GroceryMind: A Smart Solution for Food Inventory Management and Waste Reduction

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Abstract— **Food waste has become a worldwide crisis that creates substantial economic waste as well as significant environmental destruction. Grocery management inefficiencies worsen the problem by allowing expired goods to remain unchecked together with buying the same items twice. Despite the availability of various apps for grocery lists and reminders and inventory tracking these features operate independently from each other forcing users to stay on separate platforms [2]. Food tracking features together with expiry alerts and a single smart shopping list interface form the basis of GroceryMind which operates as a mobile platform. The platform fulfills the objectives of SDG 12 - Responsible Consumption and Production through its implementations for responsible consumption and waste reduction.**

Through its system GroceryMind provides users with convenience while fostering sustainable shopping practices by helping users make efficient use of food items and reducing purchase waste.

Keywords— Food tracking, grocery management, waste reduction, sustainable consumption, smart shopping lists

I. INTRODUCTION

Global food waste continues to be an ongoing issue because yearly food waste exceeds 1.3 billion tons [1]. The major cause of food waste in households arises from inadequate grocery management through expiration date tracking shortcomings and excessive buying habits and insufficient inventory knowledge. Grocery management tools which include to-do lists and reminders and digital note-taking apps fail to provide automation and efficiency, so consumers end up wasting food.

The GroceryMind solution solves these issues with its integrated platform layout which helps users monitor food stock along with sending warnings about expiration dates and creating intelligent shopping lists. The service operates differently from existing platforms by combining grocery management into a single interface which eliminates requirements for various apps. The system utilizes real-time inventory tracking and group collaboration together with AI meal suggestions functionality to improve food management practices through better user decisions and waste reduction.

II. LITERATURE REVIEW

Rising food waste concerns motivated developers to create tools for grocery management systems focused on reduction of spoilage alongside household organization improvement. The features within mobile apps and smart homes together with digital tools do not supply a complete solution to food waste management problems [3].

Utility software currently exists in three different forms which include list-making applications and inventory management systems together with smart home automation solutions. Although beneficial these tools do not achieve automatic functionality nor collaboration nor sustainability practices. Food-sharing apps solve food redistribution, yet they remain separate from standard daily groceries [3].

The fragmented system shows that users need a holistic approach to deliver effective grocery management platform which streamlines user interactions for enhanced waste reduction capabilities.

A. Traditional Grocery Management Solutions

People use simple note-taking applications together with calendar alerts and task lists to handle their grocery requirements. These tools enable quick usage but users must manually maintain their lists and track inventory in real-time while also needing automated alert functions.

The popular applications Google Keep, Apple Notes and Microsoft To-Do provide insufficient features for grocery management requirements. Users track products and maintain expiration dates by hand in these systems at their own risk of wasting food. Users experience fragmentation in their grocery management due to the need to use different applications because these applications do not integrate well.

B. Inventory Tracking Applications

Food inventory management platforms exist specifically for this purpose while they fill some gaps exposed in conventional approaches.

Out of Milk: Users can leverage on it to manage their basic list of shopping items and track inventory. Users benefit from this application through its user-friendly layout to create different product groups. Users of Out of Milk must perform manual updates of item info because this platform does not offer automated expiry alerts or real-time inventory tracking. [7]

NoWaste: This app provides a focused service to monitor expiration dates by enabling users to record purchase information and keep track of storage and expiration data. The effective tracking of expiry dates in NoWaste suffers from severe dependence on user-manual entry which creates opportunities for oversight and system inefficiencies. [8]

FridgePal: This is an inventory management system to organize food items so the app will notify them about product expiration dates. Users using FridgePal will struggle to collaborate with others on grocery management since the platform does not offer features for shared collaboration. [9]

III. IDENTIFIED GAPS IN CURRENT SOLUTIONS

Numerous problems persist in the existing grocery management tools that prevent users from tracking food properly and reducing waste effectively [2] [3]. Key gaps identified include:

Lack of Integration: People use various isolated applications to manage their inventory while also tracking expiration dates along with generating shopping lists.

Limited Automation: Most solutions require manual updates, reducing efficiency and increasing the risk of expired food.

Absence of Group Collaboration: Very few platforms allow users to collaboratively monitor shared inventory information which is necessary for families or people living together.

Inadequate Meal Planning Support: Most solutions lack capabilities to generate personalized meal recommendations using ingredients that are nearing expiration dates.

IV. PROPOSED SOLUTION

To address these limitations, GroceryMind introduces a comprehensive platform with the following features:

Integrated Grocery Management: One platform brings together features that track foods and display expiry notifications and organize shopping lists for GroceryMind users. The system consolidates grocery-related tasks into one platform thus eliminating the requirement of multiple applications and streamlining grocery management for everyday use.

Automated Expiry Reminders: The application generates notification alerts which appear 1, 3 or 5 days before expiration happens to specific items. The automated system decreases manual tracking work while enabling users to prevent waste by ensuring timely use or charitable donation of goods.

Group-Based Collaboration: Group members who share access to GroceryMind can monitor inventory simultaneously which helps them prevent duplicate purchases and work more seamlessly together.

Meal Suggestions: Users can get recipe recommendations using inventory content with priority for products that are running short before their expiration date.

V. METHODOLOGY

The development process of GroceryMind utilized design methods intended to create a user-friendly system featuring multiple features dedicated to grocery management combined with social collaboration and improved food waste reduction. The Agile Development Framework guided development because it allowed the team to build the platform through incremental updates and ongoing user input and technical requirements adjustments.

The following steps outline the development process adopted to build GroceryMind:

1.Requirement Analysis:

The development of GroceryMind started with a thorough requirement analysis dedicated to determining user problems while evaluating available solutions and specifying what primary grocery management functions should be included.

An extensive user survey comprising multiple demographics was performed which included participants from families as well as students and working professional households. The survey delved into understanding how users shop for groceries alongside their problems regarding food inventory care as well as how they monitor expiration dates. About eighty percent of users reported that they struggled with date memorization and stored food monitoring alongside list synchronization across multiple family members. Survey respondents displayed annoyance regarding the need to use different programs for grocery-related tasks because they demanded an integrated platform.

A requirement analysis received extended support as the team evaluated major grocery tracking applications Out of Milk, NoWaste and FridgePal. The team studied all platforms to detect essential shortcomings and advantages which helped identify fundamental functional shortcomings. The examination exposed three main problems which involved both the reliance on hand-driven information processing and inactive automated expiration notifications and insufficient teamwork capabilities. The collected insights proved that a platform with unification between food inventory tracking and automated reminders and group-based grocery management systems was essential.

Based on the findings from user research and competitor analysis, the team defined GroceryMind's core functionalities to include:

- Inventory tracking
- Expiry reminders
- Group-based collaboration
- Smart shopping list generation
- Meal Generation

2.Design Phase:

During the Design Phase the platform's interface received essential work to achieve both maximum user comprehension and convenience. User interface development started with basic wireframes showing needed flow paths and structure designs together with feature arrangement. The wireframes showed essential screen layouts for:

- Secure account creation features through User Registration and Login screens are available in the platform.

- The interface allows users to manage inventory data efficiently for tracking stored items.

- A system of expiry reminder screens delivers obvious food expiration date alerts to users.

- Group Management System for collaborative grocery tracking.

- The system contains a Smart Shopping List Interface that shows users which items to purchase.

- The application provides food recommendations through the remaining food items listed in the grocery.
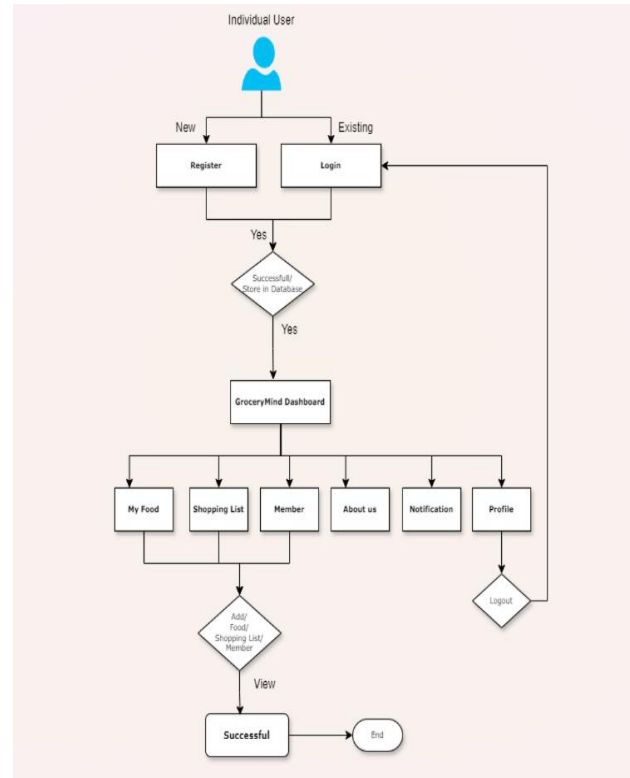
3. Architectural Diagrams:
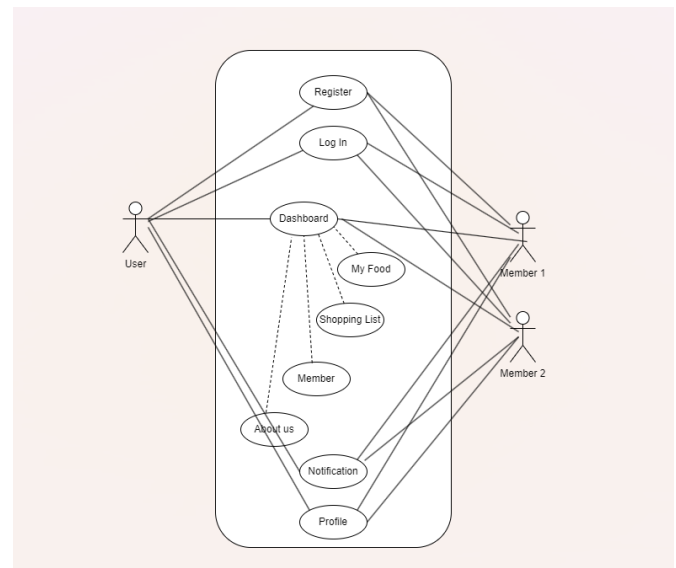

Fig 1. work-flow diagram

Fig 2. Use case diagram

4. System Architecture Overview

Different components form the basis of the system architecture:

Frontend Interface: The frontend interface implements a user interface using React.js as its dynamic JavaScript framework because of its exceptional ability to create interactive and responsive user interfaces. The selection of React.js stemmed from its component-based management

between frontend and backend services together with its efficient design capabilities.

Backend Services: The system implements Backend Services through MongoDB together with Express.js for managing API endpoints as well as user authentication and core business logic.

The software performs CRUD operations on inventory data as well as triggers expiry reminders by running scheduled services and guarantees group collaboration through real-time shared list synchronization.

VI. IMPLEMENTATION

The following screenshots of the application describe the functionality of each features:
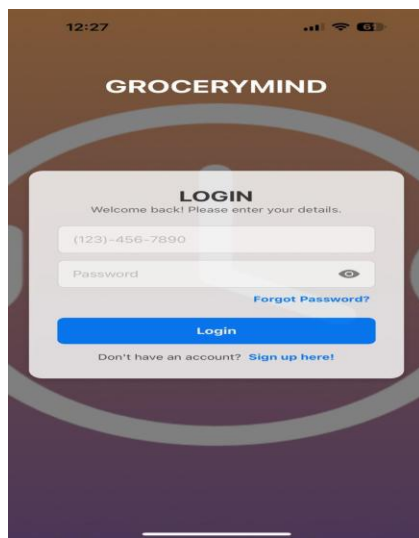

Fig3. Login Screen

Through this screen GroceryMind enables secure user access with mobile phone number authentication as well as password verification. The system provides complete signup functionality and a working forgotten password feature to support user account setup and retrieval.
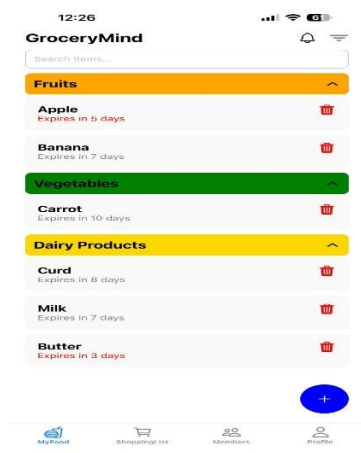

Fig 4. Home Screen

On this screen GroceryMind shows MyFood inventory which displays grocery items through Fruits Vegetables and Dairy Products categories while also showing item expiry countdowns. Specific items approaching expiration dates become highlighted in red so users can use items before they become wasted.

Fig 5. Shopping List

The GroceryMind application provides users with its Shopping List screen to track and control grocery items along with their required amounts. Through this feature users maintain planning efficiency because it stops them from buying duplicates at the store while organizing their grocery shopping activities.

Fig 6. Members screen

The members feature of GroceryMind allows users to manage household member access through this screen which includes addition and removal capabilities. The system allows different users to handle jointly their shared food inventory and shopping list through a single interface.

Fig 7. Profile Setup

Through this Profile screen of GroceryMind users gain access to important account functions along with features for finding meal suggestions and receiving expiry reminders and managing their food donation contacts. The update section contains information about the application alongside a section for receiving announcements in a centralized user control interface.

Fig 8. Meal Suggestions

Users can explore recipe videos through the meal suggestion feature located on this screen that functions with available ingredients.

VII. USER FEEDBACK & INSIGHTS

Relationship mapping for GroceryMind's functionality and user experience required an interview process with a limited number of users. The interviews served to discover which current grocery administration difficulties users face while collecting input about the app components.

USER 1: Ankita, Working Professional- Ankita who works professionally states that she loses track of expiration dates thus discarding healthy items by mistake. "*The process of tracking my groceries through multiple apps proves to be inconvenient for me. A single application which functions as an inventory tracker while keeping me updated about expiration dates seems perfect*"

Feedback for GroceryMind: Ankita highly praised the GroceryMind app because it includes an expiry reminder system along with unified grocery management functions.

USER 2: Jinak, A Parent- For Jinkal who is a parent running between responsibilities the process of coordinating grocery shopping tasks with his partner feels difficult. "*People frequently make the mistake of purchasing duplicates. A system that enables users to share their grocery lists would solve many daily convenience issues.*"

Feedback for GroceryMind: She recognized group collaboration as essential for GroceryMind because it would let users share lists to prevent duplicate buying and enhance household coordination

USER 3: Dylan, A Student- The college student Dylan frequently finds unused food items at home without proper cooking knowledge. I would value the tool that suggests recipes according to the existing items in my refrigerator. "*I would value the tool that suggests recipes according to the existing items in my refrigerator.*"

Feedback for GroceryMind: The meal suggestion feature in GroceryMind receives special interest from Dylan because he believes this functionality enables efficient ingredient to reuse to decrease food waste.

VII. CONCLUSION

The GroceryMind system brings substantial innovation to grocery management field. The platform functions as a user-friendly solution which resolves typical problems including expiration management and group organization and dietary planning features. The platform contains features with meal recommendation capabilities together with adjustable shopping list capabilities designed to minimize food waste and enhance purchasing efficiency. Customers strongly support the app because it offers first-class services that enable easier grocery management alongside decreased food waste.

The ongoing development of the project will strengthen its features through the addition of barcode scanning technology along with food based expiry suggestions features and food donation integration modules. The GroceryMind tool supports SDG 12 Responsible Consumption & Production by providing people with an effective system to improve household sustainability through better purchasing habits.

The development of GroceryMind showcases how technology effectively works toward sustainability through typical everyday activities like grocery purchasing. User feedback integration with iterative development and innovative features will enable GroceryMind to become essential for people who want to combine food inventory management with sustainable living practices.

VII. FUTURE WORK

The current version of GroceryMind successfully merges its core features, meal suggestion technology and shopping list capabilities yet various interesting options remain for additional development. Future work for GroceryMind consists of these main developments:

Barcode Scanning Integration: The system will integrate barcodes to enable users with an automated inventory entry protocol. The barcode scanning feature enables users to bring products into inventory with automatic data input that eliminates lengthy manual entry.

Food Donation Integration: The platform will identify local community food partners to develop food donation features within the mobile app for users to donate additional food products. Through integration the system will help decrease wasted food while helping the community.

Automatic Expiry Suggestions: Automatic Expiry Suggestions will provide recommendations for meals and product utilization that approaches expiration dates. The application includes a feature detection system which finds expiry-sensitive food items before offering suitable recipe recommendations. The application features will cut down food waste because users will consume perishable items before their expiration dates.

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