



American International University-Bangladesh (AIUB)

Department of Computer Science

Faculty of Science & Technology (FST)

ZeroWastee

A Software Engineering Project Submitted
By

Semester: Summer_21_22		Section:	Group Number:	
SN	Student Name	Student ID	Contribution (CO3+CO4)	Individual Marks
1	Pretom Shaha	22-49709-3		
2	Kamrul Hasan	22-49770-3		
3	Mst. Jasmin Akter	23-50285-1		
4	Mst. Shohana Akther	23-50284-1		
5	Chinmay Banik	23-51643-2		

The project will be Evaluated for the following Course Outcomes

CO3: Select appropriate software engineering models, project management roles and their associated skills for the complex software engineering project and evaluate the sustainability of developed software, taking into consideration the societal and environmental aspects	Total Marks	
	Appropriate Process Model Selection and Argumentation with Evidence	[5 Marks]
	Evidence of Argumentation regarding process model selection	[5Marks]
	Analysis the impact of societal, health, safety, legal and cultural issues	[5Marks]
CO4: Develop project management plan to manage software engineering projects following the principles of engineering management and economic decision process	Submission, Defense, Completeness, Spelling, grammar and Organization of the Project report	[5Marks]
	Total Marks	
	Develop the project plan, its components of the proposed software products	[5Marks]
	Identify all the activities/tasks related to project management and categorize them within the WBS structure. Perform detailed effort estimation correspond with the WBS and schedule the activities with resources	[5Marks]
	Identify all the potential risks in your project and prioritize them to overcome these risk factors.	[5Marks]

Description of Student's Contribution in the Project work

<p>Student Name: Student ID: Contribution in Percentage (%): <u>Contribution in the Project:</u></p> <ul style="list-style-type: none"> ▪ Contribution Description 1 ▪ Contribution Description 2 <p>_____ Signature of the Student</p>
<p>Student Name: Student ID: Contribution in Percentage (%): <u>Contribution in the Project:</u></p> <ul style="list-style-type: none"> ▪ Contribution Description 1 ▪ Contribution Description 2 <p>_____ Signature of the Student</p>
<p>Student Name: Student ID: Contribution in Percentage (%): <u>Contribution in the Project:</u></p> <ul style="list-style-type: none"> ▪ Contribution Description 1 ▪ Contribution Description 2 <p>_____ Signature of the Student</p>
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<hr/> Signature of the Student

1. PROJECT PROPOSAL

1.1 Background to the Problem

- Write the background description that helps putting your project into the right context of a problem domain and gives everyone involved a common view of the project.
- What is the root cause of this problem? Why this problem is so important to consider?.

1.2 Solution to the Problem

- Describe what is your project/thesis objective? What solutions are you going to provide to solve the above-mentioned problems?
- What are the solutions you are going to propose to deal with the problem? why is this solution is particularly appropriate to solve the problem? Is the solution feasible to the meet the business objective?
- Describe the basic functionalities of your proposed solution that makes the best use of state-of-art technology and produced a significant result that is likely to have a major impact on societal, health, safety, legal and cultural issues. Provide a deep insight that demonstrate and preset a creative solution to the real-life problem.
- Describe the target group of users of your solution? And how they will be benefited by your proposed solution to the problem?
- Describe the contribution of your project to the development of scientific results that is identified and well documented.
- Provide a literature review on what are the other studies that have discussed the same topic of yours in the literature and explain how your study has utilized and extended the problems of existing studies.
- Provide a description of all the existing studies presented in the problem area. What are the existing software solutions (for project) are available to solve the aforementioned problems?
- What are the existing software solutions are available to solve the aforementioned problem? And how your proposed solution is going to extend them in providing more benefits to the

users?

2. SOFTWARE DEVELOPMENT LIFE CYCLE

2.1 Process Model

- Provide an analysis regarding the nature and environment of the software that you are going to develop and select the best suitable method(s) to develop the software.
- Present your arguments based on your analysis about why your selected method(s) is the best choice among all other methods to develop your proposed software.
- Presents sufficient amount of evidence to support argument for your model selection in developing your proposed solution.

2.2 Project Role Identification and Responsibilities

- Identify all the roles/stakeholder in the software/project management activities in software development.
- Describes the responsibilities of the role in the software development.

Text Format:

- Style: Times New Roman
- Size: 12
- Space: 1.0
- Alignment: Justify
- Length: Maximum 6 pages (including cover page)

Rubric for Project Assessment (CO3)

Criteria	Marks distribution (Max 3X5= 15)				Acquired Marks
	Inadequate (1-2)	Satisfactory (3)	Good (4)	Excellent (5)	
Selection of Software Engineering Models	Does not articulate a position or argument of choosing appropriate model. Does not present any evidence to support the arguments for the choice of the model	Articulates a position or argument for choosing models that is unfocused or ambiguous. Presents incomplete/vague evidence to support argument for model choice	Articulates a position or argument of choosing models that is limited in scope. Does not present enough evidence to support the argument for the choice of the model	Clearly articulates a position or argument for the choosing software engineering models. Presents sufficient amount of evidence to support argument for the model selection	
Role identification and Responsibility Allocation	The project has poor project management plans for identifying roles and assigning the responsibilities	Identify few roles in the project management where some of the roles are left alone with any project responsibilities	Identify most of the roles in the project management and assign their responsibilities	Well planned project with proper role identification and responsibility allocation in the project management activities	
Impact identification					
Formatting and Submission	Project report is not complete and Several errors in spelling and grammar. Present a Confusing	Some errors in spelling and grammar. Some problems	Few errors in spelling and grammar. Presents most of the details in	Project report is complete and No errors in spelling and grammar. Consistently	

	organization of concepts, supporting arguments, and real-life example. Sentences rambling, and details are repeated.	of organizing the answer in a logical order of defining, elaborating, and providing real-life examples.	a logical flow of organization in definition, details, and example.	presents a logical and effective organization of definition, details, and real-life example of the topic.	
Acquired marks:					
CO Pass / Fail:					

Rubric for Project Assessment (CO4)

Marks Distribution (Maximum 3X5=15)					
Marking Criteria	Inadequate (1-2)	Satisfactory (3)	Good (4)	Excellent (5)	Acquired Marks
Project Planning	No background information regarding the project is given; project goals and benefits are missing.	Insufficient background information is given; project goals and benefits are poorly stated	Sufficient background information is given; the purpose and goals of the project are explained.	Thorough and relevant background information is given; project goals are clear and easy to identify.	
Effort Estimation and Scheduling	Student vaguely discuss the impact of societal, health, safety, legal and cultural issues in their project	Student provided with partial relevance to the impact of societal, health, safety, legal and cultural issues in their project	Student fairly provided the analysis to the impact of societal, health, safety, legal and cultural issues in their project	Student comprehensively provided the analysis to the impact of societal, health, safety, legal and cultural issues in their project	
Risk Management	Ambiguous representative example.	Partially identify / indicate towards real-life example.	Real-life example is fairly connected towards the definition.	Comprehensively defend with real life example.	
Acquired Marks:					
CO Pass / Fail:					

Background Study

In cities like Dhaka, a lot of good food is thrown away every day — from homes, restaurants, hotels, and events. At the same time, many people in the same city don't have enough to eat. This is a serious problem. It's not that people don't want to share food — the main issue is that there's no easy way to donate and deliver food before it goes bad.

Donors often don't know where to give the food or who can come and collect it. NGOs and volunteers want to help, but without a proper system, it's hard to organize pickups and deliveries, especially in a busy city with heavy traffic like Dhaka. Because of this, a lot of food goes to waste, and many people stay hungry.

Old systems like using phone calls or paper lists are too slow and not reliable. Donors also don't get any updates or feedback, so they feel less interested in donating again. On the other hand, food receivers sometimes don't get fresh or safe food because of delays or poor planning.

But now, technology gives us a better way. Most people have smartphones and internet access. GPS and tracking systems are available. So, we can now build a smart and easy platform that connects food donors with nearby NGOs and volunteers — quickly and in real time.

Solution to the Problem

Problems and Root Causes:

- **Food Waste in Urban Areas:**
Every day, large amounts of food are wasted by homes, restaurants, and event organizers. This food could help feed many hungry people but often goes to waste due to a lack of systems.
- **No Real-Time Coordination:**
There is no smart or fast system to connect food donors with nearby NGOs or volunteers. By the time someone arrives to collect the food, it may no longer be fresh or safe to eat.
- **Logistics and Delivery Challenges:**
In cities like Dhaka, traffic and long distances make it difficult to deliver food quickly. Many times, volunteers can't reach on time, and the food becomes unusable.
- **Old and Manual Methods:**
Traditional donation methods like phone calls or word of mouth are slow, confusing, and unorganized. There's no proper tracking or record of where food is going or who received it.
- **Lack of Donor Motivation and Trust:**
Donors often don't get updates or see the impact of their donation. This reduces their interest in donating again.

- **Unverified NGOs and Volunteers:**
Without a proper checking system, it's hard to know which NGOs or volunteers are trustworthy, leading to misuse or failed deliveries.

Opportunities and Technology Use:

- **Smartphone and GPS Availability:**
Most people now have access to smartphones and internet. This makes it easier to use apps that can track, notify, and match donors and receivers in real time.
- **Live Location and Traffic Tools:**
Google Maps and other APIs can help calculate delivery time, distance, and traffic — helping us match food that can actually be delivered before it expires.
- **Need for Simpler Solutions:**
People want fast and easy systems. A mobile app that shows where to donate, who will pick up, and how it impacts someone's life can increase trust and participation.

Why ZeroWastee Is the Right Solution:

- **Real-Time Food Tracking** – Donors and receivers can track food pickups live
- **Expiry-Aware Matching System** – Matches food with nearby volunteers who can deliver within time
- **Simple Mobile App Interface** – Easy for anyone to donate food with just a few clicks
- **Verified NGO & Volunteer Profiles** – Builds trust in the donation process
- **Gamified Impact (Badges/Points)** – Motivates users by showing their social impact
- **Awareness and Education** – Teaches users about food waste and hygiene through app content

Project Objectives :

- The main objective of ZeroWastee is to provide a **real-time food donation and delivery tracking system**.
- Enable donors to easily post surplus food with images, quantity, expiry time, and location.
- Provide verified NGOs and volunteers with notifications to pick up food nearby and deliver it safely before expiry.

- Implement an **automated expiry-aware matching system** to ensure food is only donated if it can reach recipients on time.
- Develop user-friendly **mobile apps and web portals** for donors, volunteers, and NGOs to connect and track food donations in real time.
- Include gamification features (badges, leaderboards) to motivate users and measure impact.

Solution :

- **Implement Real-Time Tracking of Donated Food and Delivery Progress:**
A GPS-enabled tracking system will be integrated into both the mobile and web applications, allowing donors, volunteers, and NGOs to monitor the journey of donated food from pickup to final delivery. This live tracking feature ensures transparency, prevents delays, and builds accountability throughout the process. Users will be able to see the real-time location of the volunteer assigned, estimated time of arrival, and delivery confirmation, helping ensure that food is redistributed before it becomes unsafe.
- **Create a Smart Matching System Based on Location and Expiry Time:**
The platform will feature an automated matching algorithm that intelligently connects donated food to the most suitable volunteer or NGO. It will consider key factors such as distance from the donor, current traffic conditions, availability of volunteers, and the remaining shelf life of the food. This ensures that donations are only accepted if there is a realistic chance of delivering them before they expire, thereby minimizing waste and improving efficiency.
- **Provide Tools to Manage Volunteer Schedules and Optimize Routes:**
Built-in scheduling tools will allow volunteers and NGOs to plan their pickups based on availability and proximity. The system will automatically suggest optimized routes using traffic data and mapping APIs (like Google Maps) to help volunteers navigate the city quickly and efficiently. Notifications and reminders will also help volunteers stay organized and avoid missing critical pickup times.
- **Develop Simple and Accessible Mobile/Web Applications with Communication Features:**
ZeroWastee will provide clean, user-friendly interfaces for both mobile and web platforms. These apps will allow users to easily register, post surplus food with images and details (quantity, expiry, pickup location), and track donation status. A built-in chat box will enable direct communication between donors and volunteers or NGOs, allowing

for clarification of pickup times, locations, or any urgent updates. This reduces dependency on external communication methods like phone calls or SMS.

- **Integrate Gamification and Feedback Mechanisms:**

To encourage user participation and sustained engagement, the platform will include gamified features like badges, points, and leaderboards. Donors and volunteers will earn achievements for their contributions, which fosters a sense of social responsibility and pride. Alongside this, a structured feedback system will allow users to rate their experience, leave reviews, and report any issues, thus improving service quality and trust in the community.

- **Verify NGO and Volunteer Profiles for Safety and Trust:**

All NGOs and volunteers will undergo a verification process during registration. Verified profiles will display badges, and users can view ratings and read community reviews before deciding to collaborate. This verification layer helps eliminate unreliable actors, builds user confidence, and ensures that food is being handled and delivered by trustworthy individuals and organizations.

Target Users :

- Individuals and households with surplus food to donate
- Restaurants, hotels, and event organizers
- NGOs and charitable organizations involved in food distribution
- Volunteers willing to pick up and deliver food
- App developers and service providers supporting the platform

Basic Functionality :

- **Login:** Users can log in using a username and password, verified against the database.
- **Registration:** New users provide their full name, phone number, email, and role (donor, volunteer, NGO).
- **Food Posting:** Donors can upload food details with images, quantity, expiry time, and pickup location.

- **Real-Time Tracking:** Users can see the location and status of food pickups and deliveries on a map.
- **Search & Match:** Users can search for available food donations or volunteers based on location and expiry urgency.
- **Request Submission:** Donors can specify preferences like “urgent pickup” or “local donation.”
- **Volunteer Dashboard:** Volunteers can view assigned pickups, navigate routes, and update delivery status.
- **Payment Options:** Optional features to support donations for delivery costs via mobile payments.
- **Feedback System:** Users can provide ratings, reviews, and complaints to improve trust and service quality.

Contribution of the Project :

- Introduces modern technology to the food donation process, improving speed and safety.
- Creates a simple, user-friendly platform for everyone to participate in reducing food waste.
- Enhances transparency and trust through verification and feedback systems.
- Helps maximize food redistribution by preventing food spoilage and improving logistics.
- Encourages community engagement through gamification and visible impact tracking.

Literature Review

Food waste is a growing problem worldwide, especially in urban areas like Dhaka, where tons of perfectly edible food are thrown away daily. Research shows that a big part of this waste happens not because the food is bad, but because there is no organized way to collect and redistribute it in time. According to studies, food donation and waste reduction can be made more effective by using technology, such as mobile apps, location tracking, and smart matching algorithms. For example, systems that allow real-time updates of available food, donor and volunteer location tracking, and automated matching between donors and NGOs/recipients can greatly reduce food spoilage. Projects like Olio (UK) and Too Good To Go (Europe) have successfully created platforms where individuals or businesses can list leftover food, and nearby people can claim or pick them up before they go to waste. These apps show that hyperlocal donation, timing, and smart

logistics are key to success. ZeroWastee builds on this idea but tailors it for Bangladesh's urban challenges — such as heavy traffic, unpredictable power/internet, and food spoilage due to heat. By adding features like expiry-aware smart matching, volunteer tracking, and urgency-based delivery, ZeroWastee addresses the unique realities of our local environment.

Existing Software

- **Olio** – Allows individuals and businesses to share leftover food with nearby people to reduce waste.
- **Too Good To Go** – Lets users buy surplus food from restaurants, bakeries, and supermarkets at a discount.
- **Food Rescue US** – Connects food donors with volunteers to deliver food to local hunger relief organizations.
- **No Food Waste (India)** – Collects excess food from donors and distributes it to the needy using a real-time tracking system.
- **Replate** – Offers scheduled food pickups from companies and delivers them to local communities in need.

2.1 Process Model

Selection of Process Model: Incremental Development Model

For the ZeroWastee project — a community-based food donation and volunteer coordination platform — we selected the Incremental Process Model as the most appropriate development approach. This model breaks down the overall system into manageable and meaningful parts (increments), where each increment is designed, built, and tested independently. Instead of waiting until everything is complete, we deliver working features in phases, making the system functional and usable early on — and more powerful over time. This approach works especially well for student projects, non-profit apps, and volunteer-based systems like ours, where resources are limited and team members are balancing multiple responsibilities.

Why was Incremental Development Process Model chosen for this project?

Why the Incremental Model Was Chosen for This Project

The nature of ZeroWastee — which involves logistics, real-time tracking, and public contribution — makes it essential to build the app gradually, test each feature thoroughly, and make it available for use as early as possible.

The Incremental Process Model supports this kind of development by allowing the system to be built and delivered in stages, where each increment adds meaningful functionality while retaining previously developed features.

Modular Delivery Based on Usable Increments

Instead of breaking the system into purely technical components, we designed the delivery phases based on actual user needs. Each increment is independently usable, functional, and adds new value to the platform. This ensured that we could test and release the system step-by-step while always having a working version available.

Increment 1 – Core Donation and Matching System (Minimum Viable Product)

In the first phase, we focused on building the essential functionalities: donor and volunteer registration, food donation posting, and basic manual matching. Even at this early stage, a donor can post available food, a volunteer can accept it, and the donation process begins. This allowed us to release a functioning version of the app quickly and gather initial feedback.

Increment 2 – Real-Time Tracking and Smart Matching

In this phase, we introduced GPS-based volunteer tracking and an automated matching system. These features help ensure food gets collected before it spoils by assigning donations to nearby, available volunteers. Additionally, we integrated live maps and real-time traffic data to optimize delivery efficiency.

Increment 3 – Verification and Communication

As trust and safety are vital in community-based platforms, we implemented user verification for volunteers and NGOs, along with an internal messaging system. This

helped facilitate secure communication between donors and volunteers without relying on external platforms.

Increment 4 – Feedback and Gamification

To maintain user engagement and promote active participation, we added a feedback and gamification system. Users can now rate each other, earn badges for milestones, and appear on leaderboards based on contributions. This promotes trust, encourages recurring use, and recognizes meaningful involvement.

Increment 5 – Awareness, Support, and Expansion

In the final phase, we implemented features that contribute to the long-term sustainability of the platform. These include educational content about food safety, an optional donation feature to support transportation costs, multi-language support (including Bangla), and visual summaries of user impact.

Additional Reasons the Incremental Model Fits Our Project:

Low Risk and Low Cost: Each feature was developed one at a time, reducing the chance of large-scale failure and helping us stay within our limited student project resources.

Early Usability: The system was usable from the first increment, allowing real users to engage with the platform and provide feedback from the very beginning.

Scalable and Flexible: We were able to adapt easily and add new features in later increments without disrupting previously developed components.

Well-Suited for Non-Profit Applications: As a volunteering-based, non-commercial platform, ZeroWastee required a process that was lightweight, goal-oriented, and compatible with limited time and technical manpower — all of which the incremental model supports.

The Responsibilities of the Roles in Software Development

1. Project Manager

- Coordinates team meetings, sets milestones, and ensures tasks are completed on time.
- Manages communication within the team and with external evaluators or mentors.

2. Developer

- Implements the features for each increment: user registration, food posting, tracking, etc.
- Performs integration and ensures stability across releases.

3. UI/UX Designer

- Designs user interfaces and ensures usability across devices.
- Prepares mockups and interacts with users/stakeholders for design validation.

4. Tester (Quality Assurance)

- Creates test cases for each new feature.
- Tests functionality, usability, and ensures that previously working features are not broken.

5. Stakeholder / NGO Representative (Client Role)

- Represents the end-users (donors, volunteers, NGOs).
- Gives feedback on each increment and helps shape priorities.

Name	Roles and Responsibilities
Pretom Shaha	Role: UI/UX Designer Responsibility: <ul style="list-style-type: none"> • Designs user interfaces and ensures usability across devices. • Prepares mockups and interacts with users/stakeholders for design validation.
Mst. Shohana Akther	Role: Tester (Quality Assurance) Responsibility: <ul style="list-style-type: none"> • Creates test cases for each new feature.

	<ul style="list-style-type: none"> Tests functionality, usability, and ensures that previously working features are not broken.
Mst. Jasmin Akter	<p>Role: Stakeholder / NGO Representative (Client Role)</p> <p>Responsibility:</p> <ul style="list-style-type: none"> Represents the end-users (donors, volunteers, NGOs). Gives feedback on each increment and helps shape priorities.
Chinmay Banik	<p>Role: Developer</p> <p>Responsibility:</p> <ul style="list-style-type: none"> Implements the features for each increment: user registration, food posting, tracking, etc. Performs integration and ensures stability across releases.
Kamrul Hasan	<p>Role: Project Manager</p> <p>Responsibility:</p> <ul style="list-style-type: none"> Coordinates team meetings, sets milestones, and ensures tasks are completed on time. Manages communication within the team and with external evaluators or mentors.