

Personal Finance Manager

SE 305 : Software Project Lab I

Submitted by

Md. Rayhan Islam Sefat

BSSE Roll No. : 1332

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Supervised by

Mr. Abdus Satter

Designation: Assistant Professor

Institute of Information Technology

Signature of supervisor.....

Date:



Institute of Information Technology

University of Dhaka

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Table of Contents

1. Introduction	3
1.1. Background Study	4
1.2. Challenges	6
2. Project Overview	8
3. User Manual	10
4. Conclusion	12
5. Appendix	12
References	12

1. Introduction

The title of this project is “*Personal Finance Manager*”. A Personal Finance Manager will help an individual person to track all kinds of financial activities of himself/herself. It will assist to monitor various types of activities like earning, spending and savings. The user will inform the software about his day to day monetary activities. The system will store all the data given by the user and analyze the insights from it. It will also let the user know about the summary of his financial activities after certain intervals like week, month and year. It will also let the user know about his financial habits for a long time and help him to determine his financial advantages and disadvantages which might help the user to make a good economic plan for the future.

The project will be divided into three parts. They are-

i. **Earning sources:** The user will inform the software about his earning sources and amounts. Sometimes it will be calculated automatically by the system with the data which are already given. The earning sources can be divided into several parts like:

- Efforts (Job/ Business)
- Investments (Share market)
- Allowance (Scholarship, stipend, pension etc)

ii. **Spending:** The user will inform the software about his spending criteria with their weights.

I have divided all spendings in two categories. They are

a. Fixed: This type of expenses will NOT vary month to month. Example:

Rent, food.

b. Non-fixed: This type of expenses will vary month to month. Example:

Shopping, gifts.

The system will analyze the cost ratio in these two types and help the user to maintain a balance between them.

iii. **Savings:** The savings of the user will also be known to the system. It will include

- DPS
- Fixed Deposit

- Investments ect

Overall, the project aims at making a synchronization among these three types of financial activities and help the user to maintain his date wise as well as monthly and annual finance management and analyze the financial advantages and liabilities of the user for both short and long terms. It also makes a regression model analyzer which takes the month wise financial data from the user and makes a polynomial regression model $y = f(x)$, where y denotes savings and x denotes the earnings of the user.

1.1. Background Study

The management of personal finances plays a crucial role in individuals' lives, influencing their financial stability, well-being, and long-term goals. In today's fast-paced and dynamic world, effective financial management has become increasingly challenging due to factors such as complex financial systems, diverse income sources, and numerous expenditure categories. To address these challenges, the development of a comprehensive and user-friendly software application, known as a "Personal Finance Manager," has gained significant importance. This background study explores the context, significance, and potential benefits of such a software project.

- a. Context: In recent years, the financial landscape has become increasingly complex. Individuals are confronted with various financial instruments, such as bank accounts, credit cards, investments, loans, and insurance policies. Managing these diverse financial aspects manually is time-consuming, error-prone, and often overwhelming.
- b. Necessity of personal finance management: Effective personal finance management is essential for maintaining financial stability, achieving goals, and securing a better future. By creating a budget, monitoring expenses, and ensuring income covers necessary expenses, debts, savings, and investments, individuals can avoid unnecessary debt and build a financial cushion. Proper financial management allows individuals to allocate resources wisely, save for important milestones such as purchasing a home or funding education, and ultimately enjoy a comfortable retirement. It is a proactive approach that empowers individuals to take control of their financial well-being and make informed decisions to secure a brighter financial future.
- c. Objectives of a personal finance management software: A personal finance management software can play a crucial role in the financial development of an individual. Some significant points of them have been described below:

i. Empowering Users:

The primary objective of the Personal Finance Manager' software is to empower individuals to take control of their personal finances. By providing comprehensive features and functionalities, the software aims to enable users to track their income, expenses, savings, investments, and debt, offering a holistic view of their financial health.

ii. Financial Planning and Goal Setting:

The software project emphasizes the significance of financial planning and goal setting. It enables users to define and track financial goals, such as saving for a house, planning for retirement, or paying off debt. By visualizing progress toward these goals, users can make informed decisions and take proactive measures to achieve financial success.

iii. Budgeting and Expense Tracking:

A crucial aspect of personal financial management is budgeting and expense tracking. The software assists users in creating budgets, categorizing expenses, and monitoring their spending habits. By providing alerts and notifications for overspending or exceeding budget limits, users can make real-time adjustments to their financial habits.

iv. Insights and Analysis:

The Personal Finance Manager software project emphasizes the importance of data-driven insights and analysis. By generating comprehensive reports and visualizations, users gain valuable insights into their financial patterns, trends, and areas for improvement. This analysis can help users make informed financial decisions and optimize their financial strategies.

- d. Benefits of a personal finance management software: Personal finance management software offers several benefits for individuals looking to streamline and enhance their financial management

i. Improved Financial Well-being:

The successful implementation and utilization of the Personal Finance Manager software can lead to improved financial well-being for users. By gaining better control over their finances, individuals can reduce financial stress, increase savings, pay off debt, and work towards achieving their long-term financial goal

ii. **Enhanced Financial Literacy:**

The software project aims to enhance users' financial literacy by providing educational resources, tutorials, and guidance on various financial topics. By equipping users with the knowledge and tools for effective financial management, the software contributes to their overall financial literacy and empowerment.

iii. **Time and Effort Savings:**

Manual financial management involves significant time and effort, often leading to errors and oversights. The software automates many financial management tasks, saving users' time and effort. With streamlined processes, individuals can focus on other aspects of their lives while ensuring their finances are well-managed.

The development of a Personal Finance Manager software project is an important step toward addressing the challenges individuals face in managing their personal finances effectively. By empowering users, promoting financial planning, offering budgeting tools, and providing data-driven insights, such software has the potential to improve financial well-being.

1.2. Challenges

Making a whole software project is never easy for someone who is doing it for the first time. It is full of challenges and obstacle as there are a lot of new things to be learned. The case of mine was not an exception. I faced many challenges while developing this project. I am describing the one by one:

a. Handling a large project

First of all I was clueless about where to start from and how to connect the small parts of my project with one another. I had no experience on building big projects as I did small academic assignments which had not more than 300 significant lines of code. I was thinking about the process of connecting all the feature modules with a root module. Then I made small C++ header files for each module which had multiple functions but a single responsibility. Each of the header files were connected in a way that they could be accessed by the *main()* function that belonged to a .cpp file.

b. Learning C++

I had no experience on coding in C++ as I had learned only C and Java in my academic curriculum. C++ was much different from those two languages in syntax, concepts, memory management and standardization. I had to learn the following things in C++ for my project:

- Complex syntax
- Memory management
- Lack of built in abstraction
- Error handling
- Lack of standardization

These things required a lot of effort from me and I had to devote myself to learn this language.

c. File read and write

My project is one that takes the data from the user and stores them in files so that they can be used in the future. I had a lot of data to be taken from the user as it was necessary to store all the data so that they can be used in the future for analyzing the users details. I had to use multiple files so that I could keep them in an organized way and find them easily when the programme needed to use them. I had to ensure that no significant data gets lost or corrupted while there will be many processes run by the user when they use it.

d. String hashing

Security is one of the most important issues for a finance management software so my project had a password hashing feature. No password will be stored in plain text so that hacking can be prevented. So usually we want the hash function to map strings onto numbers of a fixed range $[0, m)$, then comparing strings is just a comparison of two integers with a fixed length. And of course, we want $hash(s) \neq hash(t)$ to be very likely if $s \neq t$. So I used a hashing algorithm which used a prime number and multiplied its powers to the ASCII value of the characters and added the to the *hashValueOfTheString* variable.

e. Building a regression model

A regression model is a statistical approach used to analyze the relationship between a dependent variable and one or more independent variables. It is a predictive modeling technique that aims to understand and quantify the relationship between variables, allowing for the prediction of the dependent variable based on the values of the independent variables. I made a polynomial equation $y = f(x)$ which was very significant in the project as

I am not allowed to use any library function so I had to implement the whole process with raw C++ code.

f. Solving a linear equation system

I had to solve a multi variable linear equation system in my coding to determine the values of certain significant variables. I was not allowed to use any library function. As a result raw coding was important to solve the equation system. I used Gauss Jordan method for the purpose of solving the problem. The Gauss-Jordan method is an algorithm used for solving systems of linear equations and finding the solutions to linear systems. It is an extension of the Gaussian elimination method and aims to transform a matrix into reduced row-echelon form.

2. Project Overview

The Personal Finance Manager software is a comprehensive and user-friendly application designed to empower individuals in effectively managing their personal finances. It provides users with a centralized platform to track income, expenses, savings, investments, and debt, offering a holistic view of their financial health. With features such as budgeting, goal setting, data analysis, and educational resources, the software aims to enhance financial literacy and help users achieve their long-term financial goals.

Key features:

a. Register and login

The registration process allows users to create new accounts or profiles within the application. During registration, users provide certain information such as a username and password. This information is then stored securely in a database, allowing users to access the application using their credentials in the future. On the other hand,- the login process verifies the identity of users who already have registered accounts. The application then checks if the entered password matches the stored information in the database. If the password is valid, the user gains access to their account and can utilize the features and functionality provided by the application.

b. Income Handling

Income handling refers to the management and proper utilization of your earnings or revenue. It involves various aspects, such as budgeting, saving, investing, and tracking your

income to ensure financial stability and growth. The user will inform the software about his earning sources and amounts. Sometimes it will be calculated automatically by the system with the data which are already given. The earning sources can be divided into several parts like:

- Efforts (Job/ Business)
- Investments (Share market)
- Allowance (Scholarship, stipend, pension etc)

c. Expense handling

Expense handling refers to effectively managing and controlling your expenses to maintain a healthy financial situation. Proper management of expenses is crucial for maintaining financial stability, saving money, and achieving your financial goals. The user will inform the software about his spending criterias with their weights. The system will analyze the cost ratio in need purpose and demand purpose and help the user to maintain a balance between them.

d. Savings calculation and tracking

Calculating savings involves determining the amount of money you can set aside from your income for future goals or emergencies. The formula for calculating savings is relatively straightforward: $Savings = Income - Expenses$. It is important to note that savings should not be seen as a fixed amount. Expenses and income may fluctuate from month to month or year to year. Regularly review and adjust your budget and savings goals to reflect changes in your financial situation.

e. Summarizing

Financial data encompasses various elements related to an individual's or organization's financial situation. It includes income, which represents the earnings generated, and expenses, which encompass the costs incurred. Budgeting plays a crucial role in managing these inflows and outflows, allowing for effective allocation of funds. Additionally, financial data involves tracking and analyzing assets, such as properties, investments, or cash reserves. Understanding and interpreting financial data is essential for making informed decisions, setting financial goals, and ensuring financial stability and growth. The software will take data and summarize them month wise. In addition, the system will help the user to see all their financial activities at a glance.

f. Regression modeling

Regression modeling is a statistical technique used to analyze the relationship between a dependent variable and one or more independent variables. It aims to predict or estimate the value of the dependent variable based on the values of the independent variables. The dependent variable is the outcome or response variable, while the independent variables are the predictors or explanatory variables. I made a polynomial equation $y = f(x)$ which was very significant in the project as I am not allowed to use any library function so I had to implement the whole process with raw C++ code.

3. User Manual

i. Start the system and get the welcome interface.

```

                Software Project Lab 1
            PERSONAL FINANCE MANAGEMENT PROJECT
    A system that manages the finanacial activities of an individual

WELCOME! You have to register first!
```

ii. Register if you open the application for the first time.

```

                Software Project Lab 1
            PERSONAL FINANCE MANAGEMENT PROJECT
    A system that manages the finanacial activities of an individual

WELCOME! You have to register first!
Enter your first name: Charlie
Enter your last name: Chaplin
Enter your password(at least 8 characters): asdfghjkl
Congratulations! You have been registered successfully!
```

iii. If you are registered before, login please.

```

Verify that you are Charlie Chaplin
Please enter the password: asdfghjkl
Congratulations! You have been logged in successfully...
```

iv. Add balance feature

```

What do you want to do?
  1. Add your balance
  2. Transfer balance
  3. Spend Money
  4. Show monthwised activity analysis
  5. Show summary data
  6. Show regression analysis
Your response: 1
  Which type of balance?
    1. Cash balance
    2. Running Account balance
    3. Saving Account balance
Your response: 1
Enter amount: 1000
Your current cash balance: 3423

```

v. Transfer balance feature

```

What do you want to do?
  1. Add your balance
  2. Transfer balance
  3. Spend Money
  4. Show monthwised activity analysis
  5. Show summary data
  6. Show regression analysis
Your response: 2
Transfer options:
  1. Running account balance to cash balance
  2. Cash balance to saving account balance
  3. Running account balance to saving balance
  4. Saving account balance to cash balance
Your response: 1
Enter amount: 100

```

vi. Spend money feature

```

What do you want to do?
  1. Add your balance
  2. Transfer balance
  3. Spend Money
  4. Show monthwised activity analysis
  5. Show summary data
  6. Show regression analysis
Your response: 3
Enter spending type:
  1. Need
  2. Demand
Your response: 1
  Which type of balance?
    1. Cash balance
    2. Running Account balance
    3. Saving Account balance
    4. Credit card
Your response: 1
Enter amount: 100
Your current cash balance: 3523

```

vii. Month Wise activity tracker

```

Your current cash balance: 3523
Your current running account balance: 23
Your current saving account balance: 123
Your current saving account balance: 123
Total earning of the year: 2200
Total savings of the year: 1100
Do you want to conduct any more operations?

```

vii. Show summary

```

SUMMARY

Maximum earning:
Month: June
Amount: 1100

Minimum earning:
Month: July
Amount: 0

Maximum saving:
Month: June
Amount: 100

Minimum saving:
Month: July
Amount: 0

```

viii. Get regression equation

```

The final equation of the regression modeling is:
y = 33.3333+ 0.135x^1 + -1504.6x^2 + -6.0207x^3 + 0.00135115x^4

```

ix. Terminate the application

```

Do you want to conduct one more operation?
1. Yes
2. No
Your response: 2

```

4. Conclusion

Regression modeling is a statistical technique used to analyze the relationship between a dependent variable and one or more independent variables. It aims to predict or estimate the value of the dependent variable based on the values of the independent variables. The dependent variable is the outcome or response variable, while the independent variables are the predictors or explanatory variables. I made a polynomial equation $y = f(x)$ which was very significant in the project as I am not allowed to use any library function so I had to implement the whole process with raw C++ code.

5. Appendix

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