



Central Training & Placement Cell, AKTU in
association with ERA Foundation presents

KALAM PRAGATI

Empowering Engineers with Skills for Success

MakeX

Internship

DESIGN THINKING & RAPID PROTOTYPING
REPORT - 2025



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Project Overview

Project Title	Recycling and Up-scaling of Glass Bottles	
Class	3rd Year	
Team Name	InnovateX	
Team Members	Name	University Roll No.
1.	Sahil Khan	2300560100183
2.	Prateek Verma	2300540130039
3.	Arshi	2400560100044
4.	Aaradhyaa Dubey	2304280100004
5.	Sachendra Singh	2304731640020
6.	B.Prince Mayank Mishra	2400560100065
Problem identified	Glass bottles, after use, are often discarded as waste, contributing to pollution and CO ₂ emissions. There is a lack of an accessible platform that promotes recycling, upcycling, and connects eco-creators with buyers.	
Solution proposed	A digital platform that connects users and freelancers to recycle and upcycle glass bottles. Buyers can purchase eco-products, while creators earn rewards and showcase their work.	
Link to the idea pitch presentation	https://www.canva.com/design/DAGw0r5ZfLQ/Es2Jg7TBcS3gCL49i2rTw/edit? utm_content=DAGw0r5ZfLQ&utm_campaign=designshare&utm_medium=link2&utm_source=sharebutton	
Link to photos drive	https://drive.google.com/drive/folders/1P_H4lsU1gWQPo-g-I7G7nxW55NnLy2Vr	



1. Project Overview

1.1 Abstract

Glass waste, particularly bottles, poses a significant environmental challenge due to its non-biodegradable nature and low recycling rates. This project addresses the problem by developing a digital platform that connects ordinary users and freelancers to recycle and upcycle glass bottles into creative, eco-friendly products. The platform allows freelancers to showcase their work, buyers to purchase sustainable items, and both to contribute towards reducing carbon emissions and conserving energy. An integrated dashboard highlights the collective impact by tracking recycled bottles, CO₂ saved, and community engagement. This initiative not only promotes sustainable waste management but also creates new opportunities for creativity, commerce, and environmental awareness.

1.2 Introduction

Glass bottles, though 100% recyclable, often end up as unmanaged waste in landfills due to the lack of proper collection and reuse systems. Cafés, wine shops, and municipal bodies face challenges in disposing of these bottles responsibly, while artisans and freelancers struggle to access raw materials for creative upcycling. This gap not only contributes to environmental pollution but also results in the loss of valuable resources that could be transformed into high-value products.

Our project aims to bridge this gap through a digital platform that connects waste generators, municipal bodies, and freelancers. The app will facilitate bottle collection, enable artisans to upcycle glass into decorative and creative items, and provide a marketplace to sell these products. By doing so, it promotes sustainable waste management, reduces environmental burden, and creates new economic opportunities.



1.3 Proposed Solution

The final prototype is a mobile application that streamlines the entire process of glass bottle upcycling. The app connects cafés, wine shops, and municipal bodies with freelancers and artisans who transform waste bottles into creative, market-ready products. Key features include bottle collection scheduling, tracking of waste movement, raw material access for artisans, and an integrated marketplace for selling upcycled items. A sustainability dashboard highlights the positive impact by showcasing the number of bottles saved, CO₂ emissions reduced, and revenue generated.

This prototype demonstrates how a simple digital solution can bridge multiple stakeholders, turning waste management challenges into sustainable economic opportunities.

1.4 Mind Map

The mind map below illustrates the problem statement and the core components of our solution.





2. Problem statement

2.1 Problem statement:

Glass bottles, though fully recyclable, often end up as unmanaged waste due to lack of proper collection and reuse systems—causing pollution and missed opportunities for upcycling.

2.2 What is the problem?

Glass bottles, though fully recyclable, often end up as unmanaged waste due to the absence of a proper collection and reuse system. Cafés, wine shops, and municipal bodies face challenges in disposing of them responsibly, leading to increased pollution and landfill pressure. At the same time, the potential to upcycle these bottles into valuable and creative products remains largely untapped.

2.3 Why is it a problem?

It is a problem because unmanaged glass waste increases landfill pressure and environmental pollution. Recycling options are limited and inefficient, offering no incentives to businesses or individuals for responsible disposal. As a result, valuable resources that could be upcycled into creative, revenue-generating products are wasted, and opportunities for sustainable practices are lost.

2.4 Who is facing the problem?

Cafés and wine shops struggle with the disposal of empty glass bottles, while municipal bodies bear the burden of managing increasing glass waste. Freelancers and artisans face difficulty in accessing raw materials for upcycling, and society at large suffers from the environmental impact caused by unmanaged glass waste.

2.5 When and where does the problem occur?

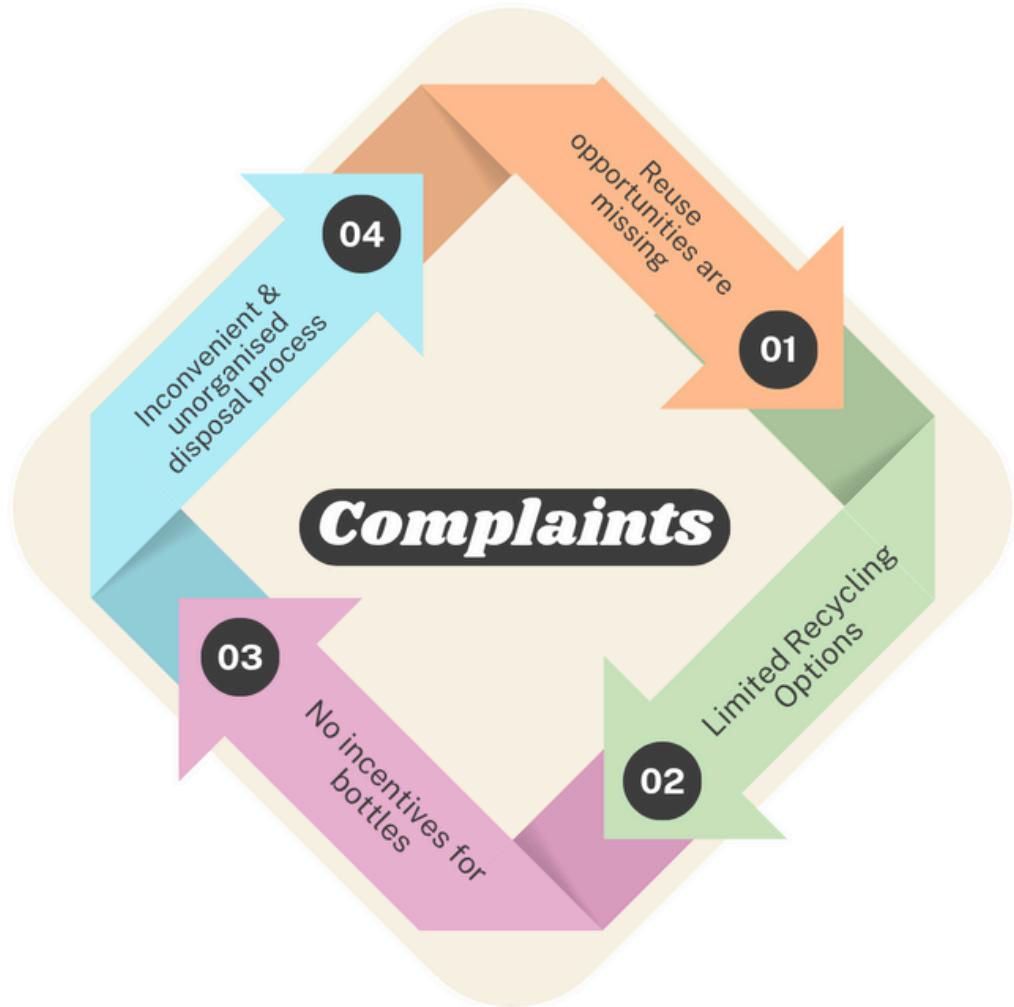
The problem occurs after the consumption of beverages in cafés, wine shops, and households, when empty glass bottles are discarded. It arises during waste collection and disposal, where municipal bodies struggle to manage the load. The issue is most visible in urban areas with high glass usage and limited recycling systems, ultimately leading to accumulation in landfills and dumping sites.

2.6 What are the existing solutions?

Currently, glass bottles are mostly collected as general waste by municipal bodies, with a small portion processed in recycling plants. Some bottles are handled by informal scrap dealers, but they are often sold at very low value. In many cases, glass waste is downcycled into construction material or simply ends up in landfills. There is no structured system to promote creative upcycling or ensure efficient reuse.

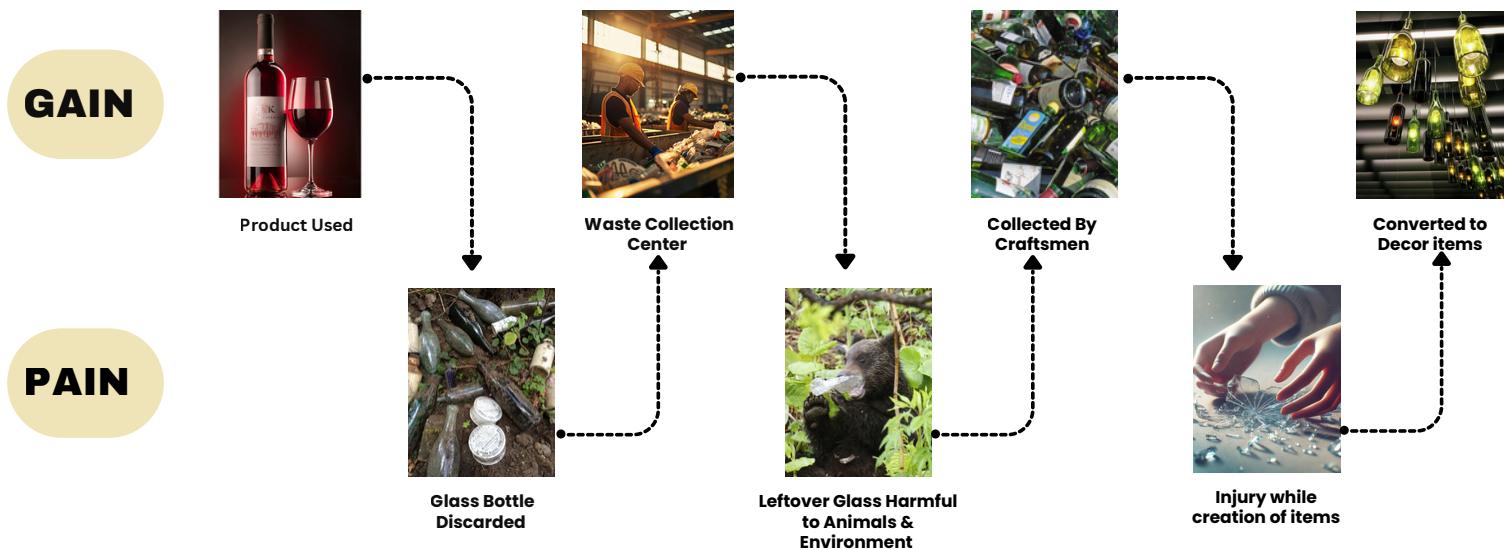
2.7 What are users/ stakeholders complaining about the existing solutions?

Users and stakeholders find the existing system inconvenient and unorganized, with no clear channel for proper disposal. Cafés and wine shops receive no incentives or returns for giving away bottles, while municipal bodies struggle with inefficiency and overload. Freelancers and artisans complain about limited access to raw materials, and society at large faces the consequences of pollution and landfill growth due to poor recycling practices.



3. Field Visit

3.1 User Journey Map



The journey begins with ordinary users who join the platform after learning about it through social media or awareness campaigns. Once they sign up as users, they can browse eco-friendly products made from recycled bottles and purchase them. With every purchase, users earn reward points while simultaneously tracking their positive environmental impact through the dashboard, which displays bottles recycled, CO₂ saved, and energy conserved.

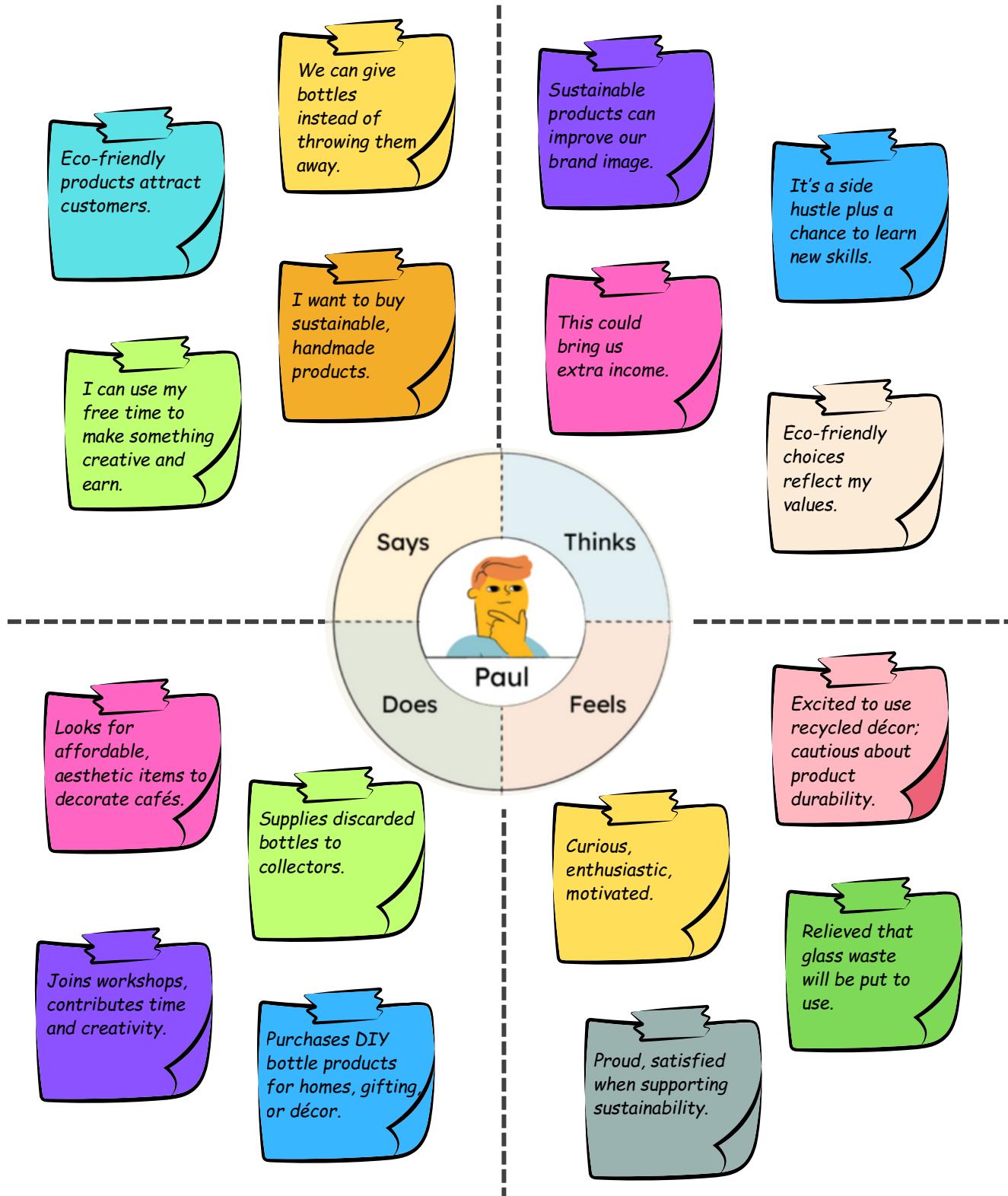
For freelancers or creators, the journey starts when they discover the platform as a means to showcase their upcycling skills. After registering as freelancers, they upload a demo of their artwork for verification. Once approved, they can request bottles from the platform, create innovative products, and relist them for sale. Through this process, they not only generate income but also earn reward points and recognition as eco-conscious artists.

Meanwhile, the admin or platform owner oversees the entire process, ensuring smooth onboarding, verifying freelancers, monitoring transactions, and maintaining quality standards. They also track the community's collective impact through the dashboard and highlight the platform's contribution to sustainability.

This journey collectively illustrates how different stakeholders interact with the platform, contributing to waste reduction, creativity, and sustainable commerce.



3.2 Empathy Map





3.3 Survey Interview Photos



Interviewed the café owner



Retro Cabana Cafe

(Sector 8, Jankipuram Extension Lucknow, Uttar Pradesh 226031)

21 August 2025 (10:00 AM)



Interviewed the café staff



The Food Oxide Cafe

(7/589, Jankipuram Extension, Lucknow, Uttar Pradesh 226031)

21 August 2025 (11:00 AM)



Material Recovery Facility

Near by AKTU new campus

21 August 2025 (1:00 PM)



Interviewed the dumpyard manager



Lucknow University new campus

LU New Campus Rd, Type IV, Sultanpur Village, Jankipuram Extension
Lucknow, Uttar Pradesh 226021

21 August 2025 (3:00 PM)

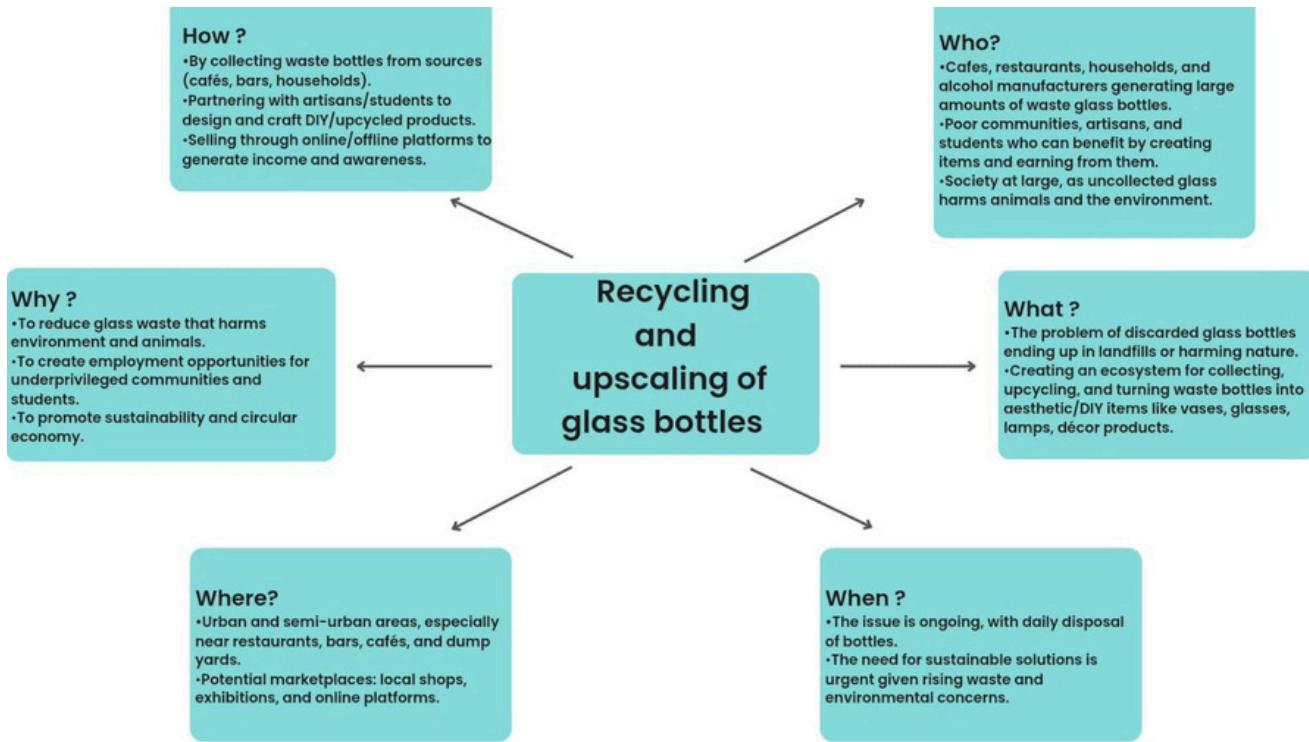




4. Problem Analysis

Using tools like 5 Whys and Problem Tree, it becomes clear that unmanaged glass waste is not just a disposal issue but a result of poor collection systems, lack of incentives, weak recycling infrastructure, and low awareness—leading to pollution, landfill growth, and loss of resources.

4.1 5W1H METHOD



5W1H – Problem Statement: Upcycling & Recycling of Glass Bottles

- 1. Who** – Cafés, restaurants, households, alcohol manufacturers generating waste; artisans, students, and society impacted.
 - 2. What** – Discarded glass bottles harming nature; need for ecosystem to collect and upcycle into useful décor/DIY items.
 - 3. When** – Daily disposal, urgent need for sustainable solutions.
 - 4. Where** – Urban/semi-urban areas near cafés, bars, dump yards; marketplaces both online and offline.
 - 5. Why** – To reduce environmental harm, create jobs for communities, and promote circular economy.
- 1. How** – Collect bottles, engage artisans/students for upcycling, and sell products via digital and physical platforms.



4.2.15 Why Analysis

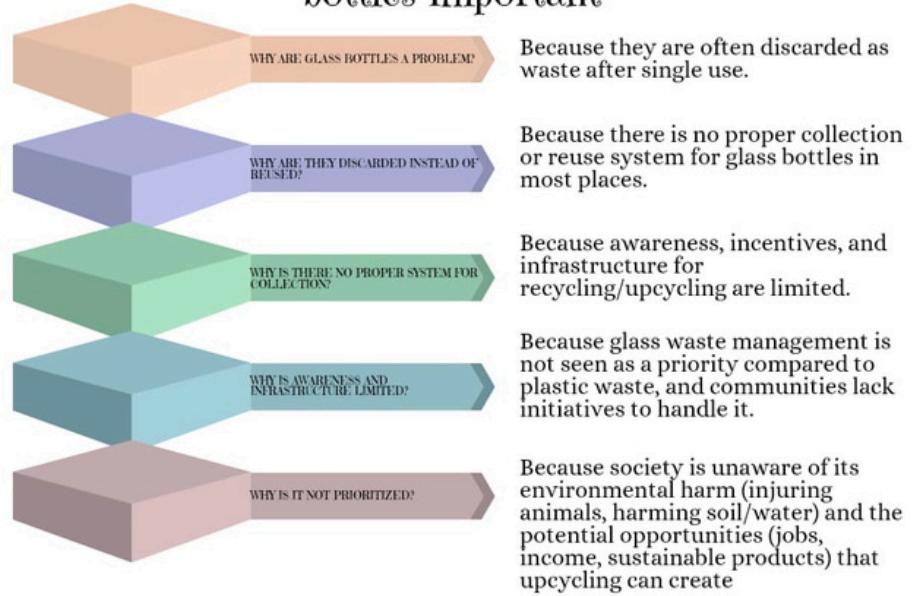
5 Whys – Why is Upcycling Glass Bottles Important?

1. Discarded after single use.
2. No proper collection system.
3. Limited awareness & incentives.
4. Glass waste not prioritized.
5. Society ignores harm & opportunities.

Root Cause: Lack of awareness, incentives, and infrastructure.

5 Why's

Why is upscaling glass bottles important



4.2.2 Problem Tree Analysis

Problem Tree Analysis helps break down an issue into its root causes and visible effects. It shows how unmanaged glass bottles stem from systemic gaps and lead to wider environmental and social impacts.

1. Main Problem

Unmanaged disposal of glass bottles.

2. Causes (Roots)

No proper collection & reuse system.

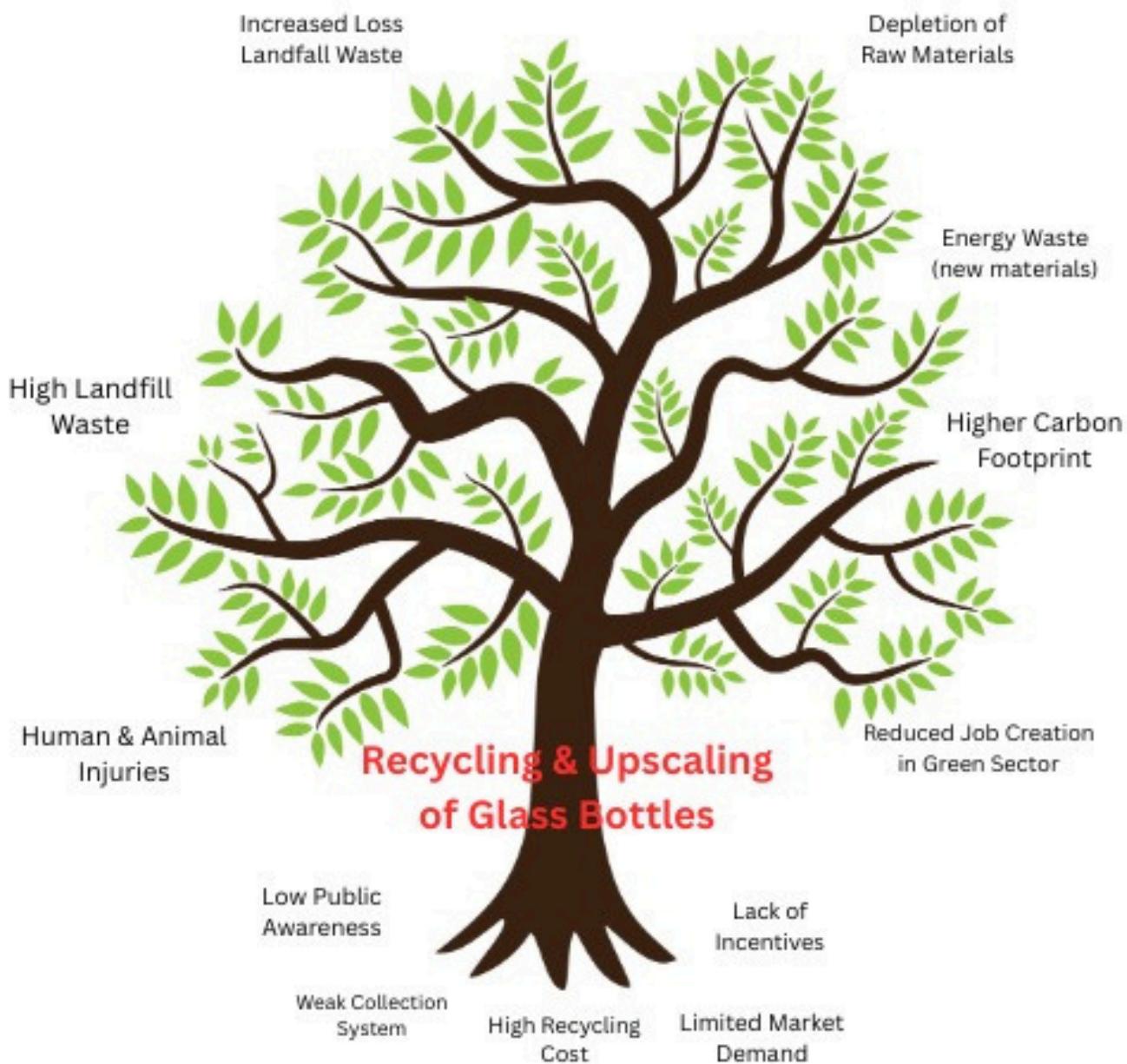
Limited awareness and incentives.

Weak recycling infrastructure.

Glass waste not prioritized compared to plastic.

3. Effects (Branches)

Landfill accumulation and pollution.
Harm to animals, soil, and water.
Loss of valuable recyclable resources.
Missed opportunities for jobs and income through upcycling.





5. Solution

5.1 Ideation

The ideation phase focused on creating a digital platform that connects cafés, wine shops, and municipal bodies with artisans and freelancers. The goal was to design a simple system for bottle collection, upcycling, and resale through both online and offline marketplaces.

Here's how the ideation process unfolded:

Step 1: Problem Identification:

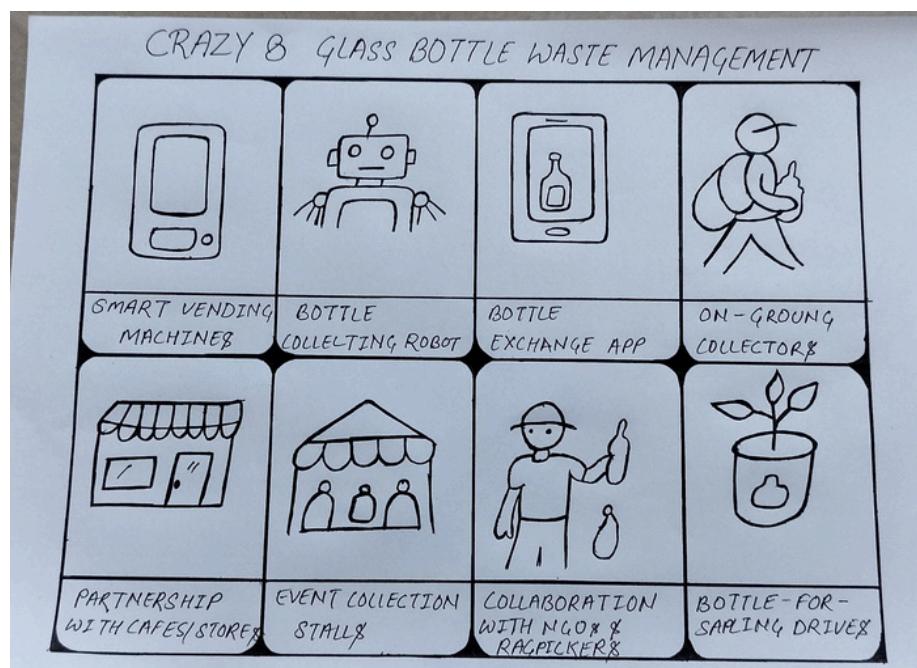
Glass bottles, though 100% recyclable, are often discarded as unmanaged waste due to the lack of proper collection, reuse, and awareness systems. This leads to environmental pollution, landfill growth, and missed opportunities for upcycling into valuable products and income generation.

Step 2: Brainstorming:

In the brainstorming phase, multiple ideas were explored to address unmanaged glass waste. Discussions revolved around creating a structured collection system, incentivizing cafés and wine shops, engaging artisans and students for upcycling, and building an online marketplace to sell creative products. After evaluating feasibility, sustainability, and social impact, the idea of a digital platform connecting all stakeholders was finalized.

Step 3: Crazy 8 Technique:

The Crazy 8 method was used to quickly sketch 8 ideas in 8 minutes for tackling glass waste. Ideas included bottle collection kiosks, DIY kits, partnerships with cafés/wine shops, artisan networks, online marketplaces, and awareness campaigns. From these, the most feasible solution chosen was a digital platform connecting all stakeholders for glass upcycling.



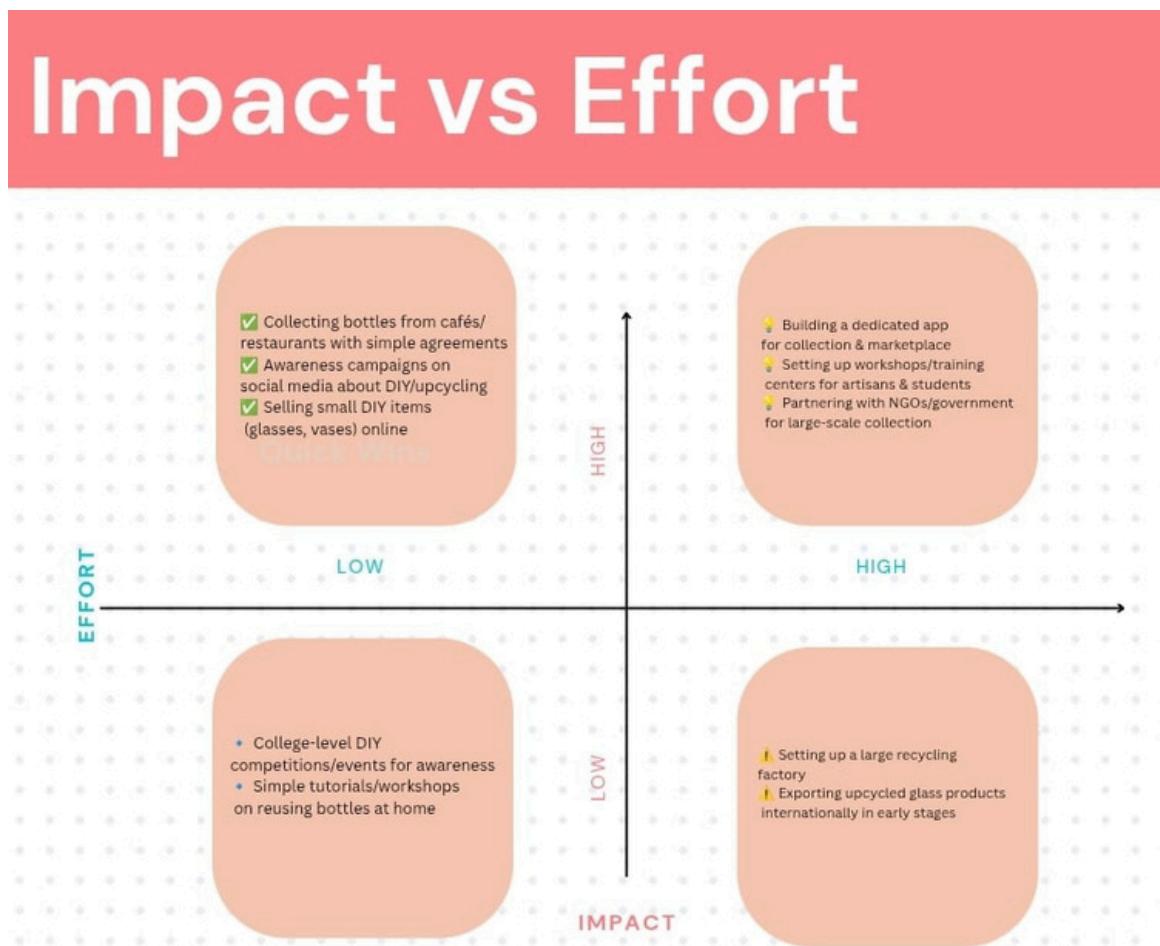


Step 4: Refinement:

In the refinement stage, the broad ideas generated during brainstorming and Crazy 8 were evaluated for feasibility, sustainability, and impact. Less practical options were filtered out, and the focus shifted to a mobile app solution that enables bottle collection, supports artisans in upcycling, and provides a marketplace for selling products. Features like pickup scheduling, artisan access, and an impact dashboard were added to enhance usability and effectiveness.

5.2 Impact vs Effort Map:

The Impact vs Effort Map was used to evaluate and prioritize the ideas generated. By plotting solutions based on their potential impact and the effort required to implement them, it became easier to identify quick wins, high-value projects, and ideas that should be postponed or avoided. This helped in selecting the most practical and impactful solution for glass bottle upcycling.





5.3 Proposed Idea

Glass bottles are often discarded after single use, leading to environmental harm and wasted opportunities for reuse. Our proposed idea is to create a digital platform that connects stakeholders, manages collection, and transforms waste bottles into valuable upcycled products, promoting both sustainability and livelihood.

1. Digital Platform

A mobile and web-based application will be developed to act as a central hub. It will connect cafés, wine shops, and municipal bodies (suppliers of waste bottles) with artisans, freelancers, and students (creators of upcycled products).

2. Bottle Collection System

The app will feature a pickup scheduling system for efficient collection of glass bottles from restaurants, bars, cafés, and households. This ensures bottles are not wasted or discarded in landfills.

3. Upcycling Network

Freelancers, artisans, and students will be onboarded to convert waste bottles into creative products such as lamps, vases, glasses, and decorative items. This fosters creativity and generates employment.

4. Marketplace Integration

The platform will provide online and offline sales channels. Upcycled products will be sold through e-commerce features in the app as well as local exhibitions and partner stores.

5. Sustainability Impact

The solution not only reduces environmental waste but also creates awareness about sustainability and supports a circular economy. Communities benefit socially, economically, and environmentally.



5.4 Prototype (Hardware/Software/UI Screens)

The prototype of Glassify represents the initial working model of our mobile application, showcasing the core functionalities and user flow for freelancers who wish to create and sell products made from recycled glass bottles. This stage of development allowed us to visualize the app's design, validate concepts, and gather feedback for future enhancements.

Goals of the Prototype

The main objectives of building the prototype were:

- To demonstrate the feasibility of connecting freelancers with recycled glass bottle resources.
- To test user interaction flows for onboarding, uploading creations, and requesting materials.
- To refine UI/UX design and identify improvements through peer and mentor feedback.

Type of Prototype

The Glassify prototype is a medium-to-high fidelity model, designed with a focus on functionality and visual aesthetics. We created detailed UI screens in Figma and implemented key functionalities such as user authentication and data storage using FlutterFlow and Firebase.

UI/UX Design Highlights

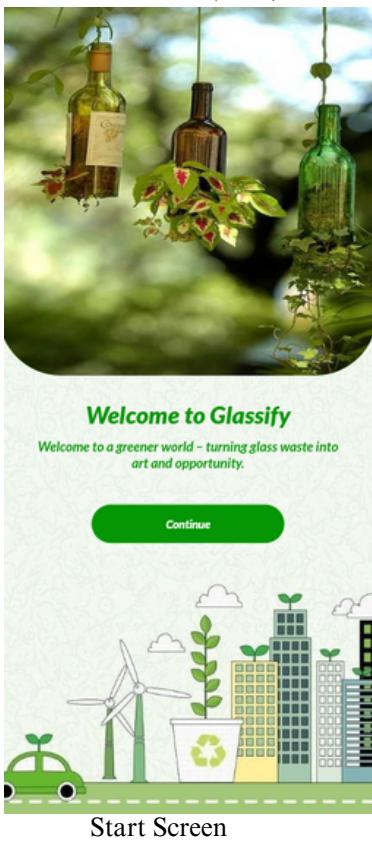
The prototype employs a clean, minimalist interface with soft green and cream tones to symbolize eco-friendliness and sustainability. Rounded cards, glassmorphism effects, and large call-to-action buttons provide a smooth and intuitive user experience.

Contribution to the Final Product

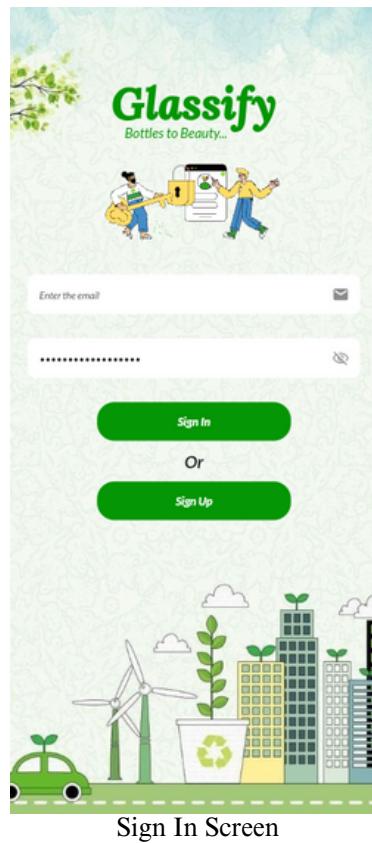
This prototype serves as a foundational step toward the final application, allowing us to identify user needs, gather insights, and ensure a seamless flow. The early version reduces risks and development costs by validating concepts before full-scale implementation.



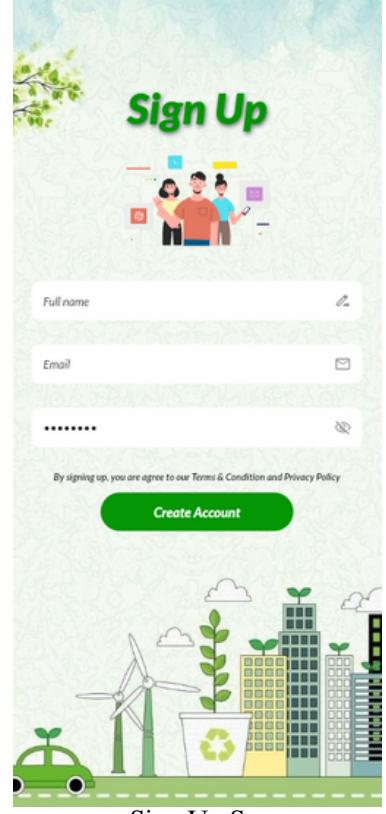
User Interface (UI) of the App



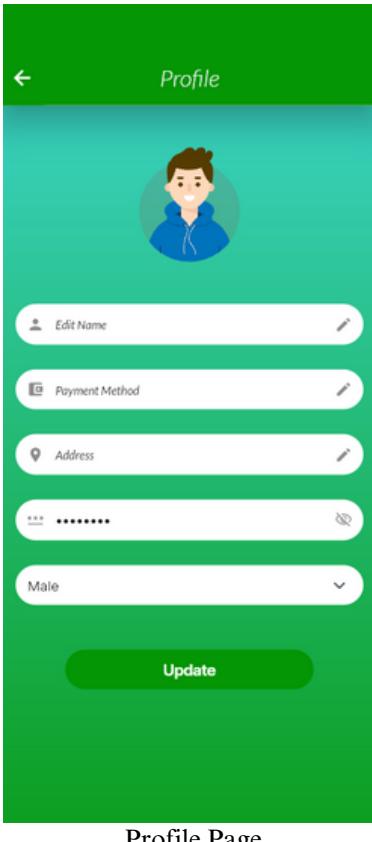
Start Screen



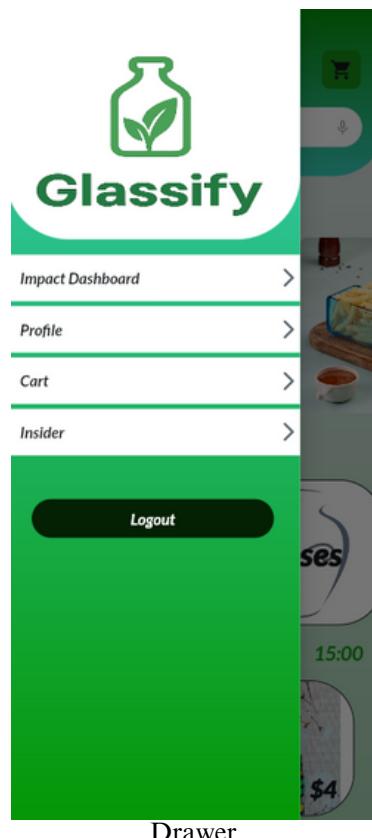
Sign In Screen



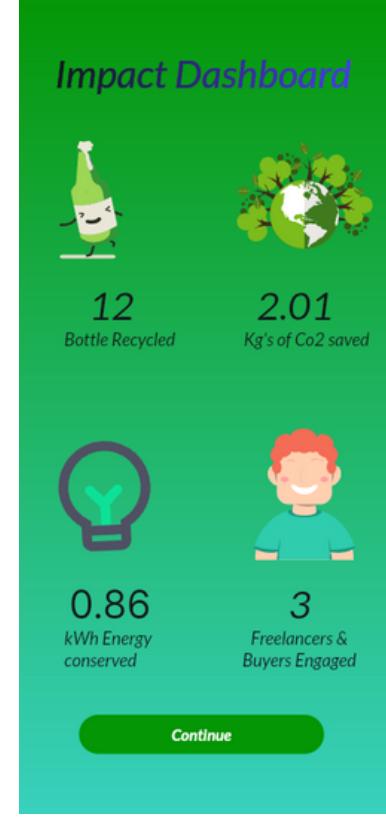
Sign Up Screen



Profile Page



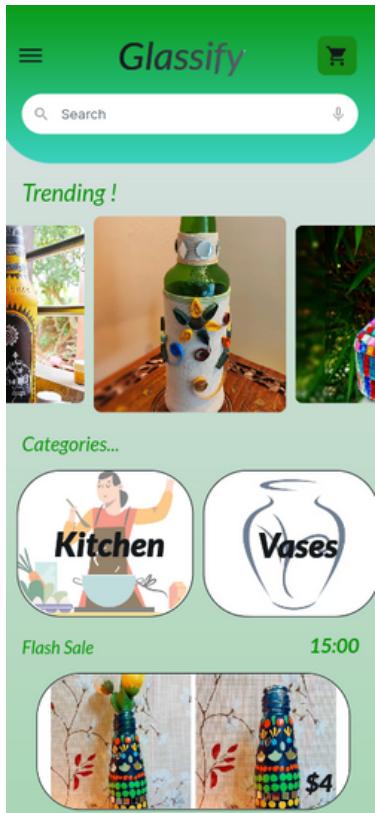
Drawer



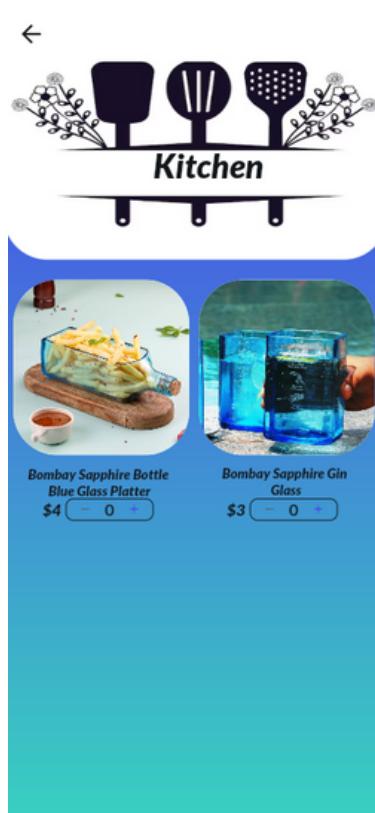
Impact Dashboard



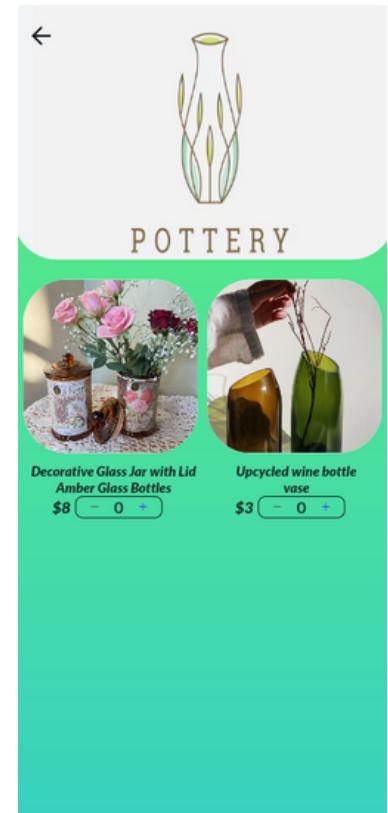
Marketplace and Cart Screen



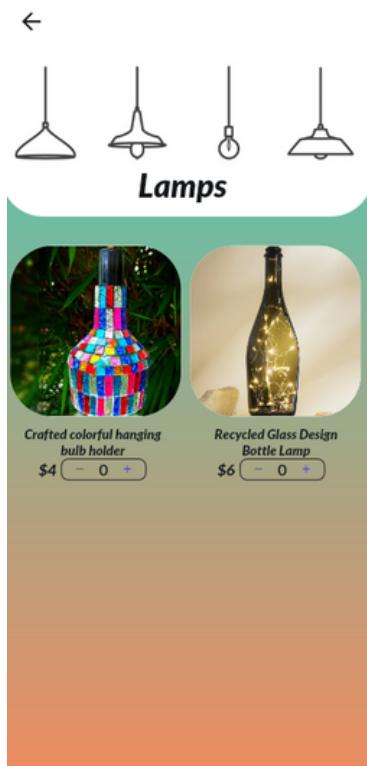
The home screen of the Glassify marketplace. It features a teal header with the app name "Glassify" and a search bar. Below the header, there's a section titled "Trending!" showing various glass items. A "Categories..." section includes icons for "Kitchen" and "Vases". A "Flash Sale" section shows two items: "Crafted colorful hanging bulb holder" for \$4 and "Recycled Glass Design Bottle Lamp" for \$6. The background has a green-to-orange gradient.



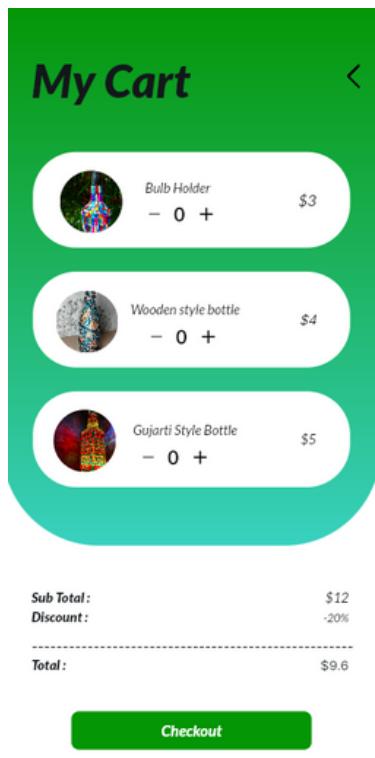
A category screen for "Kitchen" items. It shows a title "Kitchen" with three decorative icons: a blue wine glass, a blue fork, and a blue spoon. Below the title are two product cards: "Bombay Sapphire Bottle Blue Glass Platter" for \$4 and "Bombay Sapphire Gin Glass" for \$3. Both cards have a minus, zero, and plus button for quantity. The background has a blue-to-teal gradient.



A category screen for "Pottery". It features a title "POTTERY" with an illustration of a vase. Below the title are two product cards: "Decorative Glass Jar with Lid Amber Glass Bottles" for \$8 and "Upcycled wine bottle vase" for \$3. Both cards have a minus, zero, and plus button for quantity. The background has a green gradient.



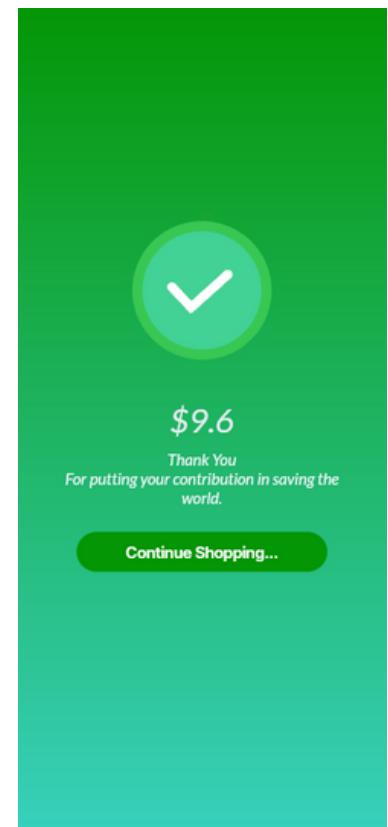
A category screen for "Lamps". It shows a title "Lamps" with four decorative icons of different lamp shades. Below the title are two product cards: "Crafted colorful hanging bulb holder" for \$4 and "Recycled Glass Design Bottle Lamp" for \$6. Both cards have a minus, zero, and plus button for quantity. The background has an orange gradient.



The "My Cart" screen. It shows a list of items in the cart: "Bulb Holder" (\$3), "Wooden style bottle" (\$4), and "Gujarati Style Bottle" (\$5). Each item has a minus, zero, and plus button. Below the cart list is a summary table:

Sub Total:	\$12
Discount:	-20%
Total:	\$9.6

At the bottom is a green "Checkout" button.



The confirmation screen after a successful purchase. It features a large green checkmark icon. The total amount "\$9.6" is displayed, along with a thank you message: "Thank You For putting your contribution in saving the world." A "Continue Shopping..." button is at the bottom.



Insider Program

The screenshot shows the 'Insider' section of the Glassify app. It features a green header with the title 'Join Glassify Creators' and a subtext 'Turn bottles into arts...'. Below this is a 'Start Creating' button and an icon of hands holding a small group of people. A large green rounded rectangle contains four thumbnail images of decorated glass bottles. Below this is a 'Bottle Request' section with a text input field 'Describe your requirement...' and a 'Send Request' button.

The screenshot shows the 'Insider Program' section of the Glassify app. It features a purple header with the title 'Join Glassify Creators' and a subtext 'Turn bottles into arts...'. Below this is a 'Upload an artwork & be a creator...' section with an icon of hands holding a small group of people. A dashed box contains a placeholder image of a landscape and the text 'Drag & drop or click to upload'. Below this is a 'Upload a demo of your artwork' section. Further down is a 'Tell us about you...' section with a text input field 'Give brief description of your work...' and a 'Submit' button.

The screenshot shows a success message. It features a large green circle with a white checkmark and decorative dots around it. The text 'Successfully uploaded' is at the top, followed by 'Congratulations, your artwork has been successfully uploaded. Once verified you will be a creator...'. A green 'Okay' button is at the bottom.

The Glassify Insider Program is a dedicated platform for talented artists and creators who want to transform used glass bottles into unique, sustainable products. This program fosters creativity, collaboration, and community building within Glassify's mission of recycling and upcycling.

Key Features:

- Artist Verification – Upload demo artwork for review and approval.
- Exclusive Access – Get used bottles and resources for creations.
- Showcase Work – Feature artwork on the Glassify Marketplace.
- Creative Community – Connect, collaborate, and share ideas.
- Growth Opportunities – Gain recognition, collaborations, and promotions.
-



5.5 Tools & Technologies Used

1. *FlutterFlow*

- A low-code platform for building cross-platform mobile applications.
- Used for designing and developing the app's user interface and navigation flow.
- Allows faster prototyping and deployment without deep coding knowledge.

2. *Firebase*

- Backend-as-a-Service (BaaS) by Google.
- Provides user authentication (sign-up, login, role-based access for users/freelancers).
- Stores data (e.g., products, orders, impact stats) securely in the cloud.
- Supports real-time database and cloud functions for seamless app performance.

3. *Figma*

- A collaborative design and prototyping tool.
- Used to create wireframes, UI/UX designs, and clickable prototypes of the app.
- Helps visualize the user journey and gather feedback before development.

4. *LottieFiles*

- A library of lightweight, scalable animations.
- Used to add interactive and visually appealing animations in the app (e.g., loading screens, success messages, impact visuals).
- Improves user engagement and gives a smooth, modern app experience.

5. *Pinterest*

- Used as a source of UI/UX inspiration.
- Helped gather modern design ideas, layouts, and color palettes for building an attractive and user-friendly app.

6. *Supporting Tools*

- Canva/Illustrator – For designing graphics, logos, and promotional visuals.



6. Conclusion

The project successfully addresses the pressing issue of glass bottle waste by transforming it into an opportunity for sustainability, creativity, and community engagement. By creating a digital platform that connects ordinary users with eco-creators, the initiative not only promotes recycling and upcycling practices but also builds an economic model where freelancers can showcase their skills and earn through their creativity.

The system ensures that every recycled bottle contributes to reducing CO₂ emissions and supports a circular economy. Features such as dashboards, impact tracking, and reward points encourage active participation from both buyers and creators.

Overall, this project demonstrates how technology and innovation can work hand in hand to solve environmental challenges, empower individuals, and promote sustainable development. With further expansion and integration of advanced technologies, the platform has the potential to become a global movement towards eco-conscious living.

6.1 Learning

The development of this solution provided valuable insights into both technical and operational challenges.

- **Problem Understanding** – Gained insights into the environmental issues caused by glass waste and how upcycling can provide sustainable solutions.
- **Research Skills** – Learned how to conduct field visits, stakeholder interviews, and secondary research to identify real challenges and user needs.
- **Design Thinking** – Understood the importance of empathizing with users, defining problems, ideating, prototyping, and testing solutions.
- **Technical Knowledge** – Learned about building a digital platform/marketplace, including user authentication, dashboards, product listing, and order management.
- **Collaboration & Teamwork** – Worked in a group setting, improving skills in brainstorming, task division, and communication.
- **Sustainability Awareness** – Developed a deeper sense of responsibility towards the environment and how technology can drive positive impact.
- **Prototyping & Tools** – Gained exposure to UI/UX design tools (like Figma/Flutter Flow) and learned how to convert ideas into working prototypes.
- **Entrepreneurial Thinking** – Understood how to link social good with business models by creating a platform that empowers freelancers while promoting eco-consciousness.



6.2 Future Scope

The proposed solution has several promising areas for future expansion:

1. Expansion Beyond Glass Bottles

- Extend recycling to plastic, aluminum, paper, and e-waste.
- Build a complete circular economy marketplace.

2. AI & Personalization

- AI-powered recommendations for buyers (suggesting eco-products based on preferences).
- AI design assistance for creators (suggesting product ideas from bottle shapes).

3. AR / VR Integration

- Users can visualize how upcycled items (lamps, décor, etc.) will look in their home.
- Virtual exhibitions for creators to showcase products globally.

4. Gamification & Rewards

- Leaderboards for top recyclers/creators.
- Streaks & badges for eco-friendly actions.
- Redeemable reward points for discounts, vouchers, or even carbon credits.

5. Partnerships & CSR Integration

- Collaboration with restaurants, bars, and bottle manufacturers for bottle collection.
- Tie-ups corporates under CSR(Corporate Social Responsibility) for funding and large-scale recycling drives.

6. Blockchain & Transparency

- Use blockchain to track the lifecycle of each bottle—from waste to product.
- Provide authenticity and traceability for eco-conscious buyers.



7. Reference

1. Avik Kumar Das & Jiacheng Xiao (2025)

Upcycling waste glass bottles as a binder within engineered cementitious composites (ECCs): Experimental investigation and environmental impact assessment.

- Explores using powdered glass from single-use waste bottles in sustainable concrete mixes, enhancing mechanical performance and durability.

Link : https://doaj.org/article/1f43d56d7de44db6b4a97da6fd6c96dc?utm_source=chatgpt.com

2. J. García Guerrero et al. (2021)

Sustainable Glass Recycling Culture-Based on Semi-Automated Glass Bottle Cutter Prototype.

- Presents a semi-automated process to encourage a recycling culture, focusing on upcycling waste glass into reusable products using Integrated Sustainable Waste Management (ISWM) and the Quintuple Helix Model.

Link : https://www.mdpi.com/2071-1050/13/11/6405?utm_source=chatgpt.com

3. Zero Waste Europe (2020, December 7)

Reusable vs single-use packaging – A review of environmental impacts (Press Release)

- Reports that reusable glass packaging achieves an 85% reduction in carbon emissions compared to single-use alternatives, highlighting the environmental benefit of reuse.

Link :

https://foodpackagingforum.org/news/zwe-report-identifies-climate-benefits-of-reusable-packaging?utm_source=chatgpt.com

5. Glass Packaging Institute (2023)

Why Recycling Glass Bottles is Crucial for the Environment

- Highlights key benefits: recycling glass saves nearly equal weight in raw materials, prevents ~1 ton of CO₂ emissions per ton recycled, and conserves energy.

Link :

https://www.gpi.org/blog/why-recycling-glass-bottles-is-crucial-for-the-environment?utm_source=chatgpt.com