Lab 1 – LivelyShelfs Product Description

Asia Gillispie

Old Dominion University

CS411W

Dr. Sarah Hosni

February 28, 2025

Version 1

Table of Contents

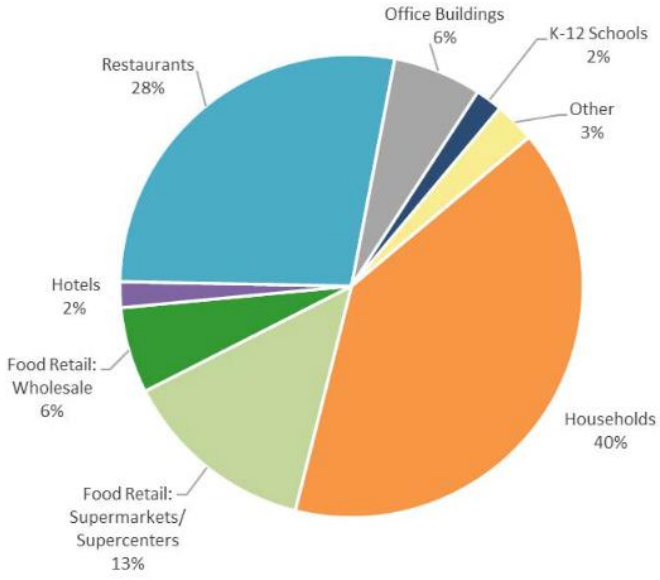
List of Figures

1 Introduction

Food waste is a large and continuing global issue and societal problem that affects our lives financially, environmentally, and socially. One of the leading producers of food waste in the US are households; A 2019 report stated that household food waste accounted for 40% of total food waste, as shown in Figure *1*. According to the same 2019 report by the EPA, an estimated 66.2 million tons of household food waste was created. The world mass produces food, but many are unaware of the issues caused by food waste. Some people are too busy to seek out ways to reduces their waste, and some lack the knowledge of how to reduce their food waste.

Figure 1

Percentage of Wasted Food from Residential, Retail, and Service Sectors (EPA, 2023)

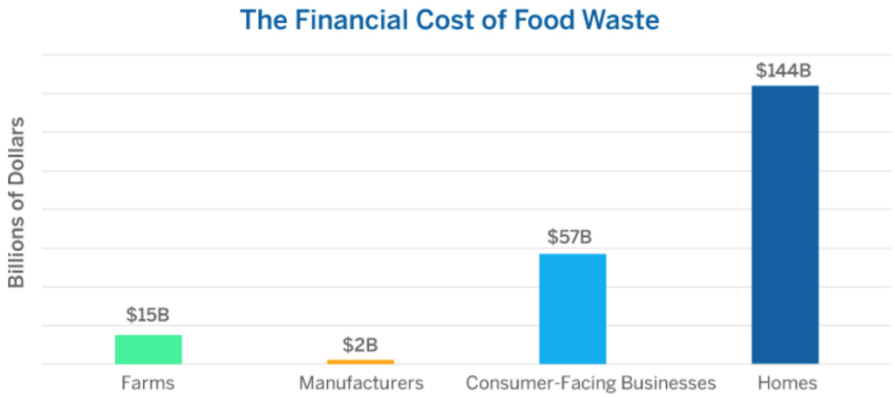


Food waste created in sectors such as businesses and farming equate to a monetary loss as shown in Figure *2*. Every year there is about $940 billion lost due to food waste, with the US being $218 billion of that loss (Shapiro, 2024). In households, purchased food that goes to waste equates to a monetary loss since the purchaser does not get to use all of what they paid for.

According to a study, “the average American consumer spends roughly $1,300 per year on food that ends up being wasted.” (Berard, 2020). Many are unaware of this loss since many people don’t usually track how much they lose based off what they throw away.

Figure 2

Financial Loss Per Sector in the US (About Kitche | Kitche Food Waste App | Kitche App, 2023)



The creation of food can be resource intensive, since over production of food depletes resources for vulnerable communities. Other aspects of food waste such as the environmental cost can also affect the welfare of people by contributing to pollution, affecting the land, and contributing to global warming. Agriculture uses about 70% of all water use, and many ecosystems are destroyed to make space for more farmland (Lewis, 2022). The creation of food waste equates to wasting the important resources used to make it which includes the needless destruction of ecosystems and their biodiversity. Food waste usually accumulates at landfills which negatively affect the environment. Landfills also require land, meaning ecosystems must be destroyed in the process of making them. They are also the producer of 8% of global greenhouse gas emissions; since, landfills produce emissions such as methane and carbon dioxide, which contribute to global warming (Move For Hunger, n.d.).

Even with the mass production of food and mass wasting of it, many people still suffer from food insecurity. It was reported that in 2023, 2.3 billion people suffered moderate to severe food insecurity (Berard, 2020). It was also reported in 2022 that 2.8 billion people couldn't afford healthy diets with a large percentage from lower income countries (World Health Organization, 2024). People end up suffering from both the lack of or lack of quality good food and the environmental affects caused by the mass creation of food waste.

Our proposed solution to reduce food waste and reduce food insecurity is our application LivelyShelfs. LivelyShelfs is a proactive tool to aid busy household by helping in food waste management. LivelyShelfs tracks the user's trends and provides notifications to aid in food waste management. This application helps in reducing food waste by providing a place for people to share food items instead of letting them go to waste. LivelyShelfs provides the user with information and recommendations to help them reduce their food waste and help the environment.

LivelyShelfs provides a way to track grocery spoilage, providing the user with a calendar and list to help provide a visualization of what they have and what nearing their spoil date. Based on user input and actions, a visualization of the user's trends is provided to show how well they are reducing their food waste and how much they have monetarily saved. The application will also incorporate predictive waste analysis, notifying the user on their purchasing habits based on their trends. The application provides convenience through easy item logging by making use of the camera. LivelyShelfs will provide the user with information such as food preservation and greener actions they can take. The application recommends the user recipes based on their food inventory and what items are nearing their spoil date. One of the sections of the application is community hub that allows friends and families to connect and share food items.

Our solution would reduce the creation of food waste; less food waste would be going into landfills, which would help the environment. Users save money since purchased food items wouldn't be going to waste. Users will see how they handle their food and gain a better understanding of how much food waste they create. The users would have access to educational resources on the topics of food waste, and its effects on the environment. LivelyShelfs encourages users to make more environmentally friendly actions and spreads awareness on the effects of food waste and food insecurity. Our application also helps combat food insecurity by encouraging the sharing of food to those that need it while also tackling the problem of food waste.

2 LivelyShelfs Product Description

LivelyShelfs is an Application that helps in food waste management. It tracks a user's food items and their expiration dates. This is accompanied with visuals to aid the user in managing their food waste. The application provides recommendations on what to do with waste and what to do with food items to reduce waste. LivelyShelfs provides predictive waste analysis to notify the user and help prevent the production of food waste. Information is given to the user to inform them about preservation and food waste. The application provides convenience by utilizing camera input to ease the user's experience when it comes to logging. The application also provides a hub to allow food sharing between people to cut down on food waste. The goal is to proactively reduce food waste, helping users manage and visualize their management while being provided with the information to aid them in reducing waste.

2.1 Key Product Features and Capabilities

The LivelyShelfs application will estimate and track the expiration dates of food items the user has inputted in their food inventory. Users can input items in their inventory manually or through use of the bar code scanner with their camera. The expiration dates will be shown

visually through a calendar and list view. There will be visual indications of what food items are nearing their spoilage date via color coding. The application will also track how the user has managed their grocery spoilage. This data will be used to create visuals for the user's trends. Keeping track of the user's trends will be a component for the waste analysis feature. Users will be notified of the food items nearing their spoil date and will be notified if they continue to buy specific food items and waste them.

The LivelyShelfs application will provide the users with various kinds of information and will link the user to the source of the information. In the calendar and list view section of the application, selecting a food item shown will bring up information on the food item such as how it will spoil and the best-known way to preserve that food item. Links to where the food item information is pulled will be provided to the user. In the recommendation section, information about the greener actions the user can take will also be provided. There will also be links to the sources for the recipes in the recommendation section.

The LivelyShelfs application will provide the user with recommendations based on the state of their food item inventory, such as what food items are nearing their spoilage date. Depending on the types of food the user has nearing the spoilage date and the food the user currently has logged, recipes using those food items will be shown to the user. If the user does not want to cook food items nearing their spoilage date, then the user will be recommended to use the community hub, Shelf Friends. If the user ends up creating food waste, the user will be recommended greener ways to deal with food waste such as composting.

The LivelyShelfs application will provide a community hub called Shelf Friends. Shelf Friends will connect the user to other users they add to their Shelf Friends group. This feature is where the user will be able to share food items they are not going to use before their spoil date to

others. In the food item inventory, there will be an option to set food items as sharable. Users will be able to message each other about food items they want to share and will receive notifications from other shelf friends.

The most innovative features of the application are the predictive waste analysis feature and the Shelf Friends feature. The competitors do have similar features such as a food management calendar and data visualization, but these features are spread out between them. LivelyShelfs compresses many of those features into one and includes our own unique features. The calendar, data visualization, trend analysis, and predictive waste analysis helps the user in food waste management. The user can keep track of their food, what they do with it, and see what they can change to reduce food waste. Recommendations gives the user ideas of what to do with food they have, so they can utilize all of what they bought instead of creating waste. In the case they do make waste, they are provided with information on environmentally friendly ways to deal with it to reduce their food waste's effect on the environment. Information provided to the user is to further prevent food waste creation by informing the user how to maximize their foods shelf life. Shelf Friends helps by reducing the creation of food waste by giving users an easy way to get in contact with people to share food they don't want. This also helps with food insecurity since food can be given to those who need it.

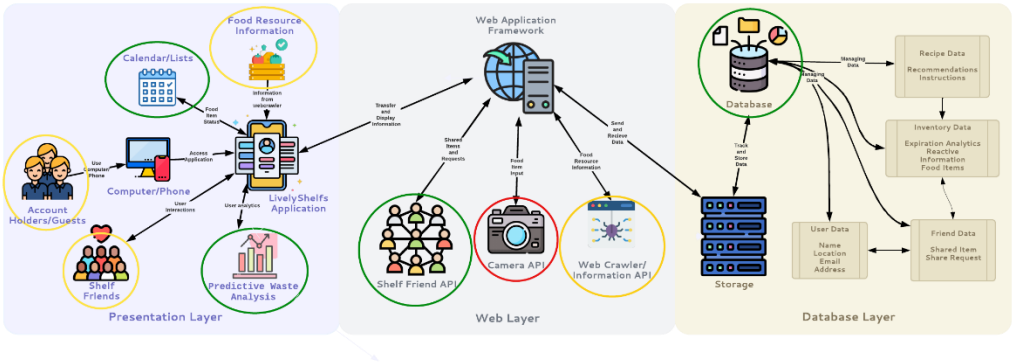
2.2 Major Components (Hardware/Software)

The hardware required for this application would at minimum include a modern-day computer that can access the internet or a mobile device. The application is more built towards mobile devices due to its utilization of the camera to input items into the user's inventory. If the user's camera does not work or if the device does not have a camera, the user can use the "input manually" function instead.

The major functional components of LivelyShelfs as seen in Figure *3* are structured as a three-tier architecture. This architecture includes the presentation layer, web layer, and database layer.

Figure 3

Major Functional Components Diagram



The presentation layer shows the parts and interactions between the user and the LivelyShelfs application and the application's interaction with the web layer. Account holders and guests will be able to access the application through computer or phone. Input from the user in the LivelyShelfs application regarding food items and their status will be shown from the calendar and list. Food resource information shows the sources of the information which will be grabbed by the web crawler and then presented to the user. Shelf Friends' interaction with the application includes interactions between users and the user with the application such as messages and notifications. The user's interaction with the application adds toward calculating the users' trends and leads to the predictive waste analysis function. Predictive waste analysis includes the notification the application displays and the data that was gathered from the user.

The web layer shows the parts and interactions between the APIs, the web application framework, and the other layers of the architecture. The web application framework will be

transferring web data needed for displaying information in the LivelyShelfs application in the presentation layer. The Shelf Friends API will be used for the functionality involving item sharing, requests, and shelf friend user interactions. The Camera API will be used for the logging methods that use the camera, such as the bar code scanner. The Web Crawler/Information API will be used to scour the web for the information regarding food items, recipes, and greener actions people can take. The web application framework will send information to the storage in the database layer that is needed.

The Database Layer shows the parts and interactions between the database and the web layer. Information from storage will be sent to and received from the web application framework. Data in storage will be managed by the database. The main four sections of data that will be stored in the database is the user data, friend data, inventory data, and recipe data. The database will be queried for information needed for the application.

The software will consist of various sections. First is the login and signup page, where the user will later gain access to the navigation section. From the navigation section, the user will be able to access their calendar and list, Shelf Friends, and settings. The calendar and list will give the user access to the food management features, recommendations, and information sections. Shelf friends is the community hub where the user will be able to add friends to their Shelf Friends group. This is where they'll be able to message other users when they want to share food. The setting section is where the user will be able to edit notification and account settings. On the non-mobile web application, the user will be able to access most features but will not be able to use the camera feature. The mobile application will be able to allow the use of the camera feature to upload food into their inventory.

3 Identification of Case Study

The target customers for LivelyShelfs are busy households, especially those that have the goal of reducing their food waste. Another target customer is anyone who cooks or purchases groceries. Generally, the target customer encompasses homes who lack time, struggle with food management, need cooking plans, and want to be more environmentally friendly. The reasons why these are the target customers is due to households being a pillar of food waste creation. The goal of the application is to reduce the creation of food waste by tackling waste creation in homes.

The customers and users of the case study group share many similarities due to the goal of the app. The types of users that would use LivelyShelfs include people who struggle with tracking and managing their groceries. Another type of user that would use LivelyShelfs are those who want to minimize excess food purchases. Another type of user that would use LivelyShelfs are those who want to get into cooking or want to broaden their use of food that they have. Many of the app's features would help users who struggle with managing their food, planning what to purchase, and planning what to cook. The prototype feedback from both the target customers and users would be important especially on the front of convenience and functionality.

The potential stakeholders of LivelyShelfs are mainly those with the goal in reducing their food waste. Such stakeholders include community groups that have the goal in reducing food waste and want the benefits of food waste reduction. Business and Retailers who have the goal of reducing food waste creation are potential stakeholders, since some tend to support organization and groups with goals in helping the environment and people in need. Political organizations who oversee and are concerned with aspects of the environment such as the current climate

crisis, pollution, and the destruction of ecosystems due to farming and landfills are potential stakeholders.

The potential users of the app in the future are very similar to the users described before. Though the target customers are busy households and people in charge of groceries, generally anyone could use and benefit from using this application. If the application was tweaked a bit depending on stakeholder feedback, the app's usage could delve into helping businesses and retailers with the number of products they make and sell. For example, a grocery store manager could see what food items don't sell and what largely ends up being waste. One of the main goals of the application is to decrease food waste creation, and businesses are one of the other pillars of waste creation next to households, as show in Figure *2*.

4 Glossary

API: Also known as "Application Programming Interface" it is a protocol that allows for different software applications to communicate with one another.

Community Hub: A part of LivelyShelfs that helps bring the community together and allows user interaction to share sustainable habits and tips.

Database: An organized collection of information stored electronically.

Food Insecurity: Not having access to enough food to meet ones needs or not being able to access quality food to meet ones needs.

Food Waste: Food that isn't used for it's intended purpose or is not used before spoiling.

GitHub: A service that allows developers to collaborate on the development of projects and provides version control.

GitHub: A service that allows developers to collaborate on the development of projects and provides version control.

JUnit: A testing framework for Java.

Landfills: A site where waste is disposed of, typically the waste is covered by soil.

Spoilage Calendar: An efficient and intuitive calendar provide by LivelyShelfs that notifies users of when their food is going bad

Landfills: A site where waste is disposed of, typically the waste is covered by soil.

Spoilage Calendar: An efficient and intuitive calendar provide by LivelyShelfs that notifies users of when their food is going bad

Sustainability: A goal to avoid actions that harm the environment or deplete natural resources while still meeting ones needs.

Trello: A service that helps with project management and planning.

VSCode: Also known as "Visual Studio Code" it is a development environment used by the team that is compatible with many different languages.

Web Application Framework: Software platform intended to help developers in building web applications, providing access to pre-built tools and libraries.

5 References

About Kitche | Kitche Food Waste App | Kitche App. (2023, June 26). Food Waste App | Save Money on Food | Kitche App; Kitche. https://kitche.co/the-app/

Assistant Secretary for Public Affairs (ASPA). (2019, April 26). *FoodKeeper App*. FoodSafety.gov; FoodSafety.gov. https://www.foodsafety.gov/keep-food-safe/foodkeeper-app

Berard, A. (2020, April 20). *Study calculates true cost of food waste in America*. William & Mary. https://www.wm.edu/news/stories/2020/study-calculates-true-cost-of-food-waste-in-america.php

Defoy, J. (2019). *Save on groceries and fight food waste | FoodHero*. Www.foodhero.com. https://www.foodhero.com/

Ehlert, J. (n.d.). *Fridgely | Food Expiration Date Tracker*. Fridgely. Retrieved January 24, 2025, from https://fridgelyapp.com/

EPA. (2023). *2019 Wasted Food Report*. Retrieved January 24, 2025, from https://www.epa.gov/system/files/documents/2023-03/2019%20Wasted%20Food%20Report_508_opt_ec.pdf

Expiry Tracking Fridge, Pantry and Recipes Manager App, Grocery Shopping List • Cozzo Smart Kitchen App. (2023, January 6). CozZo Smart Kitchen App. https://cozzo.app/

Home. (2017). NoWaste. https://www.nowasteapp.com/

Idriss, M. (2020, May). *FoodShiner - Prevent food waste, save the earth*. FoodShiner. https://foodshiner.app/en/

Igini, M. (2022, November 23). *10 Food Waste Statistics in America*. Earth.org. https://earth.org/food-waste-in-america/

Kroll, K. (2018, July 27). *The Financial Cost of Food Waste | Brown Advisory*. Www.brownadvisory.com. https://www.brownadvisory.com/us/insights/financial-cost-food-waste

Lewis, J. (2022, October 12). *How Does Food Waste Affect the Environment*. Earth.org. https://earth.org/how-does-food-waste-affect-the-environment/

Move For Hunger. (n.d.). *The Environmental Impact of Food Waste*. Moveforhunger.org; Move For Hunger. Retrieved January 24, 2025, from https://moveforhunger.org/the-environmental-impact-of-food-waste

Olio. (n.d.). *Olio - Your Local Sharing App*. Olio. Retrieved January 24, 2025, from https://olioapp.com/en/

Shapiro. (2024, January 23). *The Economic Impact of Food Waste*. Shapiro. https://shapiroe.com/blog/economic-impact-of-food-waste-effects/

Sharewaste. (n.d.). ShareWaste. Retrieved January 24, 2025, from https://sharewaste.com/

Too Good To Go. (n.d.). *Save Good Food From Going To Waste*. Www.toogoodtogo.com. Retrieved January 24, 2025, from https://www.toogoodtogo.com/en-us

UNEP. (2024, March 27). *World squanders over 1 billion meals a day - UN report*. UN Environment. https://www.unep.org/news-and-stories/press-release/world-squanders-over-1-billion-meals-day-un-report

USDA. (n.d.). *Food Security in the U.S. - Key Statistics & Graphics* . Usda.gov. Retrieved January 24, 2025, from https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/key-statistics-graphics#verylow

World Health Organization. (2024, July 24). *Hunger numbers stubbornly high for three consecutive years as global crises deepen: UN report*. World Health Organization.

https://www.who.int/news/item/24-07-2024-hunger-numbers-stubbornly-high-for-three-consecutive-years-as-global-crises-deepen--un-report