Design and Implementation of Food Waste Management & Online Donation System

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APPROVAL

The project titled "**Design and Implementation of Food Waste Management & Online Donation System**" submitted by Mohammad Nahidul Islam (CSE1903018015), Mohammad Khaled Chowdhury Naim (CSE1903018020), Md. Fahad Hossen (CSE1903018023) and Mohammad Zahidul Islam (CSE1903018158) to the Department of Computer Science and Engineering, Sonargaon University (SU), has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of Bachelor of Science in Computer Science and Engineering and approved as to its style and contents.

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DECLARATION

We, hereby, declare that the work presented in this report is the outcome of the investigation performed by us under the supervision of **Abu Said Md. Rezoun, Lecturer,** Department of Computer Science and Engineering, Sonargaon University, Dhaka, Bangladesh. We reaffirm that no part of this project has been or is being submitted elsewhere for the award of any degree or diploma.

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ABSTRACT

Food waste is a major global problem, with an estimated one-third of all food produced for human consumption being lost or wasted. This waste has a significant environmental impact, as it contributes to greenhouse gas emissions and land degradation. It also has a social impact, as it denies food to those who need it most. Online donation systems can be a valuable tool for reducing food waste. These systems allow food donors to connect with food recipients, such as food banks and soup kitchens. This can help to ensure that surplus food is not wasted, but is instead redistributed to those who need it. This paper will explore the potential of online donation systems to reduce food waste. It will review the literature on food waste and online donation systems, and will present a case study of an online donation system in Bangladesh. The paper will conclude by discussing the challenges and opportunities of using online donation systems to reduce food waste.

ACKNOWLEDGMENT

At the very beginning, we would like to express my deepest gratitude to the Almighty Allah for giving us the ability and the strength to finish the task successfully within the schedule time.

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We are also thankful to all our teachers during our whole education, for exposing us to the beauty of learning.

Finally, our deepest gratitude and love to my parents for their support, encouragement, and endless love.

LIST OF ABBREVIATIONS

CPU	Central Processing Unit
ER	Entity Relationship
HTML	Hyper Text Markup Language
PC	Personal Computer
RAM	Random Access Memory
SDLC	Software Development Life Cycle
UI	User Interface

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CHAPTER 1

INTRODUCTION TO FOOD WASTE MANAGEMENT AND ONLINE DONATION SYSTEM

1.1 Background and Motivation

Food waste management and online donation systems are critical components of efforts to address food insecurity and reduce environmental impacts associated with food waste. Here's some background and context on these topics:

Food Waste Management:

The Scale of the Problem: Food waste is a global issue, with a significant portion of the world's food supply going to waste each year. This includes both consumer-level waste and waste within the food supply chain. According to the Food and Agriculture Organization (FAO) of the United Nations, approximately one-third of all food produced for human consumption is lost or wasted globally. This amounts to about 1.3 billion tons of food annually.

Environmental Impact: Food waste contributes to a range of environmental problems, including greenhouse gas emissions, as decomposing food generates methane, a potent greenhouse gas. Wasting food also squanders the resources used in its production, such as water, land, and energy.

Economic Impact: Food waste represents a significant economic loss for individuals, businesses, and governments. It increases the cost of living for consumers and reduces profits for food producers and retailers.

Regulatory and Industry Initiatives: Many countries and regions have introduced regulations and initiatives to combat food waste. These may include food labeling standards, tax incentives, and awareness campaigns. The private sector, including grocery stores and restaurants, has also been implementing strategies to reduce food waste through improved inventory management and donation programs.

Online Donation Systems:

Leveraging Technology: Online donation systems leverage technology and digital platforms to facilitate the donation of surplus food.

These systems connect food donors (such as restaurants, supermarkets, and caterers) with local charities, food banks, and shelters that can distribute the food to those in need.

Benefits:

Online donation systems offer several advantages. They enable real-time communication between donors and recipients, reducing delays and inefficiencies in food rescue efforts. They also help ensure that surplus food is distributed safely, meeting food safety standards.

Examples of Online Donation Platforms: Various online platforms and apps have emerged to facilitate food donations. Examples include apps that connect restaurants with surplus food to nearby shelters and platforms that allow grocery stores to donate unsold products.

Legal Considerations: Legal protections, such as the Good Samaritan Food Donation Act in the United States, exist to encourage food donations by providing liability protection for donors. Online donation systems often help donors navigate legal requirements related to food safety and liability.

Impact on Food Insecurity: Online donation systems play a crucial role in reducing food insecurity by redirecting surplus food to those who need it most.

Sustainability: These systems align with sustainability goals by reducing food waste and its associated environmental impacts.

In summary, food waste management and online donation systems are essential components of efforts to address both food waste and food insecurity. They involve a combination of regulatory, technological, and social initiatives to minimize waste and ensure that surplus food reaches those in need.

1.2 Research Objectives

The research objectives of food waste management and online donation system can be summarized as follows:

- To identify the causes of food waste in different sectors, such as households, restaurants, and grocery stores.
- To develop and evaluate strategies for reducing food waste at each stage of the food supply chain.
- To create an online donation system that makes it easy for people to donate food to those in need.
- To evaluate the effectiveness of the online donation system in reducing food waste and hunger.
- To identify the challenges and opportunities for implementing food waste management and online donation systems.

Specifically, the research could focus on the following topics:

- The economic, environmental, and social impacts of food waste.
- The role of technology in reducing food waste.
- The barriers to and incentives for food donation.
- The best practices for managing food waste and donating food.
- The impact of food waste management and online donation systems on food security and sustainability.

The research could be conducted using a variety of methods, including surveys, interviews, focus groups, and case studies. The results of the research could be used to develop policies and programs to reduce food waste and hunger.

Here are some additional research questions that could be explored:

The research on food waste management and online donation systems is still in its early stages, but it is a growing field with the potential to make a significant impact on the environment and society.

1.3 Scope and Limitations

Scopes of Food Waste Management:

Waste Reduction and Recycling: Waste management encompasses strategies to reduce, reuse, and recycle waste materials. This includes promoting source separation of waste, composting organic materials, and encouraging the recycling of various materials like paper, plastics, glass, and metals.

Waste Collection and Transportation: Waste management involves setting up efficient collection and transportation systems to gather waste from homes, businesses, and public areas. This can include curbside collection, waste bins, transfer stations, and dedicated waste collection vehicles.

Waste Treatment and Disposal: Waste treatment processes like incineration, landfilling, and advanced technologies such as waste-to-energy are part of waste management. Proper disposal of hazardous waste requires specialized treatment facilities.

Public Awareness and Education: Educating the public about proper waste disposal, recycling, and the environmental impacts of waste is crucial. Waste management involves campaigns to raise awareness and encourage responsible waste practices.

Policy and Regulation: Governments and regulatory bodies play a significant role in waste management by creating policies, regulations, and standards for waste handling, disposal, and environmental protection.

Limitations of Food Waste Management:

Technological Challenges: Implementing advanced waste management technologies might be limited by infrastructure requirements, costs, and the availability of skilled personnel to operate and maintain these systems.

Behavioral Factors: Despite efforts, not everyone may follow proper waste disposal practices. Lack of awareness, motivation, or compliance can hinder the effectiveness of waste management efforts.

Financial Constraints: Establishing and maintaining waste management infrastructure can be expensive. Limited budgets could restrict the ability to invest in state-of-the-art waste treatment and recycling facilities.

Logistical Issues: Waste management requires a well-coordinated network of collection, transportation, and disposal facilities. Inadequate logistics can lead to inefficiencies and environmental problems.

Scopes of Online Donation System:

Supply Chain Optimization: Food waste management strategies can be implemented at various stages of the supply chain, from production and distribution to retail and consumer levels. This allows for a comprehensive approach to waste reduction.

Environmental Impact Reduction: Effective food waste management contributes to the reduction of greenhouse gas emissions, conserves water resources, and minimizes the use of land and energy in food production.

Economic Benefits: Businesses can save money through better inventory management and waste reduction. Additionally, food recovery and redistribution efforts can provide economic opportunities for food banks and charities.

Public Awareness and Education: Food waste management initiatives provide opportunities for public awareness campaigns and education programs to inform consumers about the consequences of food waste and ways to reduce it.

Limitations of Online Donation System:

Behavioral Challenges: Changing consumer behavior and industry practices to reduce food waste can be difficult and time-consuming. People's attitudes and habits regarding food consumption and disposal are deeply ingrained.

Resource Intensity: Implementing comprehensive food waste management strategies can require significant resources, including investments in technology, infrastructure, and personnel.

Regulatory Hurdles: Regulations related to food safety, liability, and donation can sometimes hinder food waste reduction efforts, creating legal barriers and complexities.

Cultural and Social Factors: Food waste can be influenced by cultural norms, such as portion sizes and societal expectations. These factors can be challenging to address through policy and awareness campaigns.

Logistical Challenges: Collecting and redistributing surplus food, especially perishable items, can be logistically challenging, requiring coordination and transportation resources.

CHAPTER 2

FOOD WASTE MANAGEMENT SYSTEM

2.1 Types of Food Waste and Their Impact

Food waste encompasses various types of discarded or wasted food items, each with its own impact on the environment, economy, and society. Here are some common types of food waste and their impacts:

Plate Waste:

Impact: Plate waste refers to food left uneaten on consumers' plates in homes, restaurants, or cafeterias. It is a significant contributor to food waste.

Environmental Impact: Plate waste contributes to greenhouse gas emissions when food decomposes in landfills. It also represents a waste of the resources used in food production.

Economic Impact: Money spent on uneaten food represents a financial loss for consumers and businesses.

Excess Food in Retail and Distribution:

Impact: Excess food in retail stores, supermarkets, and the distribution industry often goes unsold and uneaten.

Environmental Impact: Food waste at this level can lead to resource inefficiency, as resources like water, energy, and land are used to produce food that is ultimately discarded.

Economic Impact: Retail food waste leads to losses for businesses and can affect food prices and profitability.

Food Spoilage:

Impact: Food spoilage occurs when food items expire or go bad before they can be consumed.

Environmental Impact: Spoiled food contributes to methane emissions when it decomposes in landfills. It also represents a waste of the resources used in production.

Economic Impact: Food spoilage results in financial losses for consumers, businesses, and the agricultural sector.

Agricultural Surplus:

Impact: Agricultural surplus occurs when farmers produce more food than can be sold or used.

Environmental Impact: Surplus food can lead to the overuse of natural resources like water and land. Additionally, if not properly managed, it can contribute to soil degradation.

Economic Impact: Farmers may incur losses when they cannot sell their surplus produce, affecting their income and livelihoods.

Manufacturing and Processing Waste:
Impact: Food manufacturing and processing generate waste in the form of byproducts, trimmings, and rejected items.
Environmental Impact: These waste products may end up in landfills or require additional energy and resources for disposal. They can also contribute to pollution.

Economic Impact: Food processing waste can increase production costs for manufacturers.

Supply Chain Losses:
Impact: Losses during transportation, storage, and distribution are common in the food supply chain.

Environmental Impact: These losses can result in unnecessary resource consumption and emissions associated with food transportation.

Economic Impact: Supply chain losses can affect the availability and pricing of food products.

Unsold Restaurant and Catering Food:
Impact: Restaurants, caterers, and food service providers often have unsold prepared dishes.

Environmental Impact: Discarding unsold food generates waste and can contribute to greenhouse gas emissions.

Economic Impact: Restaurants and caterers lose money on unsold food, and this also impacts their profitability.

Cosmetic Imperfections:
Impact: Food items with minor cosmetic imperfections, such as blemishes or irregular shapes, may be discarded.

Environmental Impact: This type of waste represents a squandering of resources used in production.

Economic Impact: Farmers and retailers may lose income when consumers reject imperfect but edible produce.

Efforts to reduce food waste typically involve addressing these different types of food waste at various stages of the supply chain and within households. Such efforts aim to minimize the environmental, economic, and social impacts associated with food waste.

2.2 Causes of Food Waste

Food waste occurs at various stages of the food supply chain and is driven by a combination of factors. Understanding these causes is essential for developing effective strategies to reduce food waste. Here are some of the primary causes of food waste:

Overproduction and Over-Purchasing: Businesses, such as farms, manufacturers, and retailers, often produce or purchase more food than can be sold or used, leading to surplus that may go to waste.

Consumer Behavior: Consumer practices, such as buying more food than needed, discarding food based on appearance rather than safety, and not consuming leftovers, contribute significantly to food waste.

Food Spoilage and Decay: Natural factors, like the perishable nature of some foods, spoilage due to inadequate storage conditions (e.g., temperature and humidity control), and microbial growth, can cause food to become inedible.

Inadequate Storage and Handling: Improper storage, handling, and transportation practices can result in food spoilage and waste. For example, storing fruits and vegetables in the wrong conditions or failing to maintain cold chains during transportation can lead to spoilage.

Date Labeling Confusion: Consumers often misinterpret date labels, such as "use by," "sell by," or "best before," leading to the premature disposal of food that is still safe to eat.

Supply Chain Inefficiencies: Inefficiencies in the food supply chain, including delays in transportation, logistical challenges, and packaging issues, can lead to food waste.

Cosmetic Standards: Retailers and consumers often demand visually appealing produce and products, leading to the rejection of perfectly edible items that do not meet strict cosmetic standards.

Portion Sizes: Large portion sizes at restaurants and eateries can result in leftover food that is often discarded.

Lack of Market Access: In some cases, farmers and producers may not have access to markets to sell their entire harvest, leading to unharvested or unsold crops.

Cultural and Social Norms: Cultural practices and social norms may influence food consumption patterns and attitudes towards food waste.

Food Marketing and Advertising: Marketing strategies, such as buy-one-get-one-free promotions or bulk purchases, can encourage consumers to buy more food than needed.

Lack of Infrastructure: Inadequate cold storage facilities, transportation infrastructure, and food recovery systems can limit the ability to handle surplus food effectively.

Economic Factors: Economic factors, such as food pricing and income disparities, can influence consumer purchasing decisions and food waste patterns.

Lack of Education and Awareness: Insufficient knowledge about the consequences of food waste and how to prevent it can lead to wasteful practices.

Regulatory and Policy Issues: Regulations related to food safety, liability, and donation can sometimes hinder food waste reduction efforts.

Addressing these causes of food waste requires a holistic approach involving consumers, businesses, policymakers, and organizations throughout the food supply chain. Strategies may include improved education and awareness, changes in consumer behavior, better inventory management, innovations in packaging, and policy reforms to reduce food waste at all stages of production and consumption.

2.3 Challenges and Gaps in Current Systems

While modern waste management systems have made significant strides in addressing environmental and health concerns, there are still several challenges and gaps that need to be addressed:

Lack of Infrastructure: Many regions, especially in developing countries, lack the necessary infrastructure for proper waste collection, segregation, and disposal. This can lead to open dumping, uncontrolled burning, and pollution.

Inadequate Recycling Facilities: While recycling is a key component of waste management, the availability of recycling facilities and technology varies widely. Many areas lack the infrastructure to effectively process and recycle different types of materials.

Contamination of Recyclables: Recycling efforts can be undermined by the contamination of recyclable materials with non-recyclables. Proper education and separation at source are necessary to prevent this issue.

E-waste Management: Electronic waste (e-waste) contains hazardous materials that can be harmful to both human health and the environment. Proper e-waste recycling and disposal methods are often lacking.

Plastic Waste: Managing plastic waste remains a major challenge due to its persistence in the environment, difficulty in recycling certain types of plastics, and the prevalence of single-use plastics.

Waste Export and Dumping: Some developed countries export their waste to developing countries, leading to environmental and health hazards in those regions. This practice undermines global waste management efforts.

Behavioral Change: Encouraging individuals and businesses to adopt sustainable waste management practices requires consistent education, awareness campaigns, and incentives.

Financial Constraints: Implementing and maintaining effective waste management systems can be expensive. Many communities and governments struggle to allocate sufficient funds for waste management infrastructure and services.

Regulatory Enforcement: Even with regulations in place, enforcement can be a challenge. Monitoring compliance and imposing penalties for improper waste disposal can be difficult.

Waste Data and Monitoring: Accurate and up-to-date data on waste generation, composition, and disposal are crucial for effective waste management planning. However, data collection and monitoring systems are not uniformly established.

Waste from Informal Sector: In many places, the informal waste sector plays a significant role in waste collection and recycling. Integrating these informal workers into formal waste management systems can be complex.

Public Awareness and Participation: Despite efforts to raise awareness, some individuals and communities may still lack understanding of the importance of proper waste management and their role in it.

Emerging Waste Streams: As society changes, new types of waste emerge, such as electronic waste, medical waste, and more. Traditional waste management systems may struggle to adapt to these evolving waste streams.

Addressing these challenges requires a holistic approach involving government policies, public education, technological innovation, international cooperation, and sustainable practices at all levels of society.

2.4 Technological Innovations in Food Waste Management

Technological innovations have played a significant role in advancing food waste management and online donation systems. These innovations aim to improve efficiency, reduce waste, and facilitate the redistribution of surplus food to those in need. Here are some notable technological advancements in both areas:

Technological Innovations in Food Waste Management:

Smart Sensors and IoT Devices: These devices can monitor food storage conditions in real-time, providing data on temperature, humidity, and spoilage risk, allowing businesses to optimize their inventory management and reduce food waste.

Blockchain Technology: Blockchain can increase transparency and traceability in the supply chain, helping to identify and eliminate inefficiencies and reduce food waste by ensuring better tracking of food products from farm to table.

Smart Packaging: Innovations in packaging materials and designs can extend the shelf life of products, reducing spoilage. For example, packaging with oxygen scavengers or humidity control can help keep food fresh for longer.

Mobile Apps: Apps like Too Good to Go and Food Rescue Hero connect consumers with surplus food from restaurants and grocery stores at discounted prices, reducing food waste while saving consumers money.

Online Platforms: Websites and mobile apps help connect food donors with recipient organizations, streamlining the donation process. Some platforms use algorithms to match donors with nearby charities in real-time.

Anaerobic Digestion Technologies: These technologies convert organic food waste into biogas, which can be used for energy production or converted into renewable natural gas.

AI and Machine Learning: Predictive analytics and machine learning models can help businesses forecast demand more accurately, reducing overproduction and food waste.

Technological Innovations in Online Donation Systems:

AI and Machine Learning: Advanced algorithms can match surplus food with recipient organizations in real-time based on location, quantity, and types of food available.

Mobile Donation Apps: Apps like OLIO and ShareTheMeal allow individuals and businesses to easily post and claim surplus food donations, making the process more accessible and user-friendly.

Blockchain for Traceability: Blockchain technology can enhance transparency in food donation systems, ensuring that donated food meets safety standards and is properly distributed.

GPS and Routing Optimization: Smart routing and GPS systems help food rescue organizations plan efficient routes for food collection and distribution.

Data Collection and Analysis: Advanced data analytics tools can help organizations collect and analyze data on food donations, allowing them to measure their impact and optimize their operations.

Food Safety Apps: Mobile apps can provide guidelines and checklists to ensure that donated food adheres to safety regulations.

Online Communities: Social media and online communities can help raise awareness and engage volunteers in food rescue efforts.

These technological innovations are helping to streamline food waste management and online donation systems, making it easier for businesses and individuals to participate in food recovery efforts and reduce food waste, ultimately contributing to a more sustainable and equitable food system.

CHAPTER 3

ONLINE DONATION SYSTEM

3.1 Evolution of Philanthropy in the Digital Age

The evolution of philanthropy in the digital age, particularly through online donation systems, has brought about significant changes in how charitable giving is conducted and managed. The integration of technology has revolutionized the way people connect with causes they care about and contribute to the betterment of society. Here's an overview of how philanthropy has evolved in the digital age:

Accessibility and Convenience: Online donation platforms have made giving more accessible and convenient than ever before. Donors can contribute from the comfort of their homes using computers or mobile devices, eliminating geographical barriers and streamlining the donation process.

Global Reach: Digital platforms have enabled philanthropists to support causes and organizations across the world, transcending borders and reaching communities that might have previously been difficult to engage with.

Transparency and Accountability: Online systems allow donors to track how their contributions are being utilized. Charities and nonprofits often provide real-time updates on projects, expenditures, and outcomes, enhancing transparency and ensuring accountability.

Micro-donations and Crowdfunding: Digital platforms have facilitated the rise of micro-donations, where individuals can give small amounts of money to support specific projects. Additionally, crowdfunding has enabled grassroots initiatives and individual campaigns to raise funds for causes that might not have access to traditional funding sources.

Engagement and Storytelling: Online platforms provide a space for nonprofits to share compelling stories, images, and videos that resonate with potential donors. This emotional connection can lead to increased engagement and donations.

Data-Driven Insights: Digital philanthropy generates a wealth of data that can be analyzed to better understand donor behavior, preferences, and trends. This information helps organizations tailor their fundraising strategies and improve their impact.

Social Media Amplification: Social media platforms play a crucial role in spreading awareness about charitable causes. Campaigns and fundraising drives can quickly gain momentum through likes, shares, and retweets, reaching a wider audience.

Matching and Employee Giving Programs: Many companies have embraced online donation platforms to support matching gift programs, where they match their employees' donations to eligible nonprofits. This encourages employees to contribute and leverages corporate resources for good.

Disaster Response and Rapid Fundraising: In times of crises, online platforms enable rapid response fundraising efforts. Charities can quickly launch campaigns to gather funds for disaster relief, helping affected communities more efficiently.

Reduced Administrative Overhead: Online platforms streamline administrative processes associated with fundraising, reducing the overhead costs for nonprofits and allowing more of the donated funds to directly benefit the cause.

Diversification of Funding Sources: Nonprofits can diversify their funding sources by tapping into online donor communities, reducing their reliance on a small number of major donors.

Innovative Fundraising Models: The digital age has given rise to innovative fundraising models such as peer-to-peer fundraising, subscription-based giving, and cryptocurrency donations, expanding the ways people can contribute.

However, despite the numerous benefits, there are also challenges associated with digital philanthropy, including concerns about data security, fraud, and the potential for "slacktivism" (superficial online support without real-world action). Striking a balance between technological advancement and maintaining the human connection that drives philanthropy remains an ongoing consideration.

In conclusion, the digital age has transformed philanthropy by making it more accessible, efficient, and global. Online donation systems have empowered individuals to contribute to a wide range of causes, while also prompting nonprofits to adapt their strategies to harness the potential of technology for social good.

3.2 Benefits and Limitations of Online Donation Platforms

Online donation platforms offer a range of benefits and advantages, but they also come with certain limitations. Here's a breakdown of both:

Benefits of Online Donation Platforms:

Accessibility and Convenience: Online donation platforms allow donors to contribute from anywhere, anytime. This accessibility increases the likelihood of donations, as donors don't need to visit physical locations or engage in complex processes.

Global Reach: These platforms transcend geographical boundaries, enabling donors to support causes and organizations anywhere in the world. This global reach is particularly advantageous for international nonprofits and disaster relief efforts.

Cost Efficiency: Online platforms can significantly reduce administrative costs associated with traditional fundraising methods. They eliminate the need for physical mailings, printed materials, and manual data entry.

Real-Time Tracking and Reporting: Donors appreciate the transparency provided by online platforms. They can monitor how their donations are being used and receive real-time updates on project progress and outcomes.

Diversification of Funding: Online platforms can attract a diverse group of donors, including younger generations who are more accustomed to digital transactions. This diversification can reduce an organization's dependence on a few major donors.

Ease of Engagement: Platforms often allow for easy engagement through social sharing, allowing donors to amplify their impact by encouraging friends and family to donate as well.

Quick Response in Emergencies: Online platforms facilitate rapid fundraising during disasters and emergencies. Charities can launch campaigns quickly to provide immediate relief to affected areas.

Data-Driven Insights: The digital nature of these platforms generates valuable data that organizations can analyze to understand donor behavior and preferences, leading to more effective fundraising strategies.

Reduced Environmental Impact: By minimizing the need for printed materials and physical processes, online platforms contribute to a reduction in environmental waste.

Limitations of Online Donation Platforms:

Digital Divide: Not everyone has equal access to technology or the internet, creating a digital divide that can exclude certain demographics from participating in online giving.

Security Concerns: Online transactions raise concerns about data security and potential breaches. Donors may be hesitant to share their personal and financial information online.

Transaction Fees: Many online donation platforms charge transaction fees, which can affect the percentage of the donation that reaches the intended cause.

Lack of Personal Connection: Online interactions can lack the personal touch of face-to-face engagement, potentially making it harder to establish strong emotional connections with donors.

Potential for "Slacktivism": Online platforms might encourage passive engagement, where individuals show support online without taking further meaningful action or engaging in offline volunteering.

Overreliance on Technology: Organizations that exclusively rely on online platforms might miss out on more traditional fundraising methods that still hold value for certain donor segments.

Limited Offline Outreach: Online platforms may not effectively reach older generations or those who are not as comfortable with technology.

Potential for Misuse: Online platforms could be exploited for fraudulent or unethical purposes, and donors might be hesitant to contribute to unknown or unverified causes.

Loss of Emotional Experience: While convenience is a key benefit, the emotional experience of physically attending events or interacting with representatives of the cause might be lost in purely digital interactions.

In conclusion, online donation platforms have revolutionized philanthropy by offering convenience, transparency, and global reach. However, they also come with challenges related to inclusivity, security, and the preservation of personal connections. Successful nonprofits often find ways to balance these benefits and limitations to create effective and engaging fundraising strategies.

3.3 Case Studies of Successful Environmental Donation Campaigns

Certainly, here are a few case studies of successful environmental donation campaigns that have effectively leveraged online platforms and engagement strategies to drive donations and raise awareness:

The IoT-based smart garbage and waste collection bin used IR for level detection, weight sensor, and Wi-Fi. Whenever IR detects the overweight, it alarmed the system and user to free up the smart bin [1].

A very efficient and smart restaurant waste management system monitored the generation (using RFID and weight sensor bin at each restaurant), collection (through smart wastage collection truck enabled with RFID, weight, video surveillance cameras, and GPS/GIS monitoring), transportation (using truck with real-time video monitoring), and disposal (by measuring the weight of wastage using RFID) of food waste at restaurants. This system worked well, efficiently, and with low error rate [2].

Jagtap and Rahimifard reduces the wastage of meat 60.7% at the Chicken Tikka Masala restaurant within eight months. A bin carried the wastage where a load cell weighs the wasted meat and those figures are sent to the mobile app using a Bluetooth sensor. The data is then sent to the cloud server for analysis and storage purposes [3].

The IoT encompasses all fields of life and turns the world into a smart world. It works in hospitals, supermarkets, security areas, banks, business, offices, laboratories, restaurants, educational institutions, and home making the world smart and intellectual. As household and restaurant automation is discussed, the main unit of both areas is the kitchen where food is produced, cooked, and served to people to feed them and make them healthy. But the main problem is the wastage of food. Food wastage becomes a threatening problem nowadays. Around 1.3 billion tons of food is wasted each year that is enough to feed 3 billion hungry people each year at a cost of $990 billion [4]. Just in Pakistan, around 36 million tons of food is wasted each year [5].

These case studies showcase how effective storytelling, engaging visuals, social media amplification, and clear impact reporting can drive successful environmental donation campaigns in the digital age. By tapping into people's passion for the environment and offering them a meaningful way to contribute, these campaigns have not only raised funds but also increased awareness and inspired positive action.

CHAPTER 4

ANALYSIS OF REQUIREMENTS, DESIGN AND IMPLEMENTATION

Analysis Requirements

Requirements Analysis is the analysis of defining the expectations of the users or client for an application that is to be built or modified. Requirement's analysis involves all the acts that are conducted to identify the needs of the different stages of processing. Therefore, requirements analysis is analyzed, documented, validate, system requirements and server requirements.

High-quality requirements are documented, actionable, measurable, testable, traceable, helps to identify business opportunities, and are defined to facilitate system design. For this reason, the system is easy to understand and also easy to modify or correct for future

- System requirements
- User requirements

4.1 System Requirement

There are two types of requirements in this system requirements phase. Following are the two types of system requirements:

- Hardware requirements
- Software requirements

4.2 Hardware Requirements

- CPU: for web 1,6 GHz, for web and database 4 x 1,6 GHz CPU.
- RAM: 4GB.
- Minimum database space: 10GB.
- CPU: Quad 2GHz+ CPU.

4.3 Software Requirements

- Bootstrap
- Javascript
- PHP
- MySQL
- Xampp

4.4 User Requirements

- PC/Laptop/Mobile Device
- Must Have reachable to browser

Design and Implementation

Design and implementation parts have the same basic functions. The function is regarded as follows:

4.5 Class Diagram

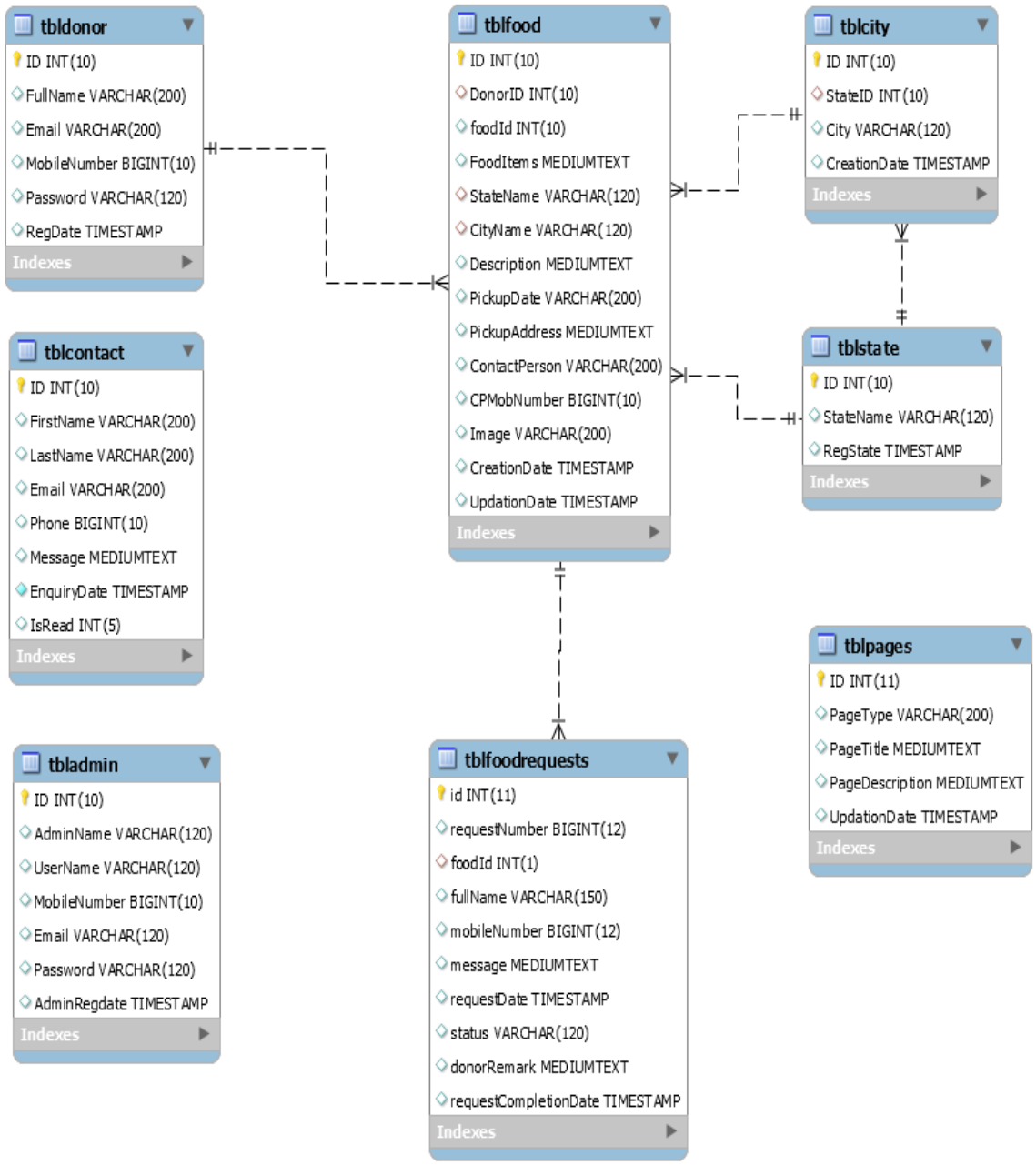


Figure 4.5: Class Diagram

4.6 Use Case Diagram

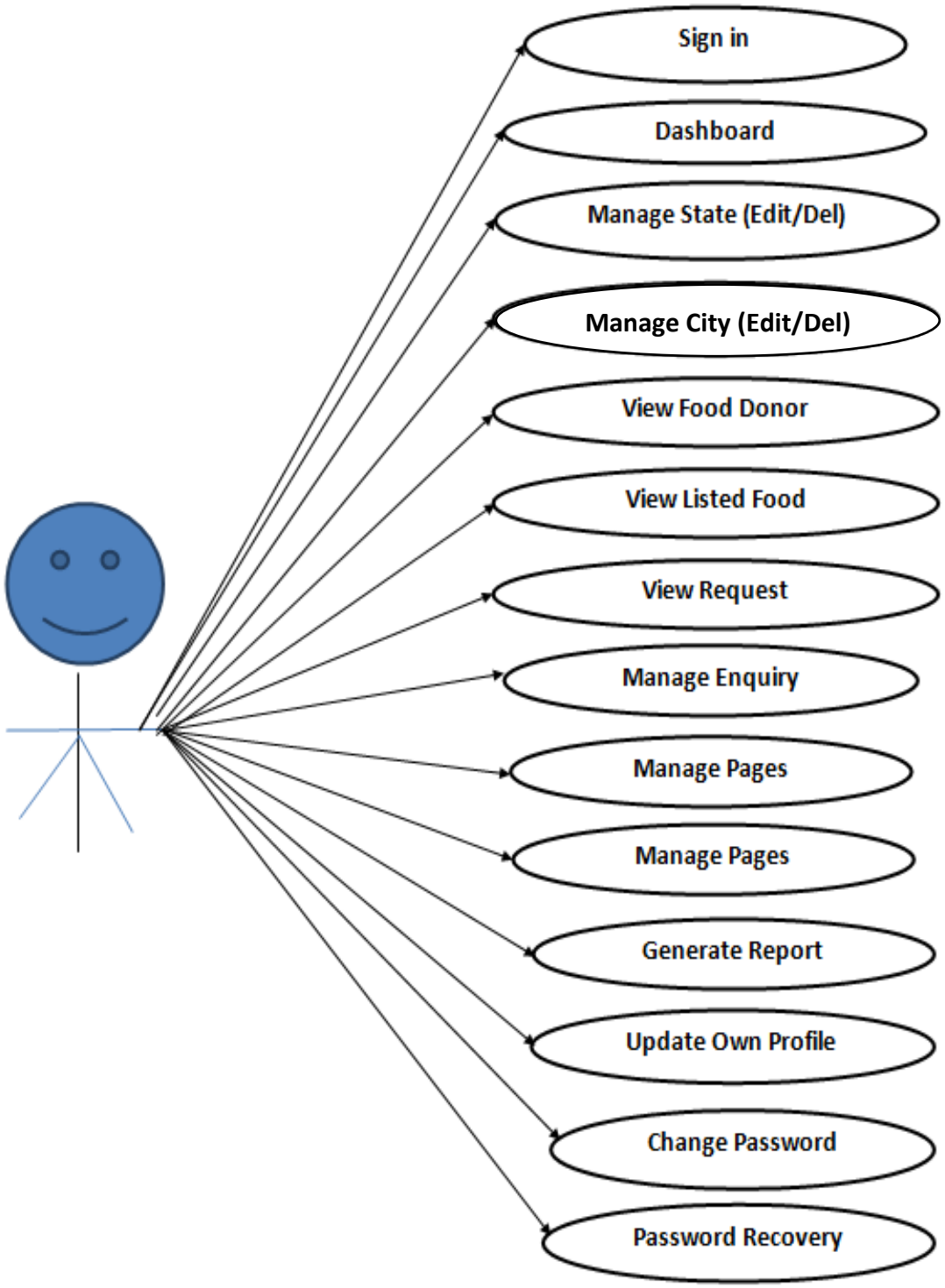


Figure 4.6: Use Case Diagram of Admin

4.7 Use Case Diagram of User

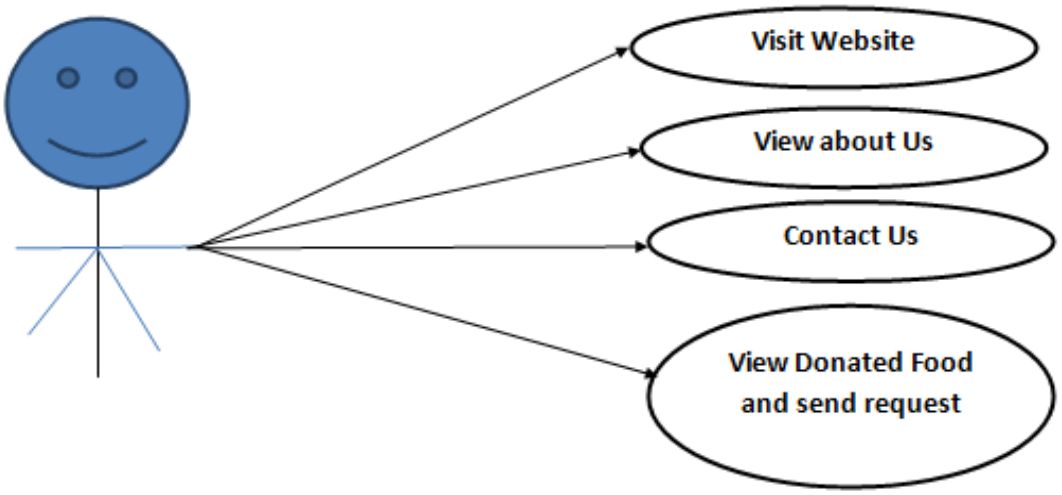


Figure 4.7: Use Case Diagram of User

4.8 Use Case Diagram of Donor

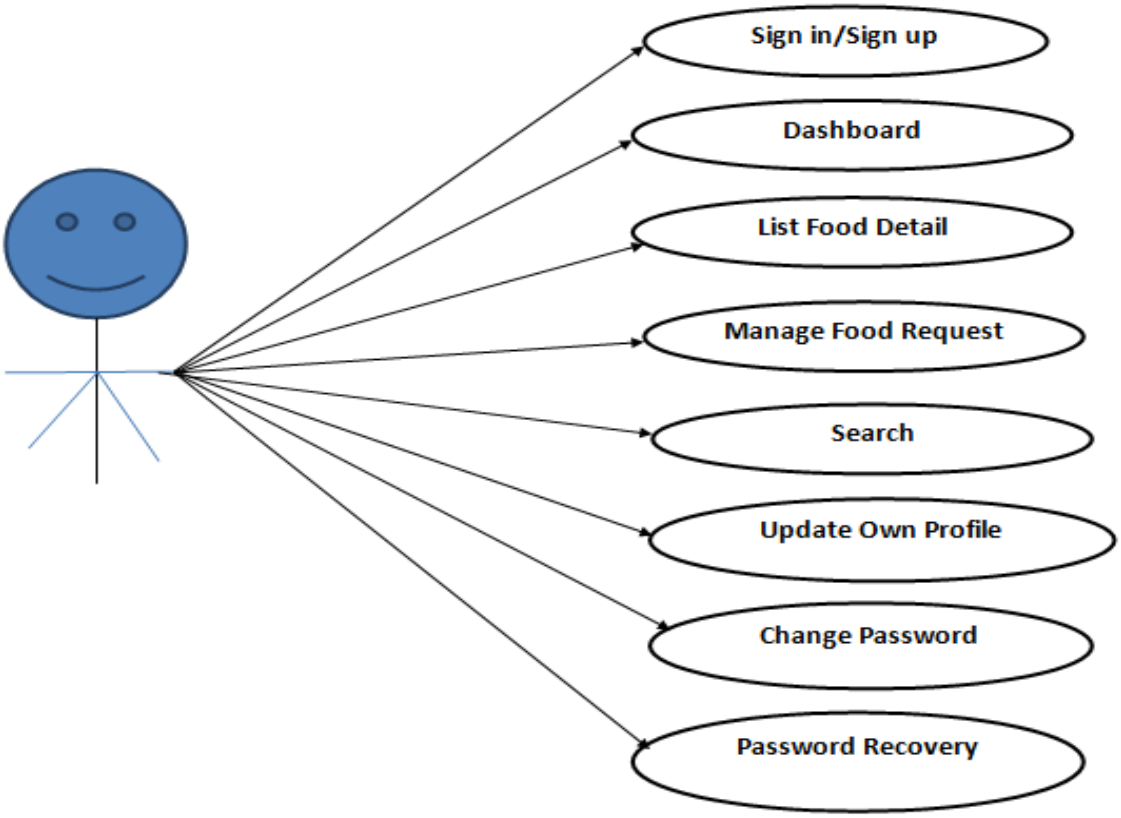


Figure 4.8: Use Case Diagram of Donor

4.9 ER Diagram

Here is an ER diagram about Food Waste Management and Online Donation System.

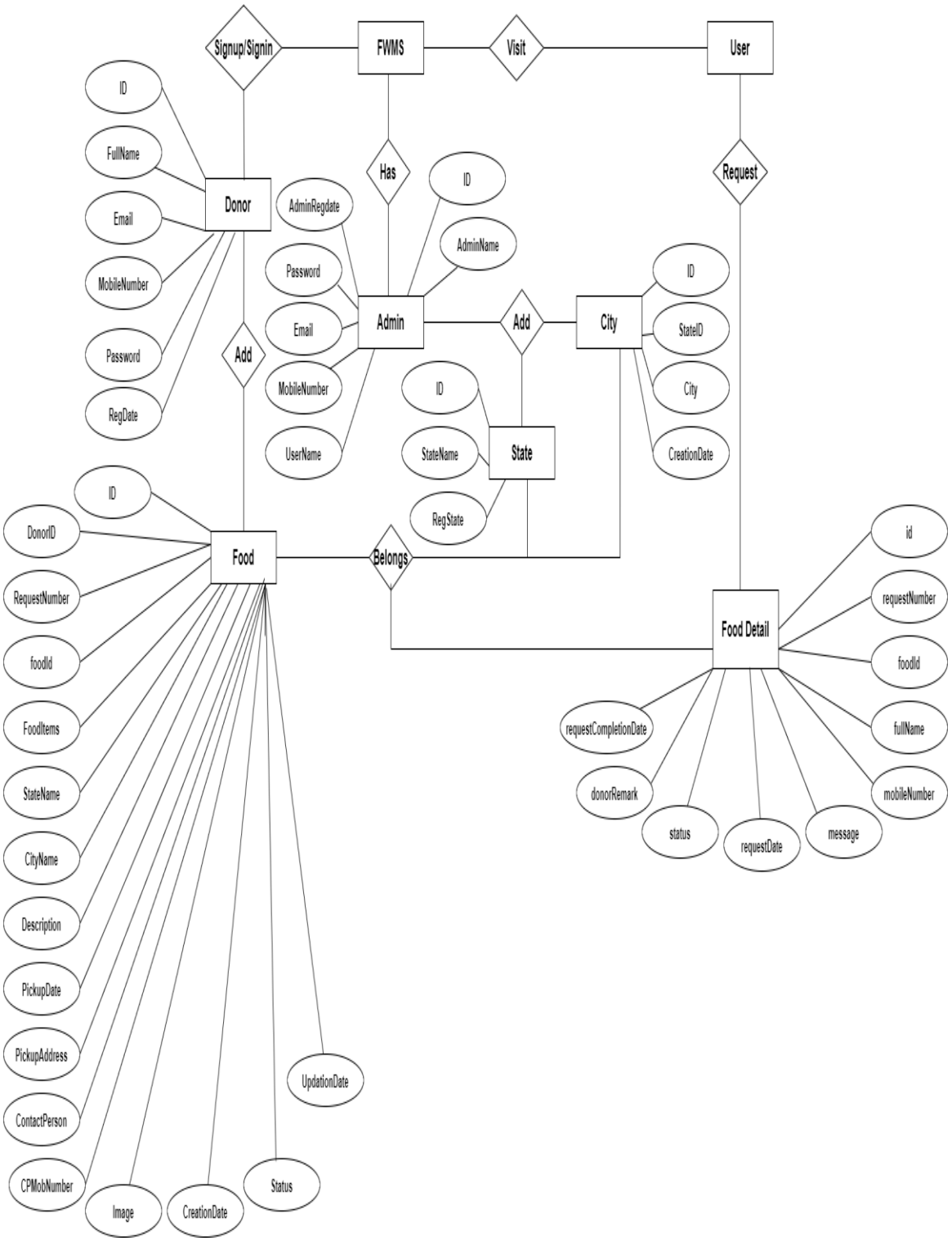


Figure 4.9: ER Diagram

CHAPTER 5

PROJECT DESCRIPTION

Here is our Project Screenshot Start. Here we will be able to see Project Screen, Admin Registration Page, Admin Dashboard and the actions, Donor Resgistration page, Donor Dashboard and actionts, etc.

5.1 Project Screen

This is our Project Screen.

Figure 5.1: Homepage Overview

5.2 Admin Log In

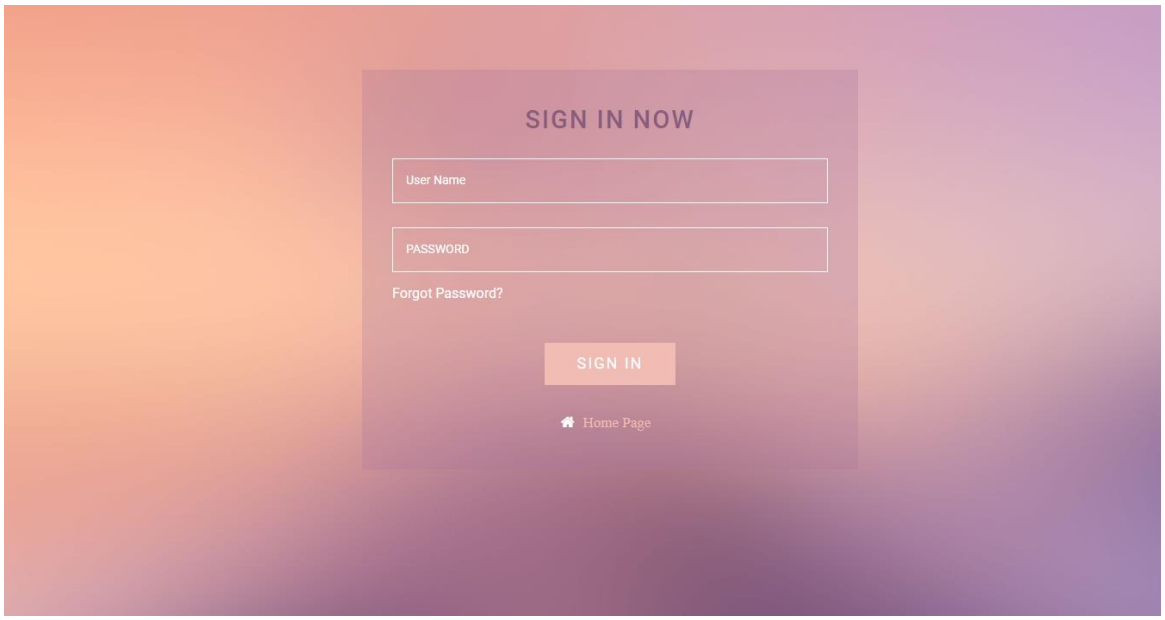


Figure 5.2: Admin Log In

5.3 Admin Dashboard

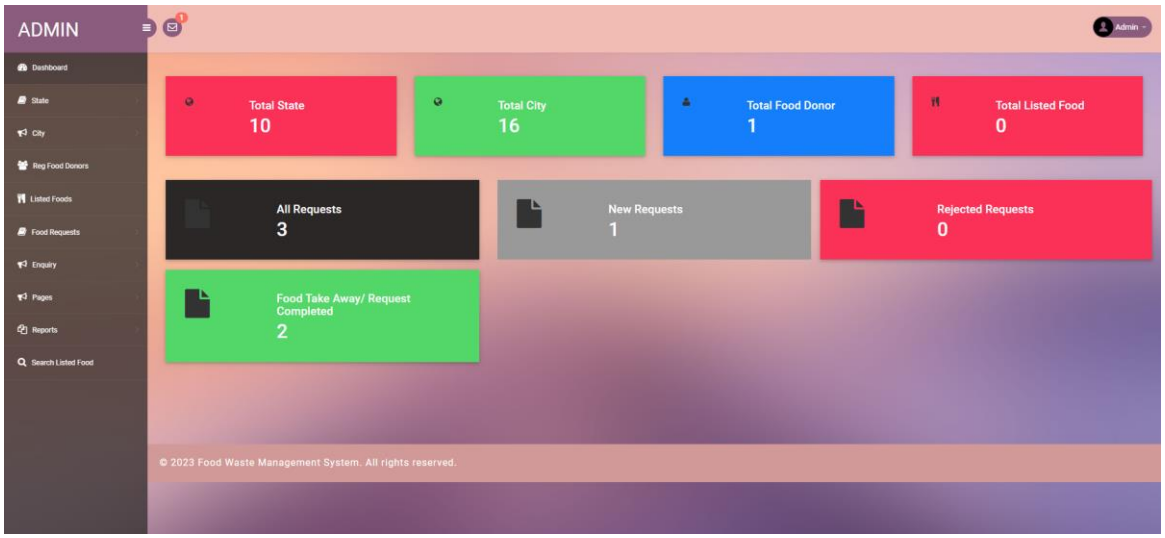


Figure 5.3: Admin Dashboard

5.4 Admin Profile

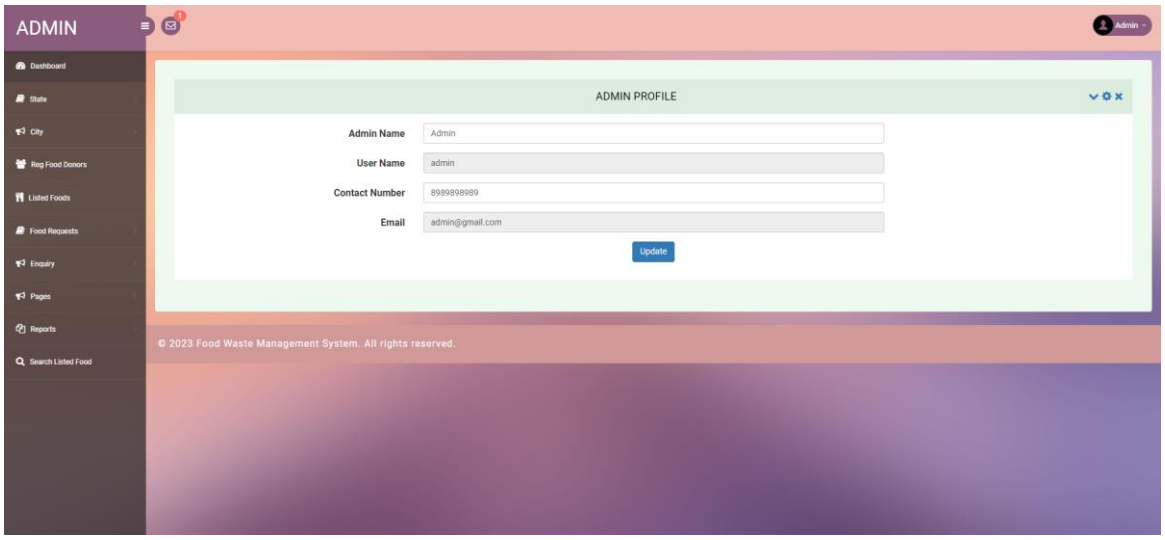


Figure 5.4: Admin Profile

5.5 Donor Details from Admin

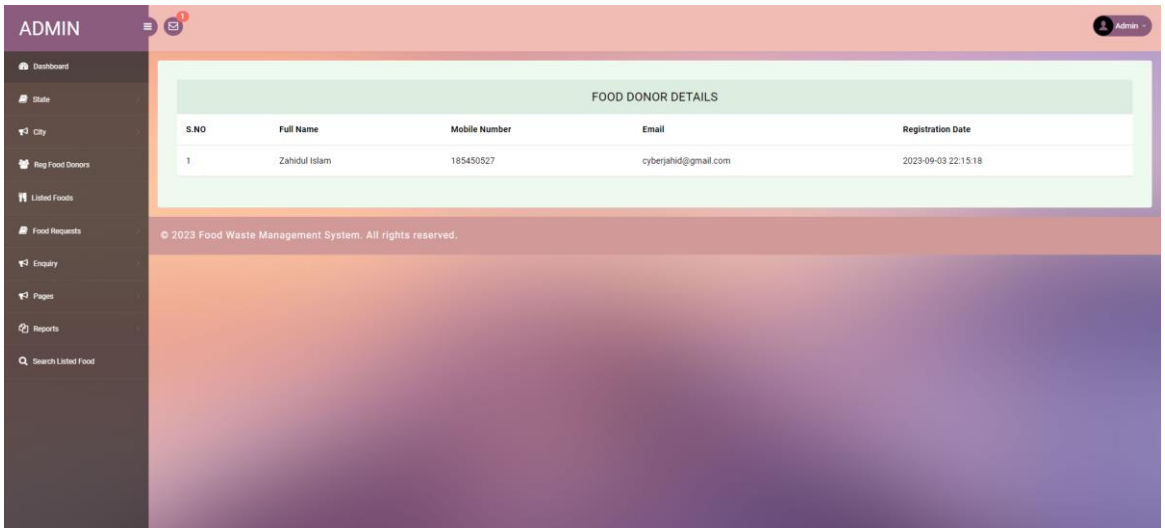


Figure 5.5: Donor Details from Admin

5.6 Available Food List from Admin point of view

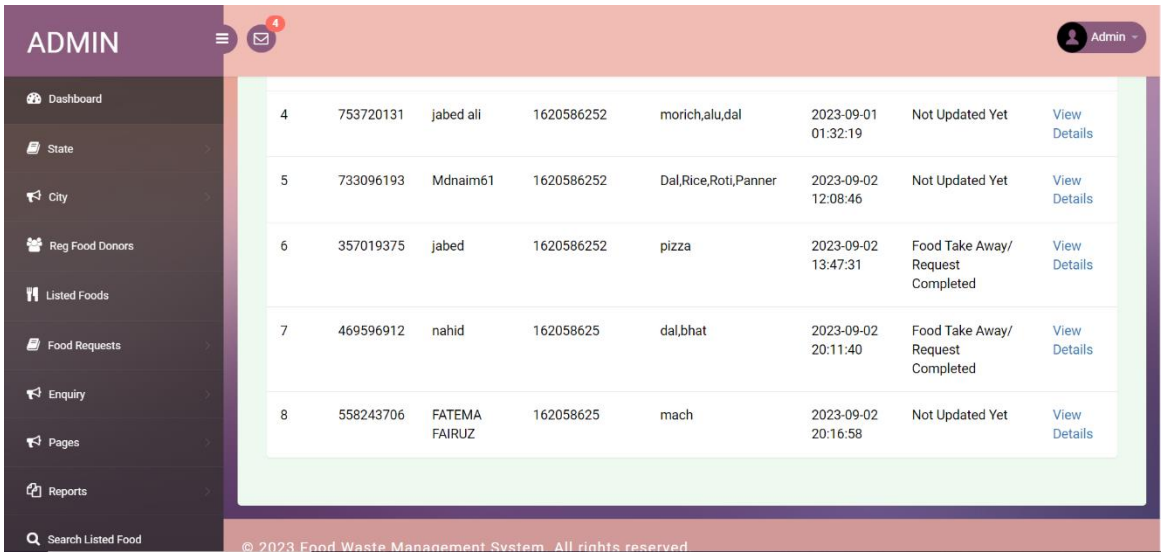


Figure 5.6: Available Food List from Admin point of view

5.7 Admin Search

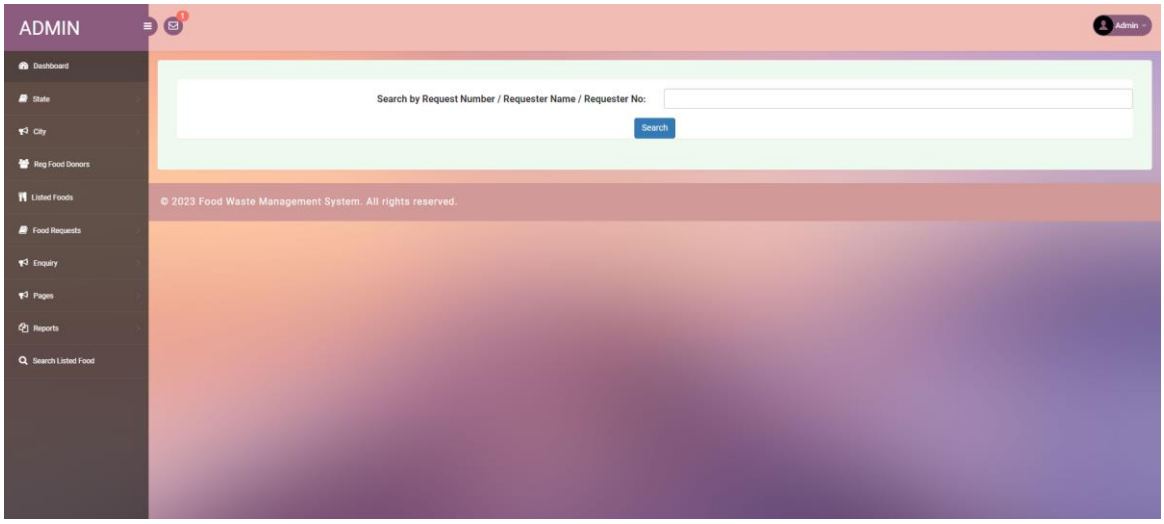


Figure 5.7: Admin Search

5.8 Avaailable Food List

Here we can see all available foods.

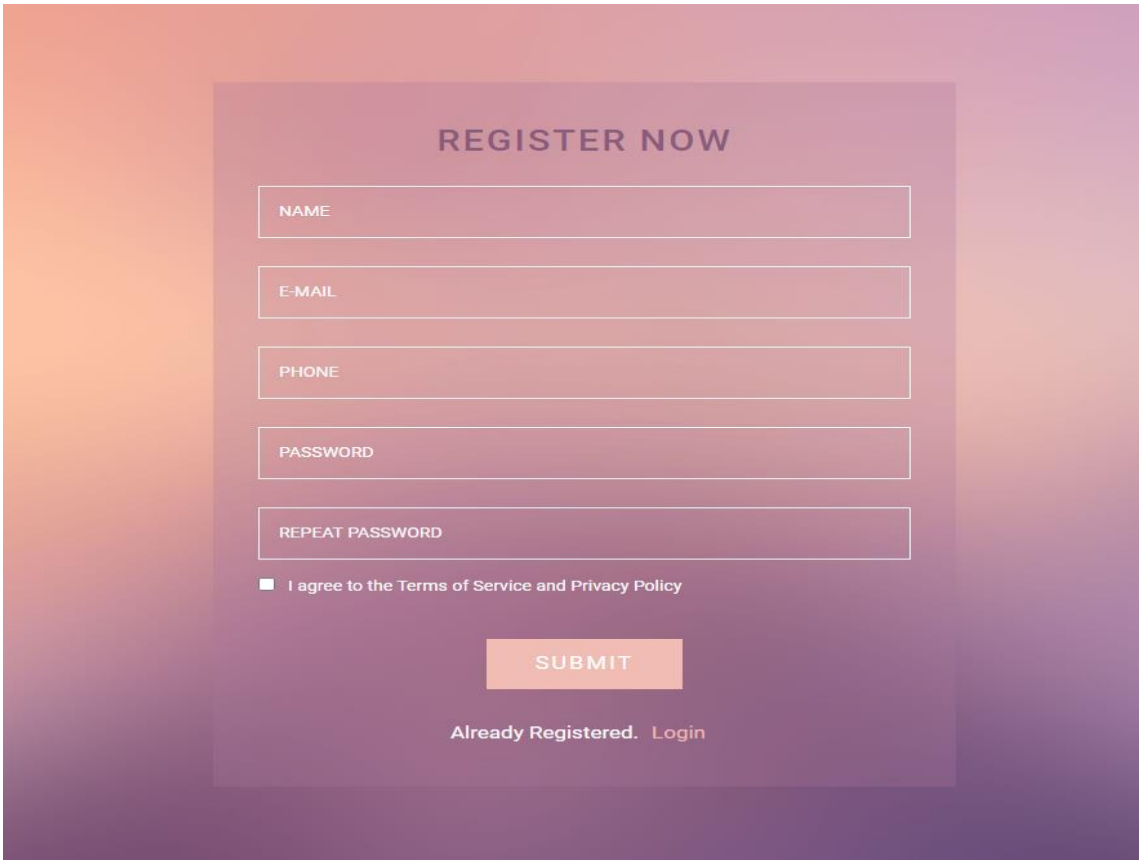
Available Food List

S.NO	Contact Person	Contact Person Mobile Number	Food Items	Address	State Name	City Name	Creation Date	Action
1	Rakib	1478523699	Dal,Rice,Roti,Panner	H 23423 Sector 10	Dhaka	Gulshan	2022-01-22 15:24:51	View Details
2	Fahad	9874563210	Dal Maknhi,Bread,Rice	J 466 ABC Street	Dhaka	Banani	2022-01-22 16:20:35	View Details
3	Amit	9852364710	Dal,Rice,Mix Veg,Panner	A 347583 XYZ Street	Dhaka	Mirpur	2022-01-23 12:26:22	View Details
4	md naim	1620586252	dal,mach,vhat	jigatola	Dhaka	Old Dhaka	2023-08-30 23:40:45	View Details
5	nahid	1620586252	morich,alu,dal	cumilla	Dhaka	MOhammadpur	2023-09-01 01:30:36	View Details
6	porna	1620586252	pizza	Zigatola Post Office, Dhaka	Dhaka	Dhanmondi	2023-09-02 13:46:55	View Details

Figure 5.8: Available Food List

5.9 Registration page

Here we can see Donor register form of this platform.



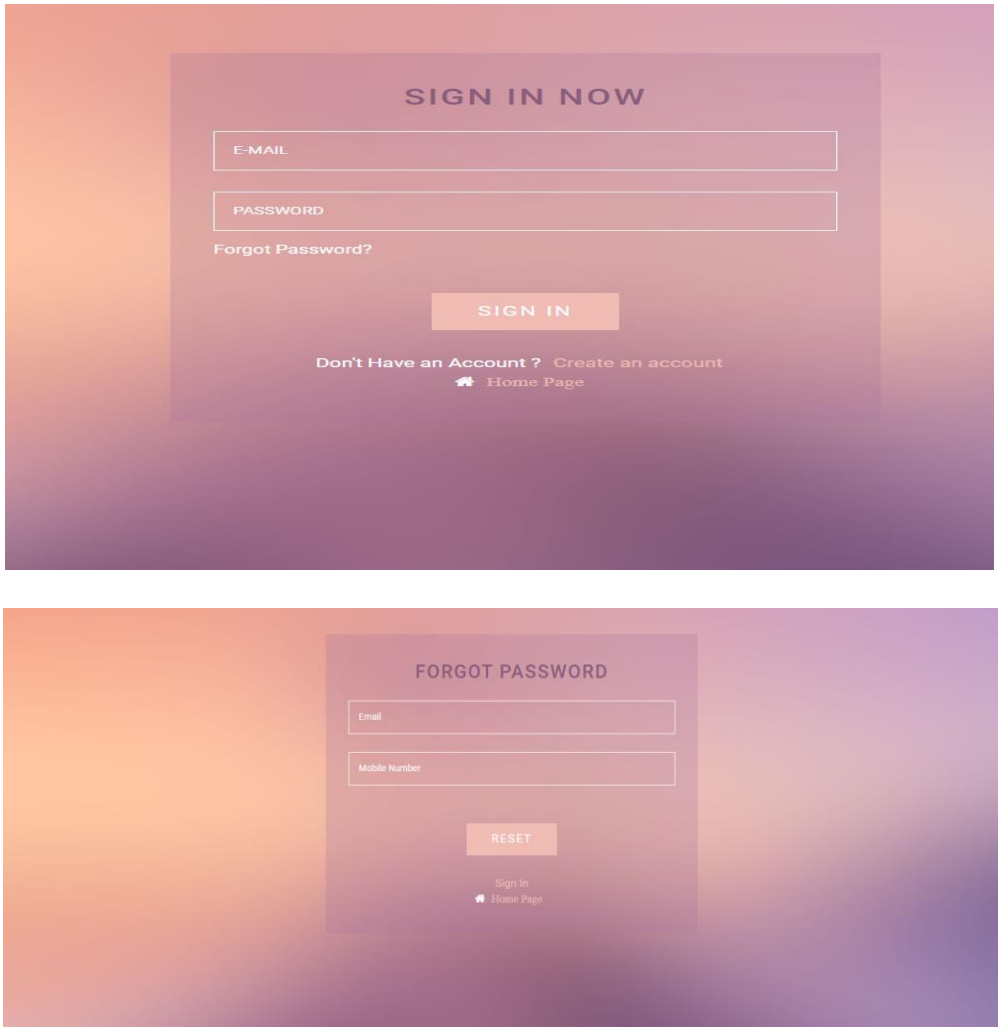


Figure 5.9: Registration page

5.10 Donor Dashboard

Here we can see the donor dashboard of this platform.

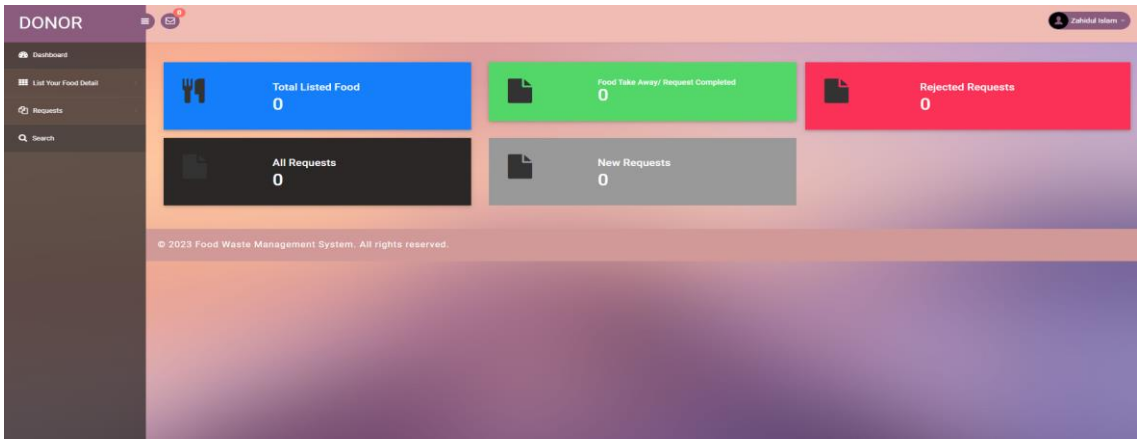


Figure 5.10: Donor Dashboard

5.11 Add Food

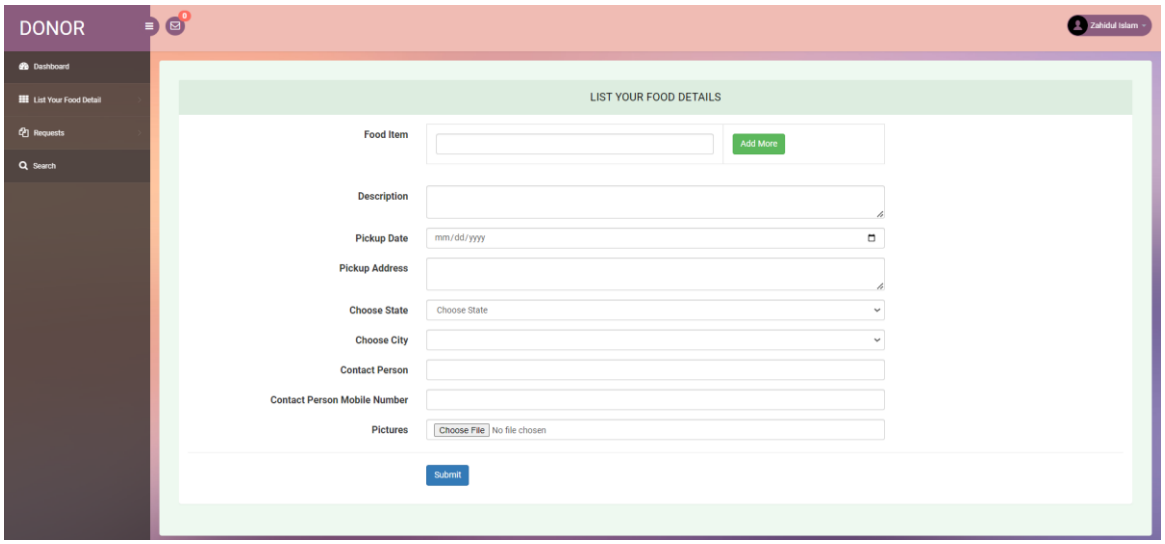


Figure 5.11: Add Food

5.12 Donated Food Details

Figure 5.12: Donated Food Details

5.13 New Food Request

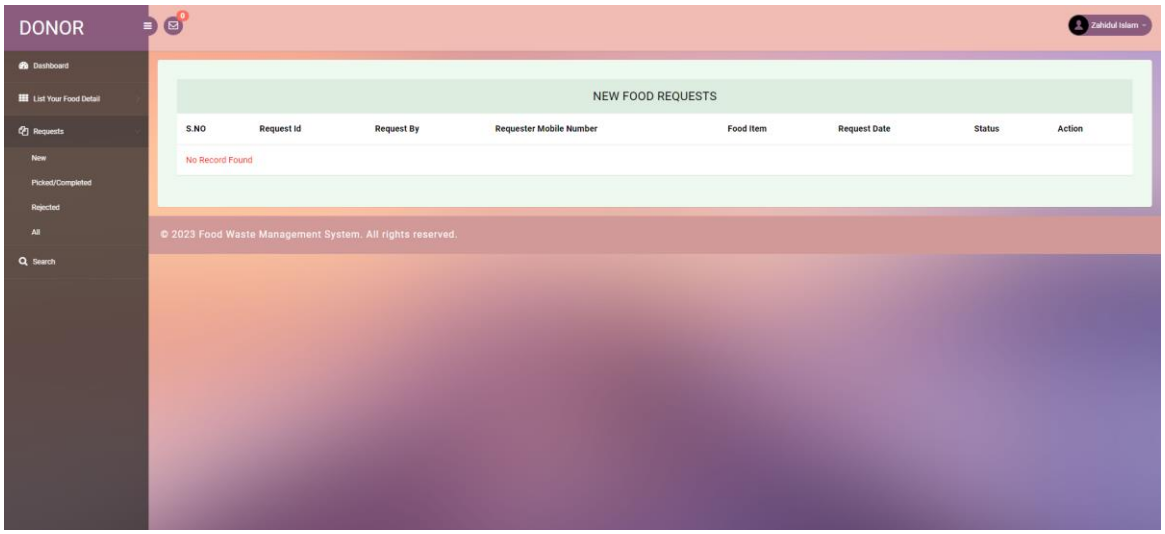


Figure 5.13: New Food Request

5.14 Picked/Completed Requests

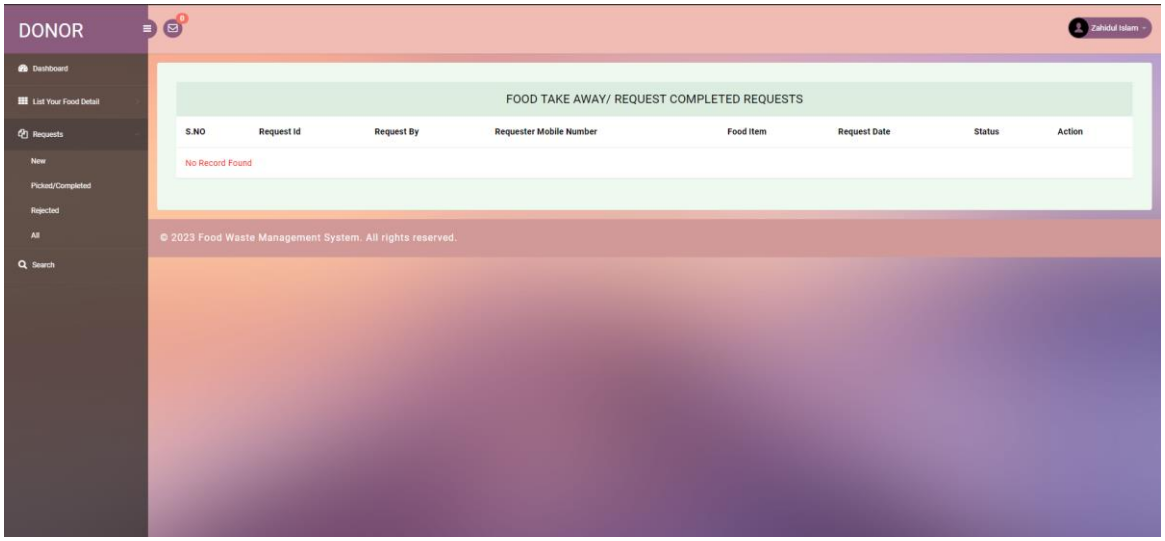


Figure 5.14: Picked/Completed Requests

5.15 Rejected Requests

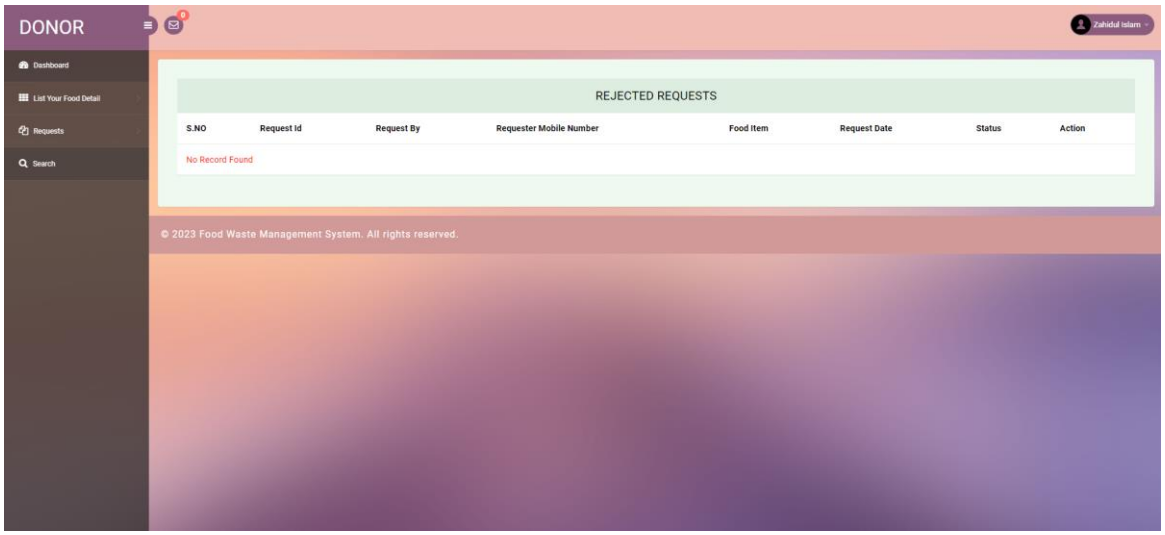


Figure 5.15: Rejected Requests

5.16 All Requests

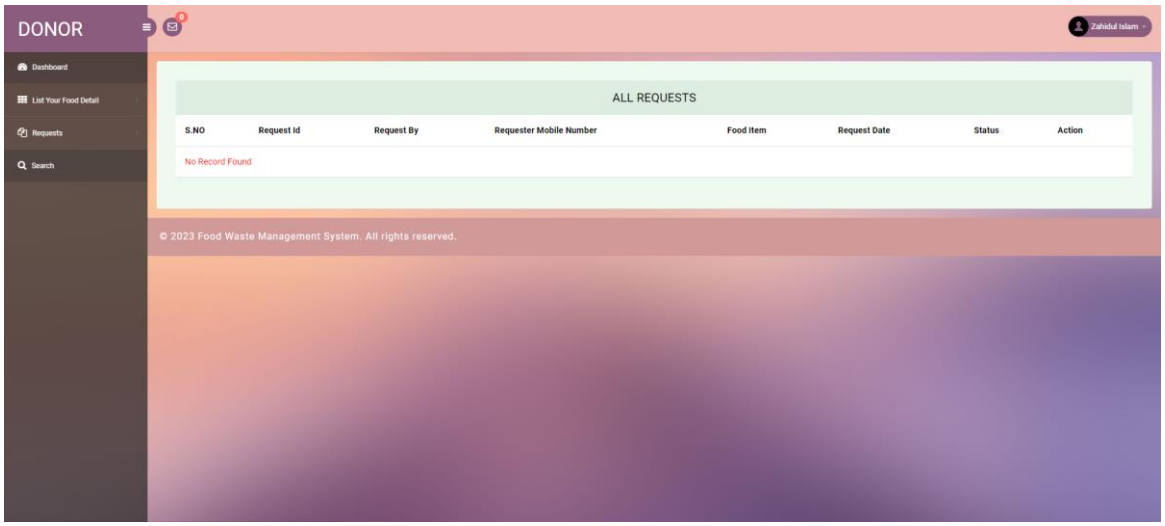


Figure 5.16: All Requests

5.17 Search

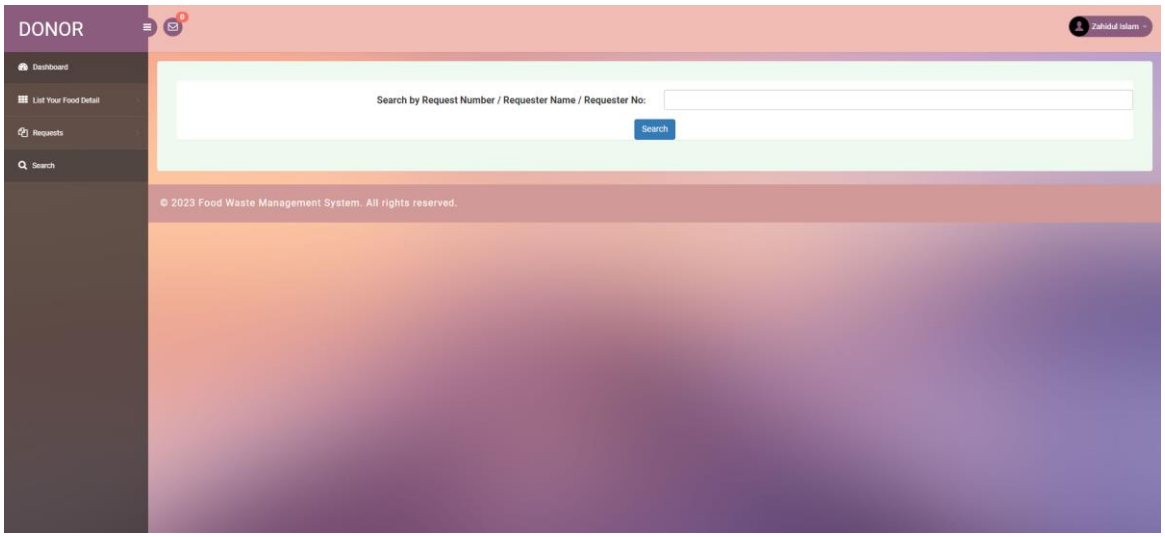


Figure 5.17: Search

5.18 Donor Profile

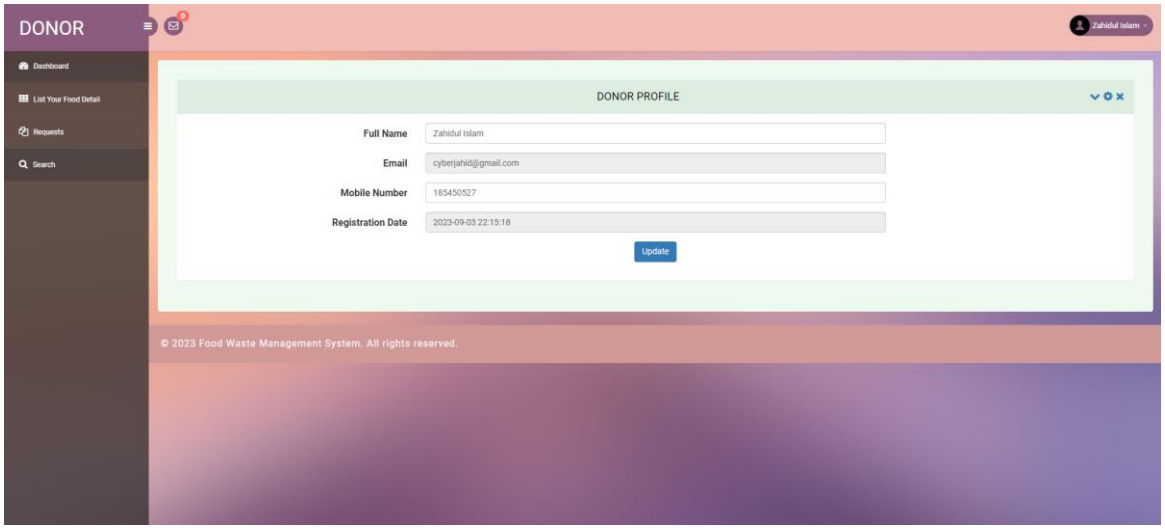


Figure 5.18: Donor Profile

5.19 Donor Password Change

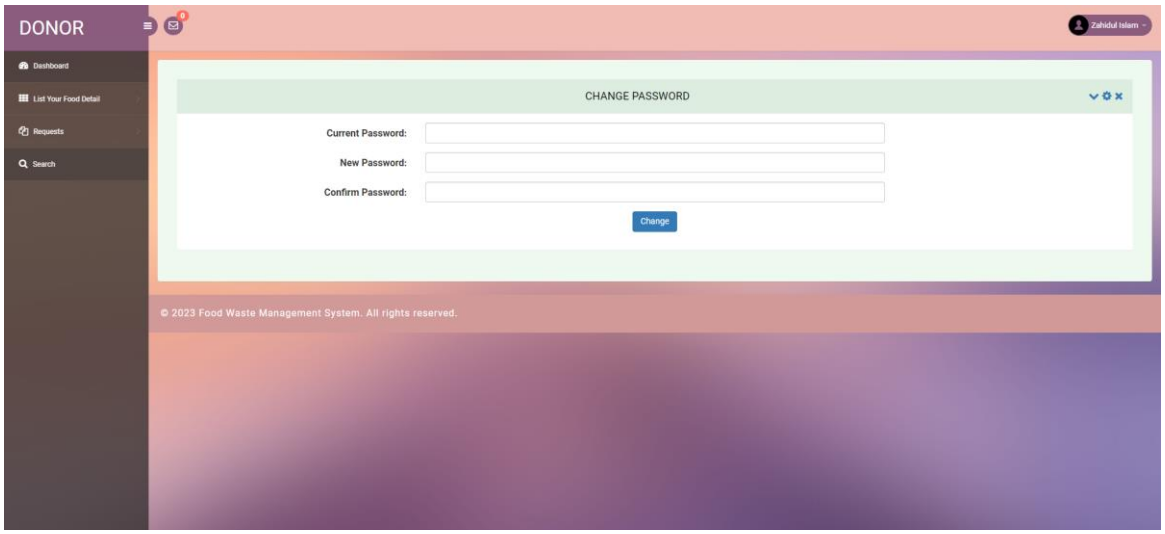


Figure 5.19: Donor Password Change

CHAPTER 6

CONCLUSION AND FUTURE WORKS

6.1 Conclusion

Food waste management and online donation systems are critical components of efforts to reduce food waste, alleviate food insecurity, and create more sustainable and equitable food systems. These areas have seen significant progress in recent years, with the adoption of innovative technologies and the implementation of various strategies aimed at addressing the complex challenges associated with food waste. Here are some key takeaways from these efforts:

Environmental Impact: Efforts in food waste management have the potential to significantly reduce the environmental impact of food production and disposal, including greenhouse gas emissions, water usage, and land resources.

Social and Economic Impact: Online donation systems have emerged as powerful tools to redirect surplus food to those in need, helping to combat food insecurity and support local communities. They also offer economic benefits to businesses and organizations.

Technological Advancements: The integration of technology, such as IoT devices, AI, blockchain, and mobile apps, has greatly improved the efficiency and effectiveness of both food waste management and online donation systems.

Consumer and Stakeholder Engagement: Increasing consumer awareness about food waste and fostering collaboration among stakeholders, including businesses, government agencies, nonprofits, and communities, are essential for success.

6.2 Future Work

While significant progress has been made, there is still much work to be done to further enhance food waste management and online donation systems. Here are some areas of future work:

Scaling Up: Efforts to reduce food waste and improve food rescue systems need to be scaled up globally. This includes expanding successful models and initiatives to reach more regions and communities.

Making an Admin by an Admin: We wiil invest more time and in coding and to add new features such as making admin by an admin from the webpage where we shouldn’t look for the source codes to add an admin.

Standardization: Developing and implementing standardized practices, such as date labeling and safety guidelines, can help reduce confusion and improve the efficiency of food waste reduction efforts.

Innovation: Continued research and development in technology, packaging, and supply chain management are essential for driving innovation and further reducing waste.

Policy and Regulation: Governments and international organizations can play a crucial role by enacting supportive policies and regulations that incentivize food waste reduction and food donation.

Behavioral Change: Efforts to change consumer behavior and promote responsible food consumption and disposal should remain a central focus of education and awareness campaigns.

Data and Analytics: Expanding data collection and analysis efforts can provide valuable insights into food waste patterns and allow for more targeted interventions.

Global Collaboration: Encouraging collaboration among countries, organizations, and stakeholders on a global scale can help address the multifaceted challenges of food waste and food insecurity.

Sustainability: Emphasizing the sustainability of food systems, including reducing food waste and its environmental impact, should be a central theme in future work.

In conclusion, the fight against food waste and the promotion of online donation systems are ongoing endeavors that require the continued commitment and collaboration of individuals, businesses, governments, and organizations worldwide. As technology and awareness continue to advance, there is great potential to make substantial progress in creating a more sustainable and equitable food system for future generations.

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