Smart Serve: Integrated Cafeteria Management & Transactions

Project Overview

☆ **Project**	*Smart Serve: Integrated Cafeteria Management & Transactions*
Developer	Zoya Hammad Khan
Description	This desktop app aims to provide user and admin functionality for a cafeteria application designed to digitalize meal ordering and payment. Users can purchase meals based on existing meal plans or via student cards, view menu, apply advanced filtering, and receive transactional history. A unique QR code is generated for each transaction, which users can easily capture and present at the counter as an e-receipt for order fulfillment. Admin functionalities include user management, creation, and modification of meal plans, adding cash to student cards, menu item management, access to user transaction history. The login system uses SHA-256 hashing system for enhanced security. All relevant data is efficiently managed using a MySQL database for ease of access. The application contains a user friendly, multiple document graphical user interface allowing for ease of navigation. The GUI is developed using QT Creator and frameworked in C++ programming language.
🔗 **Key Resources**	1. GitHub Repository*: https://github.com/zoya-hammad/SmartServe*

Licenses Used

Application Usage	Name	License Details
GUI	QT Creator	LGPL License
QR Code Generation	Qt-QrCodeGenerator	MIT License
Database Connectivity	SQL Lite Studio	GPL License
Icons	Flaticon	Free License (With Attribution)

Problem Identification

1. Absence of a Digital Ticketing System:

The current cafeteria system contains manual order placement, and small paper tokens for order verification, for which no record is stored. For meal plans, every student must get their record updated manually in a paper notebook. This may lead to potential errors, delays, and organizational issues.

2. Limited User Access to Records:

Users cannot access data regarding previously purchased meals, which leads to a less transparent customer experience, as they cannot plan meals efficiently and make informed decisions regarding cafeteria products.

3. Dependence on Cash Transactions

Students are required to have cash on hand for purchases, which is often inconvenient as students need to travel a considerable distance to go to the nearest ATM or hostel. Alternative payment methods will make purchases more accessible for students.

4. Lack of Timestamps on Receipts:

The handwritten receipts for proof of transaction do not include timestamps. This can lead to disputes over wait times, and possible inaccurate claims from both the customer and cafeteria worker regarding the time the order was placed.

5. Lack of Price Transparency:

The price of all menu items is not displayed, which is stressful for many customers who hesitate to ask questions about individual products, especially when trying to make budget friendly decisions. Moreover, the staff have to repeatedly answer pricing questions, leading to increased workload and order processing delays.

6. Manual Data Calculation:

Currently, all cafeteria data is stored on paper only and cannot be harnessed digitally to improve data analysis to make more informed decisions about the menu and operational improvements.

7. Lack of Data Security

The data regarding customer purchases, and active meal plans is currently not backed up on any server or present on a digital device. This poses a risk of data loss in case of accidental physical damage.

Deliverables

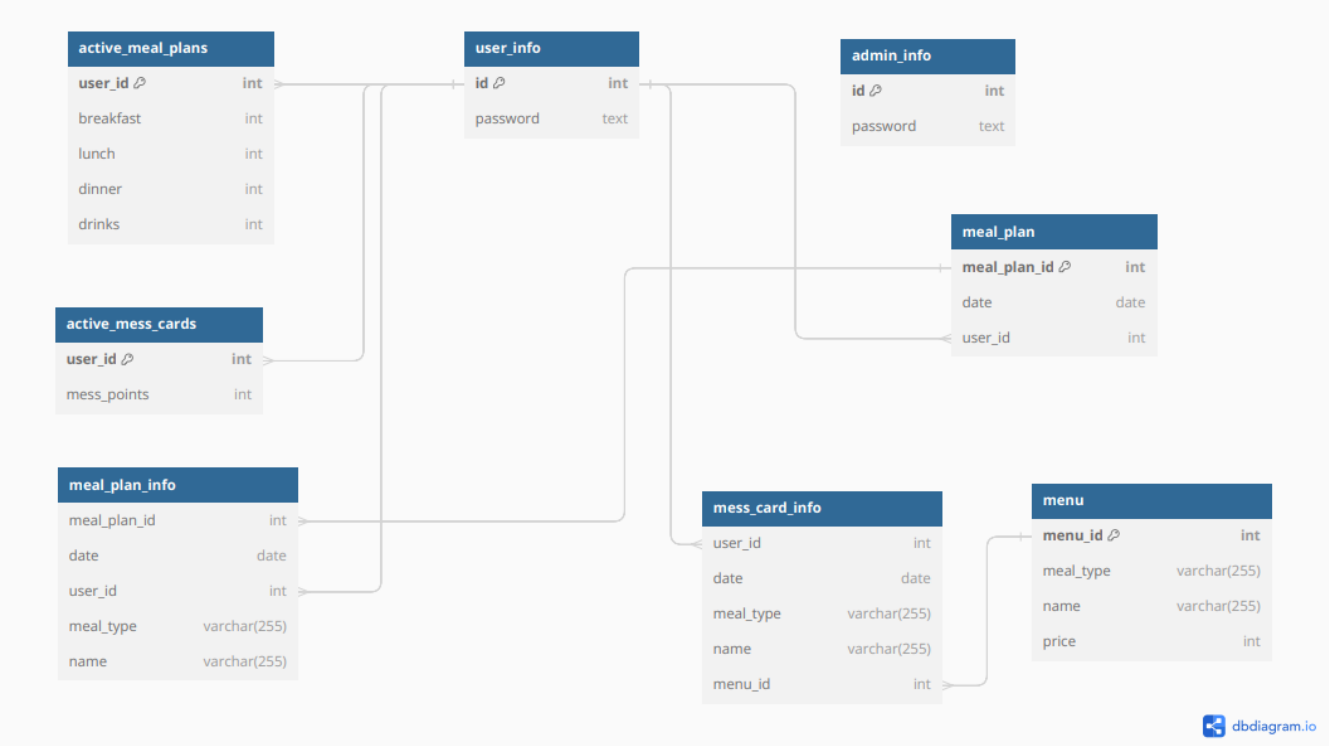
Deliverable	Description
Digital Ticketing System	Enables users to securely log in, choose meals, and place orders using virtual cash cards or meal plan points, with corresponding deductions made in the MySQL database, while generating a QR code for order verification.
User Access Portal	Contains features to manage meal plans, view and filter the menu, add new meal plans, purchase orders using meal plans or virtual wallets, and seamlessly navigate the transaction history through a user-friendly interface designed for enhanced user experience.
User History Access	User data is retrieved, using the stack data structure, enabling a Last-In-First-Out (LIFO) mechanism for easy access to meal information.
Admin Access Portal	Provides administrators with a portal to manage and create user accounts, create, and modify meal plans, add funds to student cards, edit menu items and access user transaction history and dashboard analytics.
Alternative Payment Integration	Integrates a virtual wallet, linked with user credentials, for seamless and secure digital transactions. This offers users the flexibility to make purchases without physical cash.
Meal Plan ID Generation	Implements an algorithm for generating unique Meal Plan IDs using hash tables ensuring avoidance of duplicates and maintaining data integrity.
Timestamped QR Code E-Receipts	Generates QR-coded e-receipts for each transaction, embedding crucial details like the meal name, customer ID, and timestamp, ensuring an accurate record of the purchase.
Price Transparency and Advanced Filtering	Enables users to filter menu items based on price and meal type, providing transparent pricing information. Utilizes queue objects for efficient loading of data. Also contains complete menu data tables loaded directly from database.
Admin Dashboard Analytics	Provides real-time analytics such as total meals purchased, total meal plans, active virtual cards, and insights into the popularity of menu items at various times of the day.

Graphical User Interface	The Graphical User Interface, developed using Qt Creator, is enhanced by the addition of HTML and CSS, as well as icons, for improved user experience.
Multi Document Interface	The multi-document interface (MDI) model connects the different UI pages to allow for seamless navigation and interconnection across different pages of the application.
Secure Login	The application features a robust login feature, using the SHA-256 algorithm, which creates a cryptographic hash of the password to compare with the hashed password stored in the database.
Secure Database Storage	Relevant cafeteria data, such as active meal plan info, and menu prices among others, is stored effectively within 8 data tables, that are linked schematically for efficient storage, retrieval, and maintenance.

Milestones

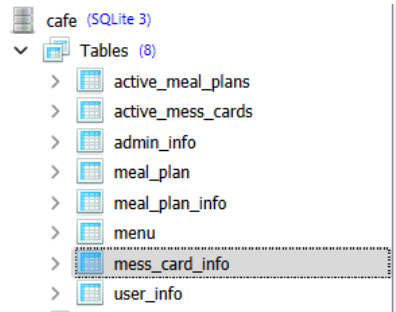
i. Database Mapping and Design
ii. Complete Database Creation
iii. Database Integration with Code
iv. Initial User and Admin Login Page
v. Login Feature with Hashing
vi. GUI Integration and Development
vii. QR Code Generation with Custom Text
viii. Implementation of Node, Queue, Stack, Hash Table Classes
ix. User History Access
x. User – Menu Filtering
xi. User – Meal Purchases
xii. User Access Portal Completion
xiii. Analytics Dashboard
xiv. Admin – Edit Menu
xv. Admin – Add User, Mess Points
xvi. Admin – Create Meal Plan ID
xvii. Admin Access Portal Completion
xviii. UI Enhancement with HTML, CSS, and Icons
xix. Project closure

Entity Relationship Diagram



Database Snapshots

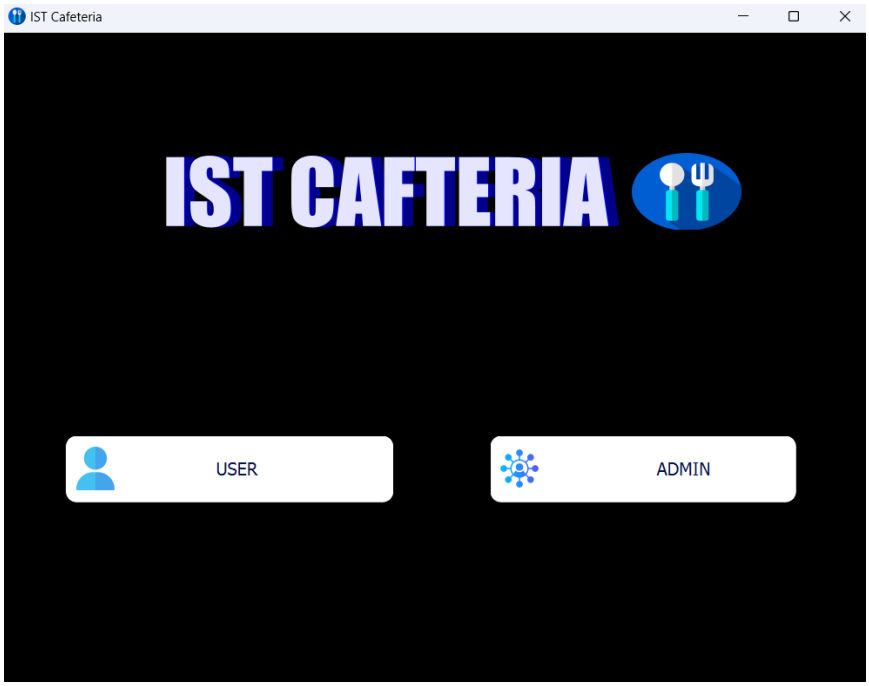
	id	password
1	67	5d8d61f81d365f6d1c69ca83991585eb83cae7eca63780c3ba43c5164879a3f7
2	324	217ac828c15d641be2d1d21123517521956afdab131b9a868139bcbf3c6f7970
3	345	5994471abb01112afcc18159f6cc74b4f511b99806da59b3caf5a9c173cacfc5
4	456	9327ae98e8fd2b7b073aafb0b634bd92a07b9e345f595f09fd7a903f47b96b1d
5	567	48b64898b62df9c206ecbd22a42ad02aeaff6193f2c29ccbdcbc738b5ef03fcd
6	4567	da60e619b86a0ddf54635cdd7b0277d72e9d3c3152bee21ef1a4148a5728e1c8
7	5676	0c5fac265cec438b465c7e66b3d141b0c6c3a9154c6d3e0d63be82b2d9f5d139
8	5765	d00669dcf9473f1273ecc42005a168ff9d3716c51738c69f6d4c9b1e1e3547de



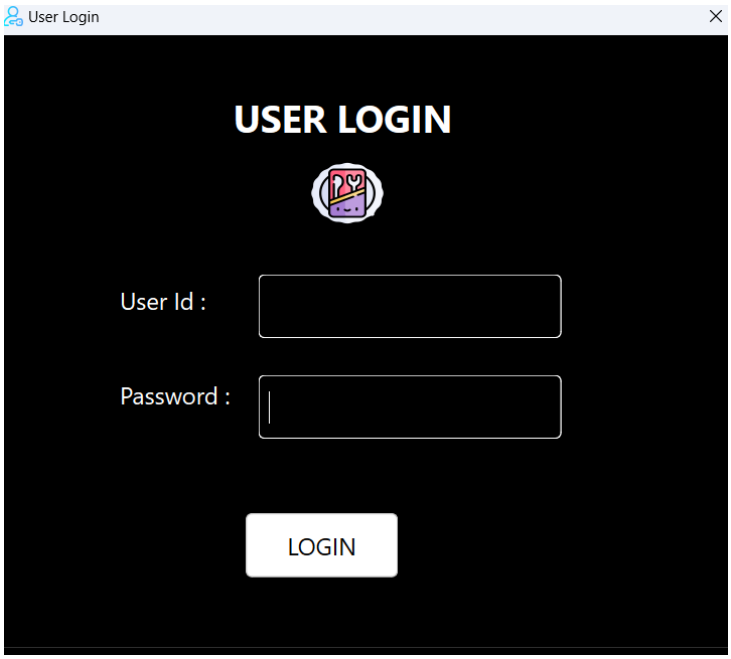
	user_id	date	mealtype	name	menu_id
1	345	2024-01-09	lunch	chicken biryani	2
2	345	2024-01-09	drinks	orange juice	4
3	345	2024-01-09	drinks	pomegranate juice	5
4	345	2024-01-09	breakfast	omelette	9
5	345	2024-01-09	lunch	chicken chowmein	8
6	345	2024-01-09	drinks	beetroot juice	6
7	345	2024-01-09	drinks	orange juice	4
8	345	2024-01-09	lunch	chicken manchurian	7
9	345	2024-01-09	lunch	chicken chowmein	8
10	345	2024-01-09	breakfast	omelette	9
11	345	2024-01-09	drinks	orange juice	4
12	345	2024-01-09	breakfast	omelette	9
13	345	2024-01-09	lunch	chicken biryani	2
14	345	2024-01-09	breakfast	omelette	9

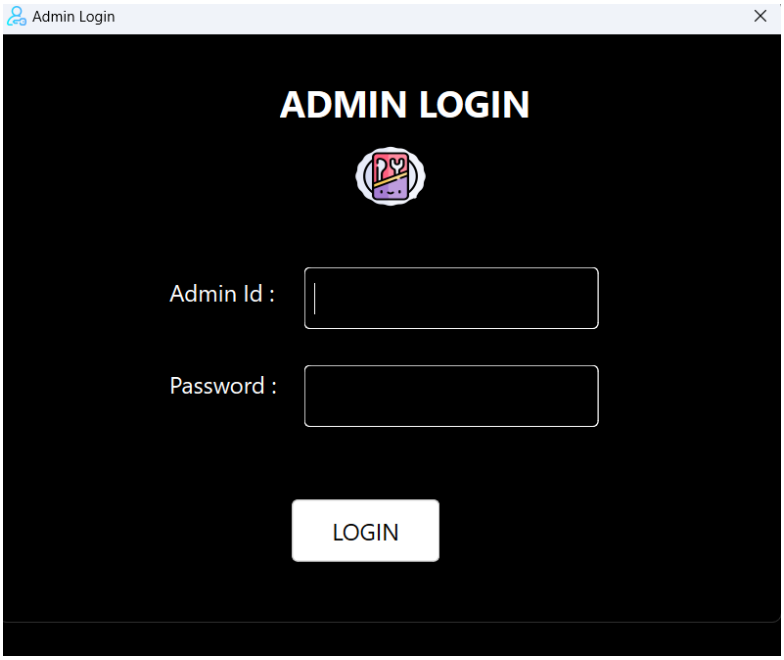
GUI Snapshots

Main Window

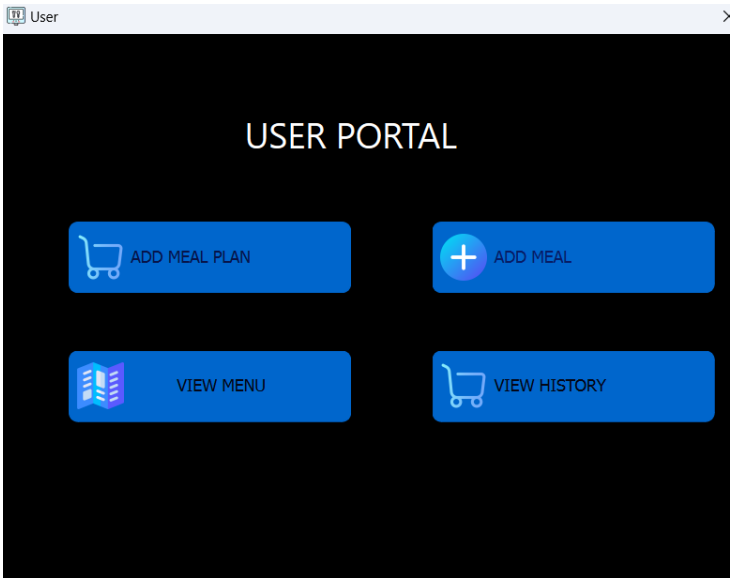


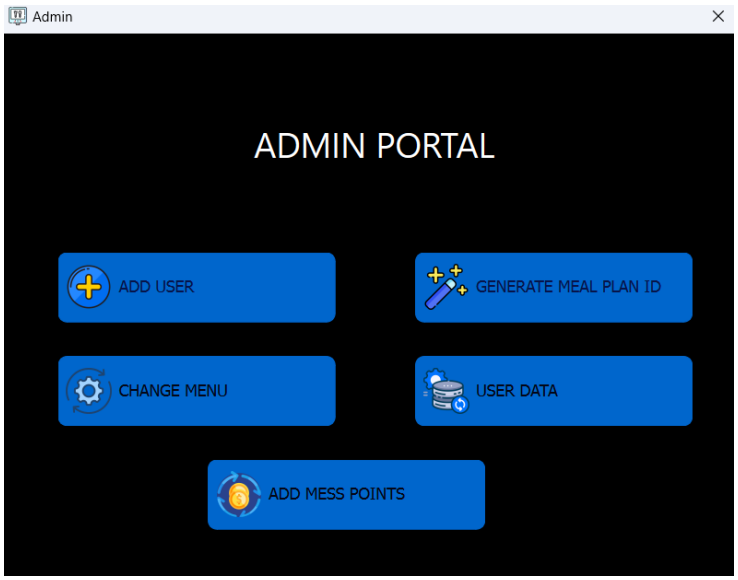
User and Admin Login Pages



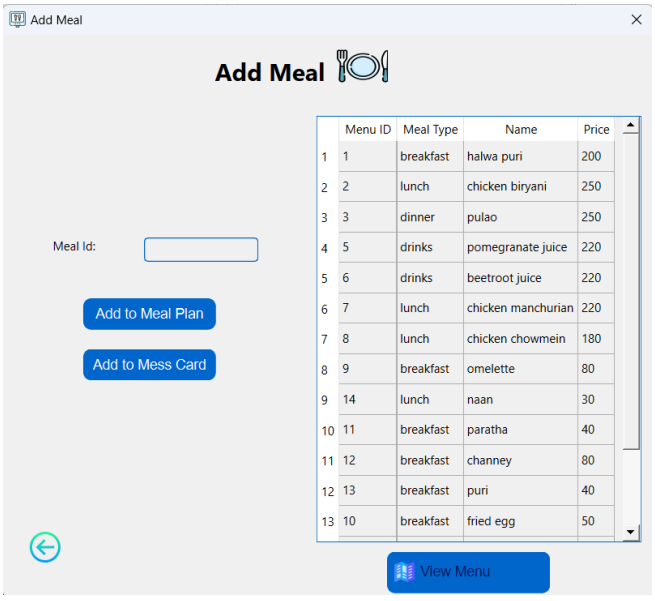


User and Admin Portal Front Pages

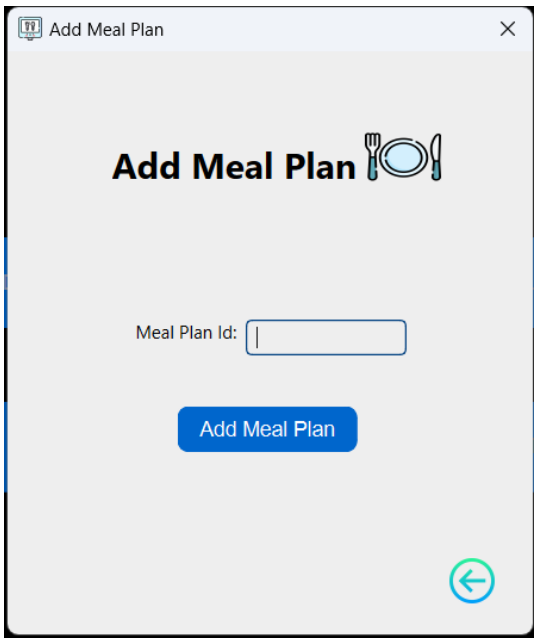


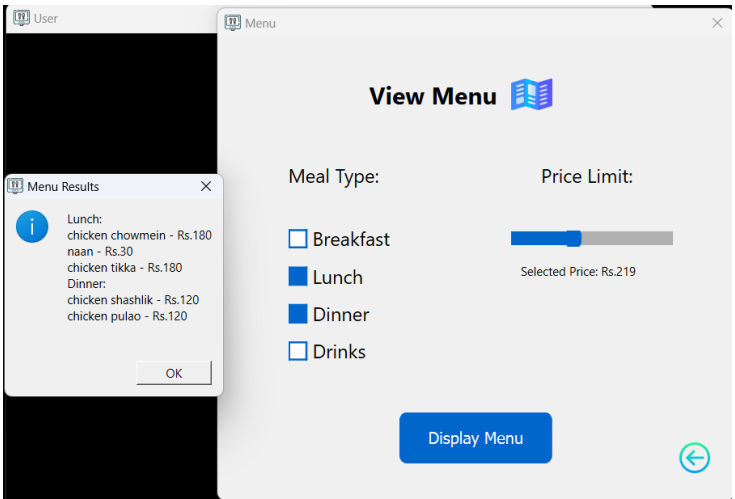


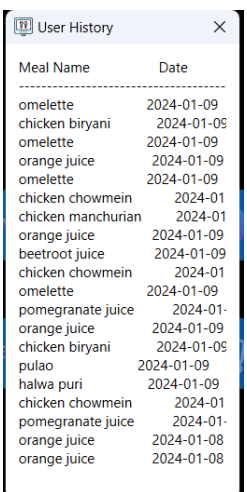
User Portal Walk-through



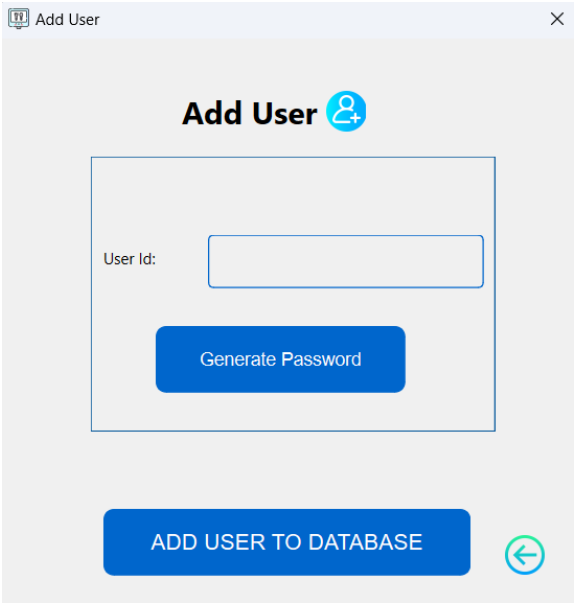
	Menu ID	Meal Type	Name	Price
1	1	breakfast	halwa puri	200
2	2	lunch	chicken biryani	250
3	3	dinner	pulao	250
4	5	drinks	pomegranate juice	220
5	6	drinks	beetroot juice	220
6	7	lunch	chicken manchurian	220
7	8	lunch	chicken chowmein	180
8	9	breakfast	omelette	80
9	14	lunch	naan	30
10	11	breakfast	paratha	40
11	12	breakfast	channey	80
12	13	breakfast	puri	40
13	10	breakfast	fried egg	50

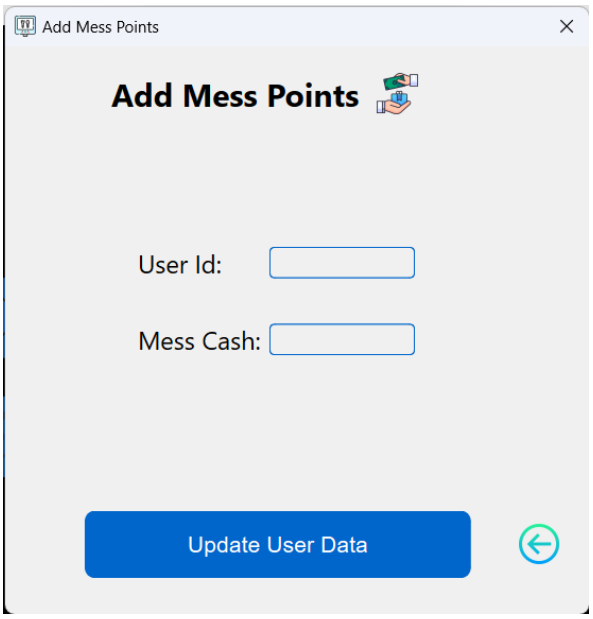


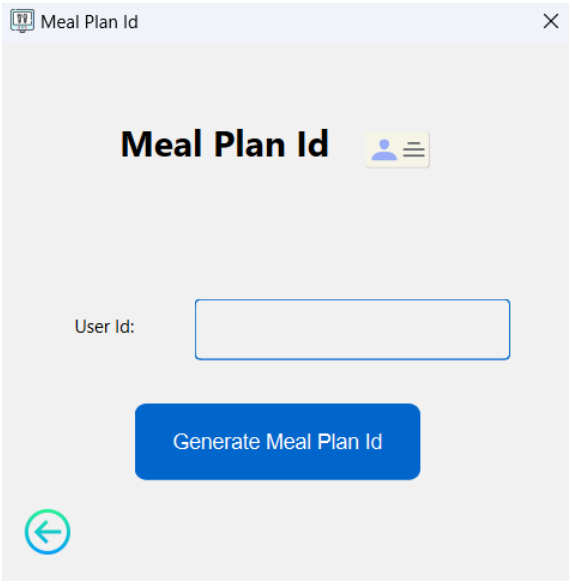


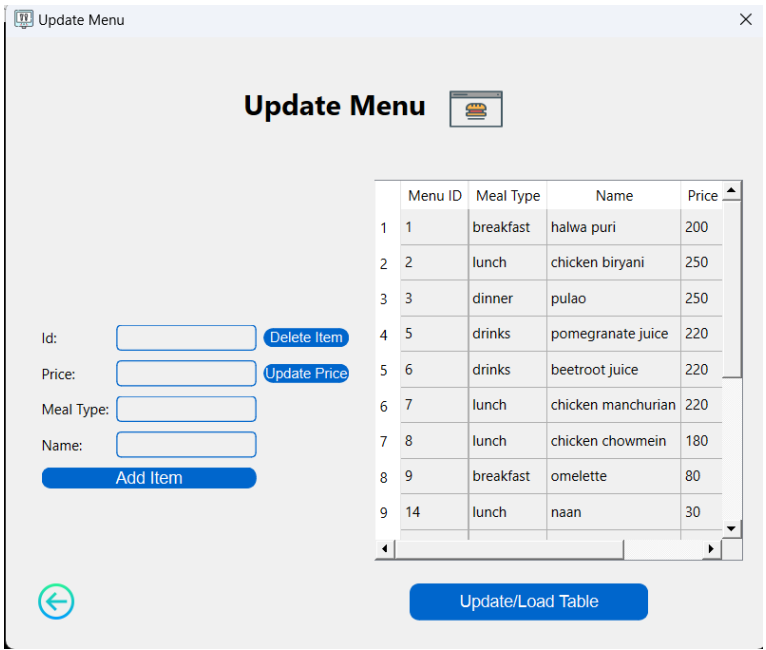


Admin Portal Walk-through









Exception Handling