focus:ring-primary transition-colors duration-200">
            <span class="absolute left-0 inset-y-0 flex items-center pl-3">
                <i class="text-green-500 group-hover:text-green-400" data-fa-i2svg=""><svg class="svg-inline--fa fa-right-to-bracket" aria-hidden="true" focusable="false" data-prefix="fas" data-icon="right-to-bracket" role="img" xmlns="http://www.w3.org/2000/svg" viewBox="0 0 512 512" data-fa-i2svg=""><path fill="currentColor" d="M217.9 105.9L340.7 228.7c7.2 7.2 11.3 17.1 11.3 27.3s-4.1 20.1-11.3 27.3L217.9 406.1c-6.4 6.4-15 9.9-24 9.9c-18.7 0-33.9-15.2-33.9-33.9l0-62.1L32 320c-17.7 0-32-14.3-32-32l0-64c0-17.7 14.3-32 32-32l128 0 0-62.1c0-18.7 15.2-33.9 33.9-33.9c9 0 17.6 3.6 24 9.9zM352 416l64 0c17.7 0 32-14.3 32-32l0-256c0-17.7-14.3-32-32-32l-64 0c-17.7 0-32-14.3-32-32s14.3-32 32-32l64 0c53 0 96 43 96 96l0 256c0 53-43 96-96 96l-64 0c-17.7 0-32-14.3-32-32s14.3-32 32-32z"></path></svg></i>
            </span>
            Register
```

```
            </button>
          </div>

          <div id="register-link" class="text-center pt-4 border-t border-gray-200">
            <p class="text-sm text-neutral">
              Not a new manager?
              <a href="/AdminPortal/AdminLogin" class="font-medium text-secondary hover:text-blue-800">Login here</a>
            </p>
          </div>

        </form>
      </div>

      <div id="footer-info" class="text-center">
        <p class="text-xs text-neutral">© 2025 Edo State Waste Management Board. All rights reserved.</p>
      </div>

    </div>
  </div>
```

Zones Page

```
<!-- Main Content -->
<main id="main-content" class="flex-1 p-6 overflow-y-auto">

  <!-- Dashboard Header -->
  <div id="dashboard-header" class="mb-8">
    <div class="flex items-center justify-between mb-4">
      <h1 class="text-2xl font-bold text-gray-900">Zones Addresses</h1>
```

<button data-open="zone-modal" class="bg-primary text-white px-4 py-2 rounded-lg font-medium hover:bg-green-600 transition-colors">

<svg class="svg-inline--fa fa-plus" aria-hidden="true" focusable="false" data-prefix="fas" data-icon="plus" role="img" xmlns="http://www.w3.org/2000/svg" viewBox="0 0 448 512" data-fa-i2svg=""><path fill="currentColor" d="M256 80c0-17.7-14.3-32-32-32s-32 14.3-32 32V224H48c-17.7 0-32 14.3-32 32s14.3 32 32 32H192V432c0 17.7 14.3 32 32 32s32-14.3 32-32V288H400c17.7 0 32-14.3 32-32s-14.3-32-32-32H256V80z"></path></svg>

Add Zone Address

</button>

@if(Model.ZoneAddresses.Count() > 0)

{

<!-- Filters and Recent Requests -->

<!-- Header with Filters -->

<svg class="svg-inline--fa fa-magnifying-glass" aria-hidden="true" focusable="false" data-prefix="fas" data-icon="magnifying-glass" role="img" xmlns="http://www.w3.org/2000/svg" viewBox="0 0 512 512" data-fa-i2svg=""><path fill="currentColor" d="M416 208c0 45.9-14.9 88.3-40 122.7L502.6 457.4c12.5 12.5 12.5 32.8 0 45.3s-32.8 12.5-45.3 0L330.7 376c-34.4 25.2-76.8 40-122.7 40C93.1 416 0 322.9 0 208S93.1 0 208 0S416 93.1 416 208zM208 352a144 144 0 1 0 0-288 144 144 0 1 0 0 288z"></path></svg>

<input type="text" id="global_filter" placeholder="Search..." class="pl-10 pr-4 py-2 border rounded-lg focus:ring-2 focus:ring-primary focus:border-transparent">

```
            </div>
          </div>
        </div>
      </div>

      <!-- Requests Table -->
      <div class="overflow-x-visible">
        <table class="w-full datatable">
          <thead class="bg-gray-50">
            <tr>
              <th class="px-6 py-3 text-left text-xs font-medium text-gray-500 uppercase tracking-wider">No</th>
              <th class="px-6 py-3 text-left text-xs font-medium text-gray-500 uppercase tracking-wider">ZoneId</th>
              <th class="px-6 py-3 text-left text-xs font-medium text-gray-500 uppercase tracking-wider">Zone Address</th>
              <th class="px-6 py-3 text-left text-xs font-medium text-gray-500 uppercase tracking-wider">Zone</th>
              <th class="px-6 py-3 text-left text-xs font-medium text-gray-500 uppercase tracking-wider">Actions</th>
            </tr>
          </thead>
          <tbody class="bg-white divide-y divide-gray-200">
            @{var i = 1;}
            @foreach(var zoneAdress in Model.ZoneAddresses)
            {

              <tr class="hover:bg-gray-50">
                <td class="px-6 py-4 whitespace-nowrap">
                  <span class="text-sm font-medium text-center">@i</span>
                </td>
                <td class="px-6 py-4 whitespace-nowrap">
```

@zoneAdress.ZoneId

</td>

<td class="px-6 py-4 whitespace-nowrap text-sm text-gray-900">@zoneAdress.Area</td>

<td class="px-6 py-4 whitespace-nowrap">

@zoneAdress.Zone.Name

</td>

<td class="px-6 py-4 whitespace-nowrap text-sm space-x-2">

<!-- Trigger Button -->

<button x-on:click="open = !open"

class="p-2 rounded-full hover:bg-gray-100 transition-colors duration-150">

<!-- Three-dot vertical icon -->

<svg xmlns="http://www.w3.org/2000/svg" class="w-5 h-5 text-gray-600" fill="none" viewBox="0 0 24 24"

stroke="currentColor" stroke-width="2">

<path stroke-linecap="round" stroke-linejoin="round" d="M12 5h.01M12 12h.01M12 19h.01" />

</svg>

</button>

<!-- Dropdown Card -->

<div x-show="open"

x-on:click.away="open = false"

x-transition:enter="transition ease-out duration-100"

x-transition:enter-start="opacity-0 translate-y-1"

x-transition:enter-end="opacity-100 translate-y-0"

```
                x-transition:leave="transition ease-in duration-75"
                x-transition:leave-start="opacity-100 translate-y-0"
                x-transition:leave-end="opacity-0 translate-y-1"
                class="absolute z-[9999] right-0 mt-2 w-56 bg-white rounded-xl shadow-lg ring-1 ring-black ring-opacity-5 p-2 z-50"
                style="display: none;">

                <form method="post" class="space-y-1">
                    <a href="#"
                    x-on:click="open = false"
                    class="flex items-center gap-2 px-3 py-2 text-gray-700 hover:bg-gray-100 rounded-md transition-colors duration-150">
                        <svg xmlns="http://www.w3.org/2000/svg" width="20" height="20" viewBox="0 0 24 24"><path fill="none" stroke="currentColor" stroke-linecap="round" stroke-linejoin="round" stroke-width="2" d="M21.174 6.812a1 1 0 0 0-3.986-3.987L3.842 16.174a2 2 0 0 0-.5.83l-1.321 4.352a.5.5 0 0 0 .623.622l4.353-1.32a2 2 0 0 0 .83-.497z" /></svg>
                        @*<img src="~/Admin/assets/img/icons/View.svg" alt="View" class="w-4 h-4">*@
                        <span>Edit Zone</span>
                    </a>
                    <a href="#"
                    x-on:click="open = false; return confirm('If you delete this booking it also deletes the user related to it. Are you sure you want to delete?')"
                    class="flex items-center gap-2 px-3 py-2 text-red-600 hover:bg-red-50 rounded-md transition-colors duration-150">
                        <svg xmlns="http://www.w3.org/2000/svg" width="20" height="20" viewBox="0 0 24 24"><path fill="none" stroke="#ce0606" stroke-linecap="round" stroke-linejoin="round" stroke-miterlimit="10" stroke-width="1.5" d="M19 8v11.6a2.4 2.4 0 0 1-2.4 2.4H7.4A2.4 2.4 0 0 1 5 19.6V8m11-3V3.2c0-.66-.54-1.2-1.2-1.2H9.2C8.54 2 8 2.54 8 3.2V5m8 0H8m8 0h5M8 5H3m9 6v6m3-6v6m-6-6v6" /></svg>
                        @*<img src="~/Admin/assets/img/icons/trash-bin.svg" alt="Delete" class="w-4 h-4">*@
                        <span>Delete Zone</span>
                    </a>
```

```
                        </form>
                    </div>
                </div>
            </td>
        </tr>
        i++;
    }
    </tbody>
</table>
</div>

<!-- Pagination -->
<div class="px-6 py-4 border-t flex items-center justify-between">
    <div class="text-sm text-gray-500 pagination-pages">
        <span>Page <input class="border w-6 p-0" type="number" id="page-input" value="1" min="1"> of <span id="total-pages"></span> </span>
    </div>
    <div class="flex items-center space-x-2 pagination-btns">
        <button id="prev-page" class="px-3 py-2 text-sm border rounded-lg text-gray-500 hover:bg-gray-50">Previous</button>
        <button id="next-page" class="px-3 py-2 text-sm border rounded-lg text-gray-500 hover:bg-gray-50">Next</button>
    </div>
</div>
</div>
}
else
{
<p class="text-center">No zone addresses yet</p>
}
```

```
<!-- Modal -->
<div data-modal="zone-modal" class="hidden fixed inset-0 bg-black bg-opacity-50 flex items-center justify-center z-50">
    <div class="bg-white rounded-xl shadow-lg p-8 w-full max-w-md relative">
        <button data-close class="absolute top-3 right-3 text-gray-500 hover:text-gray-700">✕</button>

        <form method="post" class="space-y-6">
            <div>
                <label for="zoneName" class="block text-sm font-semibold text-gray-700 mb-2">Zones Address</label>
                <div class="relative">
                    <input id="zoneName" asp-for="ZoneAddress.Area" type="text" required
                        class="block w-full pl-5 pr-3 py-3 border border-gray-300 rounded-lg placeholder-gray-400 focus:outline-none focus:ring-2 focus:ring-green-600 focus:border-transparent text-base"
                        placeholder="Enter your zone name" />
                </div>
            </div>
            <div class="mb-4">
                <label for="zone" class="block text-sm font-medium text-gray-700 mb-2">
                    Zone
                </label>
                <select id="zone" asp-for="ZoneAddress.ZoneId" asp-items="@(new SelectList(Model?.Zones, "Id","Name"))" required="required"
                    class="block w-full rounded-lg border border-gray-300 bg-white pl-5 pr-3 py-2 text-base text-gray-700 shadow-sm focus:border-green-600 focus:ring-2 focus:ring-green-500 focus:outline-none">
                    <option value="">Select a zone</option>
```

```
            </select>
        </div>

        <!-- Submit -->
        <button type="submit"
            class="w-full py-3 bg-green-600 text-white font-semibold rounded-lg hover:bg-green-700 focus:ring-2 focus:ring-green-500">
            Create
        </button>
    </form>
  </div>
 </div>
</main>
```

Customer Management Page

```
 @if(Model.Customers.Count() > 0)
 {
   <div id="requests-section" class="bg-white rounded-xl shadow-sm border">
     <!-- Header with Filters -->
     <div class="p-6 border-b">
       <div class="flex items-center space-x-4">
         <div class="flex items-center space-x-2">
           <div class="relative">
             <i class="absolute left-3 top-3 text-gray-400" data-fa-i2svg=""><svg class="svg-inline--fa fa-magnifying-glass" aria-hidden="true" focusable="false" data-prefix="fas" data-icon="magnifying-glass" role="img" xmlns="http://www.w3.org/2000/svg" viewBox="0 0 512 512" data-fa-i2svg=""><path fill="currentColor" d="M416 208c0 45.9-14.9 88.3-40 122.7L502.6 457.4c12.5 12.5 12.5 32.8 0 45.3s-32.8 12.5-45.3 0L330.7 376c-34.4 25.2-76.8 40-122.7 40C93.1 416 0 322.9 0 208S93.1 0 208 0S416 93.1 416 208zM208 352a144 144 0 1 0 0-288 144 144 0 1 0 0 288z"></path></svg></i>
             <input type="text" id="global_filter" placeholder="Search..." class="pl-10 pr-4 py-2 border rounded-lg focus:ring-2 focus:ring-primary focus:border-transparent">
           </div>
```

```
            </div>
          </div>
        </div>
        <!-- Requests Table -->
        <div class="overflow-x-visible">
          <table class="w-full datatable">
            <thead class="bg-gray-50">
              <tr>
                <th class="px-6 py-3 text-left text-xs font-medium text-gray-500 uppercase tracking-wider">No</th>
                <th class="px-6 py-3 text-left text-xs font-medium text-gray-500 uppercase tracking-wider">Customer Name</th>
                <th class="px-6 py-3 text-left text-xs font-medium text-gray-500 uppercase tracking-wider">Phone Number</th>
                <th class="px-6 py-3 text-left text-xs font-medium text-gray-500 uppercase tracking-wider">Email</th>
                <th class="px-6 py-3 text-left text-xs font-medium text-gray-500 uppercase tracking-wider">Residential Address</th>
                <th class="px-6 py-3 text-left text-xs font-medium text-gray-500 uppercase tracking-wider">Area</th>
                <th class="px-6 py-3 text-left text-xs font-medium text-gray-500 uppercase tracking-wider">Zone</th>
                <th class="px-6 py-3 text-left text-xs font-medium text-gray-500 uppercase tracking-wider">Building Type</th>
                <th class="px-6 py-3 text-left text-xs font-medium text-gray-500 uppercase tracking-wider">Requests</th>
                <th class="px-6 py-3 text-left text-xs font-medium text-gray-500 uppercase tracking-wider">Actions</th>
              </tr>
            </thead>
            <tbody class="bg-white divide-y divide-gray-200">
              @{
                var i = 1;
              }
```

```
@foreach(var customer in Model.Customers)
{
  <tr class="hover:bg-gray-50">
    <td class="px-6 py-4 whitespace-nowrap">
      <span class="text-sm font-medium text-center"> @i</span>
    </td>
    <td class="px-6 py-4 whitespace-nowrap">
      <span class="text-sm font-medium text-secondary">@customer.FirstName @customer.LastName</span>
    </td>
    <td class="px-6 py-4 whitespace-nowrap text-sm text-gray-900">@customer.Phone</td>
    <td class="px-6 py-4 whitespace-nowrap text-sm text-gray-900">@customer.Email</td>
    <td class="px-6 py-4 whitespace-nowrap text-sm text-gray-900">@customer.Addresses?.Address</td>
    <td class="px-6 py-4 whitespace-nowrap text-sm text-gray-900">Ekewan @*@Model.ZoneAddresses.FirstOrDefault(a => a.Id == customer.Addresses?.ZoneId).Area*@</td>
    <td class="px-6 py-4 whitespace-nowrap text-sm text-gray-900">Egor @*@Model.Zones.FirstOrDefault(a => a.Id == customer.Addresses.ZoneId).Name*@</td>
    <td class="px-6 py-4 whitespace-nowrap">
      <div class="flex items-center">
        <div class="text-sm font-medium text-gray-900">@customer.Addresses?.BuildingType</div>
      </div>
    </td>
    <td class="px-6 py-4 whitespace-nowrap">
      <div class="flex items-center">
        <div class="text-sm font-medium text-gray-900">5</div>
      </div>
    </td>
    <td class="px-6 py-4 whitespace-nowrap text-sm space-x-2">
```

```
<div class="relative flex justify-center" x-data="{ open: false }">
  <!-- Trigger Button -->
  <button x-on:click="open = !open"
  class="p-2 rounded-full hover:bg-gray-100 transition-colors duration-150">
    <!-- Three-dot vertical icon -->
    <svg xmlns="http://www.w3.org/2000/svg" class="w-5 h-5 text-gray-600" fill="none" viewBox="0 0 24 24"
     stroke="currentColor" stroke-width="2">
      <path stroke-linecap="round" stroke-linejoin="round" d="M12 5h.01M12 12h.01M12 19h.01" />
    </svg>
  </button>

  <!-- Dropdown Card -->
  <div x-show="open"
  x-on:click.away="open = false"
  x-transition:enter="transition ease-out duration-100"
  x-transition:enter-start="opacity-0 translate-y-1"
  x-transition:enter-end="opacity-100 translate-y-0"
  x-transition:leave="transition ease-in duration-75"
  x-transition:leave-start="opacity-100 translate-y-0"
  x-transition:leave-end="opacity-0 translate-y-1"
  class="absolute z-[9999] right-0 mt-2 w-56 bg-white rounded-xl shadow-lg ring-1 ring-black ring-opacity-5 p-2 z-50"
  style="display: none;">

    <form method="post" class="space-y-1">
      <a href="#"
    x-on:click="open = false"
    class="flex items-center gap-2 px-3 py-2 text-gray-700 hover:bg-gray-100 rounded-md transition-colors duration-150">
```

<svg xmlns="http://www.w3.org/2000/svg" width="20" height="20" viewBox="0 0 24 24"><path fill="none" stroke="currentColor" stroke-linecap="round" stroke-linejoin="round" stroke-width="2" d="M21.174 6.812a1 1 0 0 0-3.986-3.987L3.842 16.174a2 2 0 0 0-.5.83l-1.321 4.352a.5.5 0 0 0 .623.622l4.353-1.32a2 2 0 0 0 .83-.497z" /></svg>

@*<img src="~/Admin/assets/img/icons/View.svg" alt="View" class="w-4 h-4">*@

Edit details

<a href="#"

x-on:click="open = false; return confirm('If you delete this booking it also deletes the user related to it. Are you sure you want to delete?')"

class="flex items-center gap-2 px-3 py-2 text-red-600 hover:bg-red-50 rounded-md transition-colors duration-150">

<svg xmlns="http://www.w3.org/2000/svg" width="20" height="20" viewBox="0 0 24 24"><path fill="none" stroke="#ce0606" stroke-linecap="round" stroke-linejoin="round" stroke-miterlimit="10" stroke-width="1.5" d="M19 8v11.6a2.4 2.4 0 0 1-2.4 2.4H7.4A2.4 2.4 0 0 1 5 19.6V8m11-3V3.2c0-.66-.54-1.2-1.2-1.2H9.2C8.54 2 8 2.54 8 3.2V5m8 0H8m8 0h5M8 5H3m9 6v6m3-6v6m-6-6v6" /></svg>

@*<img src="~/Admin/assets/img/icons/trash-bin.svg" alt="Delete" class="w-4 h-4">*@

Remove customers

</form>

</td>

</tr>

i++;

}

</tbody>

</table>

<!-- Pagination -->

```
        <div class="px-6 py-4 border-t flex items-center justify-between">
          <div class="text-sm text-gray-500 pagination-pages">
            <span>Page <input class="border w-6 p-0" type="number" id="page-input" value="1" min="1"> of <span id="total-pages"></span> </span>
          </div>
          <div class="flex items-center space-x-2 pagination-btns">
            <button id="prev-page" class="px-3 py-2 text-sm border rounded-lg text-gray-500 hover:bg-gray-50">Previous</button>
            <button id="next-page" class="px-3 py-2 text-sm border rounded-lg text-gray-500 hover:bg-gray-50">Next</button>
          </div>
        </div>
      </div>
    }
```

Customer Feedback Pages

```
    @if(Model.Feedbacks.Count() > 0)
    {
      <!-- Requests Table -->
      <div class="overflow-x-visible">
        <table class="w-full datatable">
          <thead class="bg-gray-50">
            <tr>
              <th class="px-6 py-3 text-left text-xs font-medium text-gray-500 uppercase tracking-wider">No</th>
              <th class="px-6 py-3 text-left text-xs font-medium text-gray-500 uppercase tracking-wider">Date</th>
              <th class="px-6 py-3 text-left text-xs font-medium text-gray-500 uppercase tracking-wider">Request Title</th>
              <th class="px-6 py-3 text-left text-xs font-medium text-gray-500 uppercase tracking-wider">Prority</th>
              <th class="px-6 py-3 text-left text-xs font-medium text-gray-500 uppercase tracking-wider">Status</th>
              <th class="px-6 py-3 text-left text-xs font-medium text-gray-500 uppercase tracking-wider">Customer Name</th>
```

```
                <th class="px-6 py-3 text-left text-xs font-medium text-gray-500 uppercase tracking-wider">Zone Area</th>
                <th class="px-6 py-3 text-left text-xs font-medium text-gray-500 uppercase tracking-wider">Customer Address</th>
                <th class="px-6 py-3 text-left text-xs font-medium text-gray-500 uppercase tracking-wider">Actions</th>
            </tr>
        </thead>
        <tbody class="bg-white divide-y divide-gray-200">
            @{
                var i = 1;
            }
        @foreach (var feedback in Model.Feedbacks)
        {
            <tr class="hover:bg-gray-50">
            <td class="px-6 py-4 whitespace-nowrap">
                <span class="text-sm font-medium text-center">@i</span>
            </td>
            <td class="px-6 py-4 whitespace-nowrap text-sm text-gray-900">@feedback.Date?.ToString("MMM dd, yyyy")</td>
            <td class="px-6 py-4 whitespace-nowrap">
                <span class="text-sm font-medium text-secondary">@feedback.Subject</span>
            </td>
            <td class="px-6 py-4 whitespace-nowrap text-sm text-gray-900">@feedback.Priority</td>
            <td class="px-6 py-4 whitespace-nowrap text-sm text-gray-900">@feedback.Status</td>
            <td class="px-6 py-4 whitespace-nowrap text-sm text-gray-900">@feedback.Customer?.FirstName @feedback.Customer?.LastName </td>
            <td class="px-6 py-4 whitespace-nowrap">
                <div class="flex items-center">
                    <div class="text-sm font-medium text-gray-900">@feedback.ZoneAddress?.Area</div>
```

```
                </div>
            </td>
            <td class="px-6 py-4 whitespace-nowrap text-sm text-gray-900">@feedback.HomeAddress</td>
            <td class="px-6 py-4 whitespace-nowrap text-sm space-x-2">
                <div class="relative flex justify-center" x-data="{ open: false }">
                    <!-- Trigger Button -->
                    <button x-on:click="open = !open"
                        class="p-2 rounded-full hover:bg-gray-100 transition-colors duration-150">
                        <!-- Three-dot vertical icon -->
                        <svg xmlns="http://www.w3.org/2000/svg" class="w-5 h-5 text-gray-600" fill="none" viewBox="0 0 24 24"
                            stroke="currentColor" stroke-width="2">
                            <path stroke-linecap="round" stroke-linejoin="round" d="M12 5h.01M12 12h.01M12 19h.01" />
                        </svg>
                    </button>

                    <!-- Dropdown Card -->
                    <div x-show="open"
                        x-on:click.away="open = false"
                        x-transition:enter="transition ease-out duration-100"
                        x-transition:enter-start="opacity-0 translate-y-1"
                        x-transition:enter-end="opacity-100 translate-y-0"
                        x-transition:leave="transition ease-in duration-75"
                        x-transition:leave-start="opacity-100 translate-y-0"
                        x-transition:leave-end="opacity-0 translate-y-1"
                        class="absolute z-[9999] right-0 mt-2 w-56 bg-white rounded-xl shadow-lg ring-1 ring-black ring-opacity-5 p-2 z-50"
                        style="display: none;">
```

<form method="post" class="space-y-1">

<a asp-page="/AdminPortal/Customers/Requests/Conversation"

asp-route-feedback="@feedback.Uid"

x-on:click="open = false"

class="flex items-center gap-2 px-3 py-2 text-gray-700 hover:bg-gray-100 rounded-md transition-colors duration-150">

<svg xmlns="http://www.w3.org/2000/svg" width="20" height="20" viewBox="0 0 24 24"><g fill="none" stroke="currentColor" stroke-width="1"><path d="M4 12a8 8 0 1 1 16 0v5.09c0 .848 0 1.27-.126 1.609a2 2 0 0 1-1.175 1.175C18.36 20 17.937 20 17.09 20H12a8 8 0 0 1-8-8Z" /><path stroke-linecap="round" stroke-linejoin="round" d="M9 11h6m-3 4h3" /></g></svg>

@*<img src="~/Admin/assets/img/icons/View.svg" alt="View" class="w-4 h-4">*@

Respond

<a href="#"

x-on:click="open = false"

class="flex items-center gap-2 px-3 py-2 text-gray-700 hover:bg-gray-100 rounded-md transition-colors duration-150">

<svg xmlns="http://www.w3.org/2000/svg" width="20" height="20" viewBox="0 0 24 24"><g fill="none" stroke="currentColor" stroke-linecap="round" stroke-linejoin="round" stroke-width="1"><path stroke-width="2" d="M12.005 11h.008M8.01 11h.009" /><path stroke-width="1.5" d="M12 3c-1.48 0-2.905.03-4.244.088c-2.44.105-3.66.157-4.626 1.13c-.965.972-1.007 2.159-1.09 4.532a64 64 0 0 0 0 4.5c.083 2.373.125 3.56 1.09 4.532c.965.973 2.186 1.025 4.626 1.13l.244.01v2.348a.73.73 0 0 0 1.205.554l2.18-1.869c.547-.47.821-.704 1.147-.828s.696-.131 1.437-.145q1.171-.023 2.275-.07c2.44-.105 3.66-.157 4.626-1.13c.965-.972 1.007-2.159 1.09-4.532a64 64 0 0 0 0-4.5A43 43 0 0 0 21.878 7" /><path stroke-width="1.5" d="M15 5.333s1 0 2 1.667c0 0 2.177-4.167 5-5" /></g></svg>

@*<img src="~/Admin/assets/img/icons/View.svg" alt="View" class="w-4 h-4">*@

Close Request

<a asp-page="/AdminPortal/Customers/Requests/ManagerResponse"

asp-route-feedback="@feedback.Uid"

x-on:click="open = false"

class="flex items-center gap-2 px-3 py-2 text-gray-700 hover:bg-gray-100 rounded-md transition-colors duration-150">

<svg xmlns="http://www.w3.org/2000/svg" width="20" height="20" viewBox="0 0 24 24"><g fill="none" stroke="currentColor" stroke-width="1"><circle cx="12" cy="12" r="3.5" /><path d="M20.188 10.934c.388.472.582.707.582 1.066s-.194.594-.582 1.066C18.768 14.79 15.636 18 12 18s-6.768-3.21-8.188-4.934c-.388-.472-.582-.707-.582-1.066s.194-.594.582-1.066C5.232 9.21 8.364 6 12 6s6.768 3.21 8.188 4.934Z" /></g></svg>

@*<img src="~/Admin/assets/img/icons/View.svg" alt="View" class="w-4 h-4">*@

View all from @feedback.Customer?.FirstName

</form>

</td>

</tr>

i++;

}

</tbody>

</table>

<!-- Pagination -->

Page <input class="border w-6 p-0" type="number" id="page-input" value="1" min="1"> of

```
            </div>
            <div class="flex items-center space-x-2 pagination-btns">
              <button id="prev-page" class="px-3 py-2 text-sm border rounded-lg text-gray-500 hover:bg-gray-50">Previous</button>
              @*                <button class="px-3 py-2 text-sm bg-primary text-white rounded-lg">1</button>
            <button class="px-3 py-2 text-sm border rounded-lg text-gray-700 hover:bg-gray-50">2</button>
            <button class="px-3 py-2 text-sm border rounded-lg text-gray-700 hover:bg-gray-50">3</button>*@
              <button id="next-page" class="px-3 py-2 text-sm border rounded-lg text-gray-500 hover:bg-gray-50">Next</button>
            </div>
        </div>
    }
    else
    {
    <p class="text-center">No Feedbacks</p>
    }
```

Create Announcement Page

```
<div class="flex items-center mb-6">
    <button onclick="window.history.back()"
        class="flex items-center text-gray-700 hover:text-primary font-medium transition-colors">
        <svg xmlns="http://www.w3.org/2000/svg"
            fill="none" viewBox="0 0 24 24" stroke-width="1.5"
            stroke="currentColor" class="w-5 h-5 mr-2">
            <path stroke-linecap="round" stroke-linejoin="round"
                d="M15.75 19.5L8.25 12l7.5-7.5" />
        </svg>
        Back
    </button>
```

```
</div>

<!-- Page Header -->
<div class="flex items-center justify-between mb-8">
    <h1 class="text-2xl font-semibold text-gray-900">Create New Announcement</h1>
</div>

<!-- Blog Post Form -->
<form method="post" class="bg-white rounded-lg shadow-sm border border-gray-200 p-6 space-y-6 w-full">
    <!-- Title -->
    <div>
        <label for="Title" class="block text-sm font-medium text-gray-700 mb-1">Title</label>
        <input id="Title" asp-for="Post.Title" type="text" required
            class="w-full rounded-lg border border-gray-300 px-4 py-2 text-gray-700 shadow-sm focus:ring-2 focus:ring-primary focus:border-primary focus:outline-none">
    </div>

    <!-- Cover Image -->
    <div>
        <label for="CoverImage" class="block text-sm font-medium text-gray-700 mb-1">Cover Image</label>
        <input  id="CoverImage" asp-for="CImage" type="file"
            class="block w-full text-sm text-gray-700 border border-gray-300 rounded-lg cursor-pointer focus:ring-primary focus:border-primary">
    </div>

    <!-- Content -->
    <div>
        <label for="content" class="block text-sm font-medium text-gray-700 mb-1">Content</label>
```

```
        <textarea asp-for="Post.Description" id="content" rows="10" class="w-full rounded-lg border border-gray-300 px-4 py-2 text-gray-700 shadow-sm focus:ring-2 focus:ring-primary focus:border-primary focus:outline-none"></textarea>
    </div>

    <!-- Submit Button -->
    <div class="flex justify-end">
        <button type="submit"
                class="bg-primary text-white font-medium px-6 py-2.5 rounded-lg hover:bg-green-600 transition-colors">
            Publish Post
        </button>
    </div>
</form>
```