VIETNAM NATIONAL UNIVERSITY, HO CHI MINH CITY

UNIVERCITY OF INFORMATION TECHNOLOGY

FACULITY OF INFORMATION SYSTEMS

FINAL PROJECT REPORT

TOPIC: SMART PERSONAL FINANCE MANAGER

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Ho Chi Minh City, 05/2025

INSTRUCTOR'S FEEDBACK

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Ho Chi Minh City, May 29, 2025

PROLOGUE

Nowadays, with the development of science and technology, the application of technology in life is really important and useful, it not only brings high efficiency in work but also contributes greatly to the development of people, the community and the country. Currently, as we see, most of the popular professions in society apply technology - engineering, not only creating high productivity but also reducing working time, bringing high income contributing to promoting economic development and one of them is the management field, which really helps people a lot, applying computer management instead of manual management in businesses, companies, individuals, etc is very necessary. When the Technology era is increasingly developing, everyone is racing to update the trend. Managing personal expenses by pen and paper has become too outdated. From there, our group decided to launch the application "Personal Expense Management". Why do we have to waste time declaring information on paper, which is time-consuming and inconvenient, such as: difficult to preserve, easy to get wet, torn, etc. But we forget that we are living in the 4.0 era, the era of developing technology. The purpose of the group's personal expense management application is to help people more easily manage their personal information without having to worry about inconveniences.

This software was built by our group to help each individual manage their own expenses, record income and expenses more conveniently and easily. Based on their own spending habits, each person can build their own spending plan, keeping expenses under control. From the daily income and expense records, the software automatically creates easy-to-see, easy-to-understand statistical charts so that we can easily monitor monthly spending levels and make appropriate adjustments. Thereby helping individuals spend more effectively.

THANK YOU

I would like to sincerely thank all the women and men of the University of Information Technology, ladies and gentlemen in the Faculty of Information Systems, for helping us to study in an environment with abundant facilities and resources to study and learn more useful knowledge.

The way of learning and working in groups gives us confidence, dynamism, and supports each other in terms of knowledge and communication ability.

Because this is the first time, in the process of implementing the group project, there are still many errors and limitations, I hope that after reading this project, you and your friends will have good ideas to contribute, helping the group improve their knowledge to perform better in the following lessons.

Sincere thanks.

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LIST OF ABBREVIATIONS

No.	Abbreviation	Meaning
1	RDBMS	Relational database management system
2	BI	Business Intelligence
3	RAC	Oracle Real Application Clusters
4	IDE	Integrated development environment
5	UWP	Universal Windows Platform
6	WPF	Windows Presentation Foundation

CHAPTER 1: THEORETICAL BASIS

1.1. Oracle Database

1.1.1. Overview

Figure 1: Oracle Database

Oracle is one of the largest data providers in the technology market today. The name Oracle is an abbreviation of the company's flagship product and the relational database management system (RDBMS) officially known as Oracle Database. Database software is an important and central part of the IT sector of many companies, undertaking various tasks such as transaction processing, business intelligence (BI) or analytical applications.

Oracle was the first company to launch the RDBMS platform in 1979. It is also one of the largest companies to release databases and has a huge market share of up to 40.4% of the world software market. Based on the data, Oracle has twice the market share of Microsoft in 2016.

Oracle Corp has made many new outstanding advances over the past time with expanded product portfolios in the technology market such as many types of databases, business applications, software, storage devices, support tools, etc. Not only that, Oracle's supplier is also aiming to develop cloud computing services.

However, the most prominent of Oracle is still Oracle Database. This is the integration technology and the most used data management platform. This platform has been used for computer applications, warehouses or BI systems, etc.

The architecture of Oracle Database includes:

- The physical storage structure of a database is the files that contain data, metadata, and management files that record changes to the data. The database and its versions perform the storage and management of files.
- The logical storage structure of Oracle Database consists of data blocks which are extents and groups of contiguous data blocks. Segments are sets of extended extents. Table spaces are containers for segments.

Oracle Database has 4 editions:

- Oracle Database Enterprise Edition: Software that runs transaction processing, data warehousing, internet analytics, etc. and is used by many large organizations. It can be licensed to operate on the Exadata database engine. This is an appliance tool to optimize database software on Oracle products. In addition, it can be licensed in three different permutations for different features.
- Oracle Database Standard Edition: Provides a somewhat limited feature set for team and departmental applications. There are three main editions including Standard Edition 2 which is pre-built with the latest versions of 12c. Standard Edition can also support operation as part of the Oracle Database Cloud service.
- Oracle Database Personal Edition: Can be used on-premises and provides licensing that allows full deployment and development of the software's features and options, except for RAC technology.
- Oracle Database Express Edition: Express Edition/XE is a premium version of Oracle that allows free CPU usage and has a capacity limit of 11GB users, 1GB memory. Oracle Database 12c version does not allow the use of the free XE version. However, version 11g is still available for download.

1.1.2. Advantages and disadvantages

- Advantages:

+ Portability: Oracle Database can run on more than 100 hardware platforms and nearly 20 network protocols.

+ Backup and Recovery: Oracle Database supports online backup and recovery capabilities.

+ High performance: Oracle Database provides good speed and ability to handle large databases.

+ Multiple database support: Oracle Database can manage multiple databases in the same transaction.

+ Performance and scalability: Oracle is capable of handling large amounts of data efficiently.

+ Strong Security: Oracle provides strong security features, including encryption, access control, data masking, and audit capabilities.

- Disadvantages:

+ Pricing: Oracle can get expensive quickly, especially for large users.

+ Complex configuration: Oracle is not simple to configure.

+ Open source compatibility: If you regularly interact with open source, Oracle may not be popular.

+ Cost and Licensing: Oracle licensing costs can be an important factor when determining whether it is right for your business.

1.1.3. Application

Oracle Database is widely used in many different applications and services. Here are some examples:

- Oracle NoSQL Database: A distributed non-SQL database management system that provides horizontal scalability, high performance, and reliability.

- Oracle Multitenant: Provides the ability to create and manage multiple databases within a single entity.

- Oracle Real Application Clusters (RAC): Allows multiple servers to run Oracle RDBMS and Oracle ASM as a single system.

- Oracle Advanced Compression: Provides a suite of advanced solutions to compress data and reduce storage costs.

- Oracle Machine Learning: Provides an environment for developing and deploying machine learning models.
- Oracle APEX: A fast and easy web application development platform.

In addition, Oracle Database is also used in many different programming languages such as Java, Python, Node.js, Go, .NET, PHP, C/C++, and many more.

1.2. Microsoft Visual Studio Tools

1.2.1. Overview

Figure 2: Microsoft Visual Studio

Visual Studio is an integrated development environment (IDE) developed by Microsoft. It provides a wide range of tools and features for application development, including desktop application development, web applications, mobile applications, game applications, and many other applications.

1.2.2. Advantages and disadvantages

- Advantages:

+ Rapid Development: Visual Studio helps develop web applications and Xamarin applications for customer needs.

+ Good navigation features: Visual Studio supports searching, filtering, and previewing the code you are working on.

+ Good customization: Visual Studio allows customization and includes third-party extensions.

+ Best IDE for C#: If your project uses C#, Visual Studio is the best IDE.

+ IntelliSense Support: Visual Studio supports IntelliSense, which helps in automatic code completion.

- Disadvantages:

+ Debugging: Visual Studio is good at debugging, however sometimes it can hang, requiring you to stop debugging or restart Visual Studio.

+ Heavy Application: Visual Studio is a heavy application and takes time to load.

+ User Interface: Visual Studio's user interface is beautiful but can be a bit difficult, especially for beginners.

+ Application Design: Using Visual Studio design components can break the class application design logic.

1.2.3. Application

Windows Application Development: Visual Studio is a primary development tool for Windows application development. You can develop traditional desktop applications, Universal Windows Platform (UWP) applications, Windows Forms applications, and many other applications on the Windows platform.

Web Application Development: Visual Studio supports web application development by providing integration with ASP.NET, ASP.NET Core, and web development frameworks such as Angular, React, and Vue.js.

Cross-platform support: Visual Studio has integrated .NET Core to support cross-platform application development on Windows, Linux, and macOS.

Multi-language support: Visual Studio supports multiple programming languages, allowing you to develop applications in different languages.

Integrated version control: Visual Studio integrates with version control systems like Git and Azure DevOps, helping you track and manage changes to your project's source code.

1.3. Csharp language

1.3.1. Overview

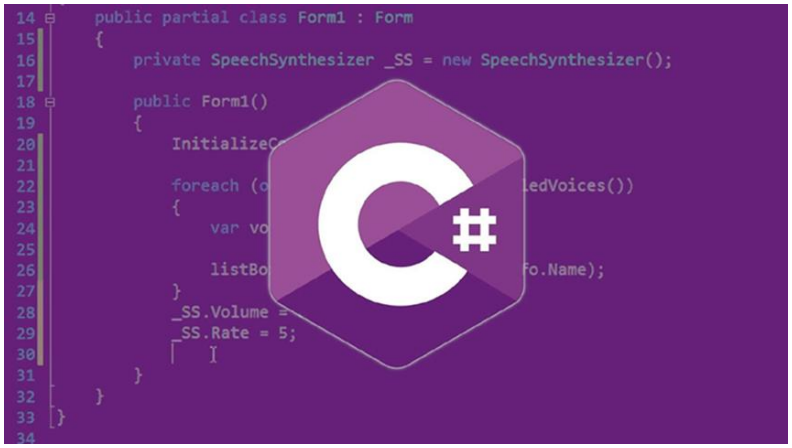

Figure 3: Csharp

C# (or C sharp) is a simple programming language, developed by Microsoft's engineering team in 2000. C# is a modern, object-oriented programming language and is built on the foundation of two most powerful languages, C++ and Java. C# with the strong support of .NET Framework makes it very easy to create a Windows Forms or Windows Presentation Foundation (WPF) application, develop games, Web applications, Mobile applications.

1.3.2. Advantages and disadvantages

- Advantages:

+ Easy to learn: C# is easy to learn and supports modern features.

+ Object-oriented programming: C# is an object-oriented programming language, which makes development and maintenance easier than procedural programming languages.

+ Fast: C# is very fast. Its compilation and execution times are very fast.

+ Supports automatic garbage collection: C# supports automatic garbage collection.

+ Type safety: C# is type-safe.

+ Easy to test and read applications: As an object-oriented programming language, C# creates applications that are easy to test and read.

- Disadvantages:

+ Debugging: Visual Studio is good at debugging, however it can sometimes hang, requiring you to stop debugging or restart Visual Studio.

+ Heavy Applications: Visual Studio is a heavy application and takes time to load.

+ User Interface: Visual Studio's user interface is beautiful but can be a bit difficult, especially for beginners.

+ Application Design: Using Visual Studio's design components can break the logic of layered application design.

1.4. Windows Forms

1.4.1. Overview

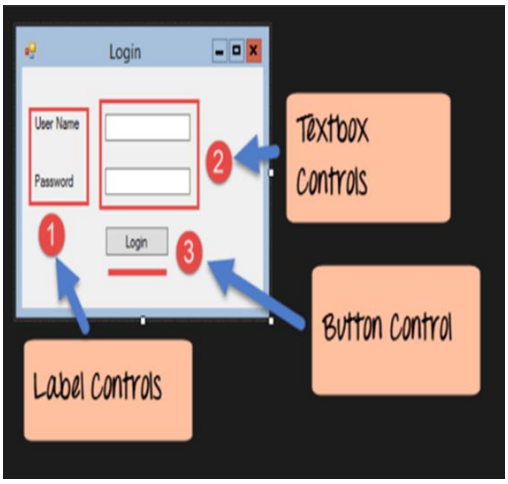

Figure 4: Windows Forms

Windows Forms (WinForms) is a part of the Microsoft .NET Framework, used to develop user interface applications for the Microsoft Windows operating system. WinForms provides a convenient way to build traditional Windows applications with a graphical user interface, including components such as windows, buttons, text boxes, checkboxes, lists, and many other controls.

1.4.2. Advantages and disadvantages

- Advantages:

+ Extensive documentation: There are many Windows Forms documentations available on the Internet.

+ Extensive and well-tested examples: Windows Forms has extensive and well-tested examples over the years.

+ WPF support: Windows Forms supports Windows Presentation Foundation (WPF).

+ Lots of third-party controls: There are many third-party controls available in the market that make the job easier.

+ Good design in Visual Studio: Designing in Visual Studio for Windows Forms is better than WPF where you will have to do more work yourself.

- Disadvantages:

+ Limited customization: Windows Forms has limited customization capabilities. Users cannot add custom CSS or HTML to their forms or quizzes.

+ Limited question and answer options: If you need to use logic and calculations to create an interactive and interactive form, Windows Forms may not be your best choice.

CHAPTER 2: SYSTEM ANALYSIS

2.1. Problem description

The personal expense management system allows users to record and track all transactions related to expenses and income. Data is stored in the following data tables:

The User table will save customer information into the system and each customer will be identified by a unique id (UserID), each id identifies information such as: Full Name (FullName), Gender (Gender), email address (Email) and password (Password).

ExpensesType identifies the type of spending that the user makes transactions, such as shopping, traveling, entertainment, ... users can classify and record their expenses according to different categories. Each type of spending is identified by an (ExTypeID) and has additional information about the name of the spending type (NameExType), each type of spending of a customer is identified by the (UserID) of that customer.

Expenses to record the types of user spending transactions, helping users record, track and control their spending. Each transaction has a unique (ExpensesID), and the user who created this transaction is identified by UserID, each Expense includes information such as: ExTypeID, money (Money), Exdate, Note.

IncomeType determines the types of income that users can record in the system, for example: salary, bonus, investment money, etc each type of income is identified by an InTypeID and has NameInType information, each type of income of a customer is identified by the (UserID) of that customer.

Income is used to record information about the user's income transactions in the system. Each transaction has a unique (IncomeID), and the user who created this transaction is identified by UserID, each Income includes information such as: InTypeID, Money, InDate, Note. An income type

(IncomeType) can be used in multiple income transactions (Income), but each income transaction is only related to a single income type.

2.2. Database design

2.2.1. Entity Relationship diagram

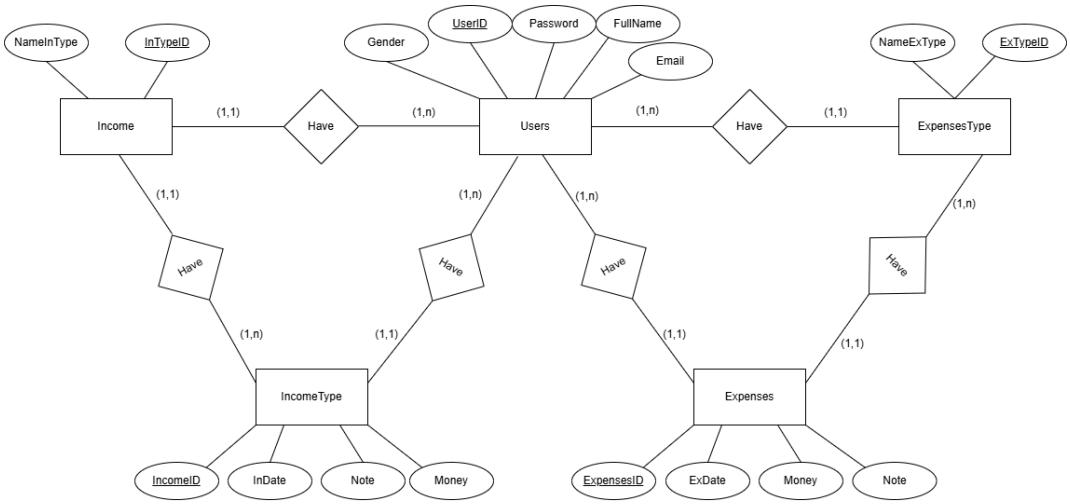

Figure 5: Entity Relationship diagram

2.2.2. Relational Model

User (**<u>UserID</u>**, Fullname, Gender, Email, Password).

ExpensesType (**<u>ExTypeID</u>**, NameExType, UserId, isActive).

Expense (**<u>ExpensesID</u>**, Exdate, Money, Note, UserId, ExTypeID).

IncomeType (**<u>InTypeID</u>**, NameInType, UserId, isActive).

Income (**<u>IncomeID</u>**, Indate, Money, Note, UserId, InTypeID).

2.2.3. Relational Schema diagram

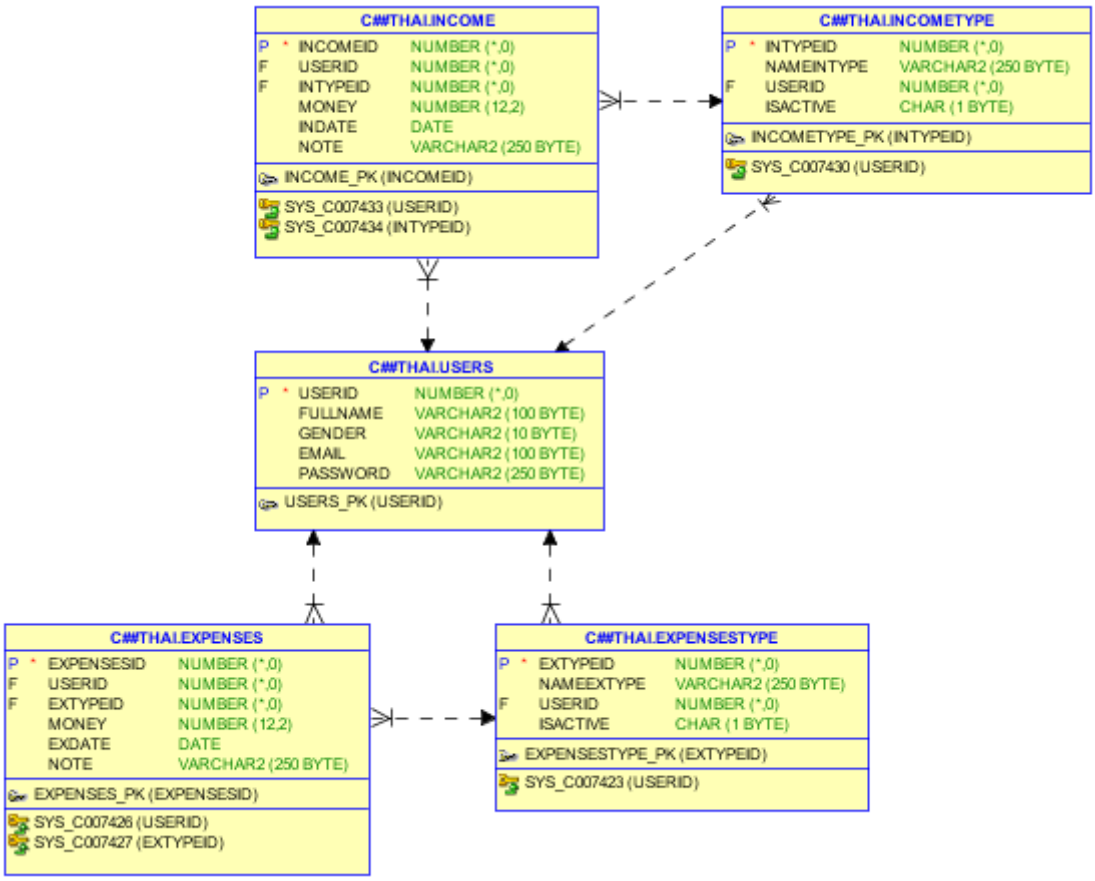

Figure 6: Relational Schema diagram

2.2.4. Database structure description table

2.2.4.1. User table

- Primary key: UserID.

Attribute name	Data type	Meaning
UserID	Number	Identify unique users
Fullname	Varchar2	User name
Email	Varchar2	Email used to log in or contact
Password	Varchar2	Password used to log in

Table 1: User table

2.2.4.2. ExpensesType table

- Primary key: ExTypeID.
- Foreign key: UserID (primary key of User table).

Attribute name	Data type	Meaning
ExTypeID	Number	Identify unique spending types
NameExType	Varchar2	Expense type name
UserId	Number	Identify what type of user spending
IsActive	Char (1)	Still active?

Table 2: ExpensesType table

2.2.4.3. Expenses table

- Primary key: ExpensesID.
- Foreign key: : UserID (primary key of User table), ExTypeID (primary key of ExpensesType table).

Attribute name	Data type	Meaning
ExpensesID	Number	Identify unique expenses
UserID	Number	Determine who spends what
ExTypeID	Number	Determine what type of spending is?
Money	Number (12,2)	Amount spent
Exdate	Date	Date of expenditure

Note	Varchar2	Note

Table 3: Expenses table

2.2.4.4. IncomeType table

- Primary key: InTypeID.
- Foreign key: UserID (primary key of User table), InTypeID (primary key of IncomeType table).

Attribute name	Data type	Meaning
InTypeID	Number	Identify unique income type
NameInType	Varchar2	Income type name
UserID	Number	Determine what type of user income
IsActive	Char (1)	Still active?

Table 4: IncomeType table

2.2.4.5. Income table

- Primary key: IncomeID.
- Foreign key: UserID (primary key of User table), InTypeID (primary key of IncomeType table).

Attribute name	Data type	Meaning
IncomeID	Number	Determine unique income
UserID	Number	Determine the income of each person
InTypeID	Number	Determine what type of

		income your income is
Money	Number (12,2)	Amount earned
Indate	Date	Income realization date
Note	Varchar2	Note

Table 5: Income table

CHAPTER 3: EXPERIMENTAL SETUP

3.1. Settings to be performed

Download and install Oracle Database 19c on your computer and create a new database named QLChiTieu (there is a sql file in the Github link).

Download and install Microsoft Visual Studio (version 2022). During the installation process, remember to tick the box (.NET desktop developer) as shown below:

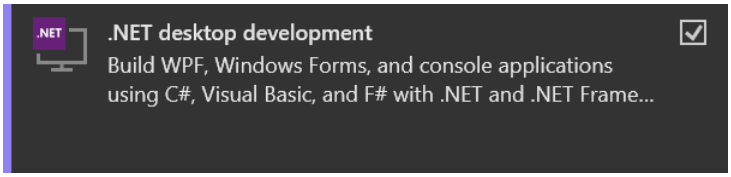

Figure 7: .NET desktop development settings options in Visual Studio

Go to Oracle website and install Oracle Development Tools For Visual Studio (link at the end of the report) and choose the version that matches the Microsoft Visual Studio installed above, or open Visual Studio -> extentions -> manager extentions -> find and install Oracle Development Tools For Visual Studio:

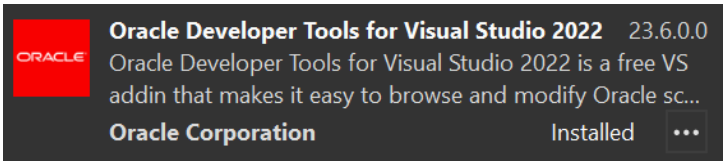

Figure 8: Oracle Development Tools For Visual Studio

Access and Github link (end of report), download, unzip and open with Visual Studio

Find and access the App.config file (in the Solution Explorer box) -> find the line **<connectionStrings>... </connectionStrings>** -> find the following line:

<addname="QLChiTieuModel"connectionString="DATASOURCE=**localhost:1521/ORCL**;TNS_ADMIN="**D:\app\network\admin**";PASSWORD

=**h123**;USERID='"**C##THAI**"'"providerName="Oracle.ManagedDataAccess.Client" />

Change the red letters accordingly as shown in the following image:

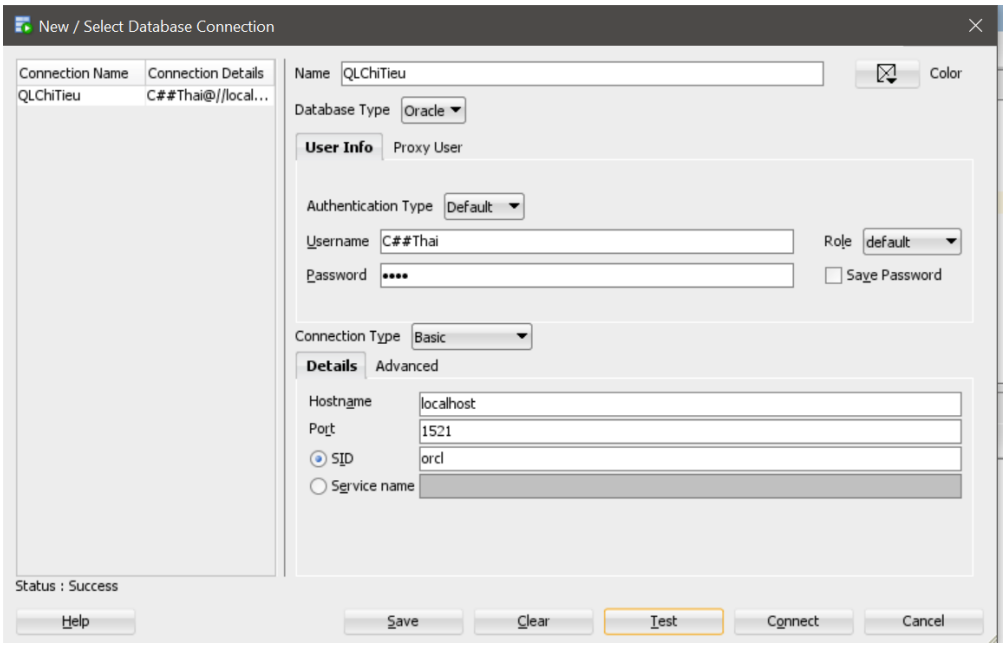

Figure 9: App.config configuration

The path at TNS_ADMIN is the path to the location containing the **tnsname.ora** file when installing Oracle Database.

3.2. Run the program

After running the program, a login form will appear so you can log in. If you don't have an account, click Register to create a new account:

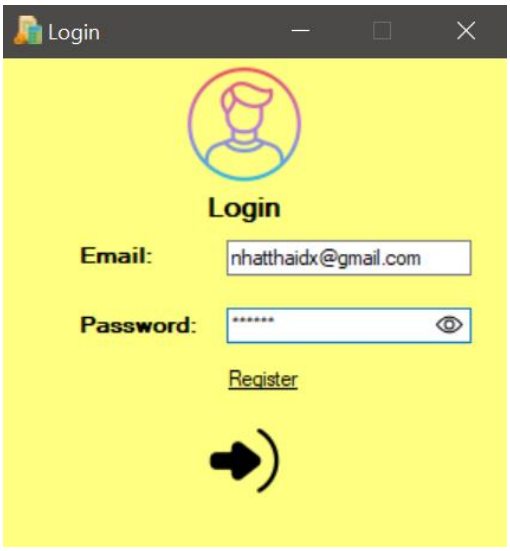

Figure 10: Form login

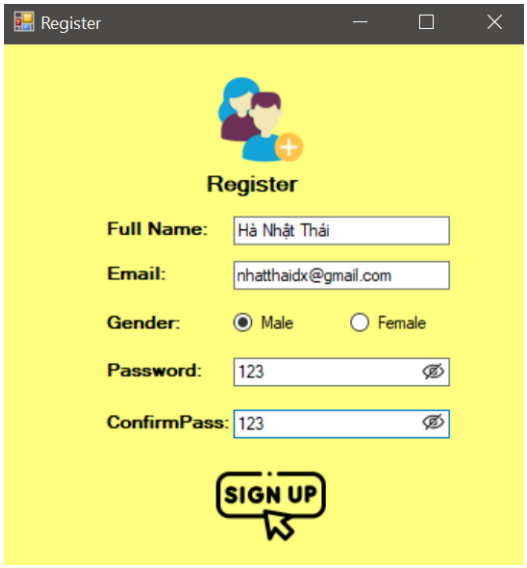

Figure 11: Form register

If the login is successful, the main page of the program will appear as follows:

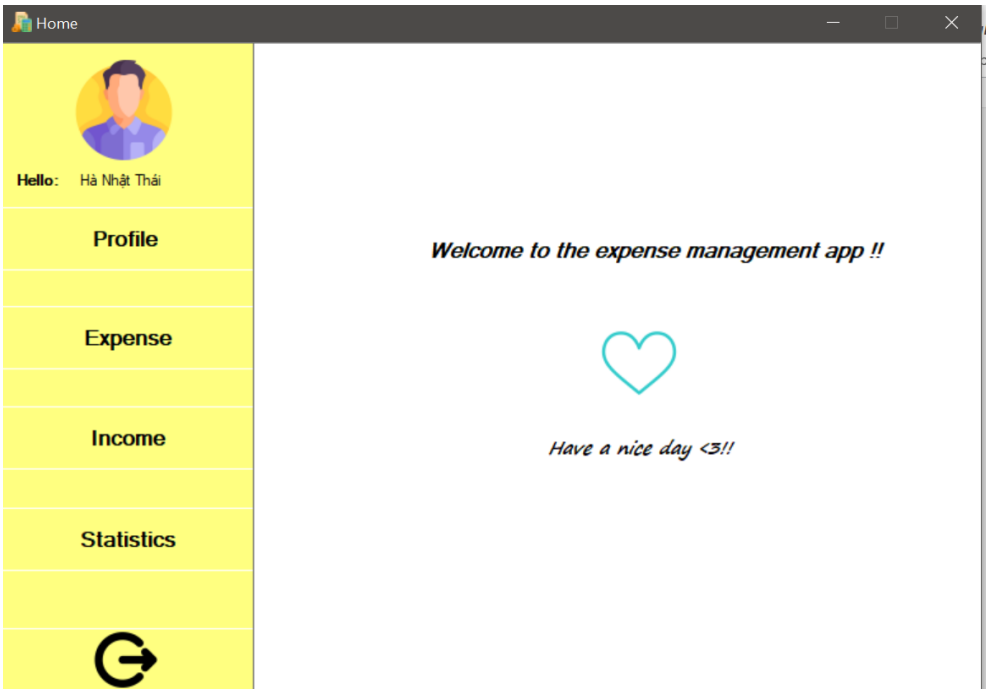

Figure 12: Home page interface

On the left side will display a list of management items including: Profile (user information), Expenses (expense management), Income (income management), Statistics (income and expense statistics chart), and finally the logout button.

The Notify message as shown above will appear if you have used the program in the past. It tells you how much your spending and income this month increased or decreased compared to last month and how much money you spent and earned on average each month in the current year.

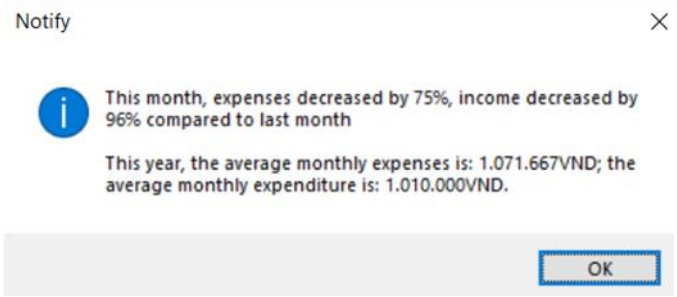

Figure 13: Notify interface

To view or update information or change password, click on Profile.

As in the Register form, in the Profile form when updating information or creating an account in Register, the email must be in the correct format and the password will be encrypted to avoid the Database being accidentally attacked later, and to avoid password disclosure.

If entered incorrectly, the program will display a message to inform the user and change:

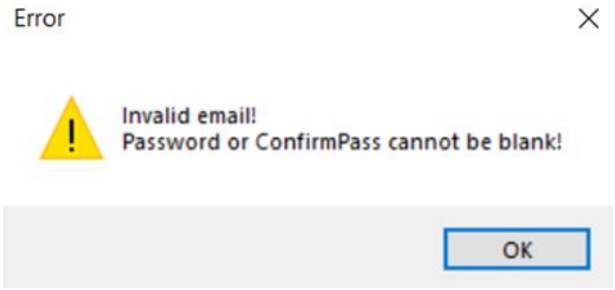

Figure 14: Error message

To manage your spending, click on Expenses:

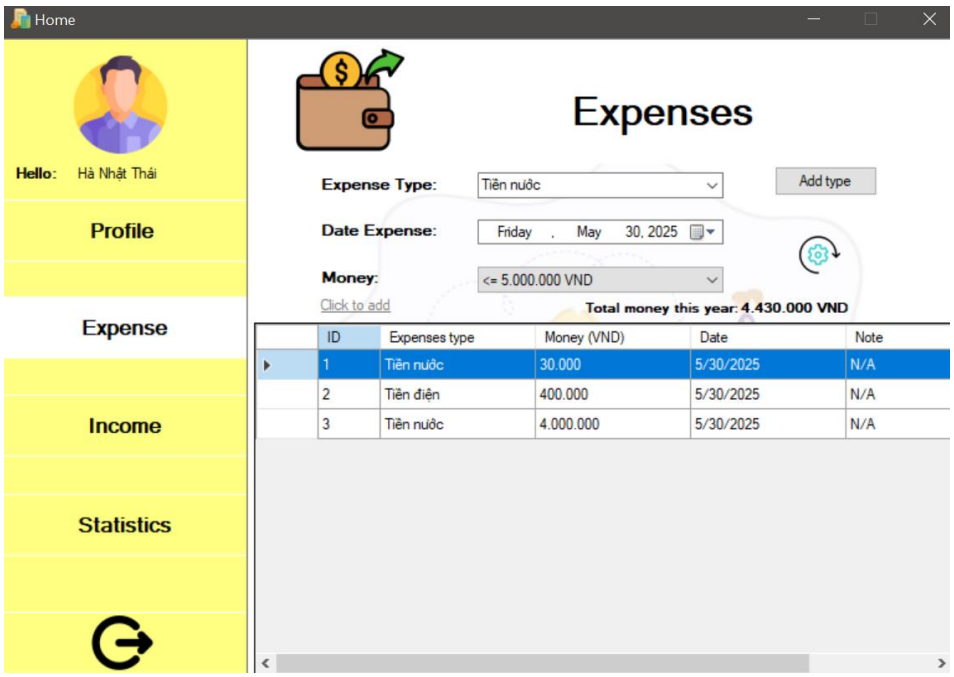

Figure 15: Expenses interface

Here you can search or filter by spending type, spending date, spending amount within a certain range. In addition, you can also add new spending types that you want, or add spending transactions that have been made:

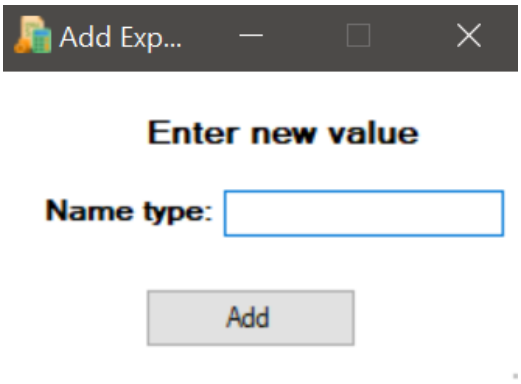

Figure 16: Add expense type

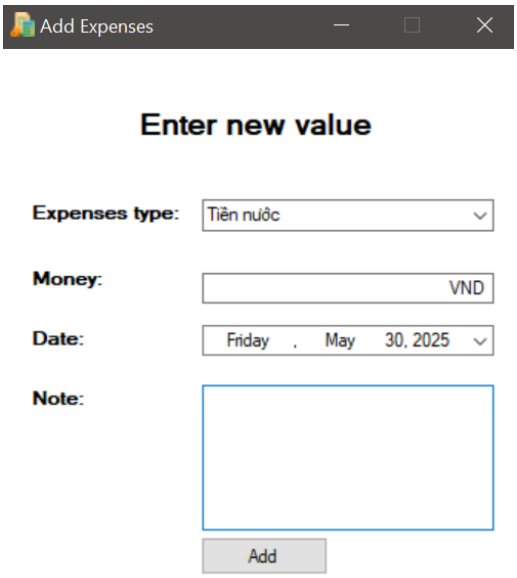

Figure 17: Add expenses

Similarly, to manage your income, click on Income:

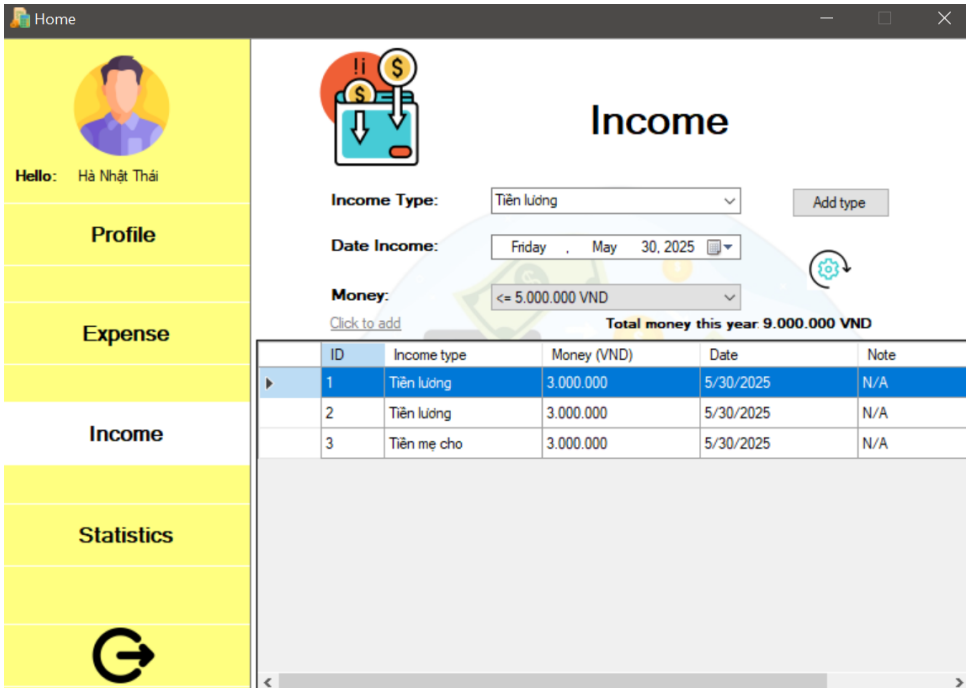

Figure 18: Income interface

Here you can search or filter by income type, income date, income amount within a certain range. In addition, you can also add new income types you want, or add income transactions that have been made:

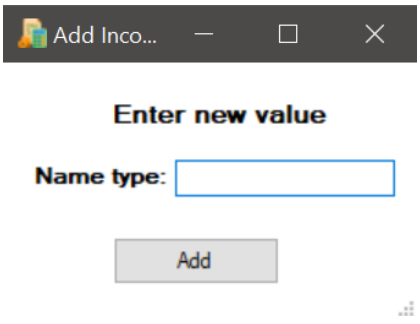

Figure 19: Add new income type

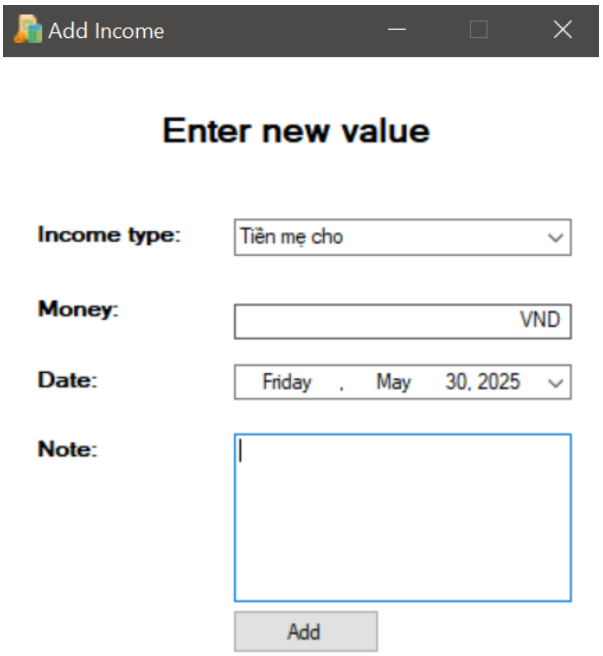

Figure 20: Add income

To see the chart of spending and income statistics, click on Statistic:

Figure 21: Statistic interface

You can view statistics for the current week, any month of the year, all months of the year or you can view at any month or any year, in the Fill box.

Similarly, you can view your own spending and income statistics by clicking on Expenses and Income. If there is no data after filtering, a message will appear on the screen:

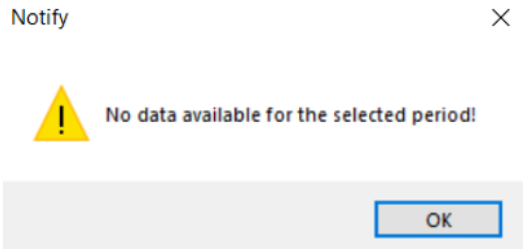

Figure 22: No data notification

CHAPTER 4: CONCLUSION

4.1. Achievements

- The program has met some of the following basic requirements:
- Simple interface, easy to see, easy to access and use.
- Allows users to log in and create passwords, encrypted passwords.
- View personal information, update information and change passwords if needed.
- Manage detailed information on spending and income transactions, can filter according to some criteria.
- There is a chart of spending and income statistics so that users know how their spending and income have differed in the past.

4.2. The shortcomings

- The program does not have advanced filtering functions: by quarter, the chart is not beautiful,etc.
- Password recovery for users when forgotten, user authentication via email is not yet implemented.
- The interface is still basic and rudimentary.
- There is no function to give advice to customers on spending or income if the customer has a certain goal.

4.3. Planned future development and updates

- Fix all the unachievable things.
- Conduct maintenance, fix errors during use of customer feedback.
- Upgrade, improve the program to suit the trend.

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