



**Engineering and Technology Faculty
Computer Engineering Department**

Municipal Services Online

Prepared By

Muheeb Hasan 12010108

Eman Khalid 12028272

Supervised by

Dr. Suleiman Naeem Abu Kharmeh

One of the requirements for the B.Sc. in Computer Systems Engineering degree is a graduation project that must be turned in to the Department of Computer Engineering.

An-Najah

June-2024

Abstract

The implementation of our project, "Online Municipal Services," is crucial for Palestine because it will positively impact technological advancement and enhance the efficiency, timeliness, cost, and delays of municipal services. In addition, our project will enable the development of various sectors in Palestine, including infrastructure. Additionally, our project benefits several stakeholders in society, including the government, staff of the municipality, and users. When a user logs in to our application, they can examine every service the municipality offers, including filing complaints, paying taxes, requesting road maintenance by uploading images of the issue, and sharing their location. Examine the various events offered by the municipality, study maps of the city, and be aware of any problems with water or electricity for better communication. Finally, this application will help the municipality repair issues that have been reported around the city, improve communication with the public, and respond to their requests promptly and with minimal effort, expense, or delay. The project's numerous advantages for Palestine make it crucial that it be carried out in the real world.

Frameworks: flutter(frontend) The project will include web-application and both Android and iOS) If available), nodejs (backend) , encryption(login password),database(mysql or firebase), authentication(firebase or code in backend same the encryption), payment systems/APIs(stripe).

Abstract	II
List of figures	VI
List of tables	VII
List of abbreviations	VIII
1. Chapter 1: Introduction	9
1.1 Motivation	9
1.2 related work:.....	10
1.2.1 Global works	10
1.2.2 Local works:.....	12
1.3 Problem Statement.....	14
1.4 Proposed Solution.....	14
1.5 Data-Collection.....	14
1.5.1 Survey Questions.....	15
1.5.2 Survey Analysis and Diagrams	15
1.5.3 Interviews	18
1.6 Novelty Statement	19
1.7 Importance of the Work.....	21
2. Chapter 2: Theoretical background and previous work	21
2.1 Proposed system:	21
2.1.1 Class Diagram	21
2.1.2 Use case diagram.....	22
2.2 Use cases	23
2.2.1 Citizen user requirement	24
2.2.2 Administrator.....	29
2.2.3 Municipality Admin	30
3 Chapter 3 Methodology	38
3.1 constraints.....	38
3.2 System model.....	39
3.3 Most important non-functional requirement for our system:	41
3.4 Interface for the actors.....	42
3.4.1 Citizens User interfaces.....	42
3.4.2 Administrator User interfaces	43

3.5 Frameworks:	46
3.5.1 Dart.....	46
3.5.2 Flutter	46
3.5.3 Node JS	46
3.5.4 Firebase database.....	46
3.6 Mobile Application System.....	47
3.7 Web Application System.....	48
3.8 Standards.....	49
4 Chapter 4: Results and Analysis.....	50
4.1 User Screens:	50
4.2 Admin Screens:	65
5 Chapter 5: Discussion.....	73
6 Chapter 6: Conclusion and Recommendations.....	73
References	75

List of figures

FIGURE 1.1: BALADI MOBILE APPLICATION APP	11
FIGURE 1.2: RAMALLAH MUNICIPALITY APP	12
FIGURE 1.3: GAZA MUNICIPALITY APP	13
FIGURE 1.4: THE OS PERCENTAGE.....	16
FIGURE 1.5: THE SUPPORT OF WANTING THE APPLICATION.....	16
FIGURE 1.6: THE SERVICES WE WILL PROVIDE AND HOW MUCH PEOPLE WANTING THEM.....	17
FIGURE 3.2: CITIZENS USER INTERFACES.....	42
FIGURE 3.3: ADMINISTRATOR USER INTERFACES	43
FIGURE 15: UI FROM THE WEB APPLICATION	49
FIGURE 4.1: WELCOME.....	51
FIGURE 4.2: ABOUT US	52
FIGURE 4.3: LOGIN	53
FIGURE 4.4: SIGNUP	54
FIGURE 4.5: HELP CENTER	55
FIGURE 4.6: PROFILE.....	56
FIGURE 4.7: USER HOME.....	57
FIGURE 4.8: EVENTS.....	58
FIGURE 4.9: NEWS.....	59
FIGURE 4.10: ADVERTISEMENTS	60
FIGURE 4.11: SERVICES	61
FIGURE 4.12: TAXES	62
FIGURE 4.13: DONATIONS.....	63
FIGURE 4.14: REPORTS	64
FIGURE 4.15:SETTINGS	64
FIGURE 4.16: CHAT	65
FIGURE 4.17: PROFILE ADMIN	66
FIGURE 4.18: SERVICES ADMIN.....	67
FIGURE 4.19: NEWS ADMIN	68
FIGURE 4.20: TAXES ADMIN.....	69
FIGURE 4.21: ADVERTISEMENTS ADMIN	70
FIGURE 4.22: REPORTS ADMIN	70
FIGURE 4.23: PROFILE ADMIN	71
FIGURE 4.24: DONATIONS ADMIN	72
FIGURE 4.25: EVENTS ADMIN	73
FIGURE 4.26: MANAGE USERS	73
FIGURE 4.27: CHAT	73

List of tables

TABLE 4-1: LOGIN USE CASE.....	24
TABLE 2-2: CHANGE INFORMATION	25
TABLE 2-3: MAKE COMPLAINANT	25
TABLE 2-4: VIEW PAYMENT HISTORY	26
TABLE 2-5: VIEW ANNOUNCEMENT	27
TABLE 2-6: VIEW EVENTS	27
TABLE 2-7: PAY FOR SERVICE	28
TABLE 2-8: VIEW ADVERTISEMENT	29
TABLE 2-9: MAINTAIN EVENTS	32
TABLE 2-10: MAINTAIN SERVICES	33
TABLE 2-11: MAKE NOTIFICATION	34
TABLE 2-12: MAINTAIN ADVERTISEMENT	35
TABLE 2-13: CHECK COMPLAINTS	35
TABLE 3-1: MUNICIPALITY EMPLOYEE DEVICE SPECIFICATION	39
TABLE 3-2: CITIZEN’S ANDROID MOBILE SPECIFICATION	39
TABLE 3-3: CITIZENS IOS MOBILE SPECIFICATION	39
TABLE 3-4: SERVER SPECIFICATION	40

List of abbreviations

App	Application
Adv	Advertisement

1. Chapter 1: Introduction

1.1 Motivation

A municipality is an organisation created in a city, village, or town that functions as a smaller version of the national government. Its duties include supplying the local populace with various services like water and electricity, collecting and recycling waste, promoting economic development, collecting taxes, and maintaining public infrastructure like parks and roads. Furthermore, in order for municipalities to maintain law and order and carry out their duties, the state government grants them a great deal of jurisdiction.

Municipalities' systems are always being improved, both in terms of the services they offer and the manner in which they record the data they gather. All of the data was manually stored on paper at the time of municipalities' establishment. This method had several drawbacks for the municipalities, including the possibility that the data would be lost and cause a great deal of problems for both the municipality and its residents; additionally, manually storing data takes a lot of time for employees, particularly when requests require a lot of data collection; and finally, it takes time for citizens to find the necessary documents, which will result in lengthy wait times. Additionally, a lot of residents have trouble getting to municipalities and services' centres for factors such remote locations, lengthy wait times, inability to obtain work or study leaves, and staff members' irregular work schedules.

Later, in order to address the problems that employees faced when storing and retrieving data, municipalities developed their systems and began using online databases to gather any necessary data for the citizens. Since these problems persist, many nations have created online platforms that allow citizens to manage and receive all municipal services, reducing the need for residents to physically visit service centres. Such a strategy aims to lessen the above described problems that citizens face while promoting technological advancement.

We discovered that Palestinian municipalities lack such a system after conducting research and corresponding with various municipalities. Consequently, we devised the project to create an online platform named "Baladyati – بلديتي" that will facilitate the conversion of municipal services into online offerings. This will bolster the technological advancement of Palestinian municipalities and address numerous concerns that the populace and municipal staff are confronting.

1.2 related work:

We will discuss various comparable work applications in this chapter, including how they connect to our system in terms of features and services offered by each system.

1.2.1 Global works

1.2.1.1 Baladi mobile application:

2. Baladi is a mobile application that works to allow citizens to use various municipal services online without having to physically visit the municipality. Users can report issues such as graffiti on walls or trash on the street by taking a picture of the item and adding its location.[6][10]

Among their offerings are:

- Business Services
- Cost Calculator Service
- Reporting Service
- New Report Submission
- Previous Submission Follow-up

Benefits of application:

- Look up services that are offered
- Get the most recent news
- Fast technical assistance



Figure 1.1: Baladi mobile application app

2.1.1 Local works:

2.1.1.1 Ramallah Municipality App

The goal of the Ramallah Municipality application is to keep the city's residents updated about impending releases of significant events, news, facilities, services, and attractions as well as linked to their municipality.

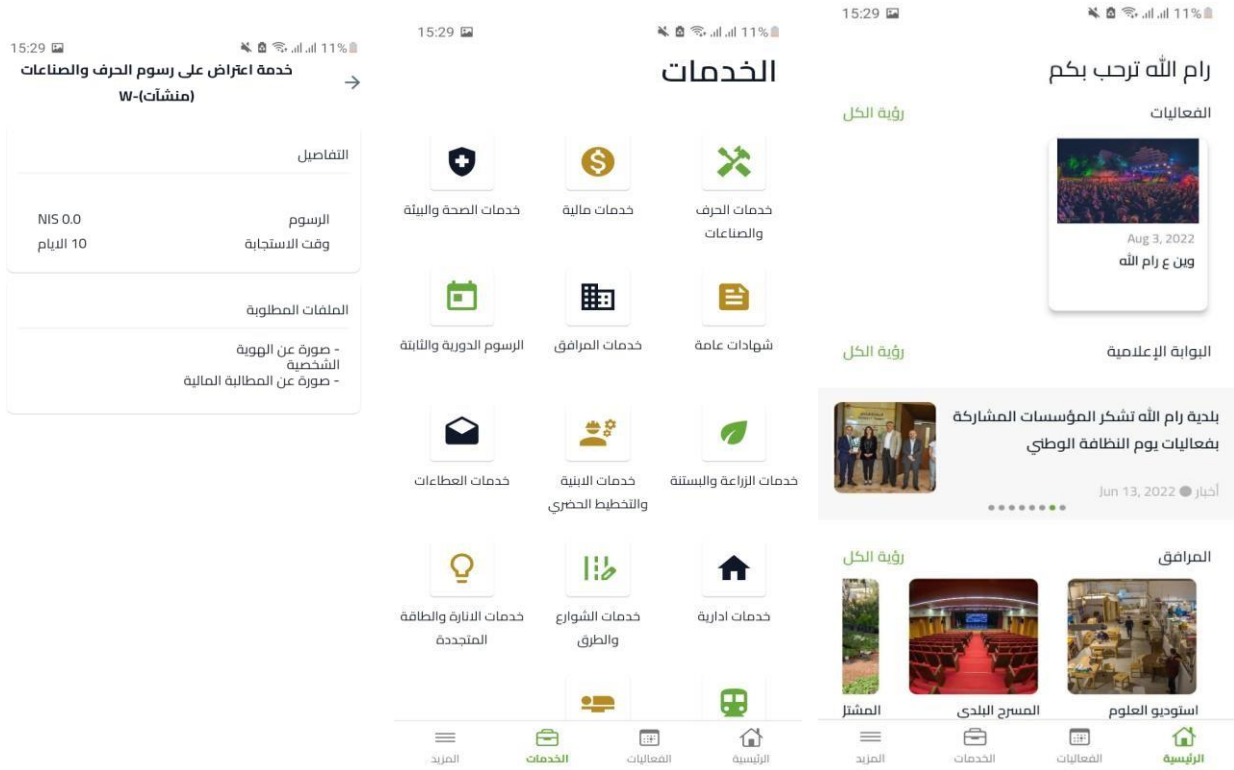


Figure 1.2: Municipality of Ramallah App

2.1.1.2 Gaza Municipality App

The Gaza Municipality application offers a range of services to service bill subscribers and city dwellers. It is intended to help with public interaction and communication, giving users access to information that interests them and facilitating engagement with the municipality.

Among their offerings are:

- Transaction follow-up: Using the programme, you may submit and request transactions as well as monitor all of them.
- File a complaint: You have the option to file a complaint, monitor its progress, and inquire about the response.

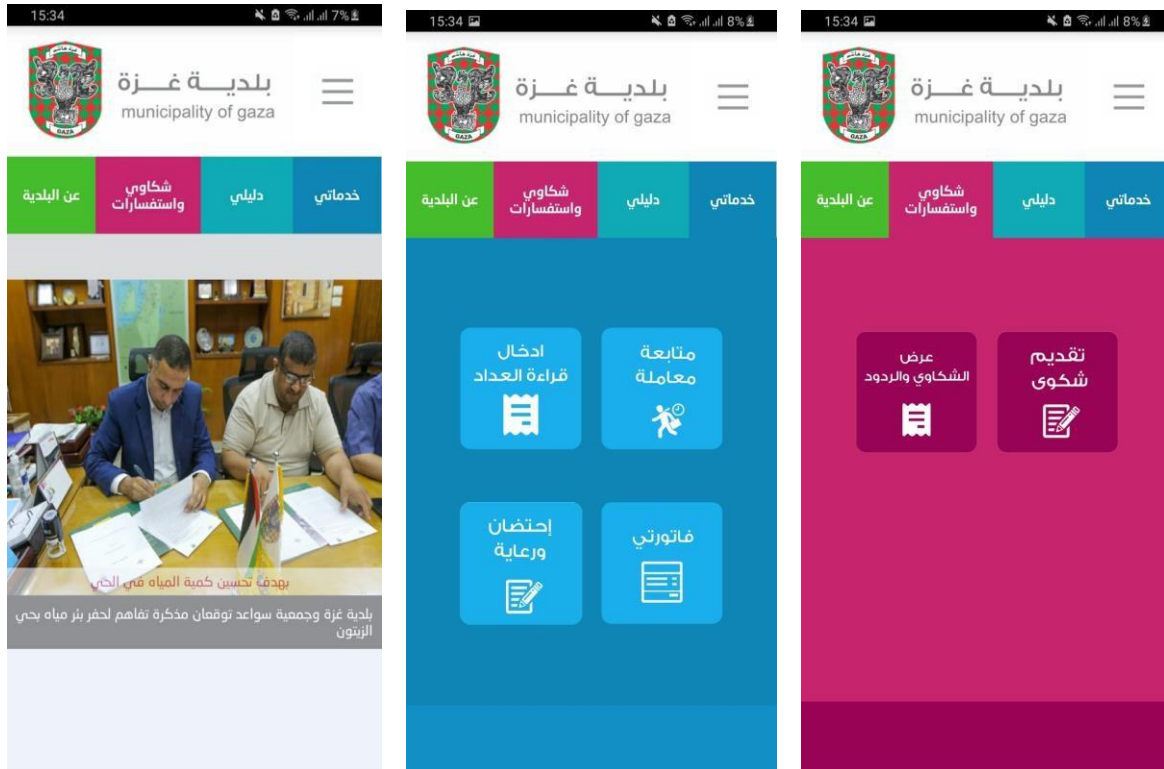


Figure 1.3: Gaza Municipality Application

This section covered a few analogous works and their features that are comparable to the system we developed.

And for the next section we will talk about the problem statement.

2.2 Problem Statement

The goal of creating an online platform for municipal services is to address the various problems that employees and residents of the municipality encounter when delivering or receiving various services. This will minimise wait times in service centres, address transportation-related problems, eliminate the need for residents to take time off from work or school to access necessary services, and allow residents to monitor their requests and data.

And we'll discuss the suggested remedy in the following part.

2.3 Proposed Solution

After conducting research and comprehending the problems that municipalities' employees and residents face (discussed in section 1.3), we came to the conclusion that the best way to address all of these problems is to create an online platform, application, and website that will include automated municipal services. This platform will help municipalities operate more efficiently in terms of time, money, and delays when citizens and employees need or request services from them.

Several elements including service payment, a section for reports and complaints, the ability to request roadside assistance, event checking, and other features that will be covered in later parts will all be included in our application.

And we completed the following questionnaire to get more information.

2.4 Data-Collection

For this project, we realised that it is crucial to research the market and the needs of the public in order to align our goals with theirs. To that end, we developed a multi-field, questionnaire-based survey with the objective of gathering data, improving our understanding of the problems that the public faces when requesting services, and determining whether or not they are in favour of the creation of an online platform. We used a variety of questions in our survey, including rating-based, multiple-choice, and open-ended questions that allowed respondents to elaborate on their thoughts and opinions.

We distributed the survey online, had respondents complete it in person, and conducted in-person interviews. This procedure took more than a week, and respondents from various cities filled out our survey. In order to better understand the demands of society, we have gathered and analysed 150 responses:

2.4.1 Survey Questions

We'll be discussing the survey questions we utilised in this part.

1. Age

Gender

3. A mobile device (Android or iOS)

4. What challenges do you encounter when requesting a service from a municipality?

5. Did you take any time off from work or school to visit a municipality to receive services?

6. How much time does it take you to get city services?

7. Are you in favour of developing a platform to convert these services into web-based offerings?

8. Rating-based questions to determine the demand for various services in our application, such as filing complaints, paying taxes, receiving notifications when water or electricity is cut off, receiving notifications for events organised by the municipality, and access to city maps.

9. Do you believe our application should offer any more services?

2.4.2 Survey Analysis and Diagrams

We were able to determine the outcomes depicted in the following figures after reviewing and evaluating the survey responses that were shared.

The first thing we found is that different citizens have different mobile operating systems, which will allow us to create cross-platform mobile applications.

ما نوع نظام الهاتف الذي تحمله؟
95 responses

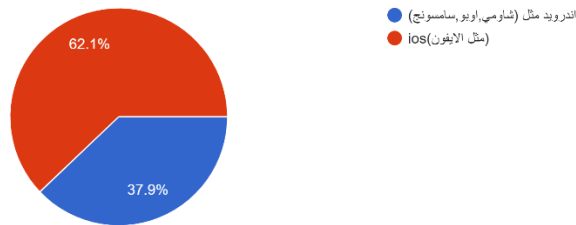


Figure 1.4: the OS percentage

When we asked, "Do you support creating a platform to transform these services into online services?", 87.4% of respondents said they did, with only 5.3% disagreeing. Their reasons were that they believed that when the service is provided online, the municipalities' employees might not know exactly what they want, and that while services may take longer than expected, they will also take much less time than usual, with some services taking only the time for payment.

هل تؤيد عمل تطبيق يحتوي على جميع خدمات البلديات لتصبح أونلاين؟
95 responses

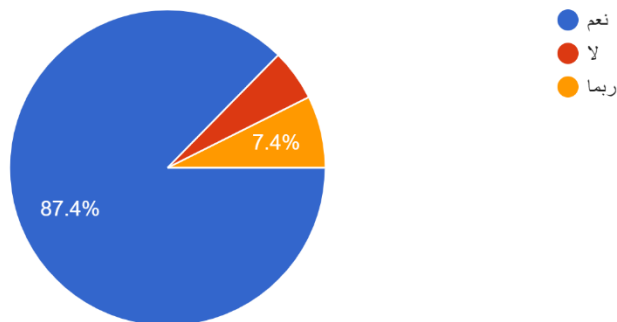
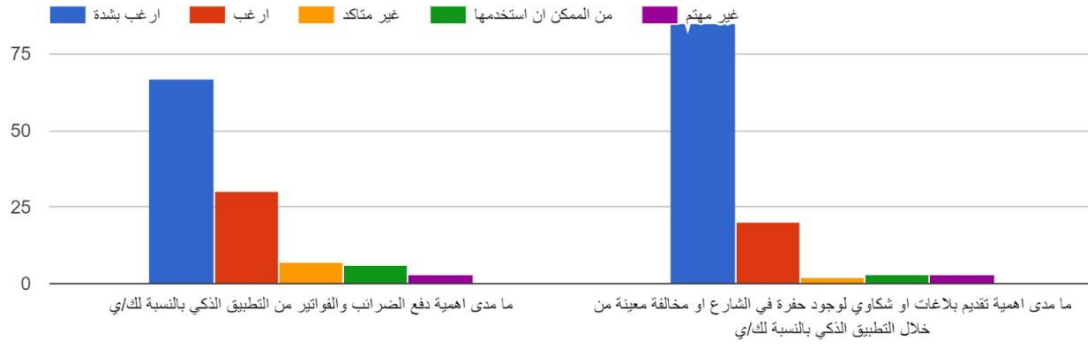


Figure 1.5: the support of wanting the application

After that, we asked about the services that we want to make and how people will react to them as a degree from “I want it” to “I don't want it”, the results were as the following.

في هذا الجزء سنعرض اهم الخدمات التي سنوفرها وكل ما عليك هو ان تختار كم انت بحاجة لهذه الخدمة عن طريق اختيار احدى الخيارات المتاحة



في هذا الجزء سنعرض اهم الخدمات التي سنوفرها وكل ما عليك هو ان تختار كم انت بحاجة لهذه الخدمة عن طريق اختيار احدى الخيارات المتاحة

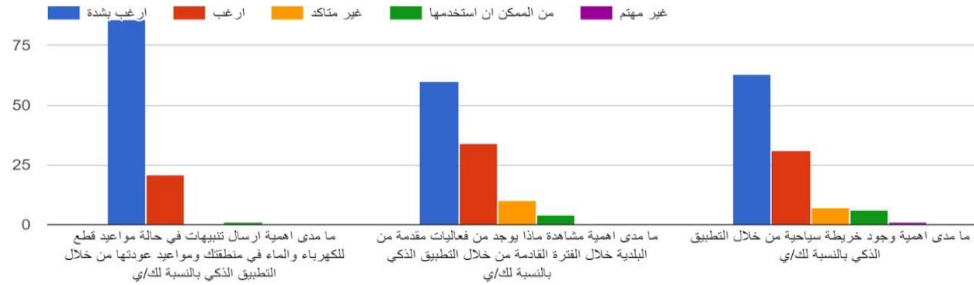


Figure 1.6: the services we will provide and how much people wanting them

In this section we talked about the survey we published.

In the next section we will talk about the interviews we have done in order to gather more information about the system we want to build.

2.4.3 Interviews

In order to better understand the services that these towns offer and how our web platform may be used to implement them, we have made contact with, visited, and met with staff members at a number of these municipalities. They have also gone into further detail regarding the problems that both them and the people in need of municipality services encounter on a daily basis.

After conducting our interviews, we have determined that the most important services that municipalities provide include tax payment, requests for architectural and road plans and maps, filing complaints, obtaining certain official documents, and more. An example of an interview with a municipality looked like this.

2.4.3.1 Nablus Municipality

We held a meeting with the Nablus Municipality, which was attended by the municipality's president, Raed Moqbel, as well as several civil and computer engineers and staff members from the public services division. To have a better grasp of our research's direction and the work required for our online platform, this conference was essential.

The aforementioned parties at our meeting reaffirmed the significance and necessity of developing such a platform for their town; they also indicated that this project was part of their goals, expressed gratitude for our idea, and expressed complete support for our efforts. They have explained to us the various services that ought to be part of our application, like filing complaints, paying taxes, obtaining official documents, and more. As a result, we are now more motivated to put in more effort into this project and see it through to completion in order to support our community and the municipalities.

2.5 Novelty Statement

The primary goal of this project is to create an online platform that will enable the automation and online transformation of municipal services in Palestine. While this platform has been developed in other nations and is currently being developed in Palestine for a few municipalities, it has not yet been widely adopted in the country and still lacks many necessary fields and requirements. As a result, we are confident that our platform and efforts will significantly influence society and bolster Palestine's technical advancement.

We have concentrated on implementing various features into our platform that will help the various parties that utilise it, save down on work, expense, and time, and facilitate the acquisition of any service that is needed. Since other municipalities' applications offer varying services—some concentrate on reporting and complaints, others on showcasing the services the municipality offers, the work the municipality completes around the city, and transaction work—our application will bring together all of these elements in one location, meaning that it will encompass all of the services offered by the municipality, where consumers may look up and make requests for these services. Additionally, our system will enable users to make various payments to the municipality through the application. They will be able to fund their application wallet with funds from designated payment locations or link their bank accounts to the application.our application will have a complaints and reports section that is creatively presented. Users can write complaints if they are standard complaints; if not, they can take a picture of the issue and send it straight to the employee in charge of this section if the complaint is about something like a street in the city, Additionally, the application will include other features that we will cover in our report later on, as well as a part that will list every event the municipality has supplied.

The most crucial aspect of all these features offered by the application is that high security will be put in place to safeguard users and their data; accounts must be validated in municipality offices in order for them to be considered valid; in addition to the outer password, an inner password will also be used for payments; and the platform will guarantee high efficiency and a reduction in time, expense, and effort for both users and municipality employees.

1.7 Importance of the Work

Our project is really important for a few big reasons:

- **Makes Studying Easier:** By putting all study materials and resources in one place, we make it much simpler for students to find what they need. This can save them a lot of time and stress.
- **Brings Students Together:** Our app helps students from different places and courses to connect and help each other. This kind of sharing and talking can make learning better and more fun.
- **Helps with Future Jobs:** Finding the right job or internship can be tough. Our app makes this easier by showing job offers that match what students are studying. This helps them get a good start in their careers.
- **Supports Group Work:** Group projects are a big part of a university. Our app makes it easier to work together, share files, and chat, which can make these projects go smoother.
- **Keeps Students Organized:** With reminders for exams and deadlines, students can stay on track with their studies. This means less worrying about missing something important.
- **Easy to Use:** We're making sure our app and website are simple and fun to use. This is really important so that everyone can use them without any trouble.
- **Always Up-to-Date:** We'll keep updating the app with the latest information and resources. This means students always have the best and most recent materials for their studies.

Chapter summarization:

In this chapter we talked about the problem that we researched and analyzed its effect on the society, and what solution we came up with to solve it. Also, we talked about gathering information to support our initiative and develop the best features for the citizens.

And for the next chapter we will talk about the system design in a visual way using diagrams.

1 Chapter 2: System Design

We will discuss how this system will be implemented, potential use cases, system users, and their interactions with our system in this chapter.

1.8 Proposed system:

This section will include a number of diagrams that will provide us with a visual representation of numerous system details. The proposed system model, which is a graphical summary of all the components we need to implement our system, will be introduced in the first subsection. Next, the class diagram will explain the system's structure through the use of classes. Finally, the use case diagram will identify the actors in an interaction and provide a description of the interaction.

We will discuss each use case and its specifics in this part, along with a primary scenario flow and a backup one.

1.8.1 Citizen user requirement

The use cases created for the Citizens Login use case, which explains how a citizen logs in to use the app's services, will be discussed in this section.

Table 4-1: login use case

Title:	Login
Primary Actor:	User
Preconditions:	Registration
Post conditions:	The citizen will be allowed to use all the services of the app.
Main Success Scenario:	<ol style="list-style-type: none"> 1. The user will launch the application and choose the Login button. 2. The user will enter the email and the password.
Another scenario:	<ul style="list-style-type: none"> ● The password or email address is not right. The user will have to enter them again as a result. ● If the user loses their password, they can reset it by clicking the "Forget Password" option, which will prompt them to provide their email address and send them a message with a new, randomly generated password that they can modify after logging in.
Frequency of Use:	Each time the user wants to use the services of the application

A use case on changing information will outline how citizens can modify their profile details, such as their password and phone number.

Table 2-2: change information

Title:	Change information
Primary Actor:	User
Preconditions:	Registration
Main Success Scenario:	<ol style="list-style-type: none"> 1. First, the user needs to log in. User selects the section of their profile. 3. After clicking the "Edit Profile" button, a new window appears. 4. The user has the option to modify their password. 5. The user makes the decision to modify the password.
Frequency of Use:	Each time the user wants to change the email or phone or the password

Make a complaint use case that will describe how the citizen can make a complaint inside the application.

Table 2-3: Make complainant

Title:	Make complaint
Primary Actor:	People
Preconditions:	Login
Main Success Scenario:	<ol style="list-style-type: none"> 1. The user must sign in first 2. The user chooses complaints section

	3. The user chooses what complaint he wants, then presses the button to insert the location of the issue, then presses the button to attach a picture of the issue.
Frequency of Use:	Each time the user wants to make a complaint

The use case for seeing payment history will explain how the citizen can view his payment history.

Table 2-4: View Payment history

Title:	View Financial Record
Primary Actor:	People
Preconditions:	Login
Main Success Scenario:	<ol style="list-style-type: none"> 1. The user needs to first log in. 2. The profile part is selected by the user 3. The financial record section is selected by the user 4. A list of all the payments is displayed to the user. 5. The user has the option to select the specifics of a payment, including the sum and the payment method utilised, as well as the date and service for which it was made.
Frequency of Use:	Each time the user wants to check for his payment history

The use case for viewing announcements will outline how citizens can access announcements shared by the local government.

Table 2-5: View announcement use case

Title:	View announcement
Primary Actor:	People
Preconditions:	Login
Main Success Scenario:	<ol style="list-style-type: none"> 1. The user must sign in first 2. The most important announcement will be displayed on the main page 3. The user also can choose announcements section 4. The user sees a list with all the announcements 5. The user can check the water and electricity announcements section for any announcement about the cut-off in electricity or water.
Frequency of Use:	Each time the user wants to check for an announcement.

The use case for viewing events will outline how citizens can view events that the municipality has shared.

Table 2-6: View events use case

Title:	View events
Primary Actor:	People
Preconditions:	Login
Main Success Scenario:	<ol style="list-style-type: none"> 1. The user must sign in first 2. The user chooses events section 3. The user sees a list with all the events

Frequency of Use:	Each time the user wants to check for an event.
--------------------------	---

The pay for service use case will outline the process by which a citizen selects and pays for a service.

Table 2-7: Pay for service

Title:	Pay for service
Primary Actor:	People
Precondition:	Login
Main Success Scenario:	<ol style="list-style-type: none"> 1. The user needs to first log in. 2. The user selects the services area 3. The consumer selects the service that they wish to pay for. 4. After logging in, the user selects the payment amount and uses their account balance. 5. If the payment is successful, a notice will be sent by the system.
other scenarios:	<ul style="list-style-type: none"> • The notice "There isn't enough balance in the account" will appear if the user tries to pay using their account balance but doesn't have enough money.
Frequency of Use:	Each time the user wants to pay for a service (depending on the service)

View the use case for advertisements, which explains how citizens can view the ads that the municipality shares.

Table 2-8: View advertisement

Title:	View advertisement
Primary Actor:	People
Preconditions:	Login
Main Success Scenario:	<ol style="list-style-type: none"> 1. The user needs to first log in. 2. A series of adverts will appear on the home page. 3. The advertisement section is an additional option for the user. 4. A list of all the adverts is displayed to the user. 5. Any advertisement can be clicked by the user to learn more about it and to obtain contact details.
Frequency of Use:	Each time the user wants to see advertisements.

We have discussed use cases created by citizens in this section; use cases created by administrators will be covered in the following section.

1.8.2 Administrator

We will discuss the use cases that the administrator completed in this part.

Table 2-9: Register an admin

Title:	Login an admin
---------------	----------------

Primary Actor:	administrator
Preconditions:	Registration
Post conditions:	The admin will be allowed to use all the services of the app.
Main Success Scenario:	<ol style="list-style-type: none"> 1. The admin will launch the application and choose the Login button. 2. The admin will enter the email and the password.
other scenarios:	<ul style="list-style-type: none"> • Either the email or the password is incorrect. That will make the user enter them again. • The admin forgets the password, then the admin will press the forget password button that will open a new screen to enter the email of the admin to send a message to the admin containing a new random password that the admin can change after signing in.
Frequency of Use:	Each time the admin wants to use the services of the application

We have discussed the use cases completed by the administrator in this area; the use cases completed by the municipality administrator will be covered in the following section.

Table 2-11:events

Title:	events
Primary Actor:	admin
Main Success Scenario:	<ol style="list-style-type: none"> 1. The administrator logs in first 2. The administrator will proceed to the events area. 3. The events list will be displayed by the system. 4. The administrator selects an event to add, update, or remove. 5. The admin can add an event by clicking the "Add Event" button, which will cause a screen to appear where they can enter the event's title, description, and photo along with the date. 6. The administrator has the option to remove the event by selecting it by tapping the ellipsis on the event card. 7. The administrator can modify an event by selecting it by clicking on the three dots on the event card. This will open a new window with the event's information, which the administrator can amend before clicking the save button to save it.
other scenarios:	<ul style="list-style-type: none"> • If the admin forgets to complete the title or description or the date of the event a warning will be displayed to complete these information's (compulsory information). • If the admin enters an invalid date a warning will be displayed to enter a valid date.
Frequency of Use:	Each time the admin wants to maintain an event.

Maintain the services use case, which will outline the admin's options for adding, removing, and editing services within the programme.

Table 2-12 : Maintain services

Title:	Maintain services
Primary Actor:	admin
Main Success Scenario:	<p>1. The administrator logs in first</p> <p>2. The administrator will proceed to the services area. 3. The system will display the services list.</p> <p>4. The administrator selects a service to add, amend, or delete.</p> <p>5. The admin can add a service by clicking the "Add Service" button, which will cause a screen to appear with an icon, title, and description for the service along with the service's entered cost.</p> <p>6. The administrator can select to eliminate a service by clicking the ellipsis on the service card and selecting that option.</p> <p>7. The administrator can modify the service by selecting it by clicking on the three dots on the service card. This will open a new window with the service's details, which the administrator can alter before clicking the save button to save it.</p>
other scenarios:	<ul style="list-style-type: none"> • If the admin forgets to complete the title or description or the price of the service a warning will be displayed to complete these information's (compulsory information).
Frequency of Use:	Each time the admin wants to maintain a service.

Create a use case for announcements that explains how the administrator can add a notice to the section dedicated to announcements.

Table 2-13: Make notification

Title:	Make a notification
Primary Actor:	admin
Main Success Scenario:	<ol style="list-style-type: none"> 1. The administrator logs in first 2. The administrator will proceed to the announcement area. 3. The system will display the list of announcements. 4. The administrator makes a choice announcement (add, update, or delete). 5. The administrator can add an announcement by clicking the "Add Announcement" button, which will cause a screen to appear where they can enter the announcement's title and description. 6. The announcement can be deleted by the admin by selecting delete from the menu by hitting the ellipsis on the announcement card. 7. The administrator can modify the announcement by selecting Edit from the menu by clicking on the three dots on the announcement card. This will open a new window with the announcement's details, which they can modify before clicking the Save button to save it.
other scenarios:	<ul style="list-style-type: none"> • If the admin forgets to complete the title or description a warning will be displayed to complete this information (compulsory information).
Frequency of Use:	Each time the admin wants to maintain an announcement.

Preserve the Advertisement use case, which will outline the admin's capabilities to add, remove, and update advertisements.

Table 2-14: Maintain Advertisement use case

Title:	Maintain Advertisement
Primary Actor:	admin
Main Success Scenario:	<ol style="list-style-type: none"> 1. The administrator logs in first 2. The administrator will handle the section for advertisements. 3. The list of advertisements will be displayed by the system. 4. The administrator makes a decision to add, alter, or remove an advertisement. 5. The administrator can add an advertisement by clicking the "Add Advertisement" button, which will cause a screen to appear where they can enter the advertisement's title, description, contact information, and photo. 6. The Advertisement card's ellipsis can be pressed by the admin, who can then select Delete Advertisement. 7. The administrator can modify an advertisement by selecting it by clicking on the three dots on the advertisement card. This will open a new window with the advertisement's details, which the administrator can amend before clicking the save button to save it.
other scenarios:	<ul style="list-style-type: none"> • If the admin forgets to complete the title or description a warning will be displayed to complete this information (compulsory information).
Frequency of Use:	Each time the admin wants to maintain an Advertisement.

Examine the complaint use case, which explains how the municipal administrator can review the complaints submitted by the public.

Table 2-15: Check complaints use case

Title:	Check complaints
Primary Actor:	Municipality admin
Main Success Scenario:	<ol style="list-style-type: none"> 1. The admin will first login to the tablet system 2. The admin will go for the complaints section 3. The system will show the list of the complaints 4. The admin will choose the complaints to do by pressing on it 5. a new screen opened showing the complaints details showing the title and description and the location of the complaints and the picture if it exists
Frequency of Use:	Each time the Municipality admin wants to check complaints.

In the previous part, we have talked about the Use cases in detail.

Chapter summarization:

This chapter covered the system design in visual form utilising diagrams, as well as the system's implementation strategy, use cases, system users, and their interactions with it.

We will discuss the necessary system parameters as well as some hardware specifications in the upcoming chapter.

3 Chapter 3 Methodology

In this part we will talk about the system implementation, how we will implement it, the system specifications, hardware options for the system, the system requirements and the nonfunctional requirements for the system, all that in detail.

3.1 Constraints

1. We encountered numerous obstacles while trying to find all the essential features that needed to be integrated simultaneously to meet all the trainee needs.
2. The Municipality app had a limited time frame for development due to several factors. Firstly, the team had existing commitments in managing Municipality operations and working on other projects. Secondly, since this was their first time developing apps using Flutter and Dart programming languages, they needed extra time to get up to speed at the beginning of the development cycle. Despite these challenges, they managed to complete the app within the four-month time limit.
3. We had a specific budget for creating and launching the app, so we had to leave out some features because they were too expensive to add. We kept these limitations in mind while working on the app to make sure we finished it on time and within budget.
Our project was developed and tested on Android devices only because we didn't have enough resources to work on IOS devices.
4. The Impact of the Brutal war on Gaza Strip: Perhaps the most profound challenge was the brutal war on the Gaza Strip that began on 7/10. The men-tal and emotional toll this war took on our team was considerable. Dealing with the psychological effects of the war, while striving to maintain focus on our project, was a strenuous balancing act. The war's impact extended beyond emotional distress, as it also introduced logistical challenges that affected communication and coordination within our team.

3.2 system model

System model is a graphical summary for all the components needed in order to implement our system including the server side and the employee's devices, also, with the citizens devices which are their mobiles.

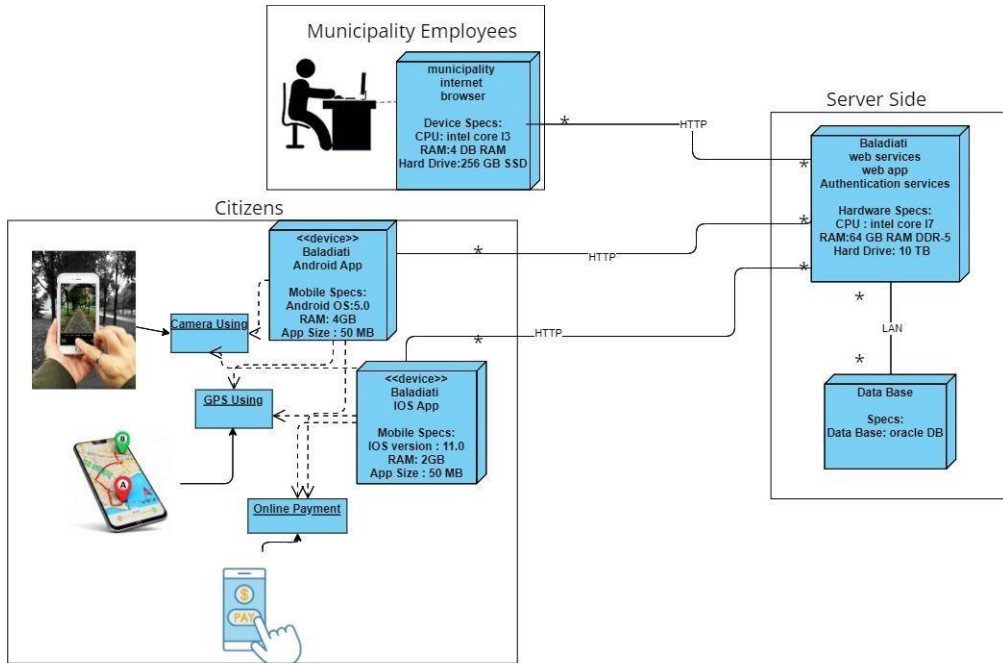


Figure 3.1: proposed system diagram

Employees of the municipality only need to have a device with an internet browser and an internet connection to complete this task.

Table 3-1: Municipality employee device specification

CPU	intel core I3
RAM	4 GB Ram
Hard Drive	256 GB SSD
OS	Windows 10

Citizens' Mobile portion:

Based on the survey results, we realised that a cross-platform mobile application was necessary. For this reason, we developed ours using the Kotlin framework. To fully utilise our mobile application, a device must have a camera and GPS capability.

Regarding Applications for Android:

Table 3-2: citizen's android mobile specification

Android Version	5.0 and up
RAM	4GB of ram
Space required	50 MB of space

Table 3-3: citizens IOS mobile specification

IOS Version	Up to ios version 11
RAM	At least 2GB
Space required	50 MB of space

Server-side part:

The web services that the municipality provides, the database side, and the web server that has the APIs for making requests and transferring data with the database make up this section.

Table 3-4: server specification

CPU	intel core I5
RAM	64GB
Hard Drive	10 TB ssd
Data Base	Mongo

We discussed our system model and its specifications in this section, along with some hardware requirements that we must meet for our system.

We will discuss some non-functional criteria in the next section.

3.3 Most important non-functional requirement for our system: -

It has become evident that in this kind of system, these non-functional needs are the most important.

Usability: Since many elderly people will use our application, it is crucial that it be simple to use. With the help of the application's instructions and the demo available on mobile stores (Google Play and App Store), the average citizen should be able to use the mobile application in no more than five minutes. As for the employees, they should be able to use it after receiving no more than an hour of training on how to use it.

Response time: We will try to improve the speed at which our software system responds because the maintenance staff will occasionally receive emergency compliments that require quick attention.

Maintainability: To ensure that the programme is usable for a minimum of 15 to 20 years, we will design it such that it is simple to add new features and updates. If the software is not maintainable, adding new features will cost more money and take longer.

Reliability : This software is guaranteed to be 100% dependable. Since citizen information is vital to municipalities and their servers (or AWS), all data will be saved in a manner that will store information.

Security: The programme will offer the complete protection for the company's data that it requires. To begin with, we will need citizens who wish to register to visit their local municipality in order to create a new account. This will help to lower the number of fraud cases and ensure the security of citizen data.

Availability: By boosting the servers' power, we can ensure that the software is always available to users to handle any urgent cases from clients (our computation indicates that the system will, on average, not fail in peak times by more than 0.1%).

Efficiency: In terms of efficiency, the programme will make excellent use of the hardware on both client and company devices, as well as servers. It will also be small in size and require minimal CPU and RAM usage, allowing a large number of citizens to use the application even with low-resource phones.

Reduce spamming: To start, communities will have a registration process that requires citizens' IDs. If a citizen violates this process, they risk having their account blocked or facing fines. We discussed some of the non-functional needs for our system in this area; in the following section, we'll discuss the user interfaces for each actor in the system in a specific way.

3.4 Interface for the actors

3.4.1 Citizens User interfaces

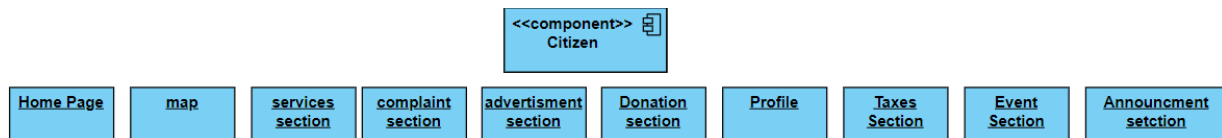


Figure 3.2: Citizens User interfaces

Homepage: The homepage interface will display all eight regions that are available for public use.

Section on contacting municipalities: A messaging area allowing municipality staff to text one another will be included in the section on contacting municipalities.

Services section: this interface lets users see the services, their costs, and any papers that could be required for those services. After determining whatever service they want, they can submit a request by including the required paperwork.

Section for complaints: This interface lets people file complaints about problems they have, whether they are on the street or with specific services. After choosing a complaint type from a list, users must describe the problem, attach a picture (taking pictures requires a phone with a camera), and provide the location of the issue, which Google Maps will locate.

Announcements section: this interface will provide alerts when specific services are reduced in addition to messages on municipal announcements like water cut times and service returns.

Events section: This interface will provide the most important events and a date-arranged calendar to citizens who request events on a specific date.

advertisements: This interface will feature a selection of regional product advertisements. This section is devoted to helping small businesses. A new screen with the owner's description, a description of the sale they offer, and contact details will show up when someone clicks on one of these adverts. The adverts merely feature a picture and a short description.

Payments: The citizen will be able to monitor all of their payments as well as the services they have paid for by using this interface, which will make all of their payments accessible.

3.4.2 Administrator User interfaces

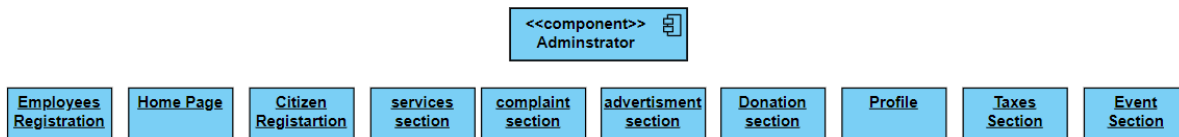


Figure 3.3: administrator User interfaces

Home Page: The navigation bar and send announcement complement section on the home page interface will house all the sections that employees can work with.

complement section: This interface will also display all of the citizen complaints that have been filed, along with the names of the submitters. Clicking on any complaint will open a new window with the complaints. In order to facilitate employee tracking of complaints according to job roles, complaints may be classed by kind and include a description and, if applicable, a photo of the place.

Section on Citizen Balance: This interface allows users to add balance to their accounts by providing their ID and the desired amount to be added.

Contact Citizens: This interface will offer a means for citizens to get in touch with authorities in case of an emergency or to report issues with the systems.

Registration: This interface allows new users to be added to the system so they can use payments and file complaints. Once a user registers, they can use the system and enter information about themselves, including name, password, email address, and phone number.

Services: This interface allows for the addition of new services in the event that they are introduced to the system. It contains the name of the service, a description of the service, any necessary paperwork, and the cost of the service.

Announcements: This interface allows for the addition of announcements and the sending of critical alerts. The announcement's title and a date-stamped description are displayed on the interface.

Events: Using this interface, you may add events to the calendar by entering their name, description, location, and date.

Advertisement: The ads section receives adverts from this interface. This interface includes the advertisement's title, description, store location, and contact details.

The user interfaces for each actor in the system were discussed in length in this section. In the following section, we will discuss the technologies we want to employ to implement our system.

3.5 Frameworks:

In this part we will talk about the technologies we used to implement our system.

3.5.1 Dart:

Dart, a programming language created by Google, is widely recognized for its application in constructing mobile apps using the Flutter framework. Its main objective is to provide a straightforward, effective, and adaptable approach, making it an exceptional option for developing mobile applications [2].

3.5.2 Flutter:

Flutter is a super cool tool made by Google that helps developers create awesome apps. It's open-source, which means that anyone can use it and contribute to its development. With Flutter, you can build apps for mobile devices like iPhones and Androids, as well as for the web and desktop [1].

3.5.3 Node JS

Event-driven servers employ Node.js, an open-source, cross-platform back-end JavaScript runtime environment. Node.js is a fast and scalable back-end JavaScript API server used in web development, which is why many programmers use it.

3.5.4 Firebase database

A development tool called Firebase Database enables users to create iOS, Android, and Web apps in addition to storing and syncing data. Because users may use it to report and fix app crashes as well as conduct product experiments, it is frequently used.

We discussed the technologies we used to implement our system in this section.

We shall display a few of the screens we created for our application in the upcoming section.

3.5.5 **Firestore database**

In my project, I used Firestore as the primary database due to its flexibility and scalability. Firestore's document-oriented storage model allows for the efficient handling of diverse and evolving data structures, which is crucial for dynamic applications. Its schema-less nature facilitates rapid development and iteration, while built-in features like indexing and replication enhance performance and reliability. Additionally, Firestore's robust support for horizontal scaling ensures that the database can grow seamlessly with the application's demands, making it an ideal choice for projects requiring agility and long-term scalability.

3.6 Mobile Application System

We have developed our real-life application, and below are some of the screens included in it.

3.7 Web Application System

We have developed our real-life web application, and below are some of the screens included in it.

3.8 Standards :

3.8.1 Provider Patterns:

The Provider pattern was employed in our system. We could divide the entire project into different layers to make it easier to follow the flow of work. These layers are as follows:

1. The Provider Layer: It represents the state management layer of the application. It will manage and provide access to the app's state to the other layers.
2. The Presentation Layer: It represents the user interface of the application. It will respond to the changes in the app's state and update the views accordingly.
3. The Data Layer: It represents the source of data for the application. It could be an API, database or any other source of data. The data layer communicates with the provider layer to fetch and update data.
4. The Services Layer: It represents the business logic of the application. It facilitates coordination and cooperation between the data layer and the presentation layer to provide a seamless user experience.

3.8.2 Agile Model:

The Agile methodology is a project management approach that involves breaking the project into phases and emphasizes continuous collaboration and improvement. Teams follow a cycle of planning, executing, and evaluating.

We classified the tasks we had to do into the following five groups: 1. Brainstorming to get all needed requirements and features required. 2. Design the requirements: We designed the UML diagram to clarify the functionality of new features and how they will interact with our system. 3. Development part: for this part, we started writing the code for the front end, and after we finish all the code required for the front part, we begin writing the code for the back end of each screen in the app. 4. Testing: we connect the back end with the front end and make sure that every page works correctly 5. Feedback: we kept getting feedback from our supervisor to ensure that the app that we built satisfied the requirements.

Chapter summarization:

in this chapter we talked about the system implementation, the system requirements and its nonfunctional requirements, we also talked about the technologies we used to develop our system and showed some of the user interfaces we developed.

In the next chapter, we will talk about future developments to include in our system.

4 Chapter 4: Result and Analysis

4.1: User Screens

Certainly! A welcome screen is a visual element that appears when an application is launched. it's a graphic or animation that appears on the user's screen before the main application interface appears. The purpose of a splash screen is to provide users with a momentary distraction during the app's loading process, while also reinforcing the brand identity of the application. A well-designed splash screen can enhance the user experience and create a positive impression of the app.



Figure 4.1: Welcome Page

The "About" section in the mobile app gives users a complete rundown of the municipality. It covers everything from its past, goals, services, and community projects. This page is made to make users more involved and proud of their city, while also being transparent about everything.



Figure 4.2: About Us Page

One of the important parts of the application's user interfaces is the login page, through it, users can authenticate themselves before being allowed access to their accounts. To check the user's email and password if it is valid, a validation technique is applied to them. This is done to make sure that the user's information is secured and valid. The process of validating emails ensures that the email is in the correct format. if the user doesn't have an account he can sign up by clicking on the signup button.

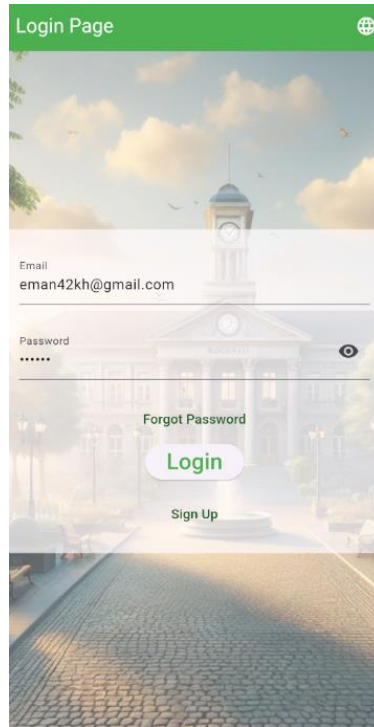


Figure 4.3: Login Page

The sign-up page is a user interface element in the application that prompts the user to enter their email, password, username, and phone number and address to create an account.

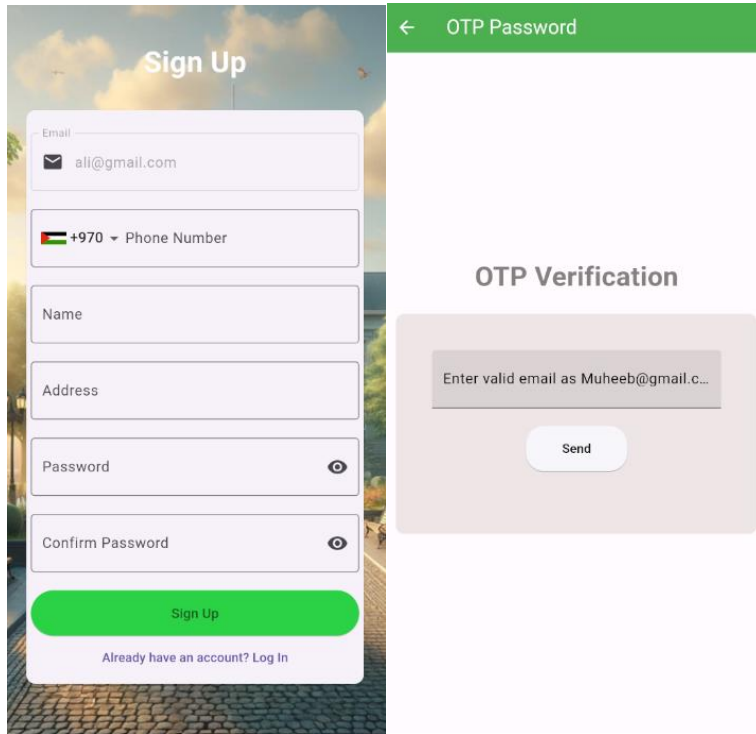


Figure 4.4: Signup Page

The Help Center on our municipality app gives quick access to FAQs, service requests, and contact details for city services. It's designed to make communication smoother and help residents effectively. Whether you're reporting problems or looking for info, the Help Center is there to provide fast help for the community.

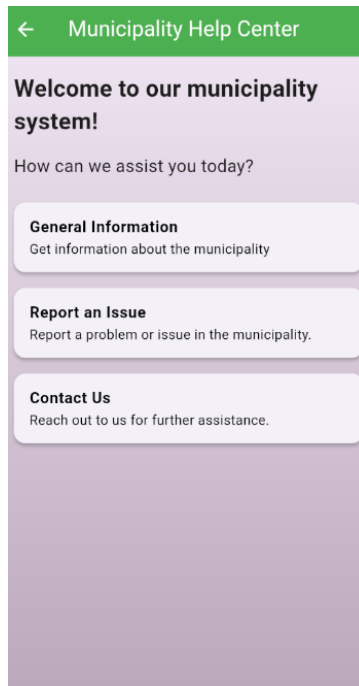


Figure 4.5: Help Center Page

The "Chat page" in a municipality mobile application enables real-time communication between residents and municipal administrators, facilitating efficient issue resolution and information sharing. Users can report problems, ask questions, and receive timely updates directly from the admin. This feature enhances transparency and improves community engagement by providing a direct line of communication.

On the profile page, you can edit or view your information, log out, or view the user's balance.

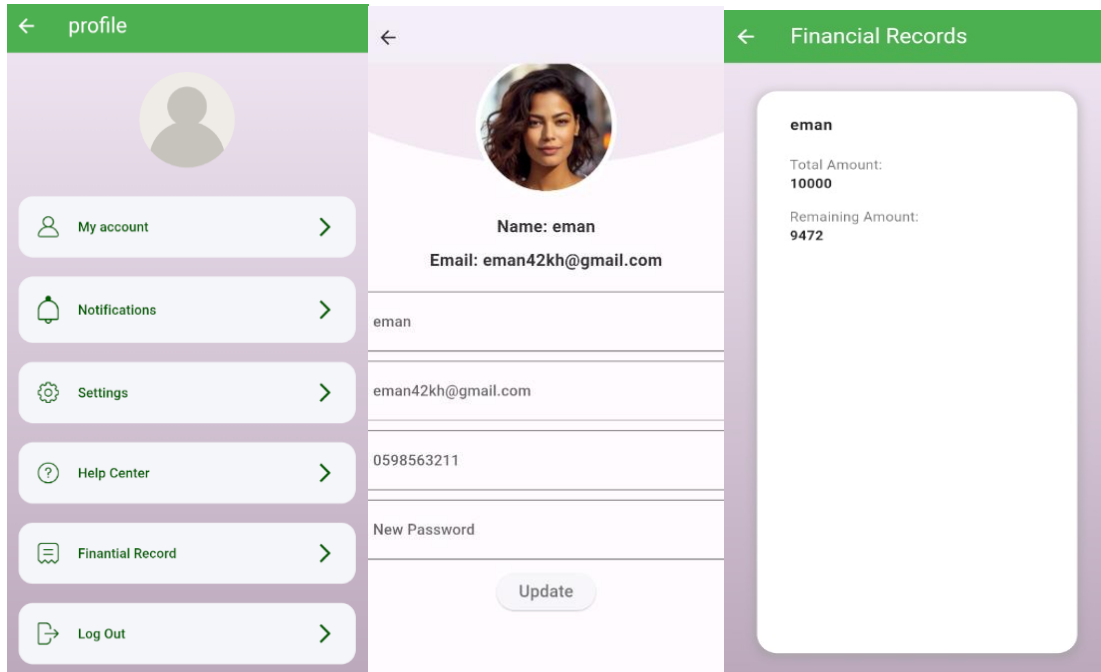


Figure 4.6: Profile Page

The "User Main Page" in a municipality mobile application serves as a centralized hub for residents. It features sections for local events, news updates, user profiles, advertisements, taxes, donations and municipal services, ensuring easy access to essential information and community engagement. This streamlined interface enhances user experience and connectivity within the municipality.

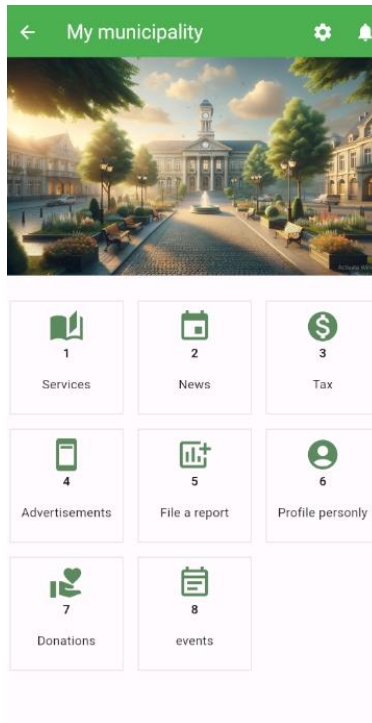


Figure 4.7: User Home Page

The "Events Page" on the has a complete list of upcoming events, making sure people know what's happening in the community. You can check out events, RSVP, and even share them with your friends. It's like a one-stop shop for everything going on in town, encouraging people to get involved and join in on the fun.

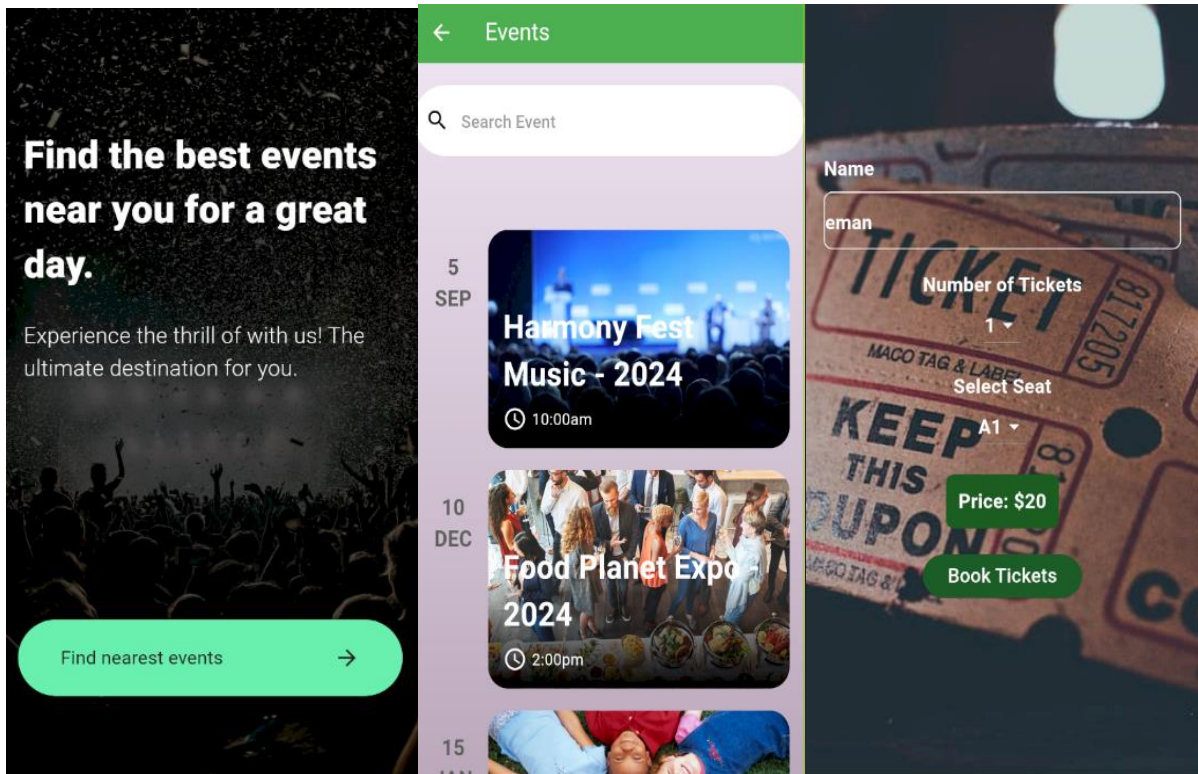


Figure 4.8: Events Page

The News Page keeps people up to date with the newest information and important messages. It includes articles, event alerts, and details about public services. By using the app, residents can easily stay in the loop about what's happening in their community.



Figure 4.9: News Page

The municipality's mobile app has an "Advertisements page" that showcases both bright and dull advertisements. This clever design makes it easy for users to spot the ongoing promotions and differentiate them from the expired ones. It's a great way to keep the interface organized and help users find the latest offers effortlessly.

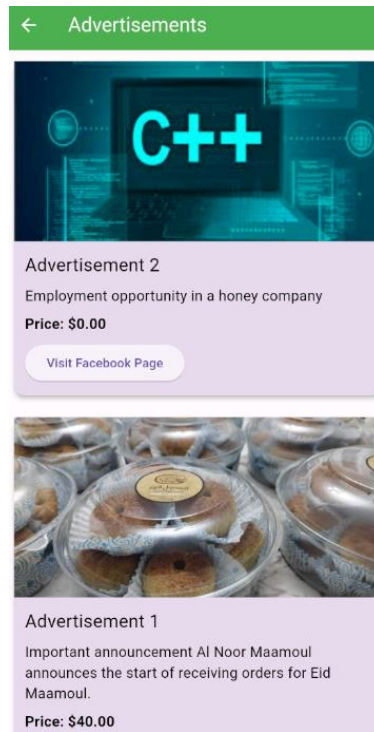


Figure 4.10: Advertisements Page

The municipality's mobile app has a Services page that brings together important services such as water, electricity, road maintenance, and fee payments. This makes it easier for people to access these services in a convenient way.

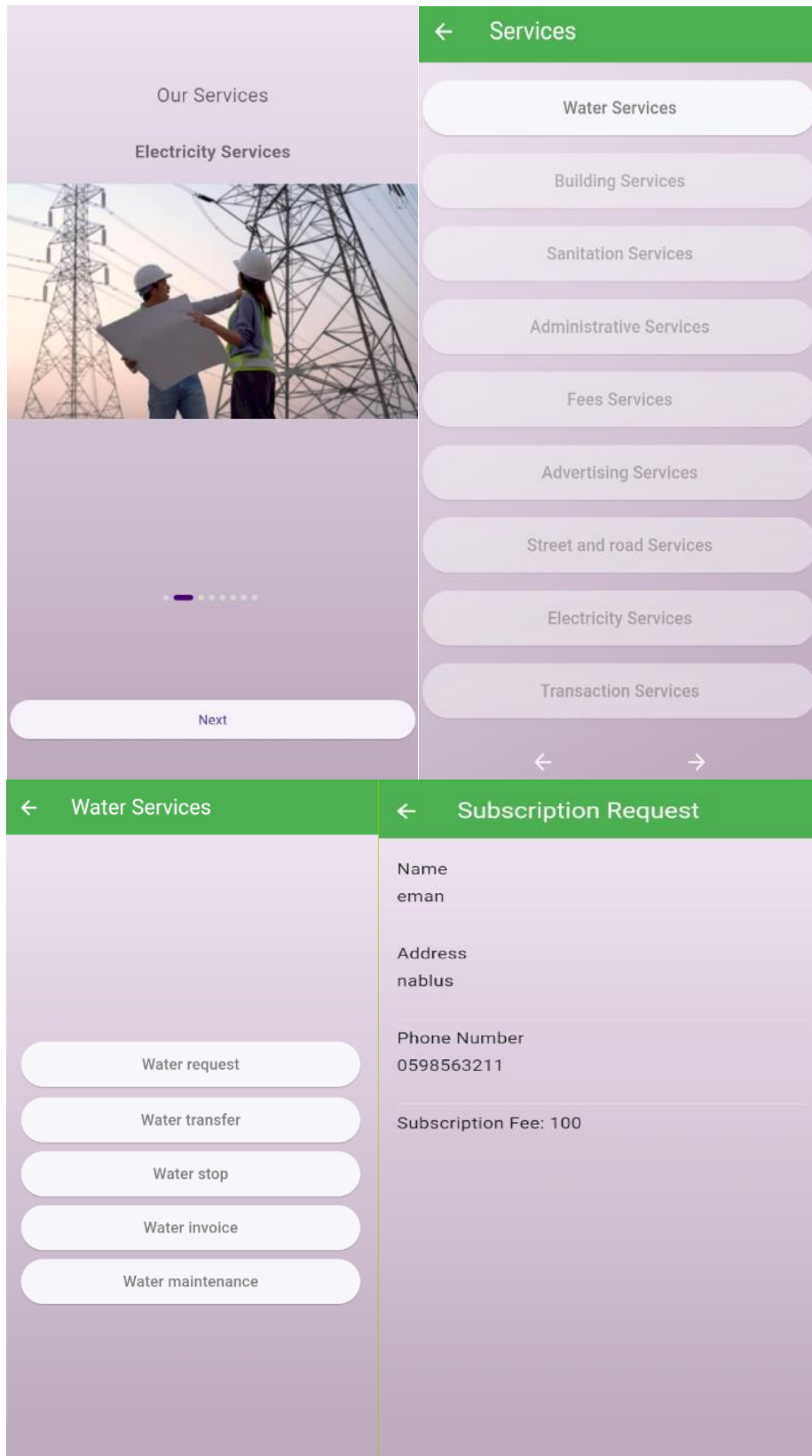


Figure 4.11: Services Page

The Taxes page provides a convenient way for users to pay different taxes. It organizes property, income, and local service taxes into separate categories, making it easy to find and access them. Users can effortlessly navigate through the app, check out specific details, and make payments without any hassle.

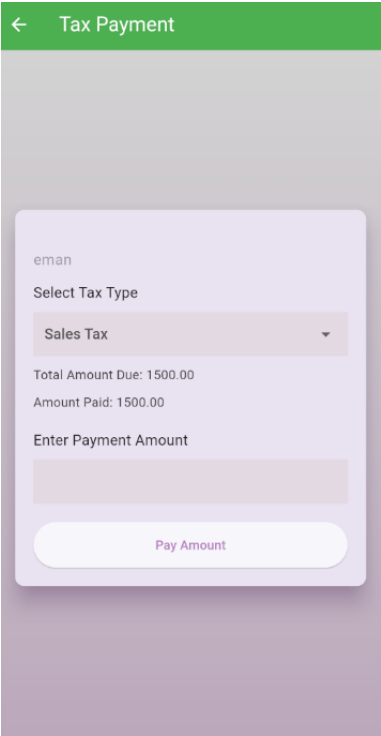


Figure 4.12: Taxes Page

Our mobile app has a special section called the 'Donations Page' where you can find different ways to help out. You can choose to donate money for community projects, offer your time as a volunteer for local events, or even give away goods to those who are in need.

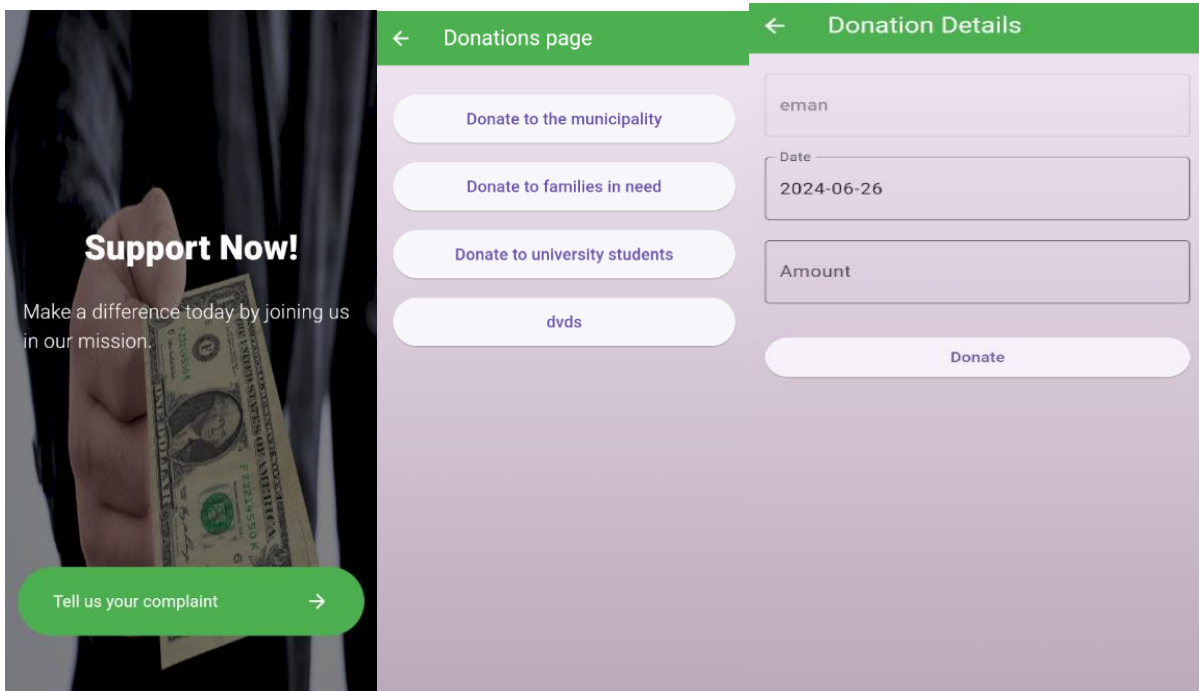
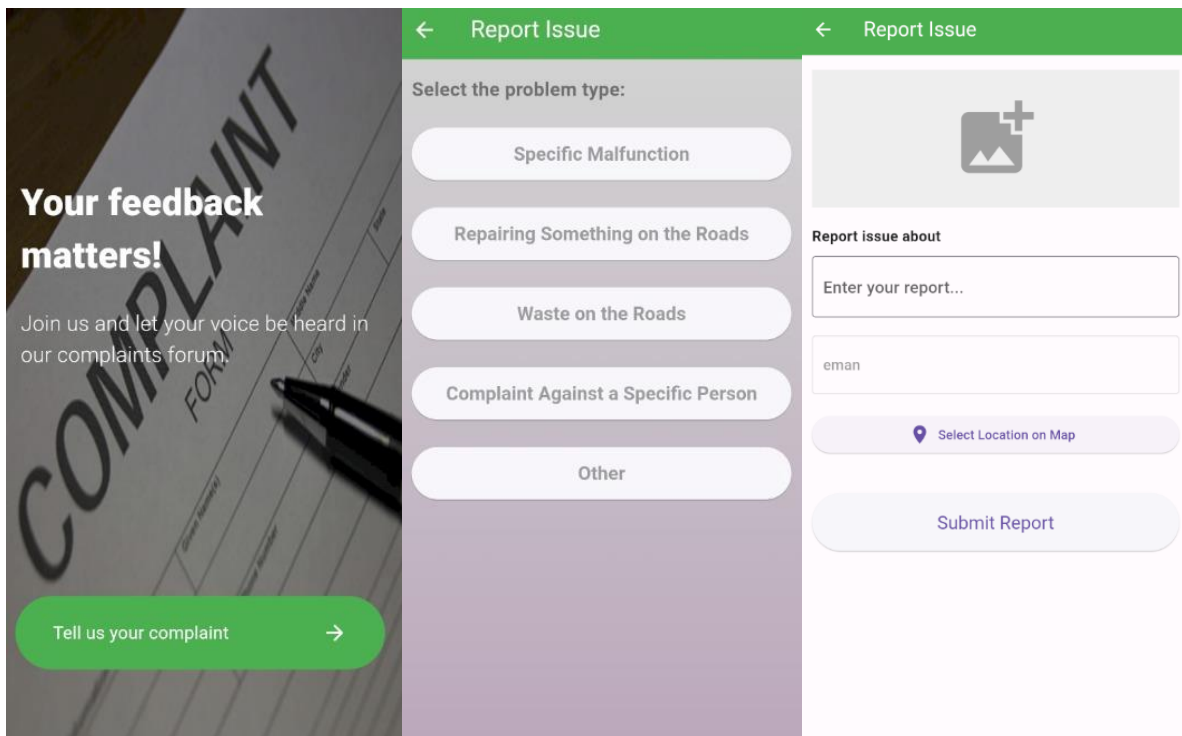


Figure 4.13: Donations Page

Our Reports or Complaints page on the municipality app to express any concerns or promptly report any issues.



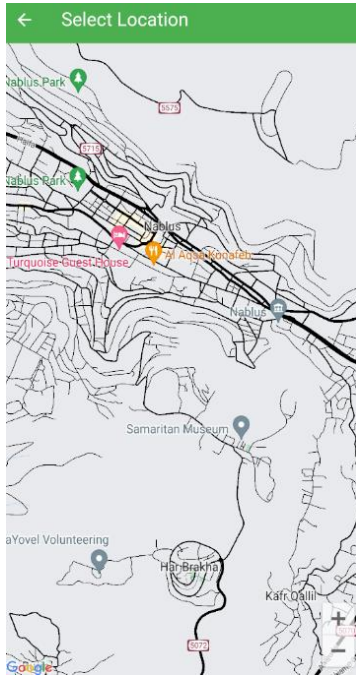


Figure 4.14: Reports Page

The municipality app allows users to personalize notifications, language settings, and accessibility options to make it easier for them to stay engaged with local government activities.

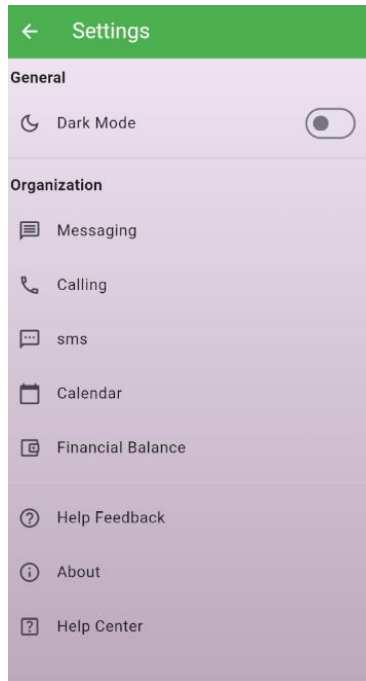


Figure 4.15: Settings Page

The chat feature on the town app lets people send messages to administrators for questions or help, promoting instant communication. This helps solve problems quickly and makes it easy for residents to talk to the staff.



Figure 4.16: Chat Page

4.2: Admin Screens

The main page for administrators on the municipality mobile app provides a central hub for controlling various services, news updates, taxes, advertisements, reports, profiles, donations, and events. Administrators have the ability to add, remove, or modify these features, as well as manage users, handle user complaints, monitor chat interactions, keep track of orders, handle reservations, and analyze data using visual representations.

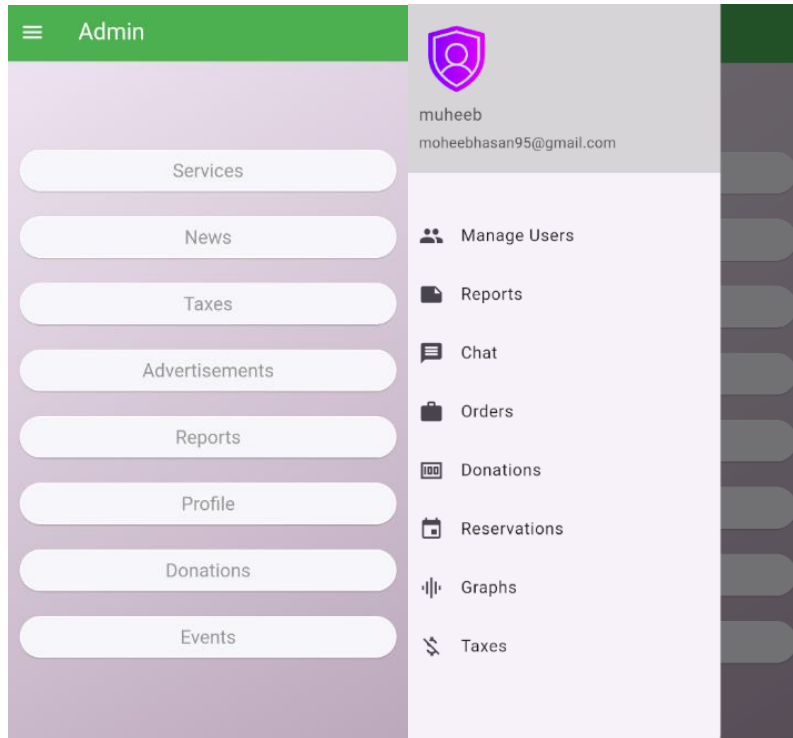


Figure 4.17: Profile admin Page

The "Services Admin Page" on the municipality's mobile app admin allows seamless management of events: add, edit, or delete them swiftly. Enhances user engagement by offering real-time updates on local happenings and services. Facilitates community interaction and satisfaction through dynamic event management capabilities.

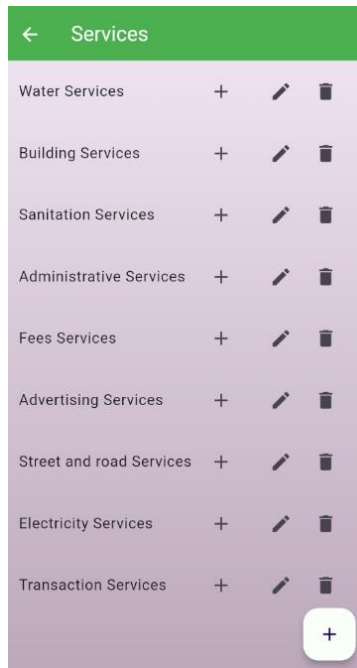


Figure 4.18: Services Admin Page

The news section on the town's mobile app lets administrators easily handle events. They have the ability to remove, modify, or include new events, guaranteeing that residents receive updates that are both timely and pertinent. This function boosts community involvement and communication by providing accessible, up-to-date information.

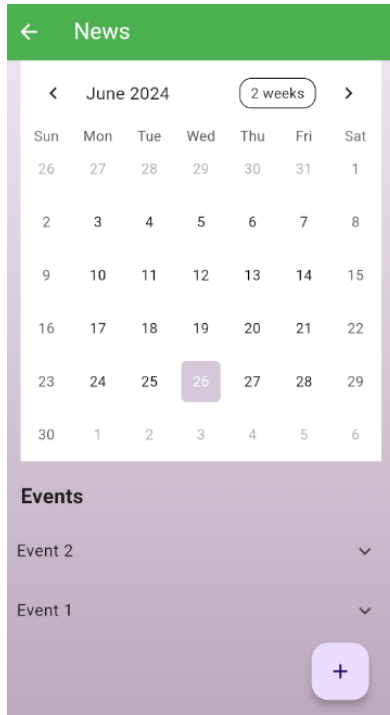


Figure 4.19: News Admin Page

The taxes section on the city's app lets admins control events by deleting, editing, or adding new ones. At the same time, admins can view a list of taxes submitted by users, giving them full control and management options on the app.

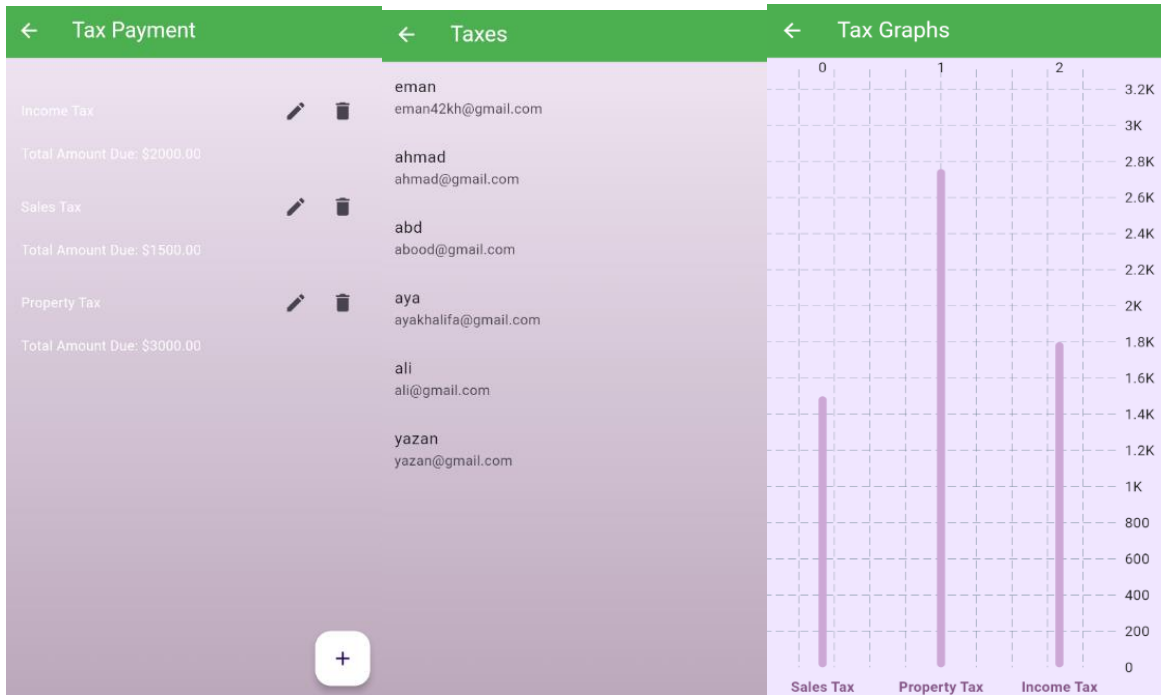


Figure 4.20: Taxes Admin Page

The admin page on the municipality's mobile app is where administrators can take care of the advertisements. They have the ability to delete, edit, or even add new ones, making sure that the content is always current. This page acts as a platform for sharing local announcements, events, and community notices, which helps to increase citizen involvement and spread information.

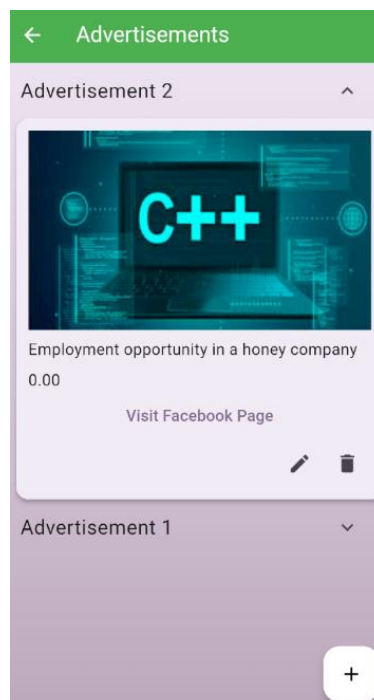


Figure 4.21: Advertisements Admin Page

The "Reports or complaints section" in the municipality app gives the administrator the ability to handle different types of reports. This includes deleting, editing, and adding new report types. Moreover, administrators can access a detailed list of complaints reported by users for better supervision and problem-solving.

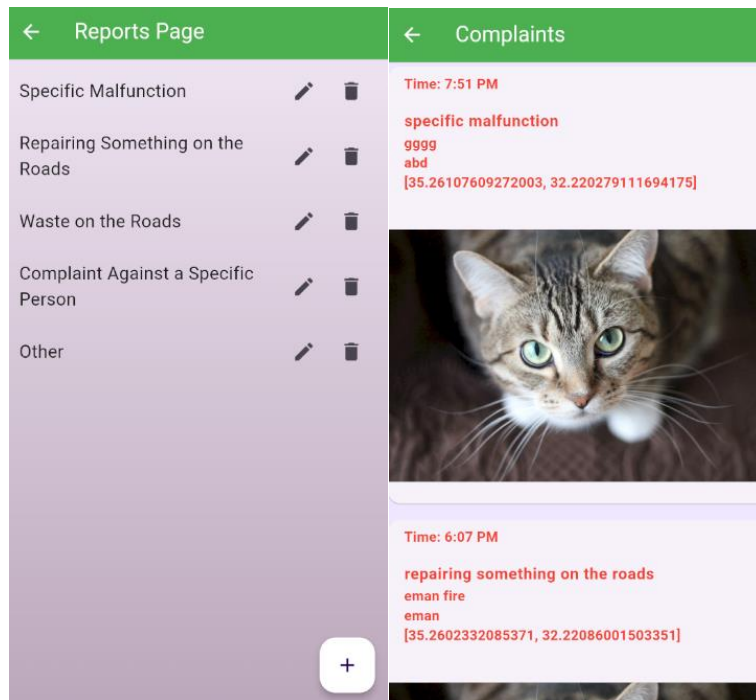


Figure 4.22: Report Admin Page

On the profile page, you can edit or view your information, log out.

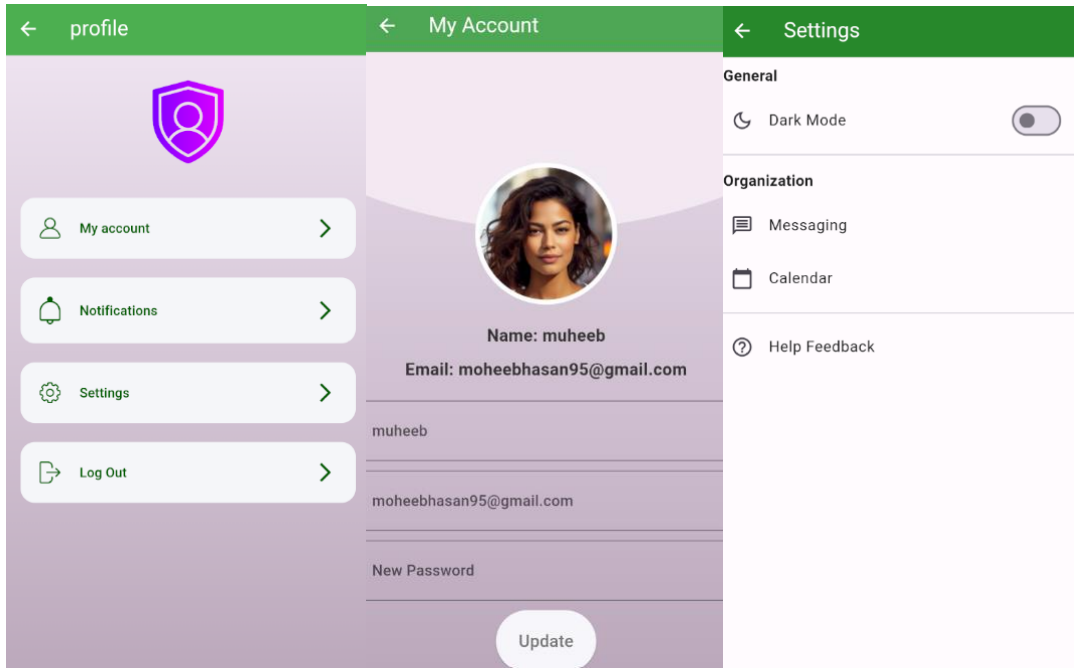


Figure 4.23: Profile admin Page

The donations section on the city app lets administrators control donations by making changes, removing, or including new donations. Administrators can also see a detailed list of donations from users, making sure everything is clear and contributions are managed well.

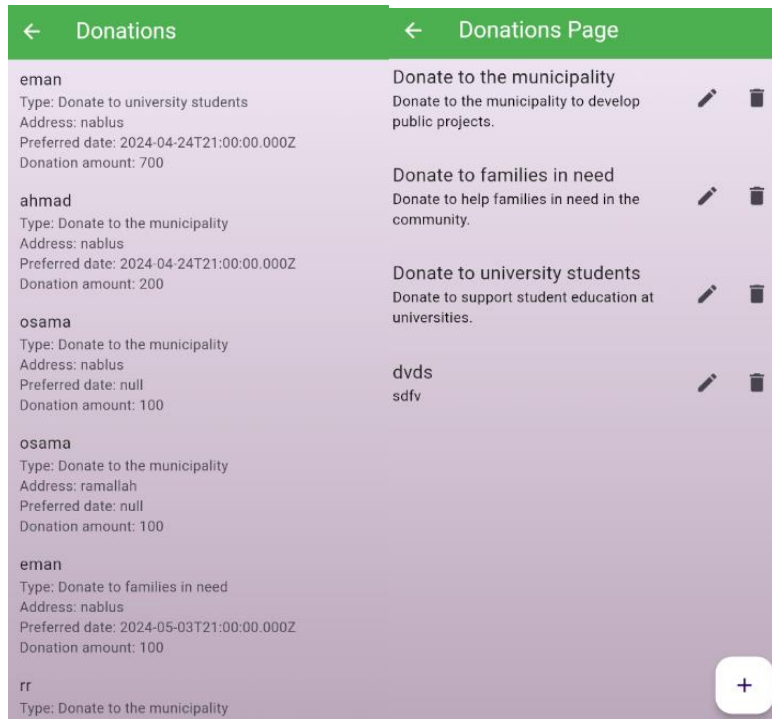


Figure 4.24: Donations Admin Page

The events section on the municipality app's admin panel allows administrators to control events by editing, removing, or creating new ones. Moreover, administrators can easily check user bookings for events.

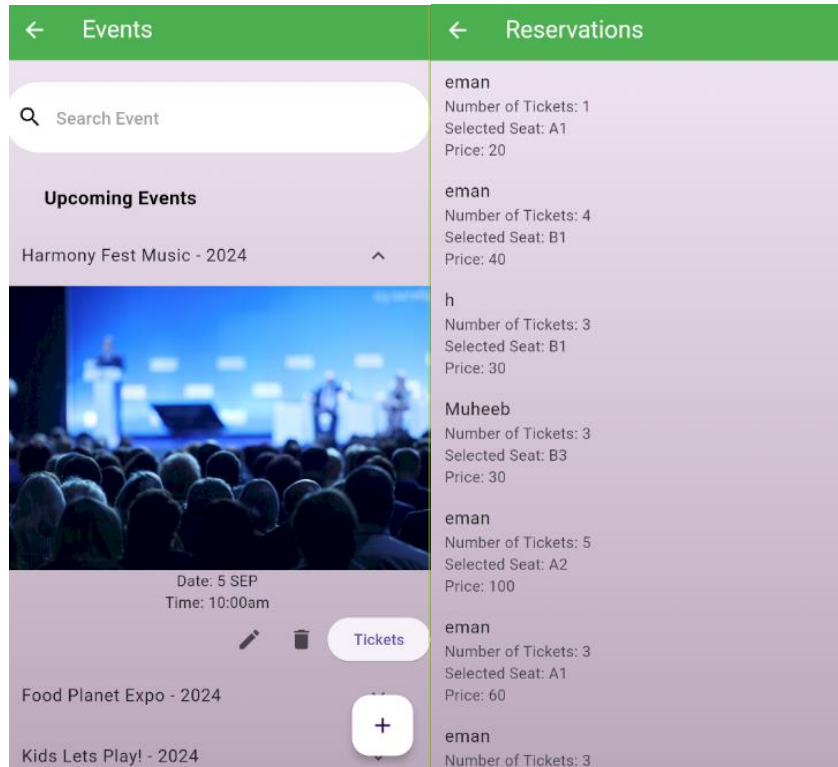


Figure 4.25: Events Admin Page

In the admin panel of the municipality mobile app, the "Manage Users" page allows administrators to efficiently oversee and handle user accounts. Administrators can quickly delete users, ensuring smooth user management. This feature guarantees a secure and efficient administration of the app's user base.

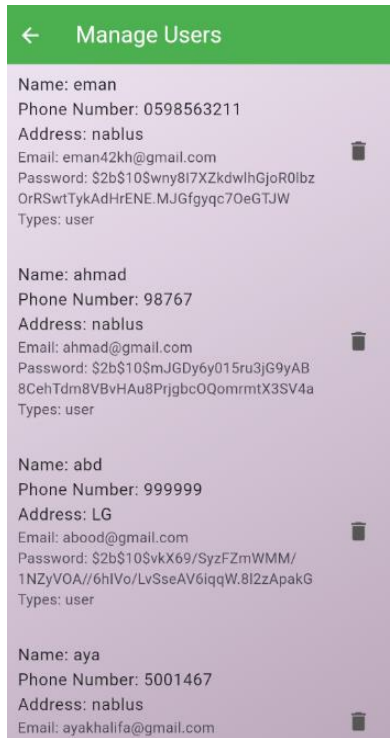


Figure 3.26: Manage Users Page

In the municipality mobile application, the chat page enables admins to directly communicate with users for real-time interaction and support. Admins can manage inquiries, provide information, and address concerns promptly through this integrated chat feature, enhancing user engagement and satisfaction.

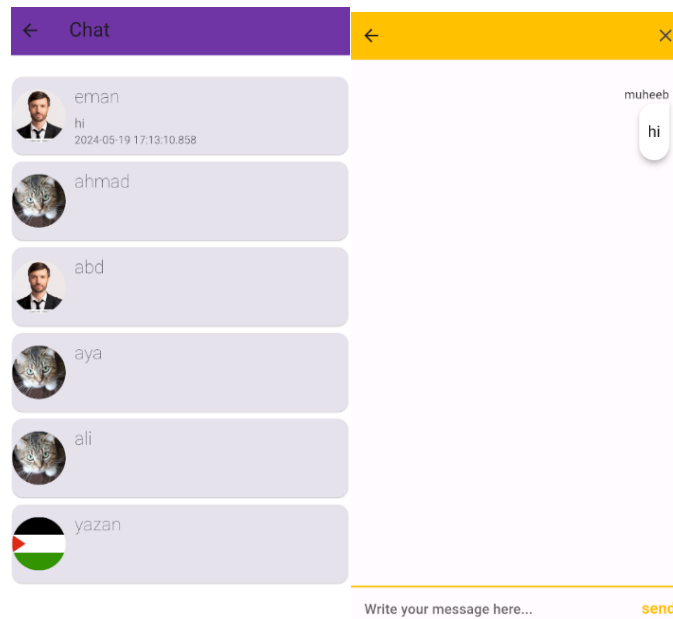


Figure 4.27: Chat Page

5 Chapter 5: Discussion

Municipality apps are a big step forward in getting people involved in their community. They make it easy for residents to get important services and info. These apps help local governments and citizens talk faster, so problems like potholes or broken streetlights get fixed quicker. But it's important to make sure everyone can use the apps and that people's info stays safe. We need to find a good balance between new technology, making sure everyone can join in, and keeping people's privacy in mind. This way, we can create a community that's connected and ready to help each other out.

6 Chapter 6: Conclusion and Recommendations

6.1 Conclusion

In conclusion, our project “Online Municipal Services” is very important to be implemented in Palestine as it will have a very good effect on the technological development and will improve the work of municipalities regarding the efficiency, time, cost and delays when requesting and needing any service from municipalities, furthermore, our project will allow the improvement of different sectors in Palestine such as the infrastructure.

Moreover, our project is beneficial to different parties in the society such as the users, municipality’s employees and the government. The project is important to be implemented in real life due to its many benefits to Palestine.

6.2 Recommendations

It takes a lot of work and time to develop a platform like this, so we were unable to complete some essential requirements for our system in the allotted time. As a result, we will continue to work on the project's development and add the following features in the future., First, a tablet system for staff members will be created to use geographic information systems (GIS) to track building violations and necessary maintenance. Secondly, an interactive tourist map will be added to enable visitors and Palestinian citizens to search for various locations within the city and view them in three dimensions,

Finally, we will work to provide all the services needed to use our application, which will increase its efficiency and cut down on the number of visits to municipalities. The third goal is to expand our platform so that all municipalities in Palestine can use it and implement it in their local area.

References

- [1] Deshpande, C., 2022. The Best Guide to Know What Is React. [online] simplilearn. Available at: <https://www.simplilearn.com/tutorials/flutter-tutorial/what-is-flutter#what_is_react> [Accessed 12 June 2022].
- [2] Dart (programming language). [online] Available at: <[https://en.wikipedia.org/wiki/Kotlin_\(programming_language\)](https://en.wikipedia.org/wiki/Kotlin_(programming_language))> [Accessed 25 February 2023].
- [3] E-Government Platform Service An Introduction to Graduation Project prepared by - Tarek Khoury 1173019 - Jihad Jitan 1171858 - Essa Salameh 1170575
- [4] Gaza-city.org. 2022. بلدية غزة. [online] Available at: <<https://gaza-city.org/>> [Accessed 19 June 2022].
- [5] McMahon, M., 2022. What Are E-Services? (with picture). [online] EasyTechJunkie. Available at: <<https://www.easytechjunkie.com/what-are-e-services.htm>> [Accessed 16 June 2022].
- [6] Momrah.gov.sa. 2022. تطبيق بلدي. [online] Available at: <<https://momrah.gov.sa/ar/node/3453>> [Accessed 19 June 2022].
- [7] Municipality of Clarington, n.d. Municipal Responsibilities. [online] Clarington.net. Available at: <<https://www.clarington.net/en/town-hall/municipal-responsibilities.aspx#:~:text=Municipal%20governments%20are%20responsible%20for,local%20roads%2C%20including%20snow%20removal>> [Accessed 15 June 2022].
- [8] NCLM, n.d. How NC Cities Work. [online] Nclm.org. Available at: <<https://www.nclm.org/advocacy/how-nc-cities-work#:~:text=Municipalities%20are%20established%20to%20protect,use%20planning%20and%20fire%20protection>> [Accessed 15 June 2022].
- [9] Node.js. n.d. About | Node.js. [online] Available at: <<https://nodejs.org/en/about/>> [Accessed 12 June 2022].

[10] Play.google.com. n.d. [online] Available at:
<<https://play.google.com/store/apps/details?id=momra.balady.android&hl=ar&gl=US>>
[Accessed 19 June 2022].

[11] Play.google.com. n.d. [online] Available at:
<<https://play.google.com/store/apps/details?id=app.intertech.ramallah&hl=ar&gl=US>>
[Accessed 19 June 2022].

[12] Play.google.com. n.d. [online] Available at:
<<https://play.google.com/store/apps/details?id=gaza.municipality&hl=ar&gl=US>>
[Accessed 19 June 2022].

[13] Rosencrance, L., n.d. What is Google Firebase? - Definition from WhatIs.com.
[online] SearchMobileComputing. Available at:
<<https://www.techtarget.com/searchmobilecomputing/definition/Google-Firebase>>
[Accessed 12 June 2022].

[14] Flutter, <https://www.flutter.dev/>