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An abstract

This project focuses on the development of **GrocerEase**, an innovative Grocery Management Application designed to optimise inventory control, streamline user management, and enhance order tracking processes. The application integrates **Microsoft PowerApps** as the front-end interface and **SharePoint** as the centralised database to automate essential operations. One of its key features is real-time inventory updates upon order placement, which significantly reduces manual errors and improves operational efficiency.

The user-friendly interface ensures a seamless ordering experience, while the integrated feedback mechanism encourages user engagement and provides valuable insights for system enhancement. Furthermore, mirrored inventory functionality guarantees data consistency and reliability, which are critical for effective grocery management. By utilizing low-code development tools such as PowerApps and SharePoint, **GrocerEase** offers scalability and cost-efficiency, making it a practical solution for grocery businesses of varying sizes.

Potential future developments include incorporating predictive analytics for inventory forecasting, advanced reporting tools, and multi-platform compatibility, allowing the application to be accessed on both mobile and desktop devices. Additional integration with external systems, such as payment gateways and delivery management platforms, could transform **GrocerEase** into a comprehensive, end-to-end solution for the grocery industry.

Introduction

Fig 1: Logo of GrocerEase

Project Background on project

Efficient inventory management and customer engagement are fundamental components of successful grocery businesses. However, traditional practices, such as manual record-keeping and the use of fragmented software systems, often result in errors, inefficiencies, and operational delays. These challenges can lead to increased costs, resource wastage, and diminished customer satisfaction, highlighting the need for a more streamlined approach.

The **GrocerEase** project was theorized to address these issues by providing an integrated and automated solution that centralizes essential grocery operations on a single platform. The application enhances inventory management through real-time stock updates, ensuring that records are consistently and accurately maintained. Additionally, it incorporates a user-authenticated log-on mechanism to safeguard security while enabling structured logging of customer orders for seamless tracking and processing.

To further enhance operational efficiency and customer experience, **GrocerEase** includes a feedback collection mechanism. This feature empowers businesses to make data-driven improvements based on customer input, ensuring continuous service refinement and data reliability. By addressing the inefficiencies of traditional systems, **GrocerEase** offers a comprehensive and modernized solution to optimize grocery management and elevate customer satisfaction.

Objective and goals

The GrocerEase project is focused on the development of a smooth, effective, and automated system for grocery businesses, ensuring ease in managing inventory, bestowing a great end-user experience, and smoothing out operational workflows.

Key objectives of GrocerEase are as follows:

1. **Inventory Management Automation:** Provide automation for inventory tracking and updating on a real-time basis. It would accurately update the amount in stock and minimize manual error tracking.
2. **Enhancements to User Authentication and Security:** Implement a secure login system for the protection of sensitive user data so that only authorized users may access inventory and order management features.
3. **Smooth the Order Management:** Log and process user orders quickly for timely fulfillment and with minimal use of manpower and paperwork to update records in the system.
4. **Gather and Act on User Feedback:** Provide a mechanism for user feedback to continuously improve based upon customer insight and suggestions.

The overall objective of GrocerEase is to provide an integrated solution to the grocery business for addressing the complex issues of inventory control, customer interaction, and order management in a much-simplified manner. The specific objectives are to:

1. **Efficiency and Accuracy:** Reduce manual data entry time and resources, tracking of orders, and inventory updates with high levels of accuracy in all processes.
2. **Cost-Effectiveness:** To develop a low-budget system for the needs of grocery business, small-and medium-scale enterprise environments, which is easily installed without necessarily involving expensive infrastructures and which requires very minimal training.
3. **Improved Customer Experience:** Ensuring seamless shopping experiences for customers through ease in placing orders, information on stock, and giving feedback about their experiences.
4. **Scalability and Flexibility:** This means that GrocerEase is going to be scalable, hence allowing grocery businesses to grow and adapt the system to their various changing needs.

. Scope of the Project

1. **Inventory Management:** Inventory management and tracking in real time shall be provided by the system GrocerEase. With every user's order, the application will update the quantity of each item automatically and allow easy access to information about items. Users shall have direct access to the system, view, and manage product stock quantities, categories, among other data
.

2. **User Authentication and Role Management:** Authentication for users will be provided securely by implementing the User ID and Password SharePoint list. Only authorized personnel will have access to the sensitive information regarding inventory, orders, and business operations. The User role can also be customized to define permissions to set higher or lower levels of access.

3.   **Order Management System:** The customer orders will be captured and logged into the User Orders SharePoint list. The application will facilitate placing orders by the customer, order status, and history tracking by the customer. Also, the admin will be able to process the order and update orders with effective management.

4.   **Customer Feedback Integration:** The Feedback SharePoint list will allow customers to submit feedback about their experience, product satisfaction, and overall service. The information obtained here will contribute to continuous improvement of the app and grocery store operations.

5.   **Agility between Mobile and Desktop:** The GrocerEase app shall be built so that the feel and use shall effortlessly work on all mobile and desktop platforms because of the flexibility and accessibility across devices. This responsiveness of the user interface for easy and smooth navigation shall ensure a flawless experience, irrespective of device type.

Previous Work

The management of grocery operations, in particular inventory, order tracking, and customer engagement, has been a subject of technological development for decades. Existing systems range from manual methods to advanced digital tools; many fall short in the delivery of a cohesive, accessible, and scalable solution tailored for small to medium-sized grocery businesses. This review summarizes prior solutions, their strengths, limitations, and the gaps GrocerEase is designed to address.

1. **Traditional Approaches to Inventory Management:** Historically, grocery businesses have used manual methods, such as tracking inventory with ledger books or spreadsheets. While these solutions are basic and cheap, they are highly vulnerable to human mistakes, inefficiency, and inability to update on time. Though partial automation is provided by spreadsheets, their incapacity to be integrated with other systems, like order tracking or mechanisms of feedback, dramatically reduces their functionality. These manual techniques are very low-cost ways of implementation and demand little or no technical expertise. Hence, they are quite feasible for small businesses. Their major drawbacks include high chances of errors and inaccuracies, ineffectiveness in performing updates, and inability to scale up according to the growth of a business.

2. **Commercial Inventory Management Systems:** Systems such as Square for Retail, Shopify POS, and Trade Gecko-QuickBooks Commerce are popular for medium to large businesses because they have extra advanced inventory tracking features, seamless integration with sales data, and strong reporting capabilities. This solution is very scalable and can therefore be used to get real-time stock tracking along with strong analytics. Because these systems are quite expensive to implement, and depend on

subscription-based methods of pricing, this may not augur well for small grocery stores. Furthermore, their complexity can be overwhelming for businesses with limited technical resources, and many of these systems are more oriented to general retail rather than the specific needs of the grocery industry.

3. **SharePoint and PowerApps-Based Systems:** This has recently changed, since low-code platforms, like Microsoft PowerApps, together with SharePoint, permit companies to create their own solutions for inventory management. Such systems offer real updates, automation of tasks, and elementary reporting capabilities, thus being an appealing cost-effective option for small businesses. Highly customizable, they integrate easily with other Microsoft software and grow as the operations grow. These solutions often lack advanced reporting and analytics capabilities, mostly handling comprehensive customer feedback and engagement. Besides, they demand that businesses operate within the Microsoft ecosystem, a fact that might not be suitable for every business using diverse platforms.

Conclusion

Previous grocery management solutions have enhanced the operational issues but stand either as fragmented solutions, very expensive to implement, or not designed for smaller businesses. GrocerEase fills this gap by providing an integrated, scalable, and affordable solution tailored to the needs of grocery businesses, addressing the limitations of prior systems while paving the way for more efficient and customer-focused operations.

Project Title, Project definition, Method

Project Title: GrocerEase, A Unified Grocery Management Application for Efficient Inventory, Orders, and Customer Feedback.

Project Definition: GrocerEase is a holistic digital solution that would smoothen operational management in grocery stores by integrating key functions: inventory management, processing orders, user authentication, and collection of customer feedback into one single system. The application, built on Microsoft PowerApps and SharePoint, makes use of low-code technology to offer an affordable, scalable, and user-friendly platform. With the automation of updating inventory, securing data through a backup system, and integrating customer feedback mechanisms, GrocerEase will help small to medium-scale grocery businesses improve operational efficiency by reducing errors and increasing customer satisfaction.

Method: The GrocerEase project has used a well-defined methodology, emphasizing the utilization of Microsoft technologies in developing the platform and managing the data. The detailed description of the platform-PowerApps and the data management backend, SharePoint-finally follows.

1. **Platform and Development: PowerApps:** Microsoft PowerApps is a low-code development platform; it aims at simplifying application development with drag-and-drop features, ready-to-use templates, and an integrated environment. PowerApps was used as the basis for development in the GrocerEase project due to the opportunities it presented to create a cross-platform prototype that would work on mobile and desktop devices. Further, strong possibilities for the implementation of logics were used for automating inventory updates, order validation, and syncing data with the backend. Because it could natively integrate with other Microsoft services, such as SharePoint and Power Automate, data would be smooth, and workflows could easily be automated. PowerApps assures great scalability and flexibility in developing customized business applications like GrocerEase.

Fig 2: Logo of PowerApps

2. **Data Management:** The backend is SharePoint, used for storing and managing data securely, centrally, and in a scalable manner. Five major lists have been set up on it: Inventory, User ID and Password, User Orders, Feedback, and Inventory Mirror. Each serves different business purposes. Strong data handling by SharePoint allowed real-time updates, secure role-based access control, and automated data synchronization to maintain data consistency throughout the application.
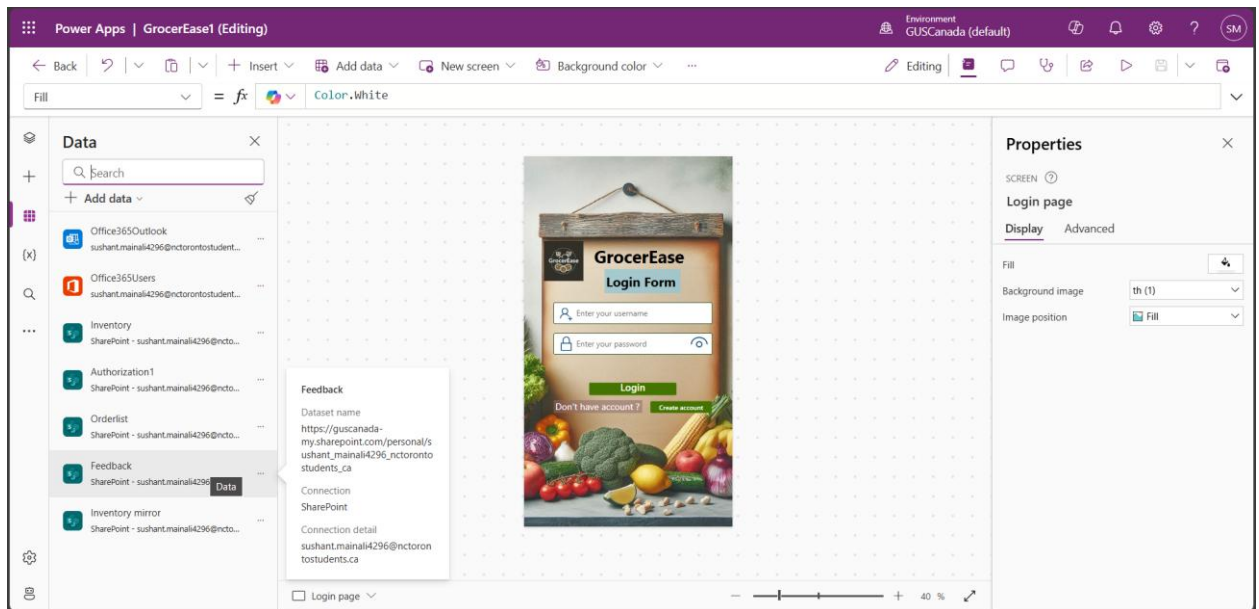
Fig 3: SharePoint connected in PowerApps

3. Features and Implementation:

1. **Inventory Management:** Through GrocerEase, stock is tracked in real time, giving the most exact and updated information. As items are ordered, the inventory level automatically adjusts on its own, reducing errors that can happen as one tries to make these changes manually. The system lets administrators know when the inventory has fallen below their threshold by sending notifications for low stocks; this is so they can take immediate action to restock.

2. **User Authentication:** This application is integrated with a secure login mechanism through the SharePoint-stored User ID and Password List. This ensures that only granted/limited access based on user roles, like an administrator or an employee, will be given to anyone, protecting sensitive data and thereby increasing security and preserving the integrity of critical information.

3. **Order Management:** The interface is user-friendly, and placing orders is rather simple, even for non-technical users. Each order is logged automatically in the User Orders List, creating a complete record that allows for effective tracking and reporting. The app also provides order history and tracking features, with which users and administrators can monitor past and current orders and thus ensure order management efficiency.

4. **Feedback Collection:** A dedicated form in the app facilitates feedback collection in an integrated manner and connects to the Feedback List in SharePoint. This allows users to have valuable input that is logged automatically and triggers notifications to administrators, ensuring timely

responses to feedback and thus fostering customer satisfaction by enabling the improvement of service continuously. .

5. **User Interface:** It is designed in a way that even users with minimal technical background can easily operate and view the interface. The application provides customizable dashboards that give a quick glimpse into the most vital metrics, such as inventory level, status of order, and feedback summaries, thus allowing administrators to track and manage operations without much hassle. This kind of thoughtful design ensures good user experience and better interaction with the application.

Description of Database

The GrocerEase project database is based on the highly reliable, scalable, and renowned secure platform for storing data centrally and collaboratively: Microsoft SharePoint Online. SharePoint Online works in perfect harmony with other parts of the Microsoft ecosystem, making it the ideal choice to help manage the application's backend. Being a cloud-based service means that the data can be accessed at any given time from any location, while still following strict security protocols to keep information safe. There will be five different custom-made SharePoint lists integrated that underpin the core functionality of this system: The main goals of each SharePoint are:

▪ **Inventory List:** Tracks the real-time stock levels of grocery items, enabling users to access up-to-date information about product availability.
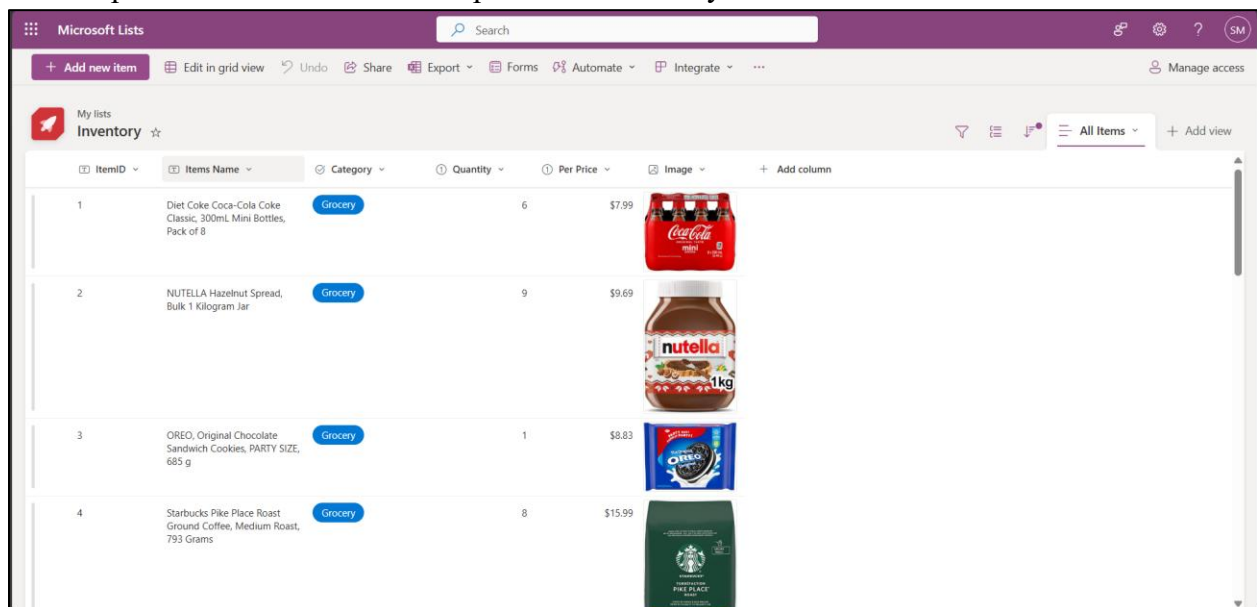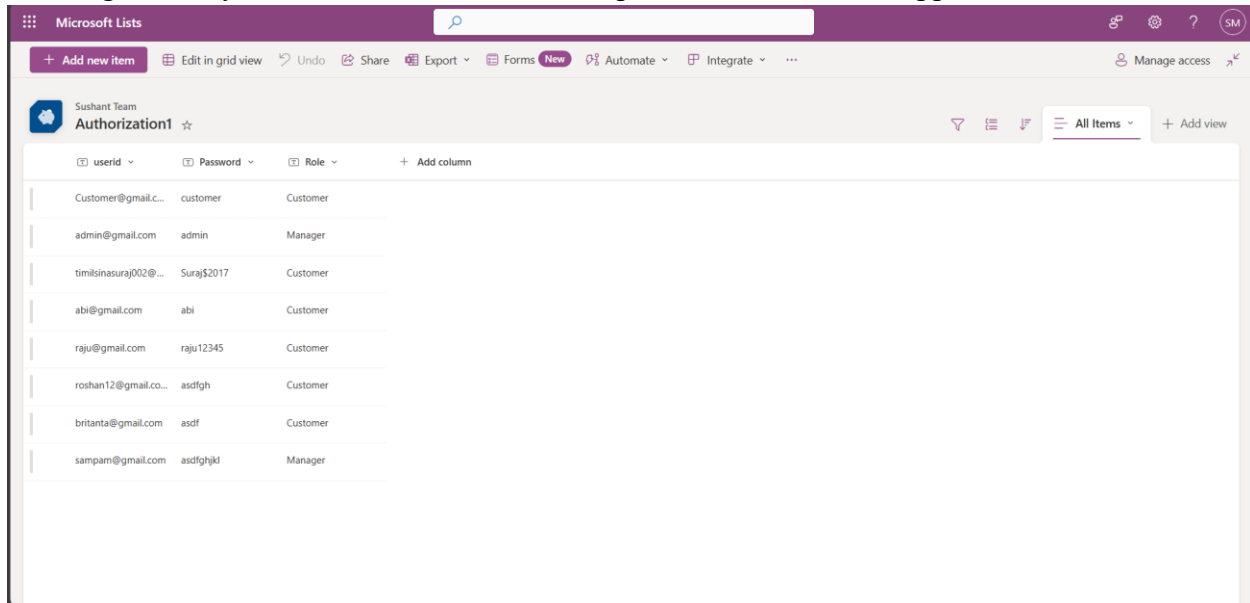
Fig 4: SharePoint of Inventory.

▪ **Authorization List:** Implements a secure and reliable user authentication system, ensuring that only authorized users can access specific features of the app.

Fig 5: SharePoint of Authorization.

▪ **Order List:** Logs all customer orders, providing an organized record for order fulfillment, tracking, and historical analysis.
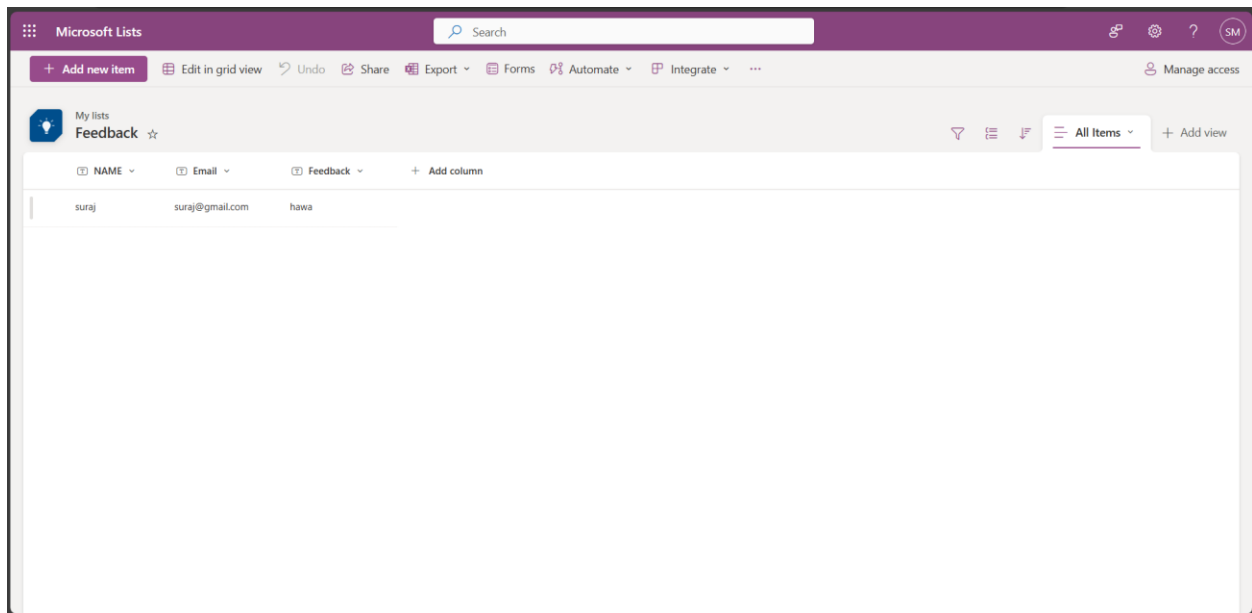

Fig 6: SharePoint of OrderList.

▪ **Feedback List:** Facilitates the collection of user feedback, enabling continuous improvement of the app's interface and functionality based on user suggestions.

Fig 7: SharePoint of Feedback.

▪ **Inventory Mirror List:** It will receive the order from the users, hold that data after completing the order procedure then all the selected items will be deducted from the Inventory List and reset for another order.
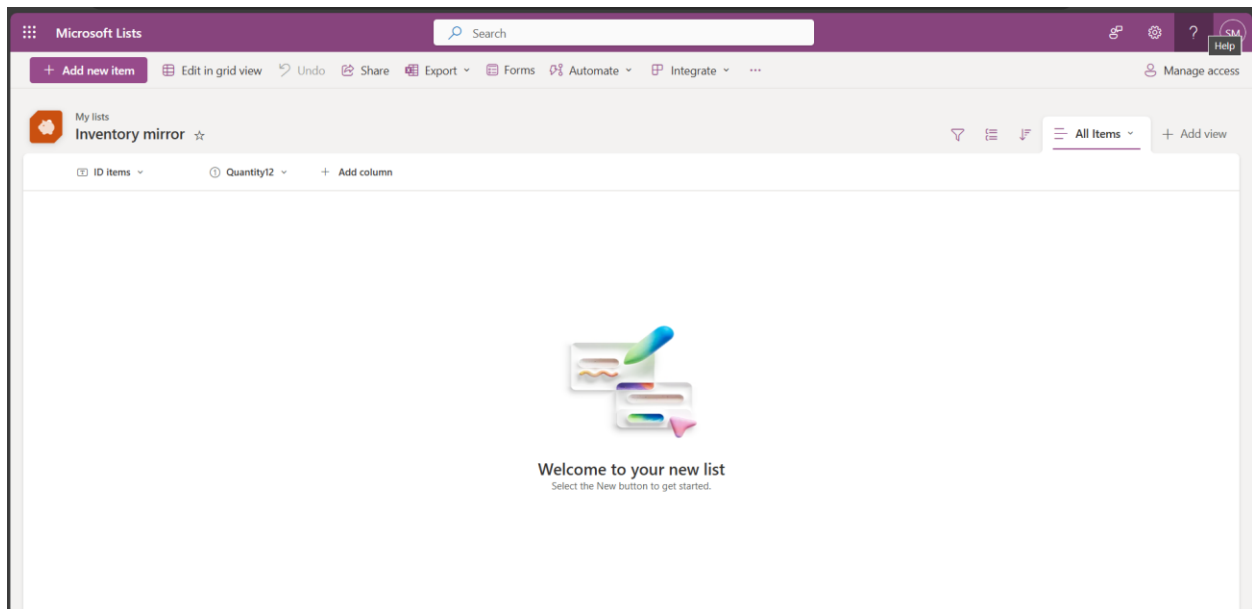
Fig 8: SharePoint of Inventory Mirror.

Description of UI

The GrocerEase app has an intuitive interface that allows for easy navigation and accessibility. In addition, the app comes with customizable dashboards that would showcase inventory levels, order statuses, and customer feedback in clear overview forms. It is fully optimized to work both on desktops and mobile devices. The UI is designed with simple layouts and logical workflows to make sure that even less-than-technical end-users will be able to efficiently manage tasks related to order management, stock tracking, and feedback review.

1. Description of UI screen.


Fig 9: Login Screen

   I.   Login Screen.
   ➔ This is the login screen of our apps, where there are 2 text input Username and Password, and 2 button named login and Create account button.
   ➔ After filling the box with your information and click on 'Login' button then, it will look up to "Authorization" SharePoint match the username and password with the role and navigates as per role either a manager screen or user screen.
   ➔ If you don't have any username and password, you can create the new one by clicking the create account.

   II.   Add User
   ➔ As soon as you click on the Create Account from the above screen. You will be navigated to this page.
   ➔ In this screen there are 2 text input User id "ending with @gmail.com" and Password, and 2 button with the sign of back at top left and Create Account button.
   ➔ The back sign button navigates to the "Login screen".
   ➔ After filing the detail and click on "Click Account". A small popup message will be shown. After clicking the "Login Site" button. It will navigate to "Login Screen"
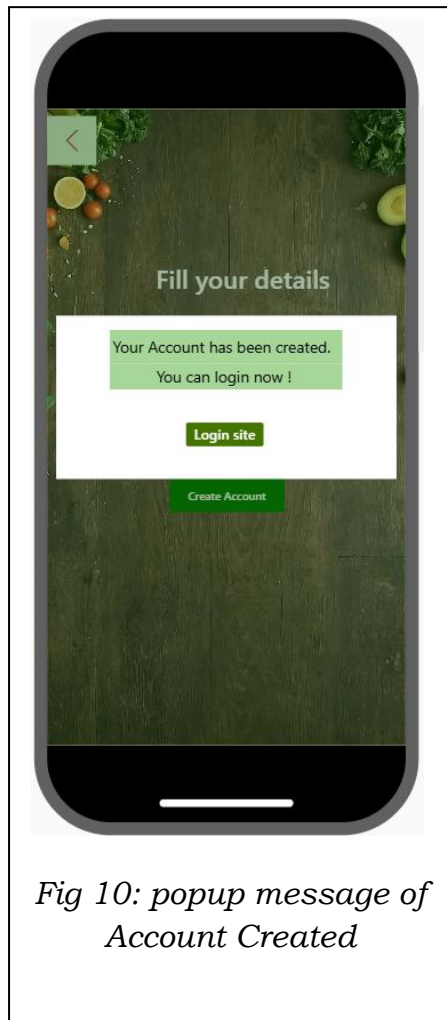
Fig 10: popup message of Account Created
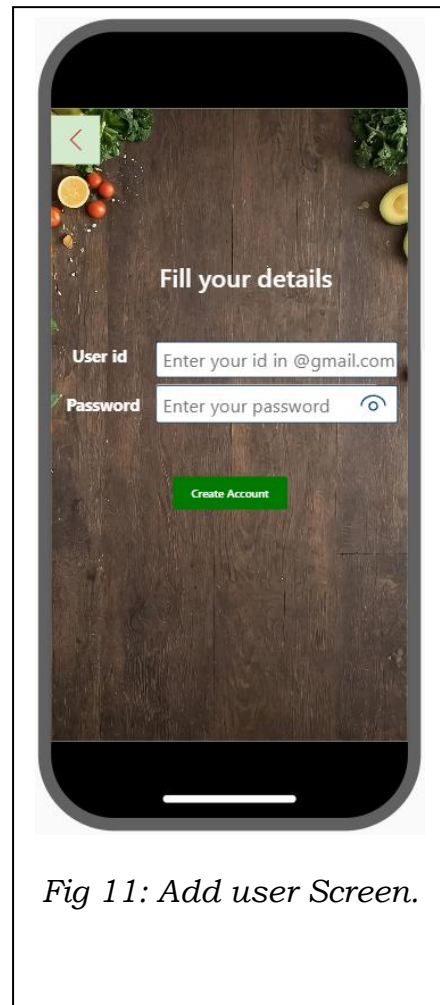

Fig 11: Add user Screen.

III.   User Home

➔ This is the "User Home" Screen, where the user can select the items.

➔ It has text input and is named as a search button; the user can type the items they wanted.

➔ It does have 3 different buttons, first one named Add to Cart, second named as home icon and last named as shopping craft button.

➔ After clicking the home icon, it will navigate to Login screen.

➔ After selecting the Add to Cart button, a small number will pop up as per number of selecting items.

➔ After selecting the required items, you can click the shopping cart button for the further procedure.

Fig 12: UserHome Screen

Fig 13: Using the Search box.

Fig 14: popup number of selecting number.
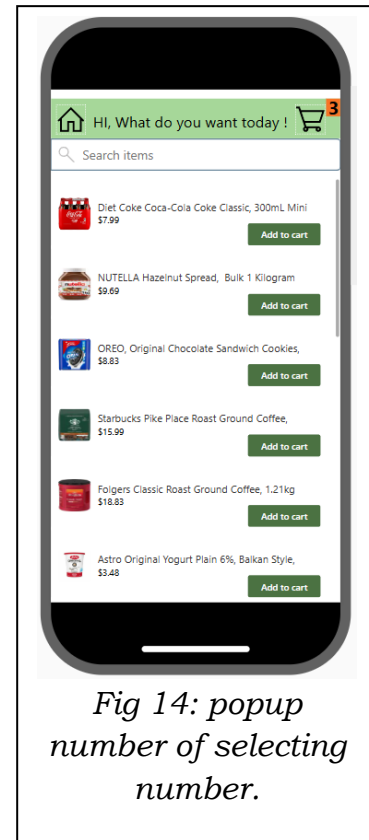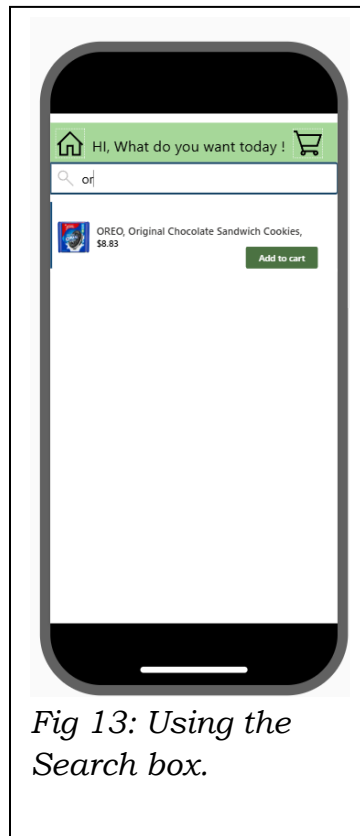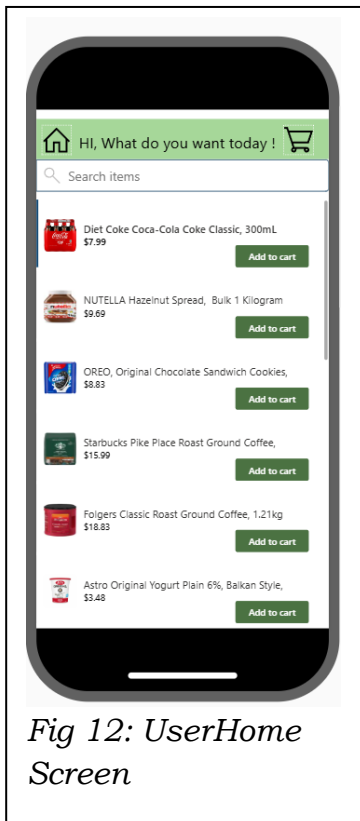
IV. **OrderItems**
  ➔ In this Screen, you can see the selected items where the user can select the quantity of each item.
  ➔ There are 3 different buttons, where the first one is on top left as a back icon, second is Clear button and last one is Next button.
  ➔ The function of the back icon is to navigate to UserHome Screen.
  ➔ The function of Clear button is to clear all the Selected Items.
  ➔ The function of Next button is to move forward to next screen (UserDetail).
 ➔ There is also the small Text label above the Next button, where the real time Price and calculation is done.

Fig 15: Selected items with calculation

Fig 16: After clicked the Clear Button
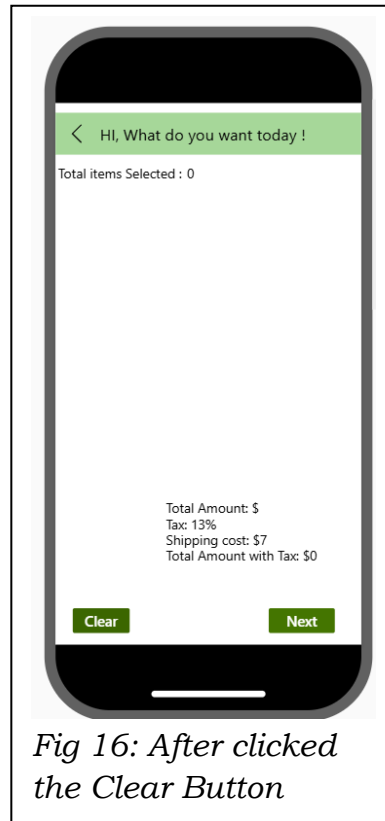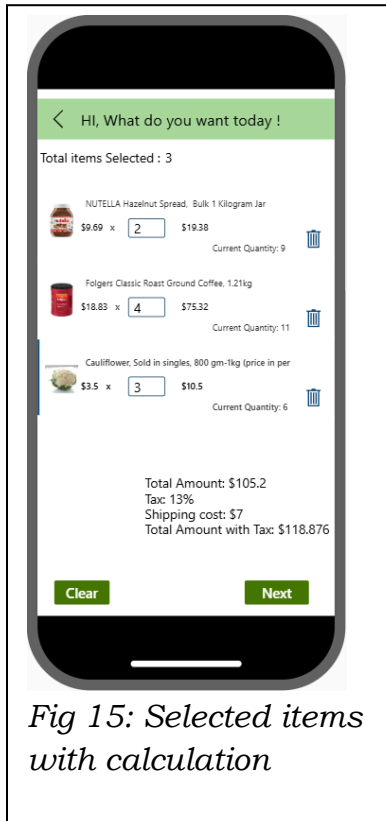
V.   **UsersDetail**

➔ In this screen, the user should insert his/her name with location and phone number.

➔ There are three Text input for Name, Address and Phone number along with the Shop Button and Back icon at the top left of the screen.

➔ The function of the Back button is to navigate to back known as OrderItems Screen.

➔ After inserting every Text Input Box and clicking the Shop Button, the popup message will be shown.

➔ If we click the Continue Button, it will navigate to UserHome Screen, LogOut Button will navigate to Login Screen and the Feedback will navigate to Feedback Screen.
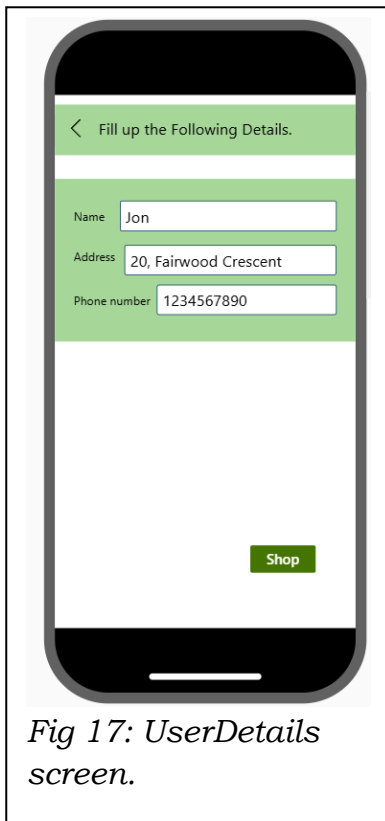
Fig 17: UserDetails screen.
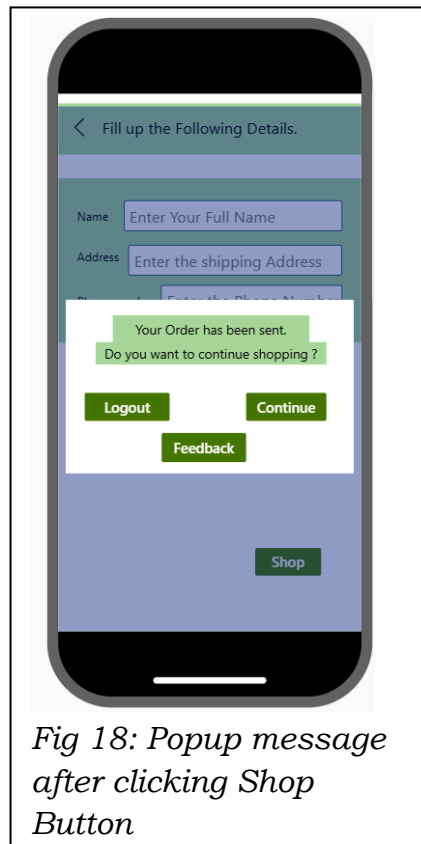
Fig 18: Popup message after clicking Shop Button

VI. **Feedback**

➔ In this Screen, you have a 3 different Text Input Box, One for Name, second for Email and last one for Message or Feedback.
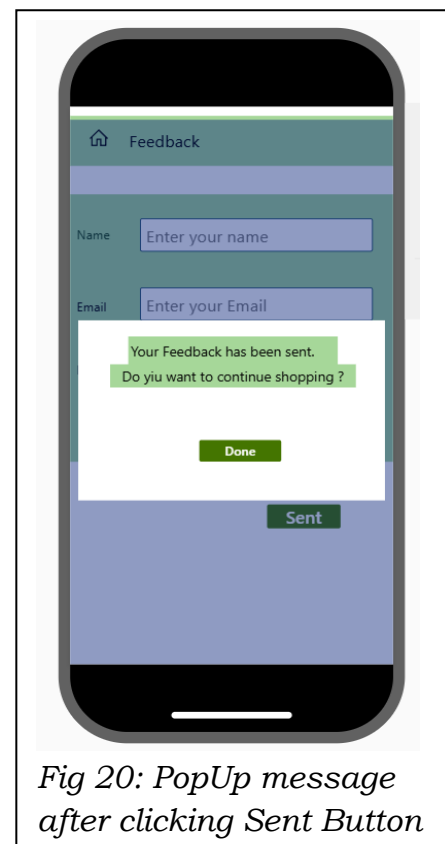
➔   There is also a Home icon, where we are able to navigate to Login Screen.

➔   There is also one Button named Sent, where all the detail will be sent and show the Popup message.

➔   If the click the Done Button of the Popup Button, it will navigate to UserHome.

Fig 19: Feedback Screen

Fig 20: PopUp message after clicking Sent Button

VII. **Home Screen**

➔ This is the Home Screen of manager.

➔ In this screen, it does have 7 different buttons, named as, Dashboard, All items, Customer's order, User's Feedback, Place Order, Contact, Authorizations.

➔ In the top left corner, there is a Home Icon
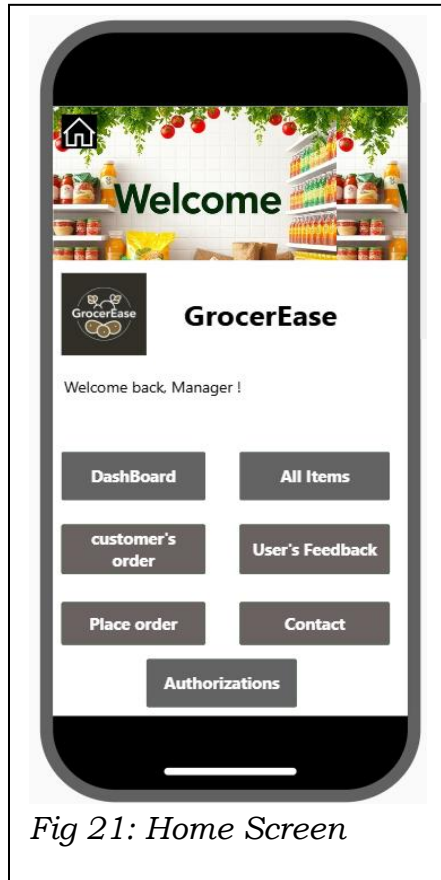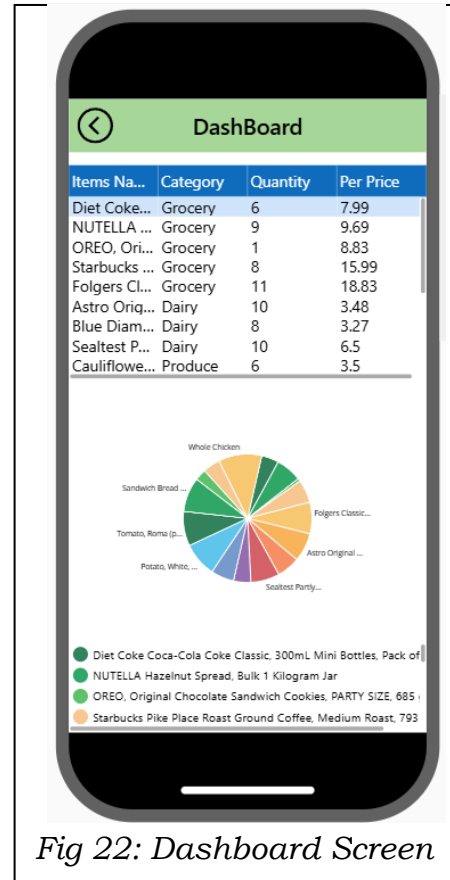

Fig 21: Home Screen

Fig 22: Dashboard Screen

VIII. **Dashboard**

➔ In this Screen, it does have a Back Icon on the top left where its function is to navigate to Login Screen.

➔ It also has a graphical interface, there is a table where all the items name, quantity, price and so on will be shown and a pie-chart where every sector area is determined by the item's quantity.

IX. UserOrder

➜ In this screen, there is a split screen where half of the screen there is a user's order in table form, and another screen will show the item where the all the item's quantity is less than 6.

Fig 23: UsersOrder Screen

X. User's Feedback

➜ In this screen, there is a table where all the feedback will be shown.
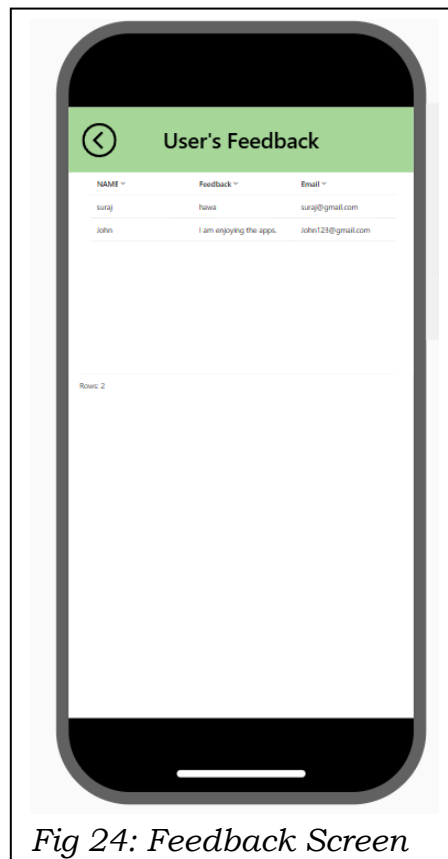
Fig 24: Feedback Screen

XI. Order Item

➔ In this screen, there is a gallery where all the items of each item of inventory SharePoint.

➔ There is a Search Textbox where the name of the items will be shown by Start With.

➔ There is a Plus icon where it navigates to parent Screen and adds the new items by inserting name and other details.

➔ There is a Back button on top left screen, where it navigates to Home Screen of Manager.

➔ If we select any items, there will be an option to increate the quantity of that item.
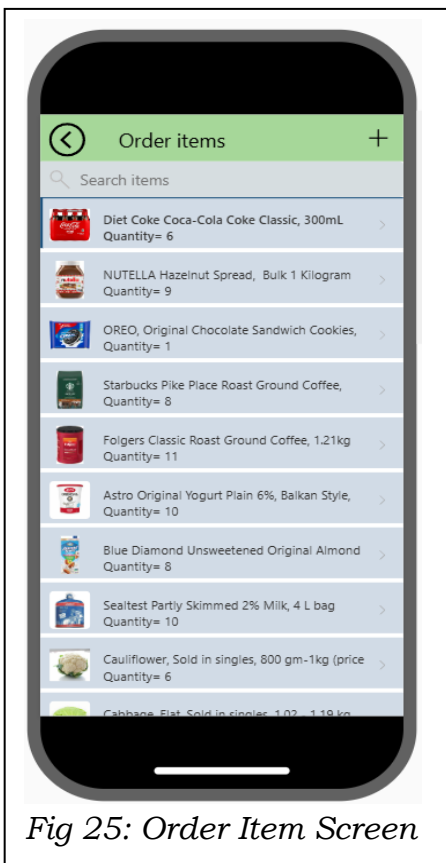
Fig 25: Order Item Screen
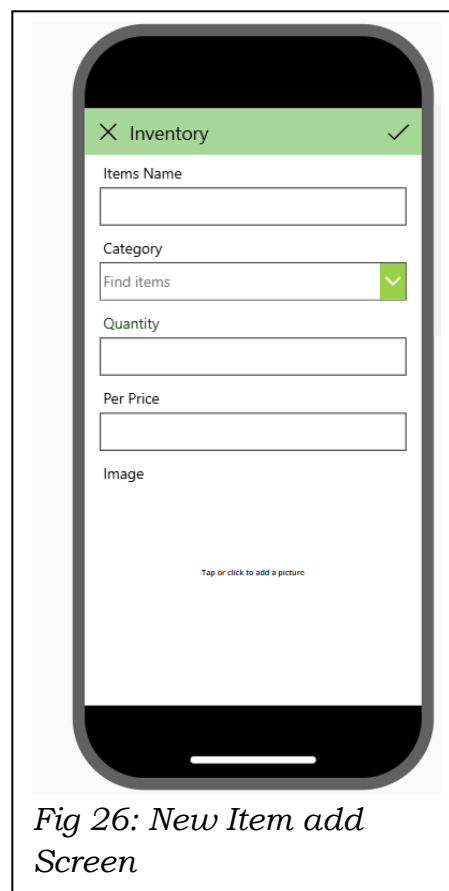
Fig 26: New Item add Screen
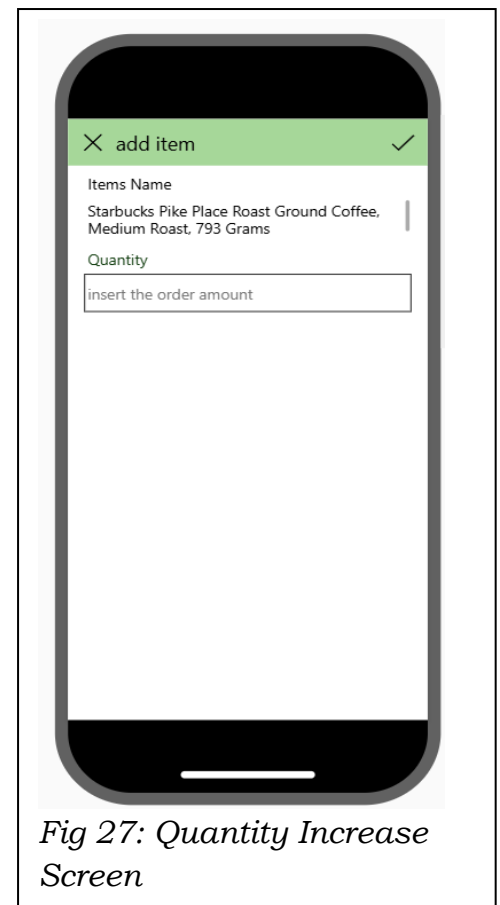
Fig 27: Quantity Increase Screen

XII. **Contact**

➔ In this Screen, we can send the message.

➔ There is 3 different Text Input Box, one of Email, second of Subject and last is Message.
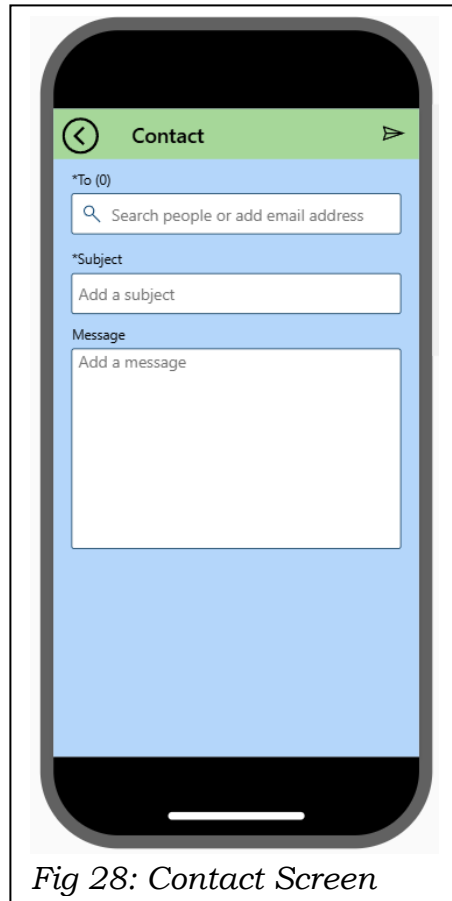
Fig 28: Contact Screen

XIII.   **Authorizations**
➔ In this Screen, we can add the user with for both user and Manager role.
➔ We can change or update the registered user's Password.

XIV.   **All Items**
➔ In this Screen, we can edit and add all the inventory items.

Fig 29: Authorizations Screen
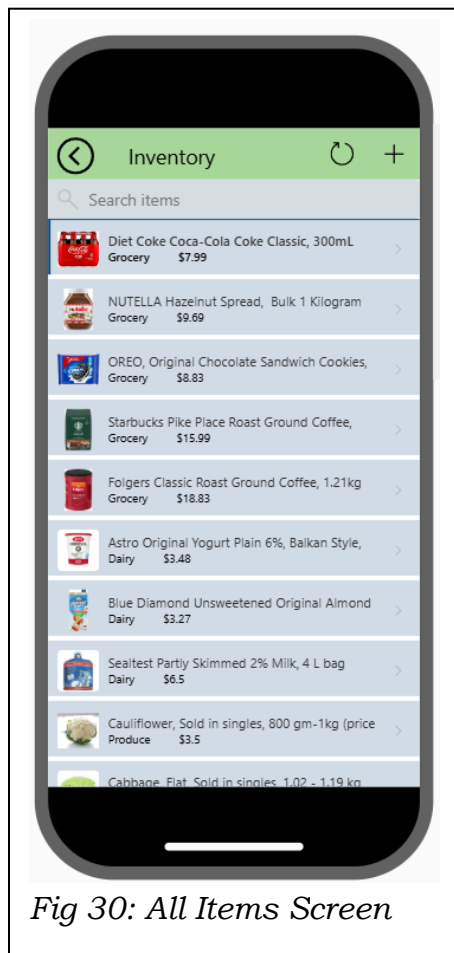
Fig 30: All Items Screen

Results and Observations

The development and testing of the GrocerEase app yielded significant results and key observations, confirming the effectiveness of its design and functionality:

1) **Real-time inventory updates**
   PowerApps integrated with SharePoint allows for real-time inventory level updates upon order placements. The feature removed manual errors and gave correct stock tracking that enhanced operational efficiency.
2) **Low-Stock Alerts:**
   The low-stock alert system worked as intended, notifying administrators when inventory levels fell below the predefined threshold. This proactive feature proved effective in preventing stockouts and ensuring business continuity.
3) **User Authentication and Security:**
   It has also tested role-based access controls using the User ID and Password List for security and access to data. All test cases were performed in verifying that the security was sound.
4) **Order Management:**
   The order placement and logging system works flawlessly in testing. Orders are recorded appropriately in the User Orders List, while it was easy to review past transactions via the order history feature, thus the system is reliable and usable.
5) **Collection of Feedback:**
   The feedback form and the notification mechanism worked well in making it easier for users to give feedback. Notification of administrators worked in time, helping in responding swiftly to customers' concerns for better customer satisfaction.
6) **Cross-Platform Accessibility:**
   It was, therefore, tried on desktops, tabs, and mobile phones, and the performance was excellent across the board. The outcome of this is a perfect, smooth user experience, further confirming versatility.
7) **User Interface Usability:**
   The intuitive UI received positive feedback during testing, with users highlighting the simplicity and ease of navigation. Customizable dashboards allow us to make relevant data available in clear and organized ways.

Key Observations:

i.   This further ensured that workflow automation with data synchronization flowed seamlessly from PowerApps through SharePoint to Power Automate.
ii. Automation eliminated much manual effort and increased efficiency, mainly with the inventory management system and order processing.
iii. It proved to be scalable: from the perspective of database design, it could handle larger datasets and more features once the business expanded.

Above all, the GrocerEase app accomplished its mission of an effective, reliable, and user-friendly grocery management system.

Future's Plan

The design of the GrocerEase app addresses the existing needs of the grocery businesses; however, quite a few options exist that could be pursued in the future to extend the functionality and reach of this app. Future plans for the project involve feature expansion, scalability enhancement, and continued alignment with evolving industry needs:

1) **Predictive Analytics for Inventory Forecasting:**

Another important development that can be forecast for the future is the integration of predictive analytics for inventory forecasting, whereby the system will be able to make predictions regarding inventory demand based on past sales, seasonal trends, and customer behavior. With such informed and advanced predictions in hand, a business will be able to make more intelligent decisions about the replenishment of stocks so as not to run into possible stockouts and overstocking.

2) **Integrating Third Party Systems:**

The need to integrate third-party systems is one of the strongest in developing and growing a business. Future versions are supposed to consider integrating third-party services in GrocerEase, including but not limited to payment gateways, delivery management tools, and accounting software. This will make the order fulfillment process smooth, right from the processing of payments up to the tracking of the same.

3) **Multi-Language Support and Localization:**

To serve more customers, particularly those in a multilingual region, GrocerEase would ensure support for multiple languages. The app has easily allowed users to shift into their chosen language with ease; hence, it is so accessible that customer service is enhanced.

Conclusion

The GrocerEase project successfully achieved its key objectives by providing a comprehensive and efficient solution tailored to the needs of grocery businesses. Leveraging Microsoft PowerApps and SharePoint, the application automated real-time inventory updates, significantly reducing manual errors in stock tracking. A low-stock alert system further enhanced operational efficiency by notifying administrators when inventory levels fell below predefined thresholds, thereby preventing stockouts and ensuring smooth business operations. To protect sensitive data, user access was restricted through a robust, role-based authentication mechanism.

The order management system streamlined the processes of capturing, tracking, and processing orders, contributing to enhanced operational efficiency and improved customer satisfaction. Furthermore, the feedback collection mechanism aggregated valuable customer insights, enabling timely responses and driving continuous improvements. The application's cross-platform compatibility ensured seamless functionality across desktops, tablets, and mobile devices, providing flexibility and accessibility. The user interface was lauded for its simplicity, with an intuitively designed dashboard that efficiently represented key data.

Notable observations revealed that the application successfully automated workflows, eliminating manual tasks and enhancing efficiency in critical areas such as inventory and order management. The system demonstrated excellent scalability, handling large datasets and supporting the integration of additional features, thereby ensuring future growth potential for grocery businesses. Ultimately, GrocerEase proved to be a user-friendly, reliable, and cost-effective solution for small- to medium-sized grocery businesses, streamlining their operations and improving customer experiences.

The future development of GrocerEase aims to further enhance its functionality and expand its capabilities. One key advancement involves the integration of predictive analytics for inventory forecasting. By analysing sales trends, seasonality, and customer behavior, the system will enable data-driven decisions regarding stock replenishment, mitigating both stockouts and overstocking. Additionally, plans include integrating third-party systems such as payment gateways, delivery management tools, and accounting software, which will streamline order fulfillment processes and boost overall business efficiency.

To increase accessibility and cater to diverse customer bases, particularly in multilingual regions, the application will incorporate multi-language support. This enhancement will ensure a more inclusive and user-friendly experience, thereby broadening the app's reach and appeal. These future developments position GrocerEase as a scalable, adaptable, and comprehensive solution for modern grocery business operations.

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