

Report: Convenience Store Management System

Introduction and Summary of Project

The "ConvenienceStore" project is a robust and user-centric application designed to cater to the operational needs of modern convenience stores. The primary objective of the project is to simplify, streamline, and enhance the day-to-day management tasks of a store, from inventory tracking to sales processing and customer relationship management. With a comprehensive suite of features and tools, the application addresses common challenges faced by store managers and employees, ensuring a seamless and efficient business operation. By integrating state-of-the-art technologies and design principles, the "ConvenienceStore" application offers a blend of functionality, aesthetics, and usability, making it an indispensable tool for contemporary retail environments.

Development Approach

The development of the "ConvenienceStore" application followed a structured and methodological approach, ensuring optimal results and future scalability:

Frameworks:

.NET Core & WPF: The core of the application was built on the .NET Core framework, leveraging the capabilities of the Windows Presentation Foundation (WPF) for the user interface. This created a rich, interactive, and responsive desktop application.

Entity Framework Core: As the primary Object-Relational Mapping (ORM) solution, Entity Framework Core was adopted to facilitate database operations. This enabled a seamless interaction between the application and the underlying database, ensuring data consistency, integrity, and ease of querying.

Libraries & Components:

Emgu.CV: To integrate computer vision capabilities, the Emgu.CV library, a .NET wrapper for OpenCV, was employed. This could be used for features like barcode scanning or image recognition.

LiveCharts & LiveCharts.Wpf: For dynamic data visualisation and reporting, the LiveCharts library was integrated, allowing the application to display real-time sales, inventory, and other vital statistics.

Material Design: To enhance the user experience and aesthetics, Material Design libraries were employed, giving the application a modern and intuitive look.

FontAwesome: The application's icons and visual cues were powered by FontAwesome, ensuring a uniform and pleasing visual presentation.

FluentValidation: Data input validation was handled using the FluentValidation library, ensuring data accuracy and integrity throughout the application.

External Tools:

AForge.Video.DirectShow: For potential video capture and processing features, the AForge.Video.DirectShow library was incorporated.

ZXing.Net: To support barcode generation and scanning, the ZXing.Net library was utilised, aiding in quick product lookup and sales processing.

Throughout the development process, a strong emphasis was placed on user-centric design, performance optimisation, and modular architecture. By leveraging the aforementioned frameworks, libraries, and tools, the "ConvenienceStore" application is a testament to modern software engineering principles, ready to revolutionise the retail sector.

Database Management: SQL Server Management Studio (SSMS)

Our choice of DBMS was SQL Server Management Studio, given its reputation for stability and efficiency. SSMS, coupled with C# and the Entity Framework, presented a cohesive ecosystem for seamless data management. This trinity ensured our application's data integrity, responsiveness, and scalability.

Project Structure:

Model: This is where we store data models. We've categorised them into Admin, Staff, and three standalone classes: Account, CurrentAccount, and Customer.

- Admin: Model of an admin account with the highest permission on all actions within the system. Their role includes HR management classes (Manager, Member and Supplier with their InputInfo), product management classes (storage (Product, SmallConsignment,...) and payment (Bill)), and salary management (Salary)

- Staff: They have a smaller access pool compared to admin, but are still able to work on most of the functionality of the system, including all product management and product management classes.
- Three smaller classes outside are responsible for user profile access and modification. This includes Account - CurrentAccount (for displaying and retrieving user account information) and Customer, which is a role without any management classes, as their sole permission is to only be able to buy products from the site.

Resources: Resources required for the UI, such as Fonts, Icons, Images, ResourceXAML, Styles, and UserControlCustom, are housed here.

Utils: Utility functions and classes are stored here. Categories include Converters, DataLayerAccess, Helpers, and Validation. There are also two utility classes Constant.cs and RegexUtilities.cs.

- Converter: An image converter class that transforms an image into a binary file for easy transmission and vice versa.
- Data Access Layers (DALs): Including different types of data conversion methods, these classes are for the data formatting and transmission between the SQL server and the controller.
- Helpers: Include a lot of useful methods that are not necessarily categorisable, with different conversion methods, getters and setters, and some validation methods as well. DatabaseHelper is for admin users with higher permission, including HR database CRUD methods and data fetchers, whereas StaffDatabaseHelpers are for users with at least staff permission, with different product and customer database CRUD methods and data fetchers. The Helpers class is for miscellaneous functions that are useful to the system.
- Validators: Used to validate inputs received from product data inputs from staff or suppliers data input from suppliers and admins. Including ProductValidator class for products and SupplierValidator for suppliers
- 2 outside classes: Constant class is used to set values onto different constants throughout the login session, e.g., role or server status; RegexUtilities are for mail validation.

ViewModel: The MVVM pattern is implemented, and this is where you've placed your ViewModels. They're categorised into Admin, Login, StaffVM, and SubViewModels.

- Admin: Consists of everything needed to display and receive information from all admin-related interfaces
 - AdminVM (Admin view models): Include all the base models in which the admin has access to
 - Command: Handle all events that can occur during an admin login session

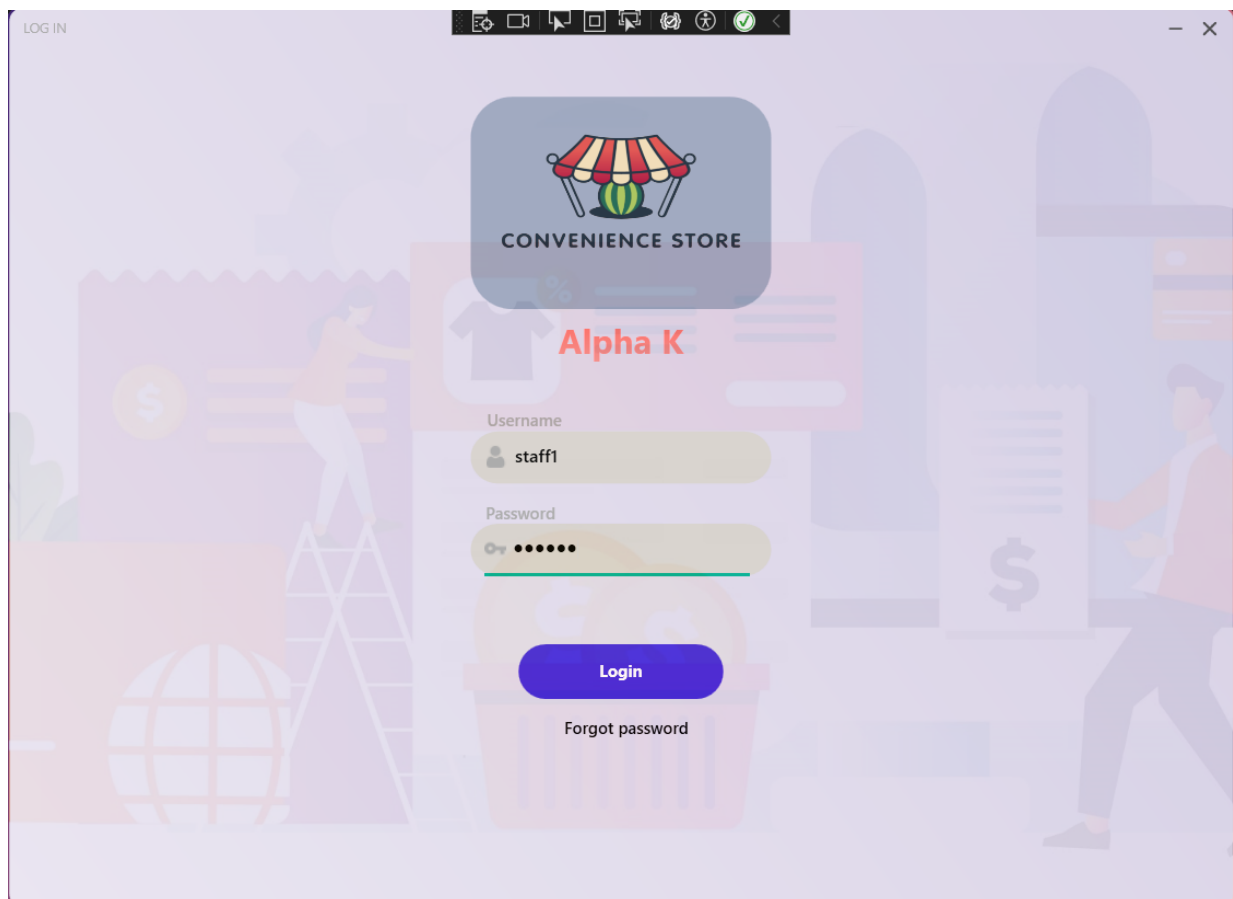
- Converter: Handle all conversions from different types of value (indicating a change in the interface) into visibility (allowing the user to view/modify something), followed by some unit converters.
- AdminMainViewModel: for the main menu after you log in as the admin
- BaseViewModel: Parent class to different functional views, with shared methods among all inherited classes.
- RelayCommand: a command permission checker and relayer.

Views: This folder contains the user interface (UI) XAML files. It includes Admin, Login, and Staff. Each folder includes all the code for generating different role's graphical user interfaces.

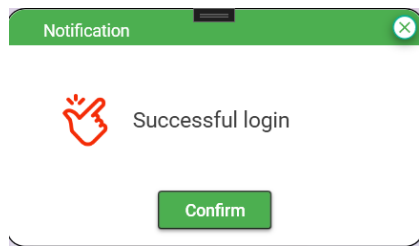
There are also a few standalone configuration and utility files such as .gitattributes, .gitignore, App.config, App.xaml, AssemblyInfo.cs, and script.sql.

User Interface:

It's a dashboard-style interface for a shop management system.

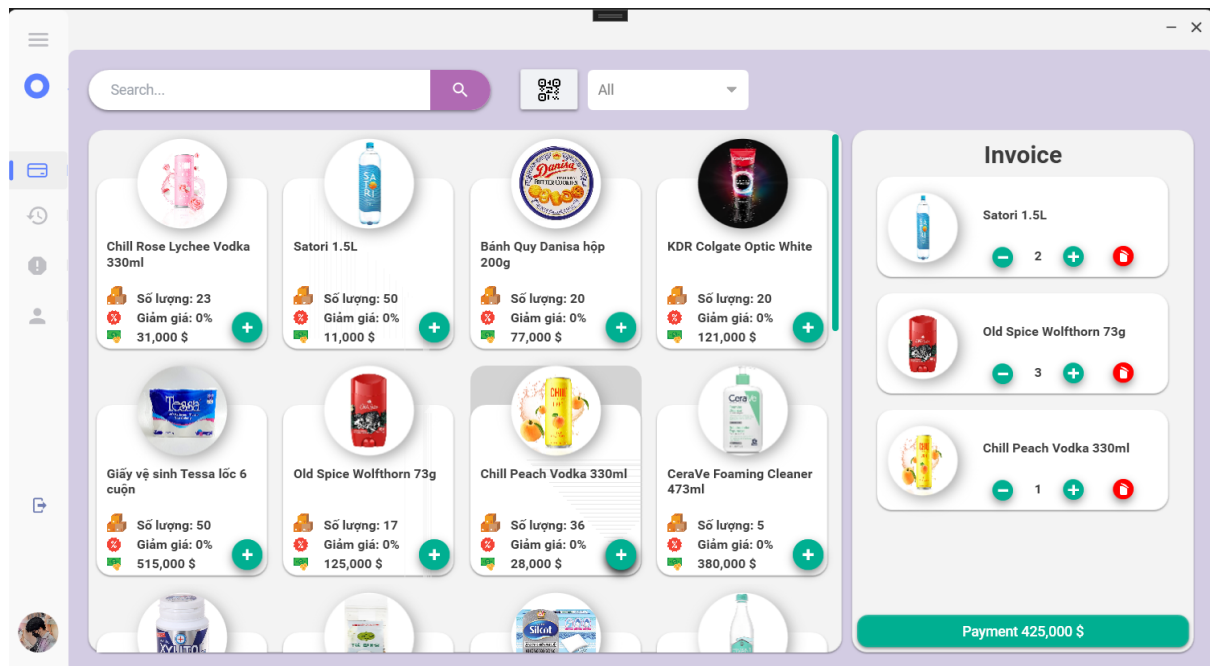


Login interface

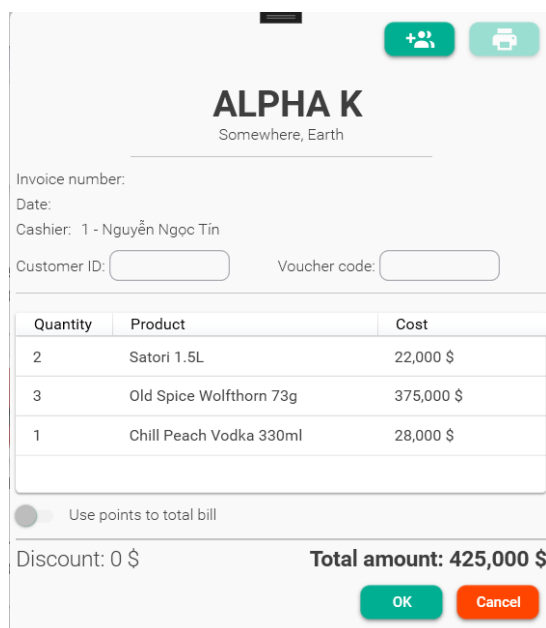


Login confirmed notification window (after valid credential was inputted)

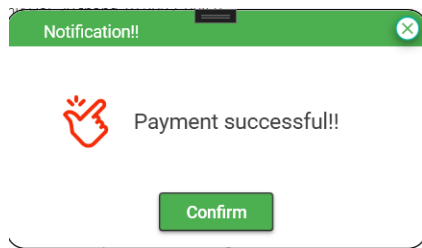
Customer/Staff interfaces:



Selecting product & invoice (shopping cart) interface



Invoice interface (After clicking the payment button)



Confirmed payment notification window

Invoice details

Quantity: 71

Search... Invoice number

Invoice number	Cashier	Customer name	Date	Total amount	Operation
3047	Nguyễn Ngọc Tín	Tin	Thứ Hai, 30 tháng 10 2023, 08:58	425,000 \$!
3046	Nguyễn Ngọc Tín	Tin	Thứ Hai, 30 tháng 10 2023, 08:57	425,000 \$!
3045	Nguyễn Ngọc Tín	Khách vắng lại	Thứ Tư, 08 tháng 2 2023, 23:21	195,000 \$!
3044	Nguyễn Ngọc Tín	Tin	Thứ Tư, 08 tháng 2 2023, 11:44	8,000 \$!
3043	Nguyễn Ngọc Tín	Khách vắng lại	Thứ Tư, 01 tháng 2 2023, 10:09	10,000 \$!
3042	Nguyễn Ngọc Tín	Khách vắng lại	Thứ Ba, 31 tháng 1 2023, 09:24	3,900 \$!
3041	Nguyễn Ngọc Tín	Khách vắng lại	Thứ Tư, 11 tháng 1 2023, 10:28	24,000 \$!
3040	Nguyễn Ngọc Tín	Khách vắng lại	Thứ Ba, 10 tháng 1 2023, 15:32	10,000 \$!

Invoice Interface










Invoice details

Quantity: 1

3047 Invoice number

Invoice number	Cashier	Customer name	Date	Total amount	Operation
3047	Nguyễn Ngọc Tín	Tin	Thứ Hai, 30 tháng 10 2023, 08:58	425,000 \$!

Invoice search using the invoice number

Trouble details						+ Report
Quantity: 12						All
Trouble	Status	Name of reporting employee	Date	Expense	Operation	
 queqwe	Chờ tiếp nhận	Nguyễn Ngọc Tín	25/12/2022	456 \$		
 10 bánh mì sắp hết hạn	Chờ tiếp nhận	Nguyễn Trọng Ninh	25/12/2022	200 \$		
 Lồng chó ở trên ghế	Đã giải quyết	Nguyễn Ngọc Tín	19/12/2022	5 \$		
 Cây chổi bị rớt hết lông	Đã hủy	Nguyễn Trọng Ninh	19/12/2022	10 \$		
 Lon Coca bị xì ga	Đã giải quyết	Nguyễn Ngọc Tín	18/12/2022	10 \$		
 Vòi sịt WC bị hỏng	Đang giải quyết	Nguyễn Ngọc Tín	12/12/2022	50 \$		
 Gà	Chờ tiếp nhận	Nguyễn Ngọc Tín	10/12/2022	100 \$		
 A	Chờ tiếp nhận	Nguyễn Ngọc Tín	10/12/2022	100 \$		
 Quạt trần bị hỏng	Đang giải quyết	Nguyễn Trọng Ninh	05/12/2022	100 \$		

Trouble list interface

New trouble

Trouble name

Detail

Status

Waiting for reception

Employee report

Nguyễn Ngọc Tín

Expected cost

Report date

30/10/2023

Preview

Cancel

Save

New trouble submission form

Full name: Nguyễn Ngọc Tín

Position: Employee

Address: 1163 Lê Đức Thọ, Phường 13, Gò Vấp

Email: 212512538@gmail.com

Phone number: 0522669557

Our team

Nguyễn Trọng Ninh

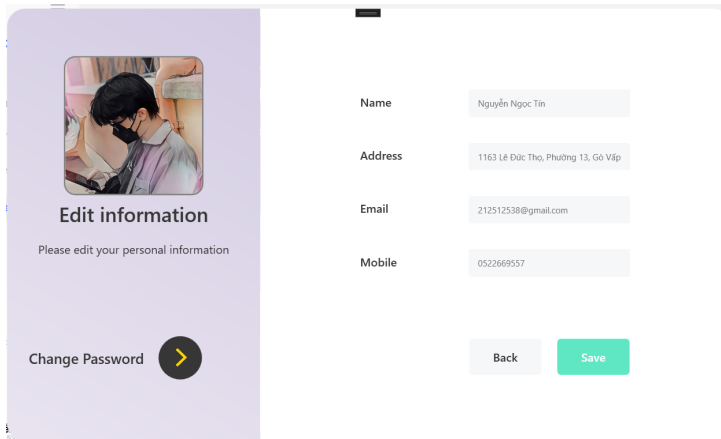
Nguyễn Minh Thường

Tăng Thị Kim Nguyễn


Bùi Cường

Đỗ Mai Minh Quân

Profile Interface



Edit information
Please edit your personal information

Change Password 

Name

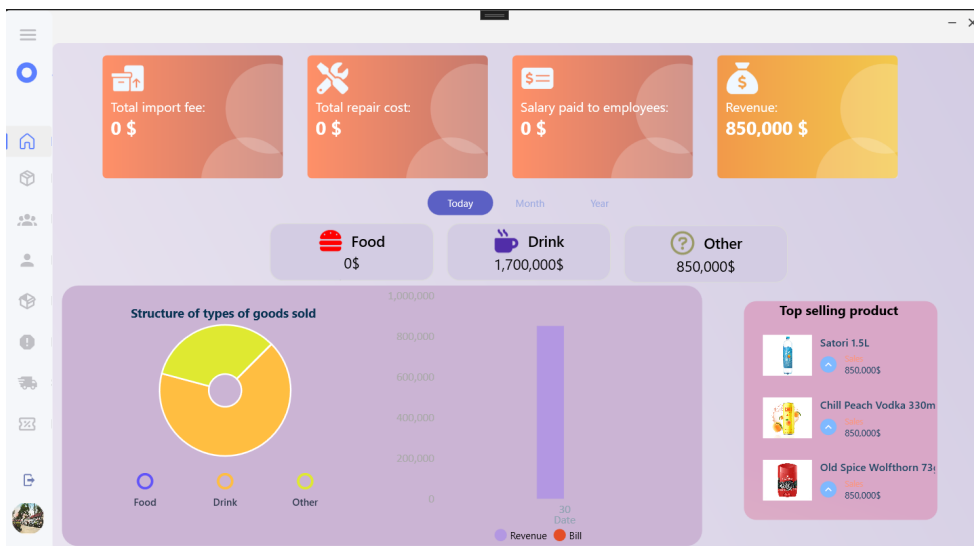
Address

Email

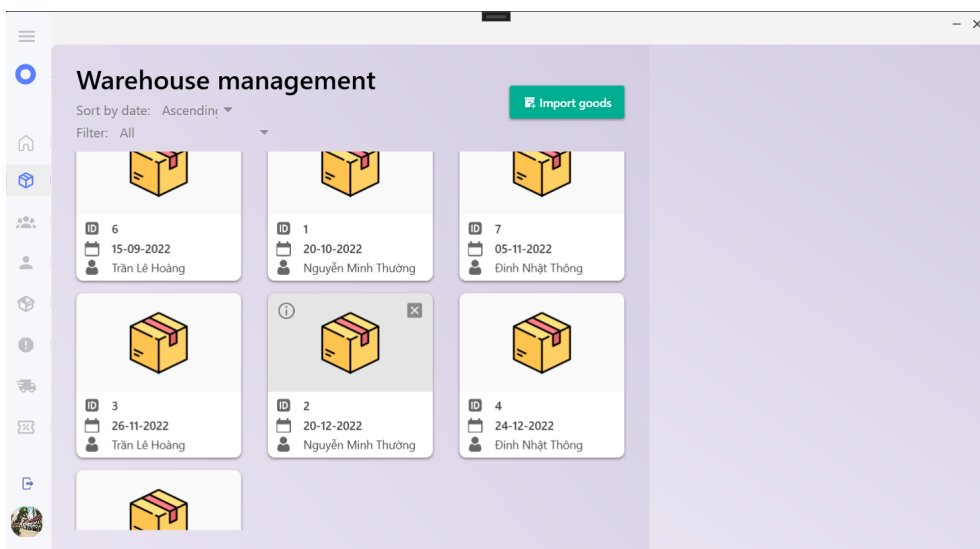
Mobile

Edit Profile Information Interface

Admin interfaces:



Financial report interface




Warehouse management

Sort by date: Ascending
Filter: All

ID	Date	Name
6	15-09-2022	Trần Lê Hoàng
1	20-10-2022	Nguyễn Minh Thường
7	05-11-2022	Đinh Nhật Thông
3	26-11-2022	Trần Lê Hoàng
2	20-12-2022	Nguyễn Minh Thường
4	24-12-2022	Đinh Nhật Thông

Warehouse management Interface (show the list of shipment)

Warehouse entry

Entered by:	Trần Lê Hoàng
Date Entry:	30-10-2023 
Supplier:	Chọn nhà cung cấp ▼

CancelSave

Create a new imported package interface (after clicking on "Import good")

Detail

+ Add

←


11 product

Search product ... 🔍

	Mi Ly Handy Hào Hào 8934563651138 Expiry Date: 30-12-2022 ✎ 🗑️
	StrongBow GoldApple 330ml 8934822111212 Expiry Date: 29-07-2023 ✎ 🗑️
	StrongBow Dark Fruit 330ml 8934822171216 Expiry Date: 16-07-2023 ✎ 🗑️
	StrongBow Chilly Peach 8934822271213 Expiry Date: 01-05-2023 ✎ 🗑️

Details about the selected imported shipment (after clicking on any package in the warehouse interface)

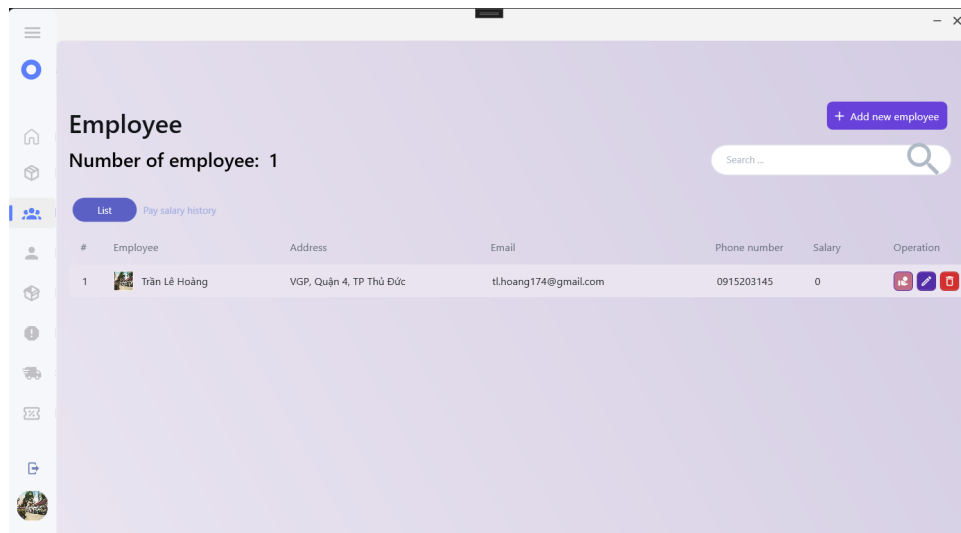
New product

Barcode *	Product site	<div><p>Product photo</p></div>
<input type="text"/>		
Tilte *	Type *	
<input type="text"/>	<input type="text"/>	
Input Price *	Output Price *	
<input type="text"/>	<input type="text"/>	
Manufacturing Date *	Expiry Date *	
<input type="text"/>	<input type="text"/>	
Quantity *		
<input type="text"/>		

Cancel

Save

New product submission form (after clicking on “Add” in the previous interface)



Employee list interface

The screenshot shows the "Add Employee" form. It features a large profile picture placeholder labeled "Preview". The form has several input fields for employee details, arranged in two columns. At the bottom, there are "Back" and "Save" buttons. The "Choose the manager" dropdown is currently set to "Trần Lê Hoàng".

Add Employee

Preview

Full Name
Enter the full name

Username
Enter the username

Email
Enter the email

Password
Enter the password

Phone number
Enter the phone number

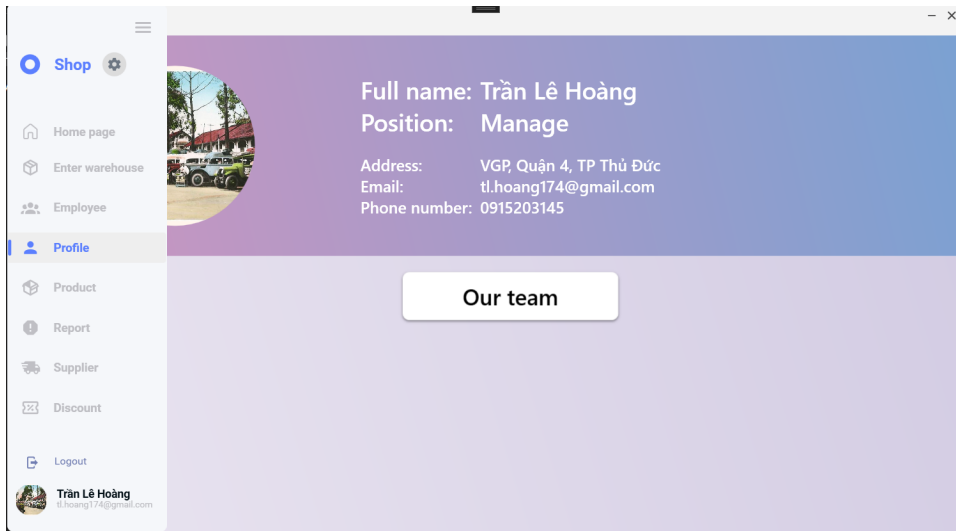
Confirm password
Confirm the password

Address
Enter the address

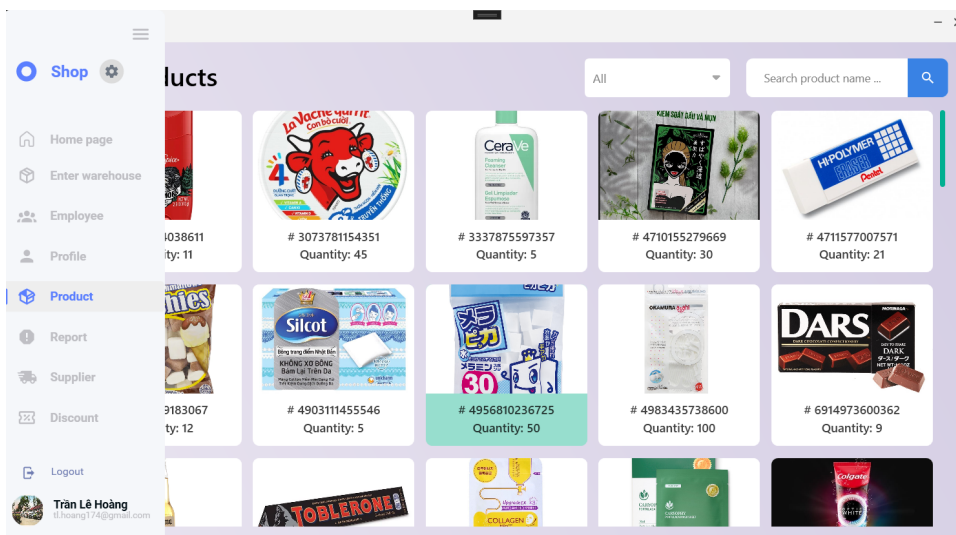
Choose the manager
Trần Lê Hoàng

Back Save

New employee submission form (after clicking on "Add new employee" in the previous interface)



Admin profile



Product interface, listing of all the product and their respective amount in the warehouse



The detail of each product in the warehouse (after clicking on any product in the previous interface). On the left side, the interface shows information about the product, and on the right side, it shows the correlated imported package that it belongs to

Supplier

Number of supplier: 10

Search Supplier name ...

#	Supplier	Address	Phone number	Email	Operation
1	Công Ty CP Thương Mại Imexco Việt Nam	Số 136 Kim Ngưu, P.Thanh Nhân, Quận Hai B	(024) 6670 8484	nhansu@imexco.com.vn	
2	Công Ty CP Hàng Tiêu Dừng Hereco	590-592 Liên Phường, Khu Biệt Thự Lucasta	(028) 3775 1496	info@horenco.vn	
3	Công Ty CP Hàng Tiêu Dừng Masan	Tầng 12, Tòa Nhà MPlaza Saigon, Số 39 Lê Di	(028) 6256 3862	info@masangroup.com	
4	Công Ty TNHH Felica VN	12/588 Đào Duy Anh, Phường 9, Quận Phú N	(028) 3842 2629	info@felica.vn	
5	Công Ty Cổ Phần Xuất Nhập Khẩu EUFOOD \	25 Tạ Hiện, Hoàn Kiếm, Hà Nội, Việt Nam	(024) 3926 2023	eufoodvn@eufood.vn	
6	Công Ty TNHH Haemir Việt Nam	33/7 Đường Số 1, Lý Phục Man, P. Bình Thuậ	(028) 3620 3940	haemirvietnam@gmail.com	
7	Công Ty TNHH TM XNK Dịch Vụ Phú Quý	57A Đinh Bộ Lĩnh, P. 26, Quận Bình Thạnh, T	(028) 3899 3158	phuquyco@phuquy-vn.com	
8	Công Ty TNHH Lotte Vina International	Tòa Nhà Beautiful Saigon, Số 2 Nguyễn Khá	(028) 5413 8119	lenguyen@lotte.net	
9	Đại lý Bía – Nước ngọt Tâm Lụa	66 Tam Đa, Long Trường, Quận 9, HCM	(028) 3746 0139		
10	Nhà Phân Phối bánh kẹo Nguyễn Phước	12/36 Nguyễn Bặc, Phường 3, Quận Tân Bìn	(028) 3844 9925		

Suppliers list interface

Add supplier

Supplier Name *

Company ...

Address *

District 9, Ho Chi Minh City

Email

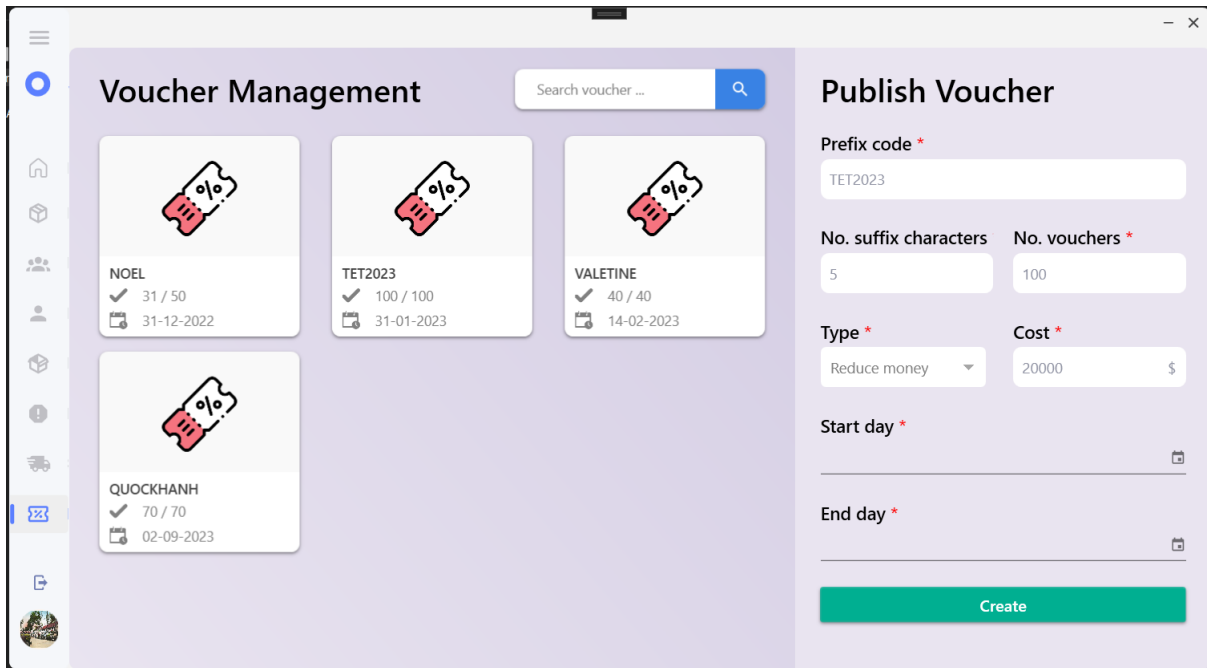
...@gmail.com

Phone number

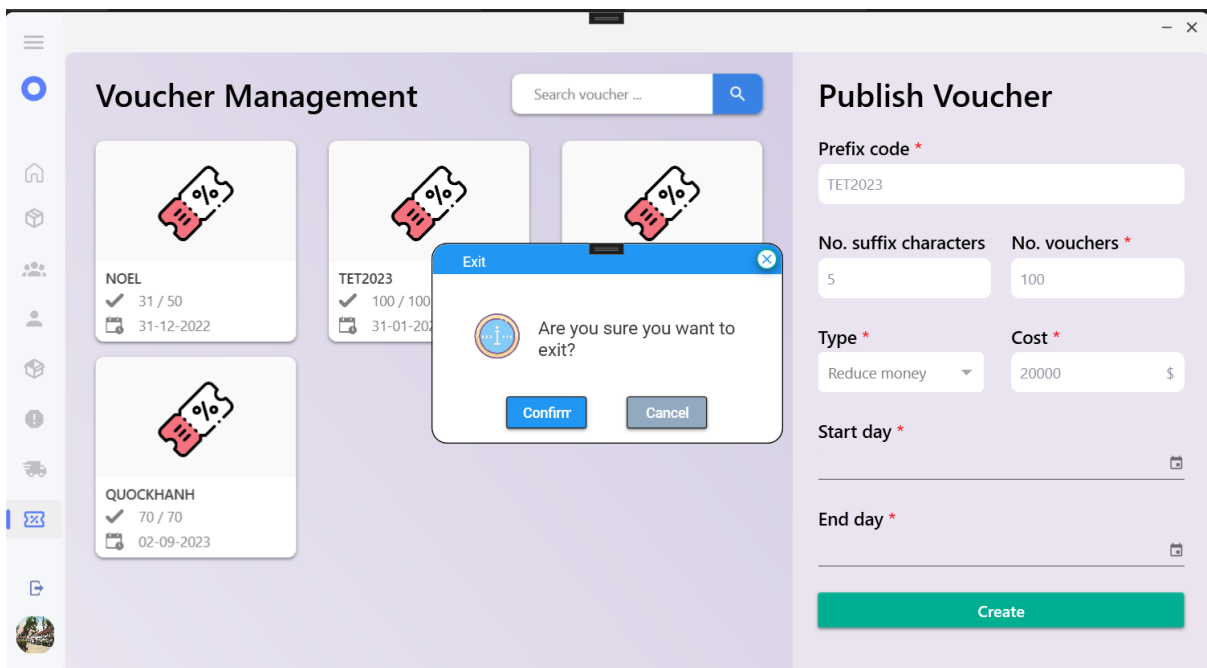
0915203143

Cancel Save

New supplier submission form (after clicking “Add” in the previous interface)



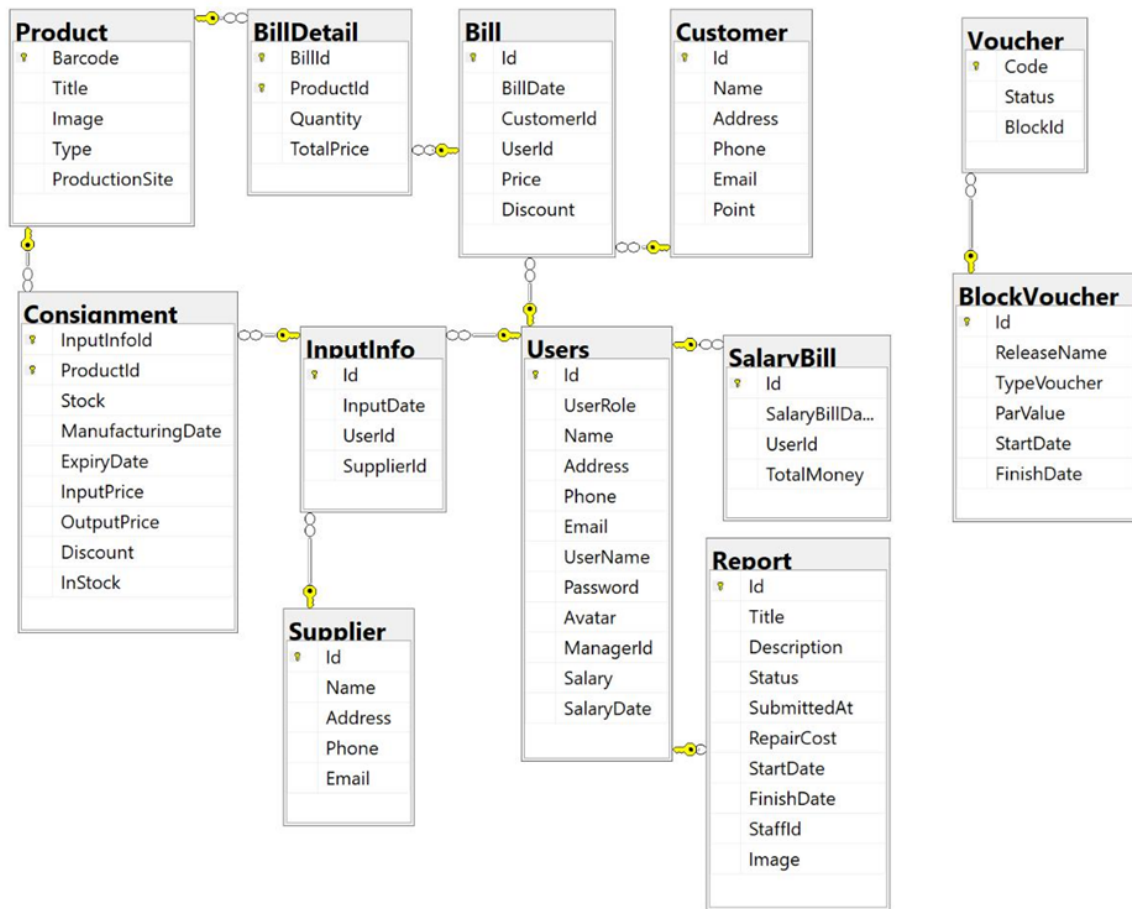
Voucher management interface



Exit confirmation interface (for all users)

Flowchart

Here is a flowchart of the system, indicating the attributes of different classes, their respective attributes and the relationship between them in the form of an entity relationship diagram



Role of Team Members

Developing the Supermarket Management System was a collaborative effort, with each team member playing a vital role in its creation. The following table summarises the roles of each team member:

Team Member	Role
Phuong Nam Dam	GUI developer
Minh Khanh Pham	Report writer, Flowchart designer
Sanghyeon Park	Report writer, Testing and QA