



University of Essex

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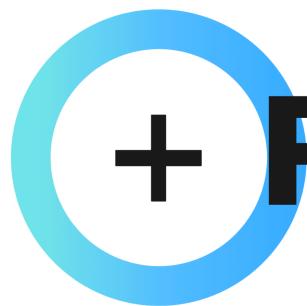
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Student Name:		Student Number (PRID):	
Module Code:	CE301	Module Title:	Languages and Compilers
Lecturer/Tutor:		Grade:	

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Fintap

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Abstract

The current economic landscape presents various challenges, including Covid-19's impact on job stability [1], inflation, increase in GST, and the growth of Buy Now Pay Later companies that encourage poor financial decisions [2]. Additionally, a survey showed that 52% of adults do not know how much they spend on a monthly basis [3]. All of these indicate a need for solutions that can help individuals navigate these complexities.

Evaluating existing solutions, I deduced the following. iBanking apps only account for transactions within their native systems, excluding expenses made in cash or with other banks. Many expense tracking apps require manual input of all expenses, a task that is tiresome and time-consuming. Lastly, existing apps also lack the functionality that enables users to gain insights into their future financial circumstances.

To address these challenges, I developed a financial tracker and planner that harnesses machine learning technology, enabling users to effortlessly monitor and forecast their finances. Our solution allows users to upload unique forms of payment documentation at their convenience (e.g., photos and videos). The platform's machine-learning algorithms subsequently extract the relevant information and categorize it, a feature that no existing solution has.

The platform also provides users with planning and forecasting features so users can gain insight into their financial future.

By amalgamating the convenience of seamless tracking with planning, our solution provides a cutting-edge tool for individuals seeking to seize control and understand their financial futures.

Acknowledgments

I want to express my most profound appreciation to Mdm Malar and Dr. Loo, who have been instrumental in successfully completing this project. Their unwavering support, insightful guidance, and expert advice have been invaluable to developing this software.

To Mdm Malar, my primary supervisor, I am deeply grateful for your continuous encouragement and belief in my abilities. Your extensive knowledge and experience have been a guiding light, illuminating the complexities of this project and making them manageable. I am truly grateful for your patience, invaluable suggestions, and relentless pursuit of excellence that inspired me to keep improving.

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Thank you both for your immense contribution to my learning journey and for shaping my understanding and skills in software development. I am truly fortunate to have had such dedicated and inspiring mentors for this project.

1. Background

1.1. Nitro-Tech Pte Ltd

Nitro Technologies is a leading software development company that develops innovative B2B and B2C software solutions for various industries.

One of the company's strengths lies in its ability to recognize gaps in existing market solutions and develop better software that addresses those gaps and the user's needs. In order to do so, the company has an extensive research team whose sole purpose is to conduct analysis and identify areas where existing solutions fall short.

The research team's most recent discovery saw gaps in the fintech sector, specifically in financial tracking and planning. Through extensive research and market analysis, the team found that solutions must be improved in several key areas. One notable shortcoming is the limited coverage of financial transactions. For example, iBanking apps do not account for expenses made in cash. This leads to an incomplete view of the user's overall financial situation.

Another area for improvement is the cumbersome task of expense input required by current solutions. Requiring manual input can be both time-consuming and prone to error. Lastly, existing solutions need to offer adequate forecasting and planning functionalities. This means that users have limited access to insight into their financial future.

Recognizing these gaps in the fintech sector, Nitro Technologies assigned my development team to create a more advanced and user-friendly financial tracking and planning solution. This new solution aims to address the shortcomings of existing tools.

2. Primary Objective

This project aims to develop a Financial Tracker and Planner that will enable users to track and plan their finances effortlessly. To elaborate, the software needs to reduce the amount of manual input by the user, thus reducing the resistance to tracking one's finances. It also has to have forecasting functionality so that, beyond tracking, users can have insights into their financial futures.

In terms of interface, we intend to create a simple, elegant, and most crucial intuitive platform so users can easily navigate our software, and there is little to no learning curve required.

Overall, it addresses the gaps identified by the research team and ensures that this project tackles them adequately.

3. Literature Review and Background Reading

Literature review and background reading is the research that has led us to believe that there is room for innovation in financial tracking and planning. The research methodology first takes a border perspective by asking which industry has the potential for change.

After identifying a few industries, the next question to address is if the hand full of selected industries is supported and well funded, as this increases the odds of success.

Next, we look into the needs of the users in the industry and try to discover how we can develop better software for them. Again, asking this question reduces the risk of developing software without product market fit.

Lastly, the research effort is completed by looking at existing solutions and identifying gaps that can be improved on by the company.

If a potential endeavor fails to adequately address the questions asked above at any point during the research, it will be discarded.

3.1. Industries with potential for change

To identify these industries, I explored websites that showed projects that have been worked on and projects that are currently being worked on. During this process, we can also get a general idea of how well-supported and funded an industry is.

3.2. The websites used for this research:

- Community Research and Development Information (Cordis)
- UK Research and Innovation (UKRI)
- Our SG Fund - Established to fund projects that aim to help the community [4]
- Integrate Grant Management System (IGMS) - A centralized software where one can see funded projects supported by the National Research Foundation Singapore (NRF), Ministry of Health (MOH), Ministry of Education (MOE), and Agency for Science, Technology, and Research (A*Star). [5]

3.3. Shortlisted Industry and Project Specifics:

Health

- Shaping the social brain through early interactions
Funded amount: €454,957 [6]
- Online portal and series of mental health in the workplace conferences for front-line and NHS workers post Covid-19
Funded amount: £71,604 [7]
- Healthy older people every day (HOPE) - Role of high protein diet on muscle and bone health
Funded amount: Undisclosed [8]
- New youth mental wellness initiative
Funded amount: SGD 20,000 (Maximum) [9]

Social Media

- RISE Social Media Analytics
Funded amount: €1,168,400 [10]

Employment

- Skills and Employment Survey 2017
Funded amount: £996,661 [11]

Finance

- The mental health of higher education students and the Role of finances and Debt
Funded amount: Undisclosed [12]
- Household finances and housing wealth
Funded amount: £109,437 [13]
- YOFI - Your Finances Limited
Funded amount: £290,683 [14]
- Machine Learning for Finance
Funded amount: Undisclosed [15]

3.4. Industries that are supported and well funded

During my research, I came across an article from the National Research Foundation (NRF) titled ‘Smart Nation and Digital Economy’ The article discussed Singapore’s ongoing effort to digitize the nation since 2006, these days it is focusing on Artificial Intelligence/Machine Learning to “build a digital economy.” [16]

From these efforts, Singapore has become one of “the world’s most highly cited” [16] for distributed ledger technologies/fintech. As stated in the article, it has also “engaged over 300 companies and started more than 60 projects focusing on sectors such as healthcare, finance, and fast-moving consumer goods.” [3] This illustrates that industries such as healthcare, finance, and fast-moving consumer goods are supported and well-funded.

Furthering my research, I found that Singapore has a tech fund called Startup SG Tech, a FinTech Association, and a fintech event called Fintech Festival which is partly organized by the Monetary Authority of Singapore (MAS) and sponsored by tech giants the likes of Ant group, Tencent, Visa, Temasek, UOB, DBS, Google J.P.Morgan to name a few. Speakers of the event included Lawrence Wong - Deputy Prime Minister; Taimur Baig - Managing Director of DBS; and Vitalik Buterin - Co-founder of Ethereum. [17]

Seeing that Fintech is a well-funded and government-supported industry in Singapore, I moved on to the following question: how can I develop better software for the users, and what issues do they face?

3.5. Financial challenges that users are facing

Since Covid-19, many Singaporeans have been affected financially as most were not expecting a black swan event to occur. A survey carried out by OCBC showed that up to 70% of surveyees need more savings to sustain them beyond six months, and many more are worried about losing their jobs. [18]

Covid-19 has also had damaging effects on Singapore’s economy, such as a reduction in GDP and a slowing down of economic growth, according to the Macroeconomic Review published by the MAS. [19] In addition to Covid-19, the war between Ukraine and Russia has affected Singapore’s import supply chain; when there is less supply than demand, this causes daily goods to increase, which Singaporeans experience as inflation. [20] To worsen the situation, Singapore will increase GST from Jan 2023. With inflation and the increase in GST, Singaporeans can expect to have less purchasing power for every dollar they spend.

While individuals are struggling with their finances, a sector in FinTech is growing fast, much to the detriment of these individuals. This sector is commonly referred to as Buy Now Pay Later (BNPL), which since 2020 has seen transactions grow from S\$114 million to S\$440 million in 2021, more than 300% in a year. [21] Based on its current momentum, the trajectory of BNPL transactions is expected to grow exponentially. Currently, 38% of Singaporeans, around 1.1 million people, have used a buy now pay later service. [22]

3.6. How does Buy Now Pay Later (BNPL) work?

Unlike traditional credit cards, which require one to show proof of income before extending credit to the consumer, BNPL lacks this requirement and allows anyone who is over 18 to sign up for an account. Proof of income is essential as it shows that one can service their debt; it is also used to assess how much credit should be extended to an individual. With Buy Now Pay Later, account creation can be done instantaneously, allowing users to distribute the payment for their purchases as repayable debt across three to four months.

Despite Buy Now Pay Later being a mechanism to make purchases by incurring debt, this is different from what is often portrayed on the website and marketing materials of these companies. Shopback, one of eight BNPL companies in Singapore, can be seen stating on their website, “Save more when you pay smarter” [23] Atome, another BNPL company, encourages impulse spending by stating on their website, “We live in the moment just like you, and we get that some things in life should not have to wait.” [24]

Some may argue that certain purchases made with BNPL are necessities, such as food and groceries for lower-income families; At the same time, this is undeniable; a deeper look at transaction statistics shows that most purchases are not necessities.

Findings from a fact-checked Buy Now Pay Later Report by Finder show that “Impulse buying is the most common BNPL mistake.” The youths of Singapore, ages 16-24, who have the least experience in financial literacy and disposable income, make up 40% of BNPL users. [2]

“27% of Singaporeans aged 16+ – equivalent to 783,000 people – admit to being worse off financially due to a buy now pay later mistake.” A contrast to Shopback’s statement of “Save more when you pay smarter” [2], The adverse effects of debt-incurring impulse purchases have become a big enough problem that MAS and The Consumers Association of Singapore (CASE) have gotten involved.

CASE was quoted saying, “raised concerns about the rising use of BNPL services, which it described as potentially giving consumers a “false perception of increased purchasing power, leading them to spend beyond their means.” [25] MAS recently issued a code of conduct that introduced a limit of “S\$2000 on outstanding payments that customers can have with each BNPL provider unless additional creditworthiness assessments are done.” [26]

It is worth noting that even with this new regulation of a S\$2000 outstanding payment limit, users can still incur a large amount of debt by creating accounts with other BNPL companies and seeing that there are eight companies in Singapore, equating to S\$16,000 of potential debt.

3.7. Financial Literacy and Habits

While the discoveries I found looking into the impact of the Buy Now Pay Later sector were not promising, I wondered if the statistics were biased and caused by the poor financial decisions of the minority. This led me to discover an even more concerning issue that is 1 in 2 Singaporeans do not know how much they spend in a month, and those between 18 - 24 are usually the ones who have no idea how much they spend; the same age group that makes up 40% of BNPL users in Singapore. For the other half that does track their expenses, even then, 28% or 1 in 4 of them have the habit of overspending, and their main reason for doing so is impulse purchases; [27] impulse purchase, which is encouraged by BNPL companies.

The article provides further insights as it states that people do not track their spending, ranging from the task being troublesome, an unnecessary activity, fear of seeing their financial outcome, and the additional stress the task will cause. [27]

3.8. Research on Existing Solutions

Observing this debt-inducing and poor financial management pandemic, I researched existing solutions that aid the consumer in making better financial decisions. This led me back to Fintech Festival's website, where I saw that the first-place winner from the SFF Global Fintech Awards [28] was given to a company called GoalsMapper Pte Ltd. Explore GoalMapper's website. It showed that they had developed software that can allow users to track, plan, and project their finances to gain better insights and control. [29] However, this software is not available to the general public and is sold as a solution to financial consultants.

Next, I looked at banking apps and quickly realized that different banks will not be able to track expenses from other banks, so there needs to be more consolidation. Also, banking apps do not allow users to add expenses made in cash. So, finally, I turned to popular expense-tracking apps available on the Play Store and App Store.

4. Application Review

4.1. Application Review 1 - Money Manager [30]

Company Name	Realbyte Inc.
Application Name	Money Manager Expense & Budget
App Store Rating	4.8 / 5 - 8.6k Ratings
App Store Downloads	Data unavailable
App Store Link	https://apps.apple.com/us/app/money-manager-expense-budget/id560481810
Play Store Rating	4.6 / 5 - 355k Ratings
Play Store Downloads	10M+
Play Store Link	https://play.google.com/store/apps/details?id=com.realbyteapps.moneymanagerfree&hl=en&gl=US

4.1.1. Screenshots

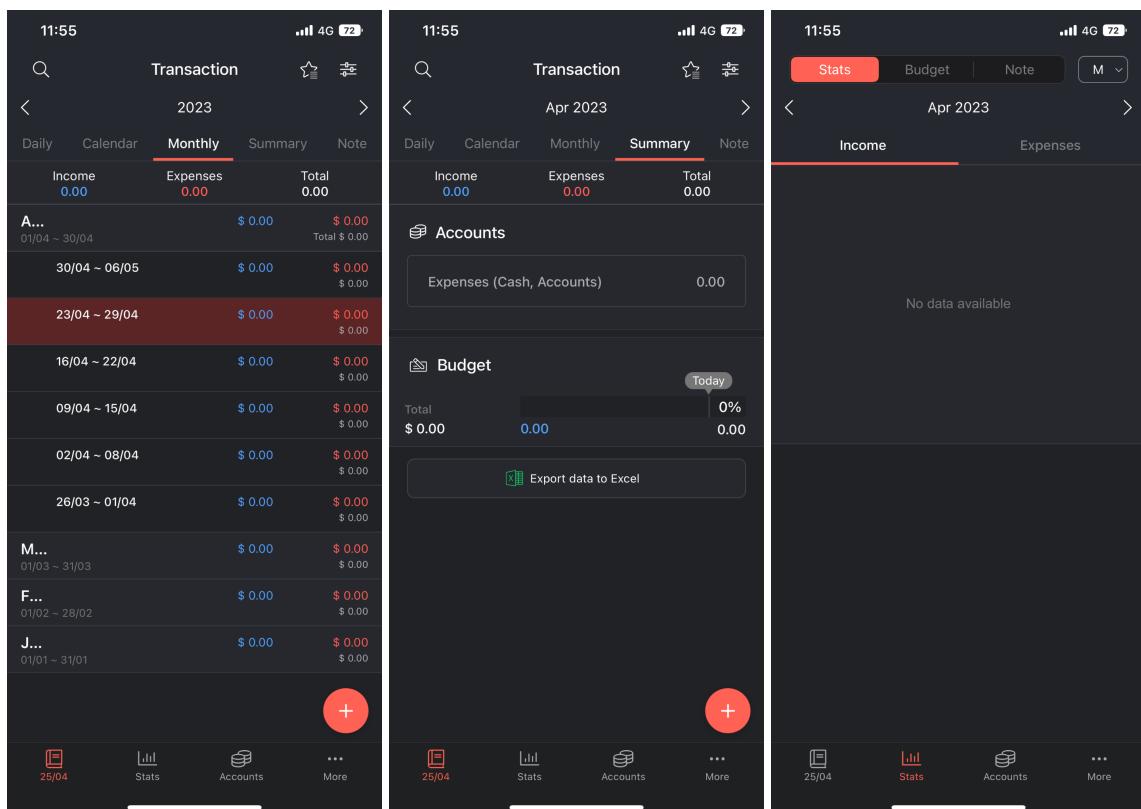


Figure 4-1a

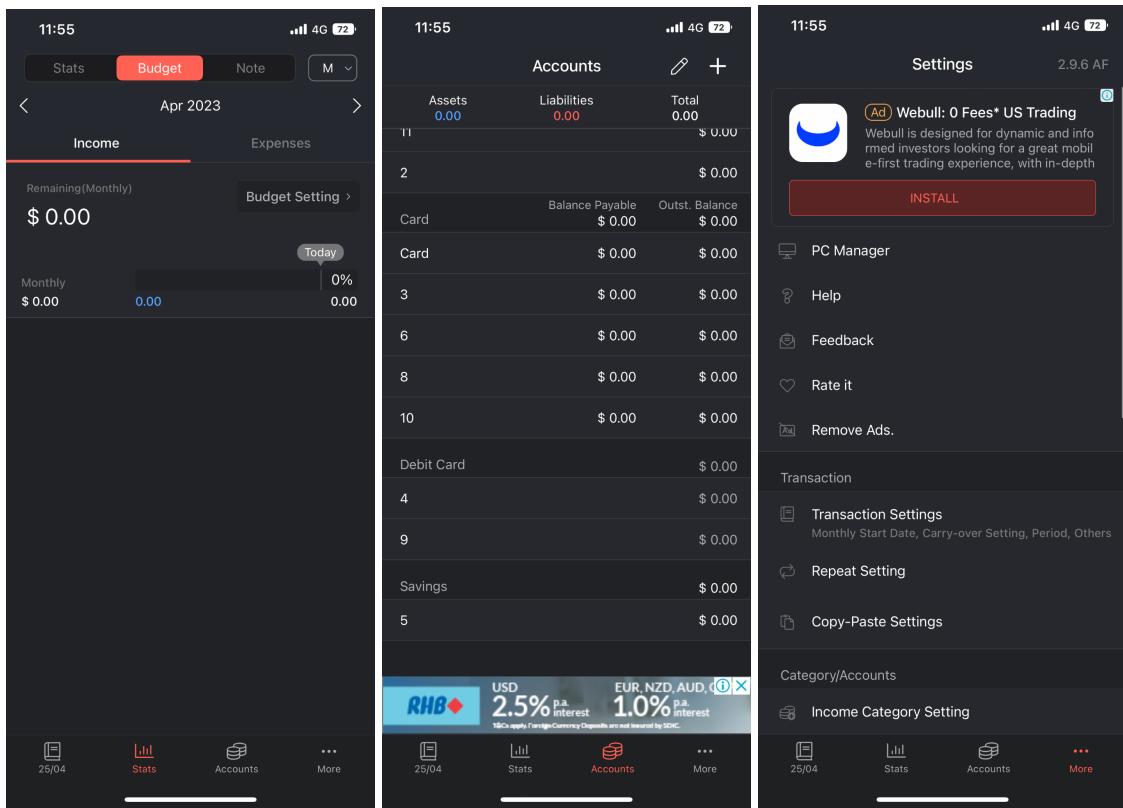


Figure 4-1b

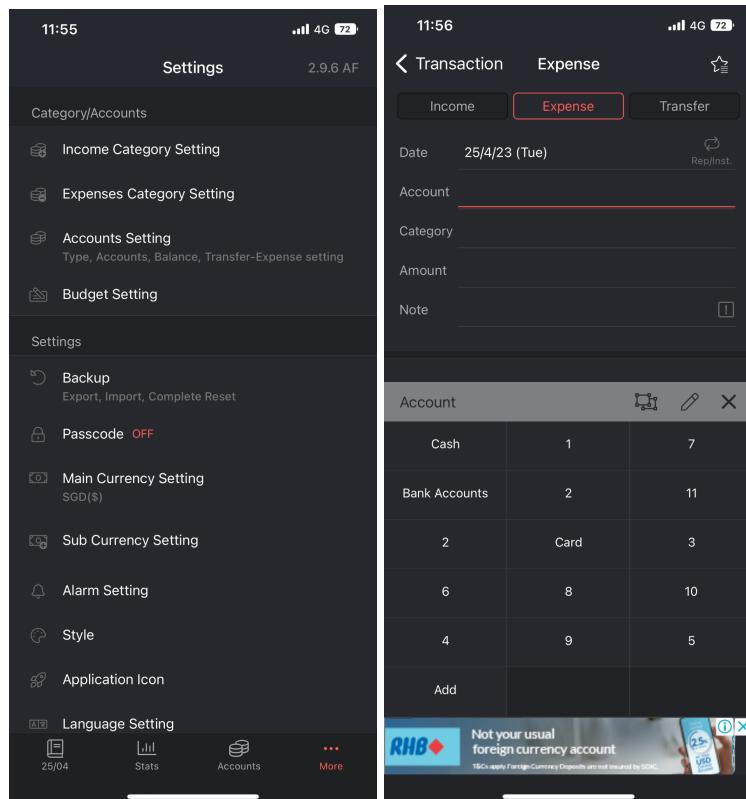


Figure 4-1c

4.1.2. Advantages of the Money Manager app:

- **Comprehensive expense tracking:** The Money Manager app allows users to track their income and expenses.
- **Budgeting planning:** The app enables users to set budgets for various categories.
- **Multiple accounts support:** The Money Manager app supports multiple accounts, allowing users to manage and track expenses across different bank accounts or credit cards.
- **Data backup and synchronization:** The Money Manager app provides data backup and synchronization options across multiple devices, ensuring the user's financial data is safe and accessible.
- **Professional design:** UI and UX

4.1.3. Disadvantages of the Money Manager app:

- **Manual data entry:** Users may need to input their transactions manually, which can be time-consuming and prone to errors.
- **Limited integration with financial institutions:** The Money Manager app may not integrate with all banks or financial institutions, making it difficult for users to have a holistic view of their finances.
- **No machine learning capabilities:** The Money Manager app may not leverage machine learning to categorize expenses automatically.
- **Too many nonessential options:** Choice paralysis in an already stressful task. Lack of focus.
- **No password protection:** Security is paramount in any application that deals with personal financial information. The Money Manager app's lack of password protection is a significant concern.
- **Lack of forecasting functionality:** Doesn't provide users with the ability to gain insight into their financial future.

4.2. Application Review 2 - Monny [31]

Company Name	Greamer
Application Name	Monny
App Store Rating	4.8 / 5 - 2.7k Ratings
App Store Downloads	Data unavailable
App Store Link	https://apps.apple.com/sg/app/monny/id590327036
Play Store Rating	4.6 / 5 - 9.29k Ratings
Play Store Downloads	100k+
Play Store Link	https://play.google.com/store/search?q=monny&c=apps&hl=en&gl=US

4.2.1. Screenshots

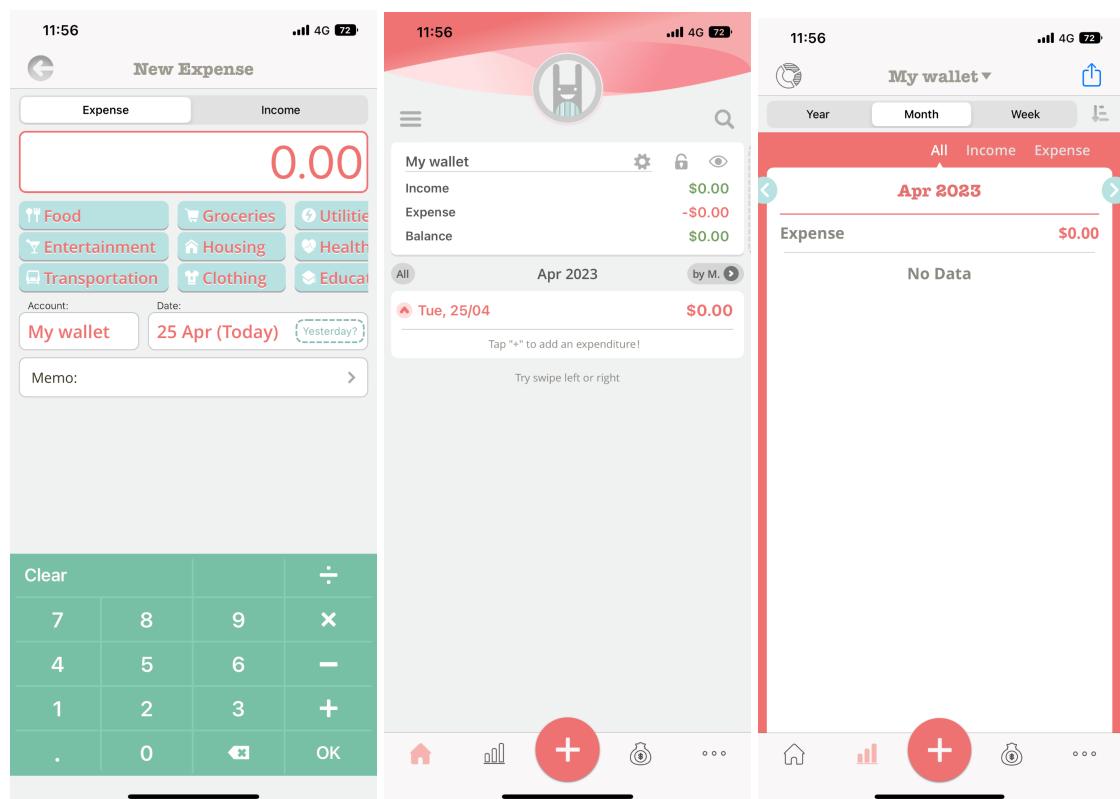


Figure 4-2a

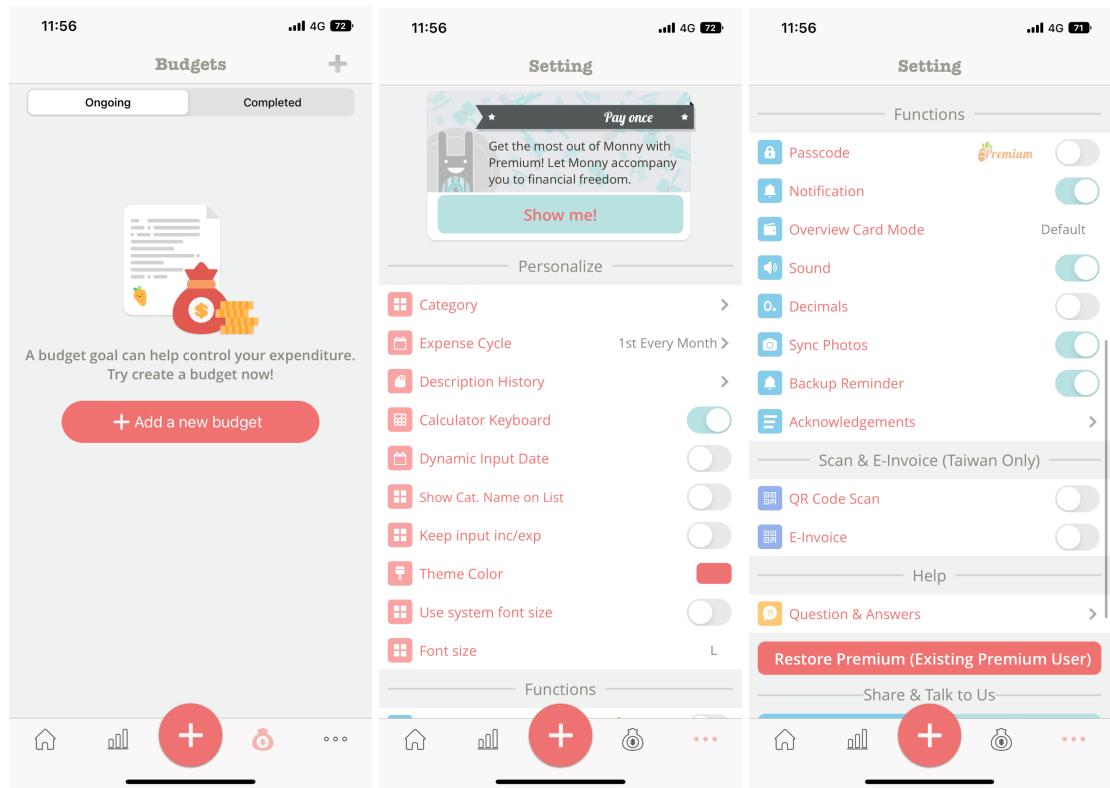


Figure 4-2b

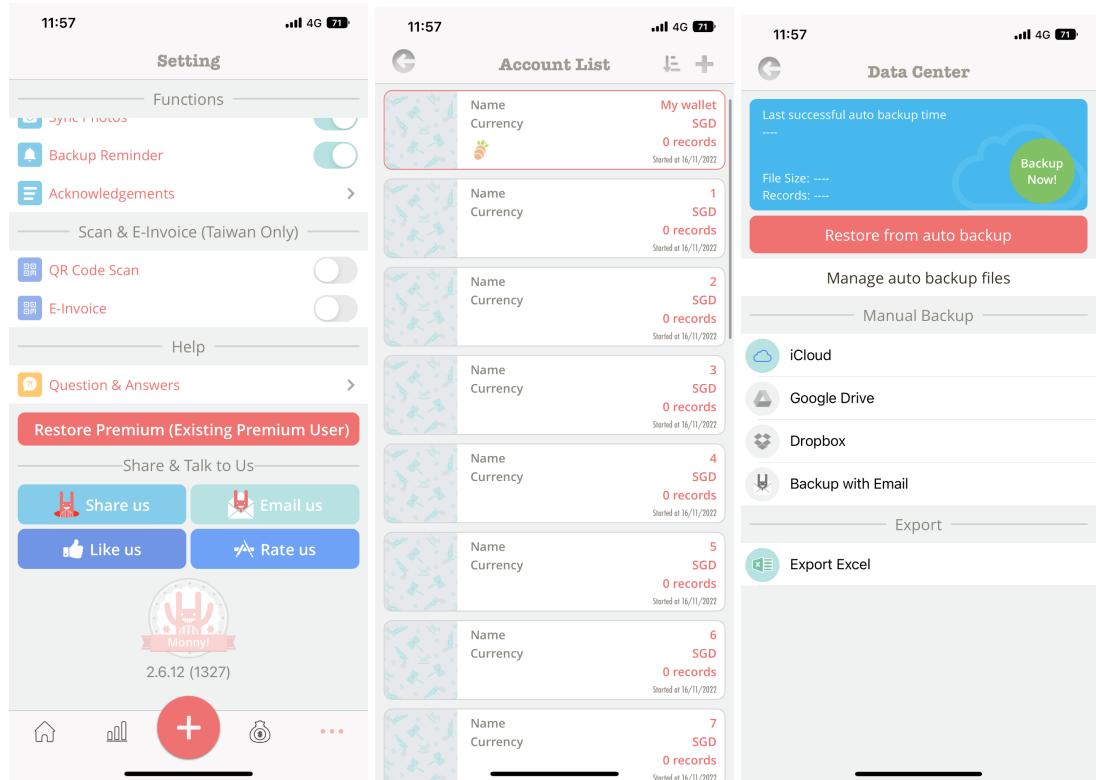


Figure 4-2c

4.2.2. Advantages of the Monny app:

- **Comprehensive spending tracking:** The Monny app users may keep tabs on their earnings and outgoing costs.
- **Planning your budget:** The software lets users define budgets for several categories.
- **Data backup and synchronization:** The Monny app offers options for data backup and synchronization across various devices, guaranteeing the security and accessibility of the user's financial information.

4.2.3. Disadvantages of the Monny app:

- **Manual Input:** Users are required to manually enter their transactions, which can be time-consuming and error-prone.
- **Limited interaction with financial institutions:** Making it challenging for consumers to get a complete picture of their finances.
- **Machine learning is not supported:** The Monny app does not use machine learning to classify spending automatically.
- **Poor UI and UX Design:** Design is poorly executed resulting in a poor user experience
- **Too many unnecessary choices choice:** Paralysis in a situation that is already difficult.
- **Lack of forecasting functionality:** Doesn't provide users with the ability to gain insight into their financial future.

4.3. Application Review 3 - Monefy [32]

Company Name	Reflectly ApS
Application Name	Monefy
App Store Rating	4.7 / 5 - 4.1k Ratings
App Store Downloads	Data Unavailable
App Store Link	https://apps.apple.com/us/app/monefy-money-tracker/id1212024409
Play Store Rating	4.3 / 5 - 183k Ratings
Play Store Downloads	5M+
Play Store Link	https://play.google.com/store/apps/details?id=com.monefy.app.lite&hl=en&gl=US

4.3.1. Screenshots

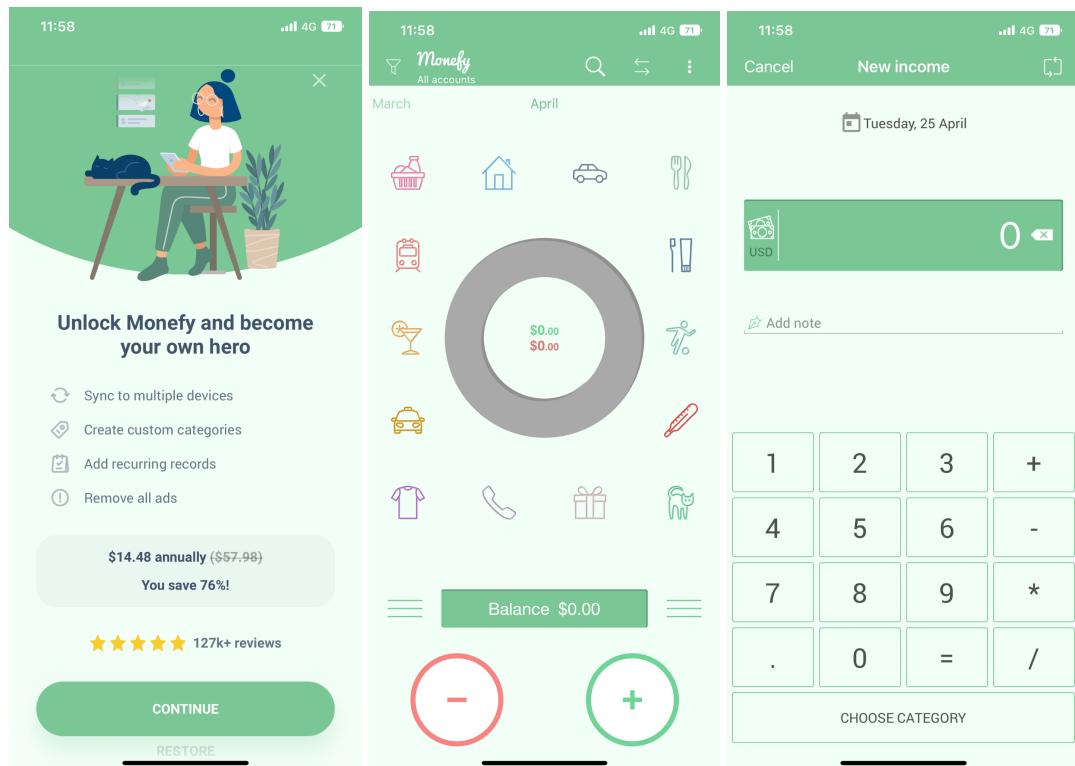


Figure 4-3a

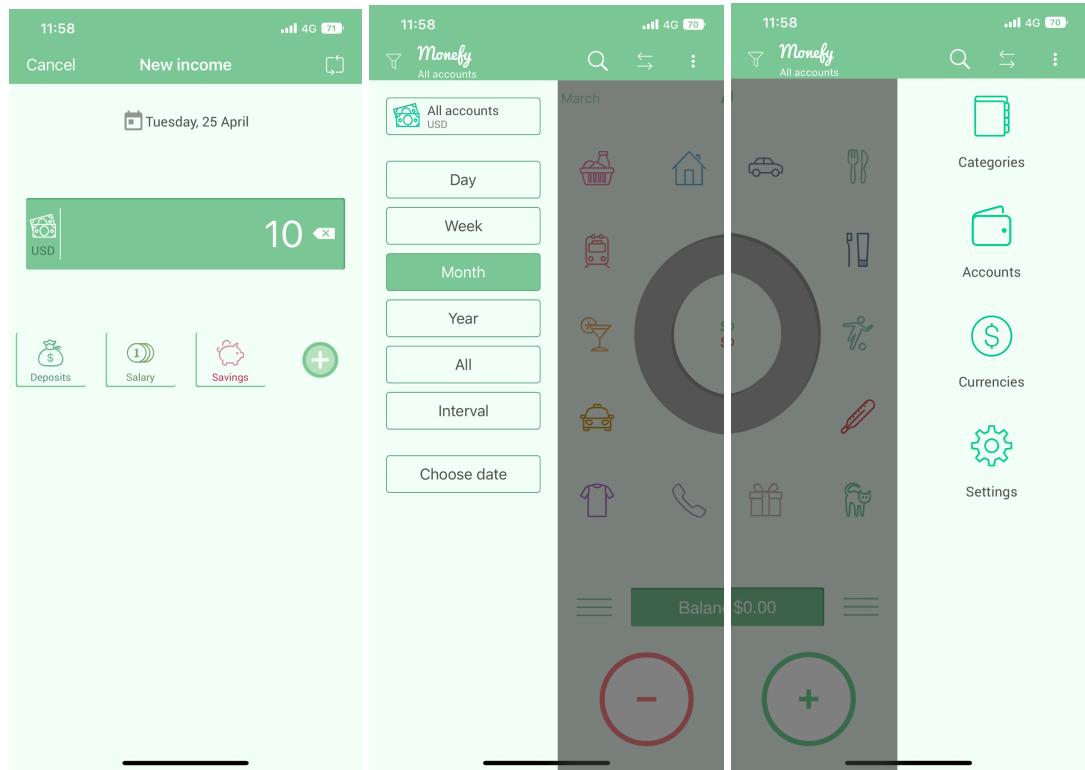


Figure 4-3b

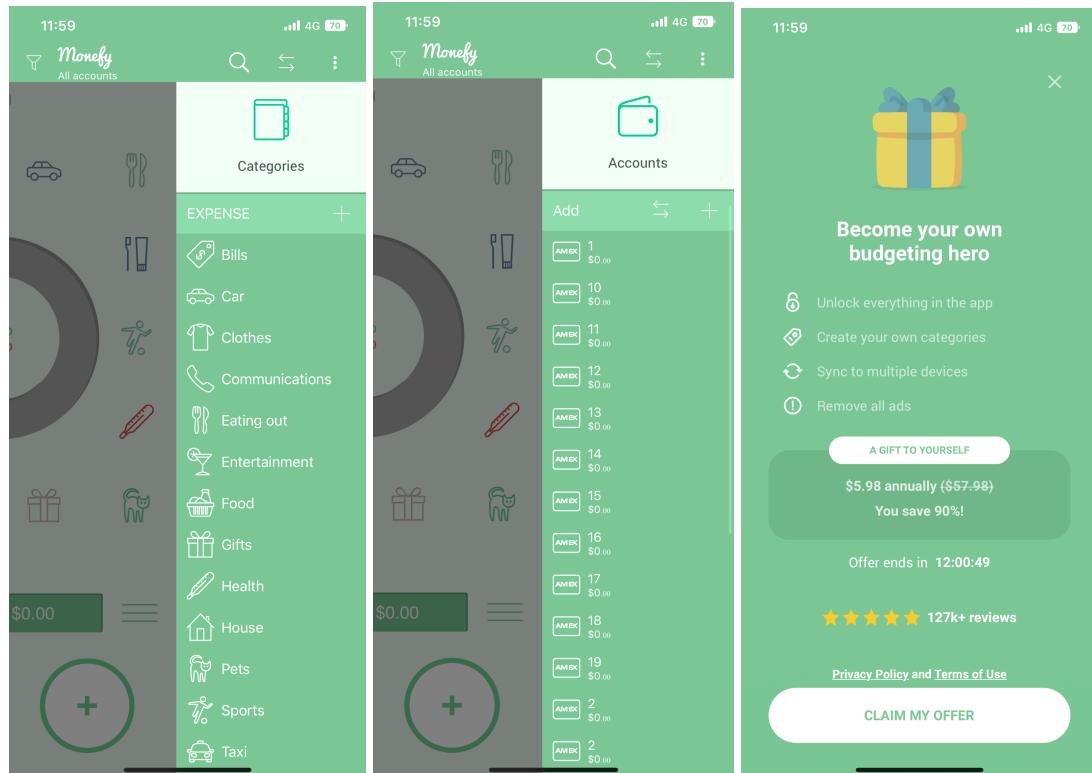


Figure 4-3c

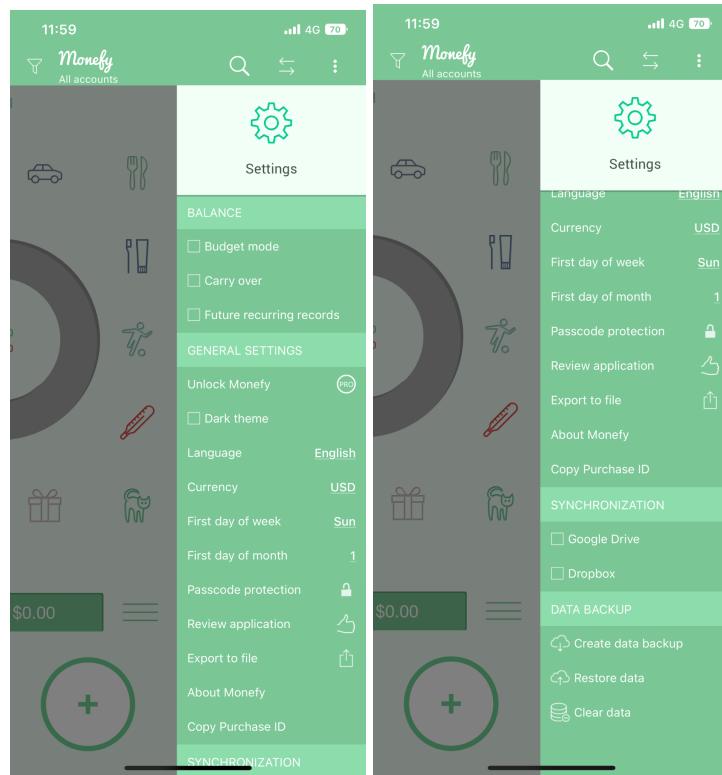


Figure 4-3d

4.3.2. Advantages of the Monefy app:

- **User-Friendly Interface:** Monefy offers a simple and intuitive user interface that easily tracks your expenses and income.
- **Comprehensive Expense Tracking:** The app allows users to record their expenses and categorize them into different groups.
- **Synchronization:** Monefy supports synchronization with Dropbox and Google Drive

4.3.3. Disadvantages of the Monefy app:

- **Manual Data Entry:** All transactions must be entered manually in Monefy, which can be time-consuming and prone to human error.
- **Limited Free Version:** While Monefy does offer a free version, it has limited features. Users need to upgrade to the Pro version to access all features. The free version has frequent intrusive ads.
- **No Machine Learning Capabilities:** The app does not leverage machine learning to categorize expenses automatically.
- **Lack of forecasting functionality:** Doesn't provide users with the ability to gain insight into their financial future.
- **Too many unnecessary choices choice:** Paralysis in a situation that is already difficult.

4.4 Application Review 4 - Money+ [33]

Company Name	Chongqing Zhouhu Technology Co.,Ltd
Application Name	Money+
App Store Rating	4.7 / 5 - 899 Ratings
App Store Downloads	Data Unavailable
App Store Link	https://apps.apple.com/us/app/money-cute-expense-tracker/id1510760825
Play Store Rating	4.7 / 5 - 48.6k Ratings
Play Store Downloads	1M+
Play Store Link	https://play.google.com/store/search?q=money%2B&c=apps&hl=en&gl=US

4.4.1 Screenshots

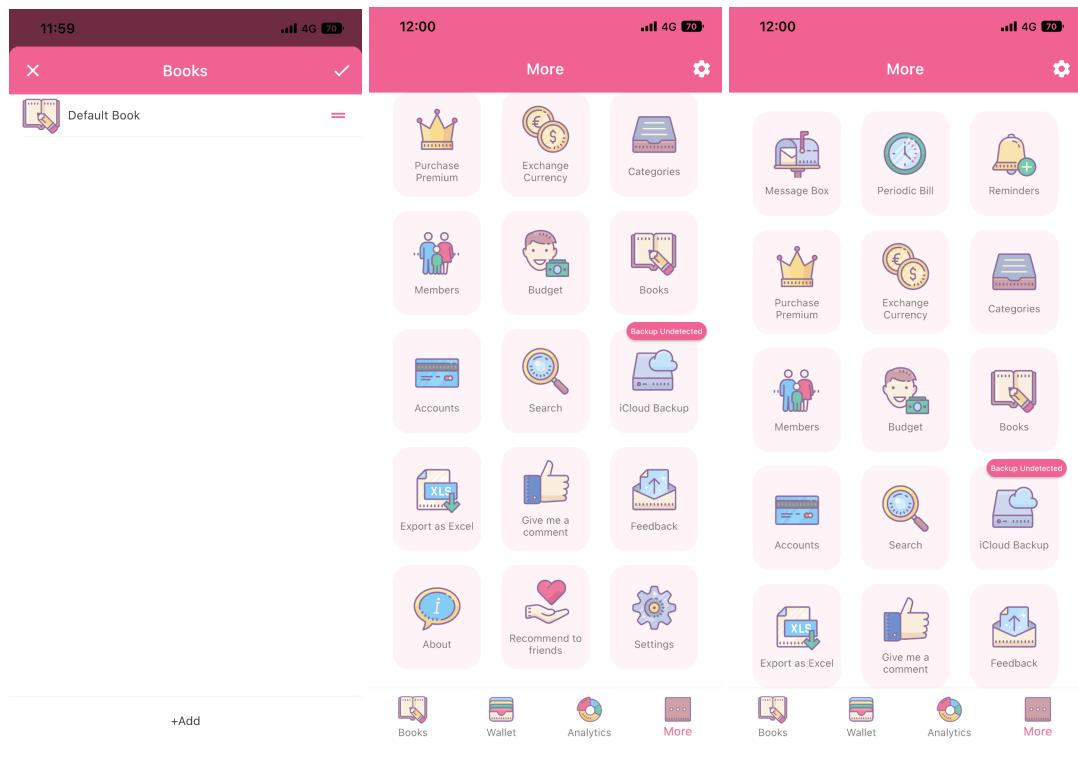


Figure 4-4a

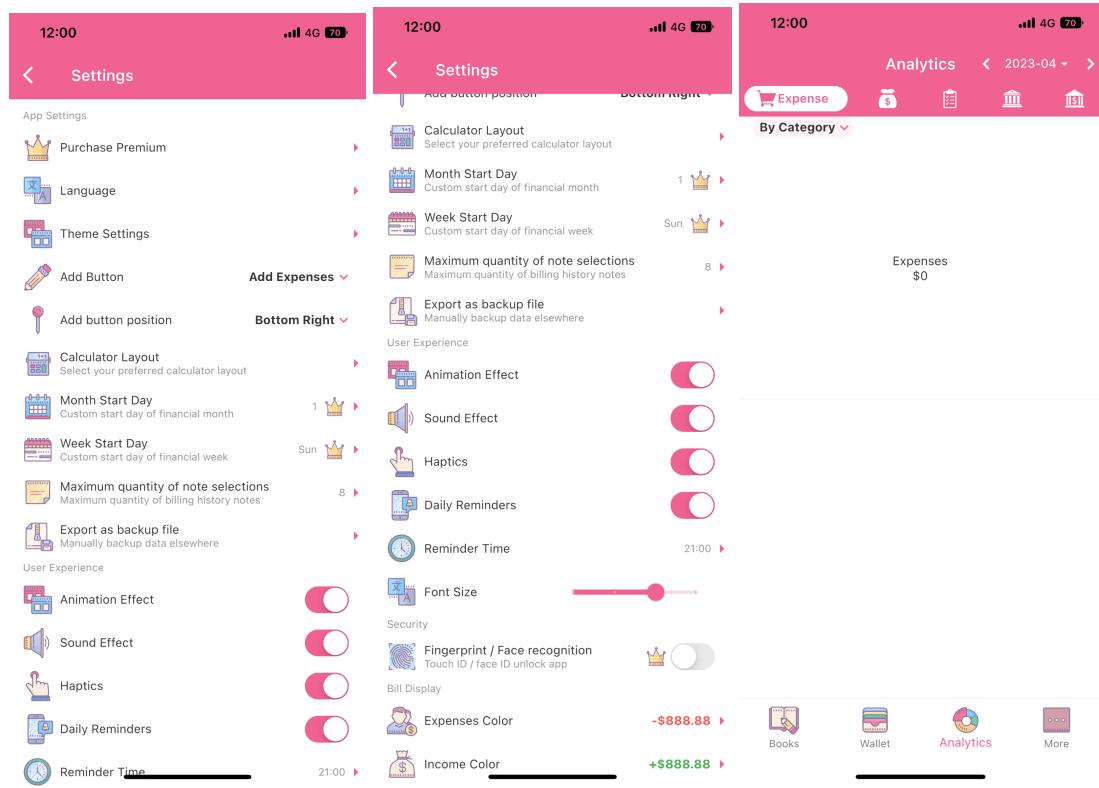


Figure 4-4b

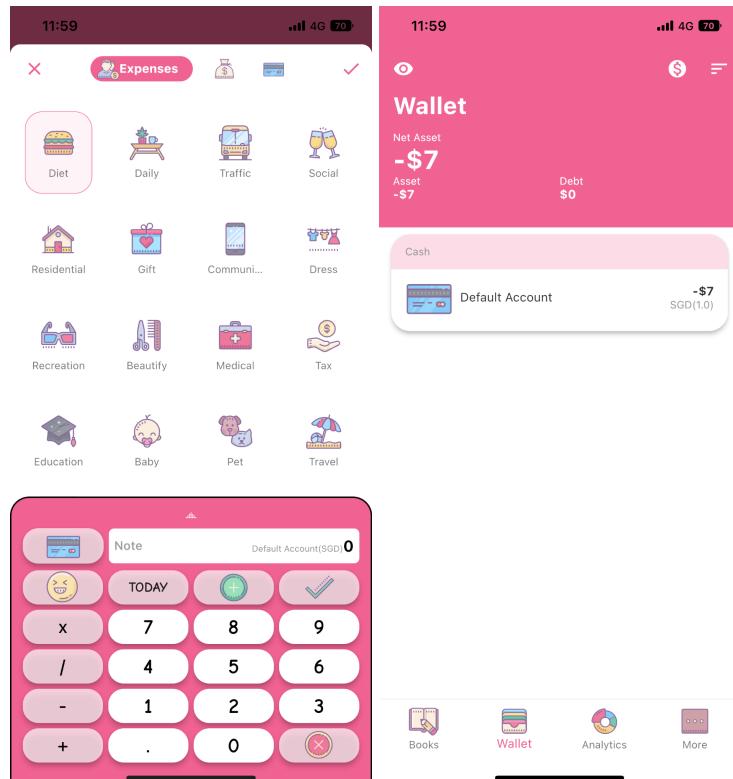


Figure 4-4c

4.4.2. Advantages of the Money+ app:

- **User-Friendly Interface:** Money+ offers a simple and intuitive user interface that easily tracks your expenses and income.
- **Comprehensive Expense Tracking:** The app allows users to record their expenses and categorize them into different groups.

4.4.3. Disadvantages of the Money+ app:

- **All transactions in Money+ must be manually:** Takes time and increase the risk of human error.
- **No machine learning capabilities:** The software does not use machine learning to categorize expenses automatically.
- **Lack of forecasting capabilities:** Prevents users from being able to understand their financial future.
- **Too many unnecessary choices choice:** Paralysis in a situation that is already difficult.

Features	Money Mgr.	Monefy	Monny	Money+
Different account types (e.g: debit, credit)	Free limited to 15	✓	✓	Free limited to 1
Recurring expenses	✓	Paid Version	✓	Paid Version
Export data	✓	✓	✓	Paid Version
Import data	Formatting Need	✗	✗	✗
Methods available to add expenses	Manual Input	Manual Input	Manual Input	Manual Input
Expense Categories	✓	✓	✓	✓
Customise or add categories	✓	Paid Version	✓	Paid Version
Methods to add categories to expenses	Manual Input	Manual Input	Manual Input	Manual Input
Allow users to set budgets	✓	✓	✓	✓
Allow users to forecast financials	✗	✗	✗	✗
Available on desktop	Paid Version	✗	✗	✗
Visualise financial reports	✓	✗	✓	✓

Figure 4-5a

4.5 Application Review 5 - Excel Spreadsheet / Google Sheets

4.5.1. Advantages of the Excel Spreadsheet / Google Sheets:

- **Customization:** Excel and Google Sheets allow for a high degree of customization. You can create categories, formulas, and layouts that suit your unique financial situation and preferences.
- **Free to Use:** Excel (for those with Microsoft Office) and Google Sheets (free online) are readily accessible and do not require a subscription fee like some financial apps.
- **Data Control:** When using these spreadsheet tools, you control your data. There is no need to worry about third-party access or data breaches with an online app.
- **Advanced Calculations:** With knowledge of Excel or Google Sheets functions, you can perform complex calculations and create models to analyze your financial health and plan for the future.

4.5.2. Disadvantages of the Excel Spreadsheet / Google Sheets:

- **Time-Consuming:** Building and maintaining a financial spreadsheet can be very time-consuming, particularly for those unfamiliar with Excel or Google Sheets.
- **Lack of Automation:** Unlike some financial apps, spreadsheets do not automatically sync with your bank accounts or credit cards. All transactions need to be entered manually, which can lead to errors or omissions.
- **No Real-Time Updates:** Unlike many financial tracking apps, spreadsheets will not provide real-time updates or notifications about your spending or saving.
- **Limited Accessibility:** While Google Sheets is accessible from any device with internet access, Excel files are typically saved on one device and might not be accessible everywhere (unless saved and synced through a cloud service like OneDrive).
- **No Machine Learning Capabilities:** Unlike some modern financial apps, spreadsheets lack machine learning capabilities to help categorize transactions or predict spending patterns.

4.6 Summary of Existing Solutions

When comparing the features, advantages, and disadvantages of the Money Manager, Monny, Monefy, Money+, banking apps, and Spreadsheets, it is clear that each offers a unique set of tools and functionalities that can be useful in financial tracking and planning. However, all of them have limitations.

Financial tracking apps provide comprehensive expense tracking and budgeting tools with visual representations of financial data. Their major drawback lies in the need for manual data entry, which could be time-consuming and prone to errors. Limited or no integration with financial institutions. Unnecessary complex settings and a complete lack of forecasting tools.

Spreadsheets can offer tracking and forecasting capabilities; however, finding a template that ultimately fits the user's needs can be challenging. The alternative is if the user creates a custom template for a task already dawning, and most find it difficult. Unfortunately, this also requires manual entry, and other drawbacks include no integration.

Lastly, The iBanking app, a significant bank product, offers a high level of integration with bank accounts and provides real-time transaction tracking. However, it needs to track cash transactions or transactions from other banks.

In conclusion, while these different tools offer valuable options for tracking expenses and budgeting, they might need to provide a holistic view of a user's financial health, particularly in tracking transactions across different payment methods and planning for their future financial. As a result, users may need to use a combination of these tools or seek a more comprehensive solution to cover all bases of their financial tracking and planning needs.

5. Interview

5.1 Purpose of Interview

The need to conduct interviews in the software development process is paramount due to the following reasons:

1. **Understanding Users' Needs:** The interview provides an in-depth understanding of the users' needs, challenges, and gaps in existing solutions. From the interview transcript, it is clear that all three individuals, though diverse in their financial habits, expressed the need for a simplified tool for financial planning and expense tracking.
2. **Building Relevant Features:** Interviews help identify the key features most valuable to the users. For example, the small business owner wanted integration with accounting tools, the civil servant desired a user-friendly interface and forecasting ability, and the freelance artist highlighted the need for accommodating variable incomes.
3. **Validation of Concept:** Interviews can also serve as an early validation tool for the concept. The positive responses from all three individuals indicate a potential market for the proposed software.
4. **Pricing Insights:** Interviews can provide insights into pricing. The question of how much the individuals would be willing to pay for such a service could guide the pricing strategy.

5.2 Interviewee Selection

The three people selected for the interview each represents different segments of the potential user base:

1. **Small Business Owner:** This individual represents users with financial tracking needs for business and personal finances. They could benefit from a comprehensive tool that integrates personal and business financial management.
2. **Civil Servant:** This individual represents the stable-income users who need more assistance in managing their finances.
3. **Freelance Artist:** This person represents users with variable incomes, a group that might find financial planning and expense tracking particularly challenging due to income fluctuations.

5.3 Interview Questions

1. Thank you for taking the time to help me with this interview. Can you share a bit about yourself and what you do?
2. Has covid 19 affected you financially, and if so, please elaborate
3. Did you have sufficient emergency funds to assist you during this period
 - a. Why did you not have sufficient emergency funds?
 - b. What actions could you have taken to be better prepared?
4. A survey shows that 1 in 2 adults in Singapore need to learn how much they spend every month. What do you think of this?
5. Do you personally track your expenses? If so, what tools do you use
6. What are your thoughts on Buy Now Pay Later? Have you used it in the past, or are you currently using it?
7. What do you think will buy now and pay later positively or negatively affect the younger generation's financial habits in the coming years?
8. On that note, what can the younger generations do to cultivate better financial habits? What learns can you pass on to them?
9. Circling back to over the economic landscape, do you feel that the prices of goods and services have increased, and what are your thoughts on Goods and Service Tax (GST) increasing from 7 to 9%
10. You previously mentioned that tracking one's finances can be a tedious process. What are your thoughts if there is a solution that allows you to take a photo or video of your payment receipt, upload it, and the software will categorize and track your expenses from there? Could you see yourself using a service like this?
11. You mentioned that you track your finances or try to, but do you have a financial plan for your future? If yes, why, and if no, why? Is having a financial plan essential?
12. What are your thoughts if the software can help you quickly show you a financial forecast with a few clicks of a button, and it will also use data from your tracked expenses and income?
13. How much every month can you pay for a service like this?
14. Do you want to see any features in this new financial tracker and planner?
15. Thank you so much for your time. Are there any final words you would like to share?

5.4 Interview Conclusion

In the interview, we spoke with three individuals from Singapore, each with different occupations: a small business owner, a civil servant, and a freelance artist. They shared their perspectives on various financial matters, such as expense tracking, financial planning, and the impact of the COVID-19 pandemic on their lives.

All three individuals acknowledged the importance of financial management, though they differed in their approaches and experiences. Small business owners track their finances but need more time for personal finance management. The civil servant does not actively plan due to job stability but recognizes its significance. Finally, the freelance artist knows planning is essential but needs more financial expertise.

They expressed interest in a software solution that could simplify expense tracking and financial planning with features tailored to their specific needs. The small business owner wanted integration with existing accounting tools. The civil servant desired a user-friendly interface and forecasting functionality. Finally, the freelance artist emphasized the importance of accommodating variable incomes.

When discussing the younger generation's financial habits, they encouraged starting early, saving, and investing wisely. They also shared their experiences and challenges in their respective fields and how they approached their careers.

Overall, the interview provided valuable insights into different financial perspectives and the potential impact of financial tracking and planning software on their lives.

6. Proposed System

6.1 Functional Requirements

Functional requirements outline the specific features and functionalities that a system must possess to fulfill its intended purpose.

1. **Comprehensive Financial Tracking:** The system will provide the ability to track expenses and income from all sources, including cash transactions, digital transactions from all banks and financial institutions, and non-traditional payment methods. This addresses the limitations of iBanking apps that only account for transactions within their native systems.
2. **Automated Data Input and Categorization:** Users can upload unique payment documentation, such as photos and videos. The system's machine learning algorithms will extract the relevant information and automatically categorize it. This addresses the time-consuming task of manual data entry in many existing solutions, a concern raised by several interviewees.
3. **Financial insights:** The system will analyze users' past financial behavior and provide insights into their average expenses
4. **Financial Forecasting:** Users can set financial forecast.
5. **Expense and Income Tracking:** The system must allow users to record, categorize, and monitor expenses and income from various sources.
6. **User Management:** The system must support user account creation, authentication.

In summary, this proposed system addresses the limitations of existing financial tracking and planning solutions, incorporates their strengths, and introduces new features based on user feedback from the interviews. The result is a comprehensive, user-friendly, and powerful tool that empowers individuals to take control of their financial futures.

6.2 Non-Functional Requirements

Non-functional requirements specify the system's quality characteristics or constraints under which a system must operate.

1. **Usability:** The system should be user-friendly, with an intuitive interface that individuals with varying financial and technical knowledge levels can easily use.
2. **Performance:** The system should handle many transactions and users without lag or delay. The response time for data processing and retrieval should be minimal.
3. **Scalability:** The system should be designed to handle growth in the number of users and the amount of data over time without performance degradation.
4. **Security:** The system should implement robust security protocols to protect user data, including encryption for data at rest and in transit and secure user authentication methods.
5. **Reliability:** The system should have high availability with minimal downtime. It should be able to recover quickly from potential system failures.
6. **Cross-Platform Compatibility:** The system must be compatible with various devices and platforms, such as web browsers, smartphones, and tablets, to provide users with a seamless experience across the device.
7. **Maintainability:** The system should be easily modified to correct faults, improve performance, or adapt to a changed environment. This includes well-documented code and adherence to coding standards.
8. **Backup and Recovery:** The system should have robust data backup and recovery mechanisms to prevent data loss and ensure business continuity.

When fulfilled, these non-functional requirements will help ensure the system is secure, reliable, efficient, and user-friendly, delivering a high-quality user experience.

7. Methodology and Approach

This financial tracking and planning system will be created using a thorough methodology and strategy that guarantees high-quality output and a final result that satisfies the intended audience's needs. The project's development approach will take into account the following things:

1. **Agile Methodology:** We will use the Agile software development methodology, emphasizing iterative development, adaptability, and cooperation amongst cross-functional teams. This strategy provides project adaptation to shifting requirements and permits continual development.
2. **Project Management Tool:** *Jira* is a project management application that enables efficient planning, monitoring, and reporting of tasks, sprints, and releases. It will be used to support the Agile development process.
3. **Extreme Programming (XP):** To enhance overall software quality and lower development risks, we will implement techniques including pair programming, test-driven development, and continuous integration.
4. **Clean Code:** To provide maintainable and easily comprehensible code, the development process will use clean codings best practices, such as consistent naming standards, appropriate commenting, and modular code organization.
5. **Object-Oriented Programming (OOP):** To create more modular, reusable, and manageable code, the software will be created using the object-oriented programming paradigm, which places a strong emphasis on using objects, classes, and inheritance.
6. **Cloud Relational Database:** To store and manage the application data, we will use a cloud-based relational database management system. Scalability, security, and high availability are all features of this strategy.
7. **Unified Modeling Language (UML):** To provide a clear grasp of the system's design, we will use UML diagrams, such as use case, class, and sequence diagrams, to visually depict the system's architecture, components, and interactions.
8. **Charts and Diagrams:** Various charts and diagrams will be employed to represent data and visualize different aspects of the system, making it easier to understand and analyze the information.
9. **Wireframes:** Wireframes will be created to outline the structure and layout of the application's user interface, helping to guide the design and development process.
10. **Black Box Testing:** Black Box Testing is a software testing process where the tester is not aware of the inner workings or structure of the software. Through black box testing, we can effectively validate that the software meets the user's requirements and expectations, ensuring high quality and reliability.

By incorporating these methodologies and approaches, the development process will be efficient, adaptable, and focused on delivering a high-quality financial tracking and planning system that meets the needs of its users.

8. System Design

A crucial step in constructing a system's architecture is the system design process, which concentrates on the system's specifications, including its modules, interfaces, and data. It is essential to developing a reliable, effective, and efficient system. This is achieved through the use of the UML diagrams and charts listed below:

1. Use Case Diagrams and Use Descriptions
2. Activity Diagrams
3. Decomposition Diagrams
4. Data Flow Diagrams
5. Entity-Relationship Diagrams
6. Data Dictionary
7. Class Diagram
8. Sequence Diagram
9. CRUD Matrix

8.1 Use Case Diagram and Use Case Descriptions

A Use case diagram illustrates the linkages and dependencies between use cases and actors while representing user and system interaction. It provides a high-level overview of the functionality of the system and the responsibilities that various users play in its operation. Additionally, each use case's entire narrative is provided in the use case descriptions, which elaborate on the system's capabilities from the user's viewpoint. They outline the expected inputs and outputs, define the preconditions and postconditions, and describe the user's steps to complete a particular task. Together, they give a thorough picture of how the system works and how users interact with it, making it easier to comprehend and implement the system requirements.

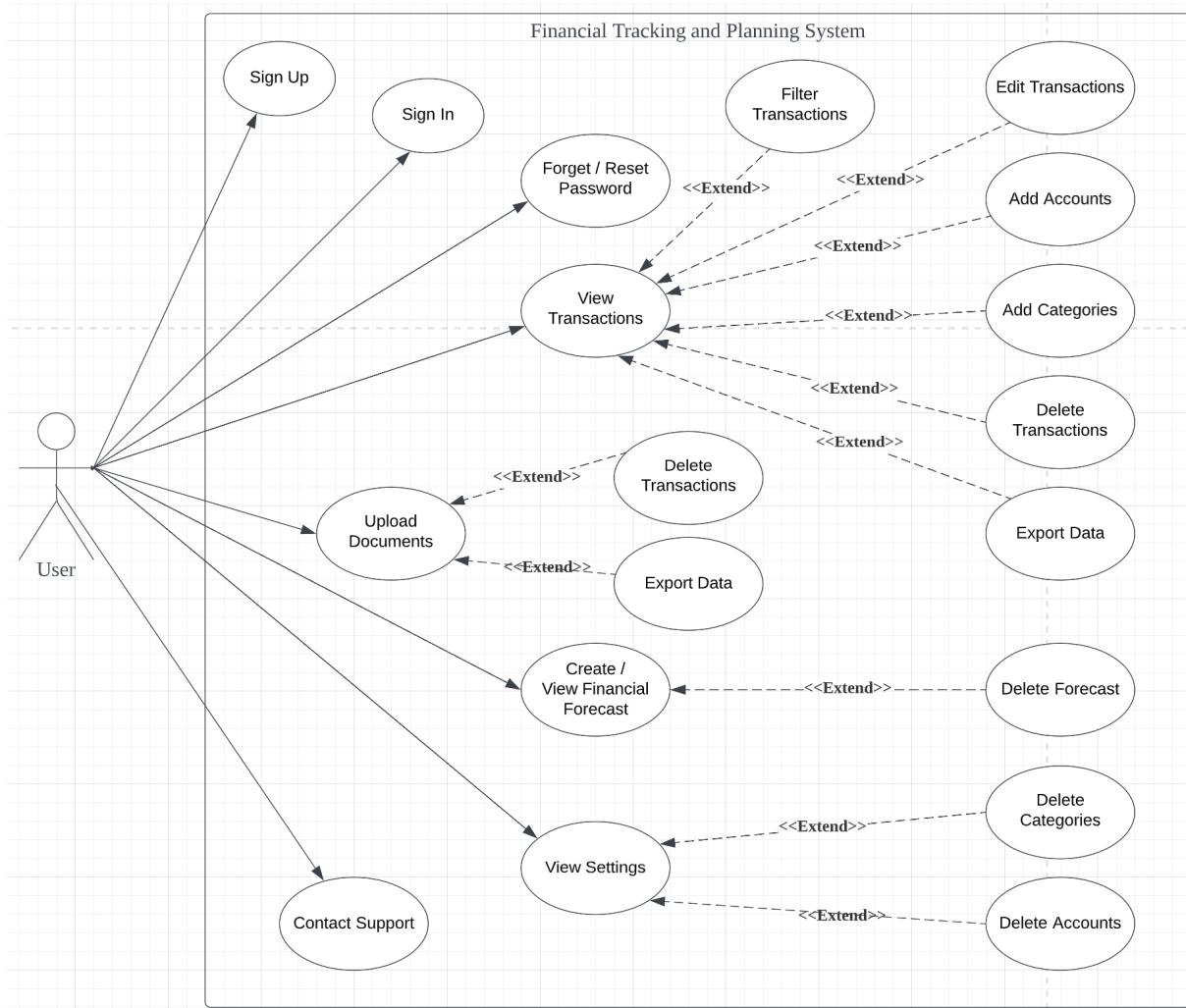


Figure 8-1a

Case ID	UC-01
Case Name	Signing Up for Fintap
Goal	To sign up successfully
Description	A new user wants to create an account. The registration process includes providing a desired username, email address, and password that meets the specified requirements.
Actor	User (new user interested in creating an account)
Pre-Conditions	<p>The user has access to the internet and a compatible web browser.</p> <p>The user has a valid email address.</p> <p>The user still needs to register with the expense tracker application.</p>
Flow of Events	<p>The user navigates to Fintap's website</p> <ul style="list-style-type: none"> - The user opens a web browser and enters the URL <p>The user accesses the registration page.</p> <ul style="list-style-type: none"> - The user clicks on the "Sign Up" available on the homepage to access the registration page. <p>The user enters the desired username.</p> <ul style="list-style-type: none"> - The user enters their desired username on the registration page in the appropriate input field. <p>The user enters the email address.</p> <ul style="list-style-type: none"> - Enters their valid email address in the designated input field. <p>User enters password</p> <ul style="list-style-type: none"> - Creates a password according to the specified requirements: - At least eight characters in length. - Contains at least 1 number and one alphabet. - Not too familiar or easily guessable. - The user enters their password in the designated input field. <p>User confirms password</p> <ul style="list-style-type: none"> - Re-enters their password in the "Confirm Password" input field to ensure it matches the initially entered password. <p>The user initiates the registration process.</p> <ul style="list-style-type: none"> - The user clicks the "Sign Up" button to submit their username, email address, and password for account creation. <p>The system validates the provided information.</p> <ul style="list-style-type: none"> - Checks the entered information for validity and ensures the username and email address are not registered in its database.

	<p>Successful registration</p> <ul style="list-style-type: none"> - If the entered information is valid and meets the specified requirements, the system creates a new user account, and the user is redirected to the transactions page. <p>Failed registration</p> <ul style="list-style-type: none"> - The system displays an error message if the entered information is invalid or does not meet the specified requirements. - The user can attempt to register again by providing the required information correctly.
Post-Conditions	<p>The user has successfully created an account The user is redirected to their transaction page</p>
Exceptions	<p>The user may experience a loss of internet connectivity, preventing them from accessing the application.</p> <p>The application may be down for maintenance or experiencing technical issues, preventing the user from registering.</p>

Table 8-1a

Case ID	UC-02
Case Name	Logging in to Fintap
Goal	Login successfully
Description	User wants to log in to access their account. The login process includes entering their username and password to ensure secure access to their account.
Actor	User (registered member of Fintap)
Pre-Conditions	<p>User has an active and valid account The user has access to the internet and a compatible web browser. The user has their username and password associated with the account.</p>
Flow of Events	<p>The user navigates to Fintap's website</p> <ul style="list-style-type: none"> - The user opens a web browser and enters the URL <p>The user accesses the login page.</p> <ul style="list-style-type: none"> - The user clicks on the "Sign in" button available on the homepage to access the login page. <p>User enters username</p> <ul style="list-style-type: none"> - On the sign-in page, the user enters their registered username in the appropriate input field. <p>User enters password</p> <ul style="list-style-type: none"> - The user enters their password in the designated input field. The password is obscured by dots for security purposes.

	<p>The user initiates the login process.</p> <ul style="list-style-type: none"> - The user clicks on the "Login" button to submit their username and password for authentication. <p>The system verifies user credentials.</p> <ul style="list-style-type: none"> - Fintap checks the entered username and password against its database to ensure a match. <p>Successful login</p> <ul style="list-style-type: none"> - If the entered credentials are valid, the system grants access to the user's transaction page. <p>Failed login</p> <ul style="list-style-type: none"> - If the entered credentials are invalid or do not match any account in the database, the system displays an error message. - The user can attempt to log in again by re-entering their username and password or utilizing the "Forgot Password" feature to reset their password.
Post-Conditions	<p>The user is successfully logged in and has access to their transactions</p> <p>The user can perform various expense tracking and planning activities within the application.</p>
Exceptions	<p>User may experience a loss of internet connectivity, preventing them from accessing the application.</p> <p>The application may be down for maintenance or experiencing technical issues, preventing the user from logging in.</p> <p>The user may have forgotten their password, requiring them to reset it before logging in.</p>

Table 8-1b

Case ID	UC-03
Case Name	Adding a New Transaction
Goal	Being able to add a new transaction
Description	User wants to add a new transaction. They will provide necessary information, such as title, description, amount, credit or debit, date, category, and account, to record the transaction accurately.
Actor	User (registered member of Fintap)
Pre-Conditions	<p>The user has an active and valid account</p> <p>The user is logged in to their account.</p> <p>The user has access to the internet and a compatible web browser.</p>

Flow of Events	<p>The user navigates to the transaction page.</p> <ul style="list-style-type: none"> - The user clicks on the "Add New Record" button, which triggers a form to pop up. <p>The user enters transaction title (Required)</p> <ul style="list-style-type: none"> - In the form, the user provides a title for the transaction in the appropriate input field. <p>The user enters transaction description (Optional)</p> <ul style="list-style-type: none"> - The user enters a brief description of the transaction in the designated input field. <p>The user enters transaction amount (required)</p> <ul style="list-style-type: none"> - The user inputs the amount of transaction in the required input field <p>User select credit or debit type (required)</p> <ul style="list-style-type: none"> - The user chooses if the transaction is a credit or debit transaction from a drop-down list. <p>The user enters transaction date (required)</p> <ul style="list-style-type: none"> - The user selects the date of the transaction in the required date input field using a date picker tool. <p>User selects transaction category (required)</p> <ul style="list-style-type: none"> - The user chooses the appropriate category for the transaction from a drop-down list. <p>User selects account (required)</p> <ul style="list-style-type: none"> - The user chooses the account associated with the transaction from a drop-down list <p>User submits transaction information</p> <ul style="list-style-type: none"> - The user clicks on the "Add" button to save the transaction information and add the transaction to their account. <p>System processes transaction information</p> <ul style="list-style-type: none"> - The expense tracker application processes the submitted information and adds the new transaction to the user's account. <p>User is redirected to the transaction page</p> <ul style="list-style-type: none"> - The user is redirected to the transaction page, where they can see the newly added transaction along with other previous transactions. <p>The user clicks on "Cancel."</p> <ul style="list-style-type: none"> - The transaction form is closed, and the user is redirected to the transaction page.
Post-Conditions	<p>The user has successfully added a new transaction to their account.</p> <p>The transaction information is accurately recorded and can be viewed, filtered, edited or deleted</p>
Exceptions	<p>The user may experience a loss of internet connectivity, preventing them from adding the transaction.</p>

	<p>The application may be down for maintenance or experiencing technical issues, preventing the user from adding the transaction.</p> <p>The user may not fill in the required fields, resulting in an error message and the need to complete the form before submitting it.</p>
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Table 8-1c

Case ID	UC-04
Case Name	Deleting a transaction from Fintap
Goal	Successfully deleting a transaction
Description	The user wants to delete a specific transaction from Fintap. They can accomplish this by clicking the delete button next to each transaction record.
Actor	User (registered member of Fintap)
Pre-Conditions	<p>The user has an active and valid account.</p> <p>The user is logged in to their account.</p> <p>The user has access to the internet and a compatible web browser.</p> <p>The user's account contains at least one transaction to delete.</p>
Flow of Events	<p>The user navigates to the transaction page.</p> <ul style="list-style-type: none"> - The user accesses the transaction page, where they can view a list of their recorded transactions. <p>The user locates the transaction to delete</p> <ul style="list-style-type: none"> - The user browses through the list of transactions and identifies the specific transaction they want to delete. <p>The user initiates transaction deletion.</p> <ul style="list-style-type: none"> - Next to the desired transaction record, the user clicks on the "Delete" button to initiate the deletion process. <p>The system processes transaction deletion.</p> <ul style="list-style-type: none"> - The system proceeds to remove the selected transaction from the user's account.
Post-Conditions	<p>The user has successfully deleted the desired transaction from their expense tracker account.</p> <p>The deleted transaction is no longer visible in the transaction list and will not be included in future reports or calculations.</p>
Exceptions	<p>The user may experience a loss of internet connectivity, preventing them from deleting the transaction.</p> <p>The application may be down for maintenance or experiencing technical issues, preventing the user from deleting the transaction.</p>

Table 8-1d

Case ID	UC-05
Case Name	Editing a Transaction in Fintap
Goal	Successfully make changes to a transaction
Description	The user wants to edit the details of a specific transaction in Fintap. They can accomplish this by clicking the edit button next to each transaction record, which allows them to modify all fields associated with the transaction.
Actor	User (registered member of Fintap)
Pre-Conditions	<p>The user has an active and valid account with Fintap.</p> <p>The user is logged in to their account.</p> <p>The user has access to the internet and a compatible web browser.</p> <p>The user's account contains at least one transaction to edit.</p>
Flow of Events	<p>The user navigates to the transaction page.</p> <ul style="list-style-type: none"> - The user accesses the transaction page, where they can view a list of their recorded transactions. <p>User locates the transaction to edit</p> <ul style="list-style-type: none"> - The user browses through the list of transactions and identifies the specific transaction they want to edit. <p>User initiates transaction editing</p> <ul style="list-style-type: none"> - Next to the desired transaction record, the user clicks on the "Edit" button to initiate the editing process. <p>System displays editable transaction form</p> <ul style="list-style-type: none"> - The expense tracker application displays a form pre-filled with the transaction's existing information, allowing the user to edit any of the transaction's fields, such as title, description, amount, credit or debit, date, category, and account. <p>User modifies transaction details</p> <ul style="list-style-type: none"> - The user makes the necessary changes to the transaction fields, ensuring that any required fields are completed. <p>User submits updated transaction information</p> <ul style="list-style-type: none"> - The user clicks on the "Save Changes" button to submit the modified transaction details. <p>System processes and saves updated transaction information</p> <ul style="list-style-type: none"> - The expense tracker application processes the submitted changes and updates the transaction in the user's account accordingly.
Post-Conditions	<p>The user has successfully edited the desired transaction.</p> <p>The modified transaction information is accurately saved and visible in the transaction list.</p>
Exceptions	The user may experience a loss of internet connectivity, preventing them from editing the transaction.

	<p>The application may be down for maintenance or experiencing technical issues, preventing the user from editing the transaction.</p> <p>The user may accidentally click on the "Edit" button for the wrong transaction, requiring them to cancel the editing process.</p>
--	---

Table 8-1e

Case ID	UC-06
Case Name	Adding a New Category or Account in Fintap
Goal	Successfully add a new category and/or account
Description	The user wants to add a new custom category and/or account to Fintap By clicking the "Add Category" and/or "Add Account" button, they can create a new category and/or account that will later be available in the drop-down menu when adding new transactions.
Actor	User (registered member of Fintap)
Pre-Conditions	<p>The user has an active and valid account</p> <p>The user is logged in to their account.</p> <p>The user has access to the internet and a compatible web browser.</p>
Flow of Events	<p>User navigates to the transaction page</p> <ul style="list-style-type: none"> - The user accesses the transaction page where the "Add Category" and "Add Account" button can be found <p>User initiates the category and/or account creation process</p> <ul style="list-style-type: none"> - The user clicks on either the "Add Category" or "Add Account" button to initiate the process of creating a new custom category or account. <p>System displays either the add category or add account form</p> <ul style="list-style-type: none"> - The expense tracker application displays a form for adding a new category or account, which includes an input field <p>User enters new category or account information</p> <ul style="list-style-type: none"> - The user provides a name for the new category/account in the appropriate input field. <p>User submits new category/account information</p> <ul style="list-style-type: none"> - The user clicks on the "Add" button to submit the new category/account information <p>System processes and saves new category/account information</p> <ul style="list-style-type: none"> - The application processes the submitted category/account information and adds the new category/account to the user's interface <p>User adds a new transaction using the new category/account</p> <ul style="list-style-type: none"> - When the user adds a new transaction, they can now select the newly created category/account from the drop-down menu in the transaction form.

Post-Conditions	<p>The user has successfully added a new custom category/account to their expense tracker account.</p> <p>The new category/account is available for selection in the drop-down menu when adding new transactions.</p>
Exceptions	<p>The user may experience a loss of internet connectivity, preventing them from adding the new category/account.</p> <p>The application may be down for maintenance or experiencing technical issues, preventing the user from adding the new category/account.</p>

Table 8-1f

Case ID	UC-07
Case Name	Editing or Deleting Multiple Transactions in Fintap
Goal	Successfully edit or delete transaction in bulk
Description	The user wants to edit or delete multiple transactions in Fintap. They can select specific transactions or click on the "Select All" button, then choose to either edit or delete the selected records.
Actor	User (registered member of Fintap)
Pre-Conditions	<p>The user has an active and valid account</p> <p>The user is logged in to their account.</p> <p>The user has access to the internet and a compatible web browser.</p> <p>The user's account contains at least one transaction to edit or delete.</p>
Flow of Events	<p>User navigates to the transaction page</p> <ul style="list-style-type: none"> - The user accesses the transaction page where they can view a list of their recorded transactions. <p>User selects specific transactions or selects all transactions</p> <ul style="list-style-type: none"> - The user either: <ul style="list-style-type: none"> - Manually selects the specific transactions they want to edit or delete by clicking the checkboxes next to each transaction record. - Clicks on the "Select All" button to select all transactions in the list. <p>User initiates either editing or deletion of selected transactions</p> <ul style="list-style-type: none"> - After selecting the desired transactions, the user clicks on either the "Edit Selected" or "Delete Selected" button to initiate the editing or deletion process for the selected transactions. <p>System processes the chosen action</p> <ul style="list-style-type: none"> - Based on the user's choice: <ul style="list-style-type: none"> - If the user chooses to edit the selected transactions, the expense tracker application displays a form with editable fields for each selected transaction. The user can then proceed to modify the

	<p>transaction details as needed and submit the changes.</p> <ul style="list-style-type: none"> - If the user chooses to delete the selected transactions, the application displays a confirmation prompt, asking the user to verify their intention to delete the selected transactions. This step helps prevent accidental deletions. <p>User confirms the chosen action</p> <p>System processes the user's confirmed action</p> <ul style="list-style-type: none"> - Based on the user's confirmed choice: <ul style="list-style-type: none"> - If the user chose to edit the transactions, the expense tracker application processes the submitted changes and updates the transactions in the user's account accordingly. - If the user chose to delete the transactions, the application proceeds to remove the selected transactions from the user's account.
Post-Conditions	<p>The user has successfully edited or deleted the selected transactions in their expense tracker account.</p> <p>The transaction list accurately reflects the changes made.</p>
Exceptions	<p>The user may experience a loss of internet connectivity, preventing them from editing or deleting the selected transactions.</p> <p>The application may be down for maintenance or experiencing technical issues, preventing the user from editing or deleting the selected transactions.</p> <p>The user may accidentally select the wrong transactions, requiring them to cancel the editing or deletion process</p>

Table 8-1g

Case ID	UC-08
Case Name	Filtering Transactions in Fintap
Goal	View the correct transactions based on the selected filter
Description	The user wants to filter transactions in Fintap based on various criteria, such as date range, debit or credit items, category, or account. This allows them to easily view and analyze their financial activity based on specific parameters.
Actor	User (registered member of Fintap)
Pre-Conditions	<p>The user has an active and valid account</p> <p>The user is logged in to their account.</p> <p>The user has access to the internet and a compatible web browser.</p> <p>The user's account contains at least one transaction to filter.</p>

Flow of Events	<p>User navigates to the transaction page</p> <ul style="list-style-type: none"> - The user accesses the transaction page where they can view all the filter options <p>System displays the filter options</p> <ul style="list-style-type: none"> - The expense tracker application displays a set of filter options, allowing the user to filter transactions by: <ul style="list-style-type: none"> - a. Start date and end date - b. Now (Current month) - c. Past 3 months - d. Past 6 months - e. Past 9 months - f. Past 12 months - g. Debit items only - h. Credit items only - i. Selected category - j. Selected account <p>User selects filter criteria</p> <ul style="list-style-type: none"> - The user chooses one or more filter options from the provided list, such as selecting a date range, choosing to view only debit or credit transactions, filtering by a specific category, or filtering by a specific account. <p>System processes and displays filtered transactions</p> <ul style="list-style-type: none"> - The expense tracker application processes the selected filter criteria and updates the transaction list to display only the transactions that meet the specified conditions.
Post-Conditions	<p>The user has successfully filtered their transactions in Fintap based on the chosen criteria.</p> <p>The filtered transaction list accurately reflects the user's selected filter options.</p>
Exceptions	<p>The user may experience a loss of internet connectivity, preventing them from filtering their transactions.</p> <p>The application may be down for maintenance or experiencing technical issues, preventing the user from filtering their transactions.</p> <p>The user may apply filter criteria that result in no transactions being displayed, in which case they may need to adjust the filter options to view transactions.</p>

Table 8-1h

Case ID	UC-09
Case Name	Exporting transactions
Goal	Successfully exporting transactions into a CSV file
Description	The user wants to export all their transactions from the transactions page in Fintap. This use case describes the steps the user will take to export their transactions data for personal record-keeping or analysis.
Actor	User (registered member Fintap)
Pre-Conditions	<p>The user has an active and valid account with the expense tracker application.</p> <p>The user is logged in to their account.</p> <p>The user has access to the internet and a compatible web browser.</p> <p>The user has recorded transactions in their account.</p>
Flow of Events	<p>User navigates to the transactions page</p> <ul style="list-style-type: none"> - The user accesses the transactions page where they can view all their recorded transactions. <p>User initiates the export process</p> <ul style="list-style-type: none"> - The user clicks on the "Export Transactions" indicating their intention to export their transactions data. <p>System prepares the data for export</p> <ul style="list-style-type: none"> - The expense tracker application gathers all the transactions data <p>System initiates the download</p> <ul style="list-style-type: none"> - The expense tracker application generates the export csv file and triggers a download process.
Post-Conditions	The user has successfully exported and downloaded their transactions data from Fintap
Exceptions	<p>The user may experience a loss of internet connectivity, preventing them from exporting and downloading their transactions data.</p> <p>The application may be down for maintenance or experiencing technical issues, preventing the user from exporting and downloading their transactions data.</p> <p>The user may not have any transactions recorded, making the export process unnecessary.</p>

Table 8-1i

Case ID	UC-10
Case Name	Uploading and Processing Bank Statement in Fintap
Goal	Successfully convert their finance data into Fintap
Description	The user wants to upload a bank statement in the form of a screenshot or video recording, from which the Fintap will extract transaction information, clean and categorize the data, detect duplicates, and allow the user to export the extracted transactions to their main transaction page
Actor	User (registered member of Fintap) System (Fintap)
Pre-Conditions	The user has an active and valid account The user is logged in to their account. The user has access to the internet and a compatible web browser. The user has a bank statement in the form of a screenshot or video recording that complies with the application's supported format.
Flow of Events	<p>User navigates to the upload page</p> <ul style="list-style-type: none"> - The user accesses the upload page where they can upload their bank statement. <p>User initiates the upload process</p> <ul style="list-style-type: none"> - The user clicks on the "Choose File" button, triggering a pop-up window that allows them to choose between uploading a screenshot or video recording of their bank statement. <p>User uploads the bank statement</p> <ul style="list-style-type: none"> - The user selects the desired file format (screenshot or video recording) and uploads their bank statement document. <p>System processes the uploaded document</p> <ul style="list-style-type: none"> - The system extracts text from the uploaded bank statement. <p>System cleans and categorizes extracted transactions</p> <ul style="list-style-type: none"> - If the format is correct, the system proceeds to clean up the extracted text and uses machine learning (Random Forest algorithm) to categorize the extracted and cleaned transactions. <p>System checks for duplicate transactions</p> <ul style="list-style-type: none"> - Checks the extracted transactions for potential duplicates within the user's existing transaction records. <p>System displays potential duplicates</p> <ul style="list-style-type: none"> - The system highlights any potential duplicates to the user <p>User manages duplicate transactions</p> <ul style="list-style-type: none"> - The user can select the duplicate transactions they want to remove and delete them, leaving only the unique extracted transactions.

	<p>User decides on the final action for extracted transactions</p> <ul style="list-style-type: none"> - The user can either: <ul style="list-style-type: none"> - a. Delete all extracted transactions - b. Export the extracted transactions to the transactions page. <p>The exported transactions will be removed from the upload page.</p>
Post-Conditions	<p>The user has successfully uploaded a bank statement, and Fintap has processed, categorized, and exported the extracted transactions to the user's main transaction page</p>
Exceptions	<p>The user may experience a loss of internet connectivity, preventing them from uploading the bank statement or processing the extracted transactions.</p> <p>The application may be down for maintenance or experiencing technical issues, preventing the user from uploading the bank statement or processing the extracted transactions.</p> <p>The uploaded bank statement may not be in a supported format, requiring the user to re-upload a properly formatted document.</p> <p>The system may fail to detect duplicates accurately, necessitating manual intervention from the user.</p>

Table 8-1j

Case ID	UC-11
Case Name	Creating and Managing Financial Forecasts in Fintap
Goal	Successfully creating a new forecast and viewing saved forecast.
Description	The user wants to create and manage financial forecasts using Fintap. They can add or delete columns, input transactions, and view the automatically calculated net amount, net expense, and net income. Users can also save their forecasts for future reference.
Actor	User (registered member of Fintap)
Pre-Conditions	<p>The user has an active and valid account</p> <p>The user is logged in to their account.</p> <p>The user has access to the internet and a compatible web browser.</p>
Flow of Events	<p>User navigates to the forecast page</p> <ul style="list-style-type: none"> - The user accesses the forecast page where they can create and manage their financial forecasts. <p>User manages columns</p> <ul style="list-style-type: none"> - The user can choose to add a new column with their chosen name or delete any of the existing 12 columns, each representing one month of the year. <p>User adds a new transaction</p>

	<ul style="list-style-type: none"> - The user inputs a new transaction, specifying the transaction amount and the starting and ending points (columns) for this transaction. For example, the transaction may start from the 2nd column and end on the 10th. <p>System calculates net amount, net expense, and net income</p> <ul style="list-style-type: none"> - After adding a new transaction, the expense tracker application automatically calculates the net amount, net expense, and net income, which will be displayed on the first three rows of the table. <p>User manages transactions</p> <ul style="list-style-type: none"> - The user can delete any transaction they have added. However, the first three rows (net amount, net expense, and net income) cannot be deleted. <p>User saves the forecast</p> <ul style="list-style-type: none"> - The user can choose to save the financial forecast they have created for future reference or analysis.
Post-Conditions	<p>The user has successfully created and managed a financial forecast using Fintap</p> <p>The user has saved their financial forecast for future reference.</p>
Exceptions	<p>The user may experience a loss of internet connectivity, preventing them from creating or managing their financial forecasts.</p> <p>The application may be down for maintenance or experiencing technical issues, preventing the user from creating or managing their financial forecasts.</p> <p>The user may accidentally delete a column or transaction, requiring them to recreate the deleted element.</p> <p>The user may enter incorrect transaction information, necessitating manual correction of the entered data.</p>

Table 8-1k

Case ID	UC-12
Case Name	Deleting Categories or Accounts in Fintap
Goal	Successfully deleting desired categories or accounts
Description	The user wants to delete specific categories or accounts from their settings page in Fintap. This use case describes the steps the user will take to manage and delete categories or accounts as per their requirements.
Actor	User (registered member of Fintap)
Pre-Conditions	<p>The user has an active and valid account</p> <p>The user is logged in to their account.</p> <p>The user has access to the internet and a compatible web browser.</p>
Flow of Events	<p>User navigates to the settings page</p> <ul style="list-style-type: none"> - The user accesses the settings page, where they can manage their categories and accounts. <p>User selects the category or account to delete</p> <ul style="list-style-type: none"> - The user browses through their list of categories or accounts and identifies the one(s) they wish to delete. <p>User initiates deletion process</p> <ul style="list-style-type: none"> - The user clicks on the "Delete" button next to the chosen category or account. <p>System deletes the category or account</p> <ul style="list-style-type: none"> - Upon receiving the user's confirmation, the system deletes the selected category or account from the user's profile.
Post-Conditions	The user has successfully deleted a category or account from their profile in Fintap
Exceptions	<p>The user may experience a loss of internet connectivity, preventing them from deleting categories or accounts.</p> <p>The application may be down for maintenance or experiencing technical issues, preventing the user from deleting categories or accounts.</p> <p>The user may decide to cancel the deletion process after the system prompts for confirmation.</p>

Table 8-11

8.2 Activity Diagram

Below are activity diagrams for the main features of the system, specifically the Transaction Page, Upload Page, and Forecast Page. The purpose of this activity diagram is to help in understanding and explaining the sequence of actions that a user can perform and how the system responds to these actions.

8.2.1 Activity Diagram - Adding a new transaction record

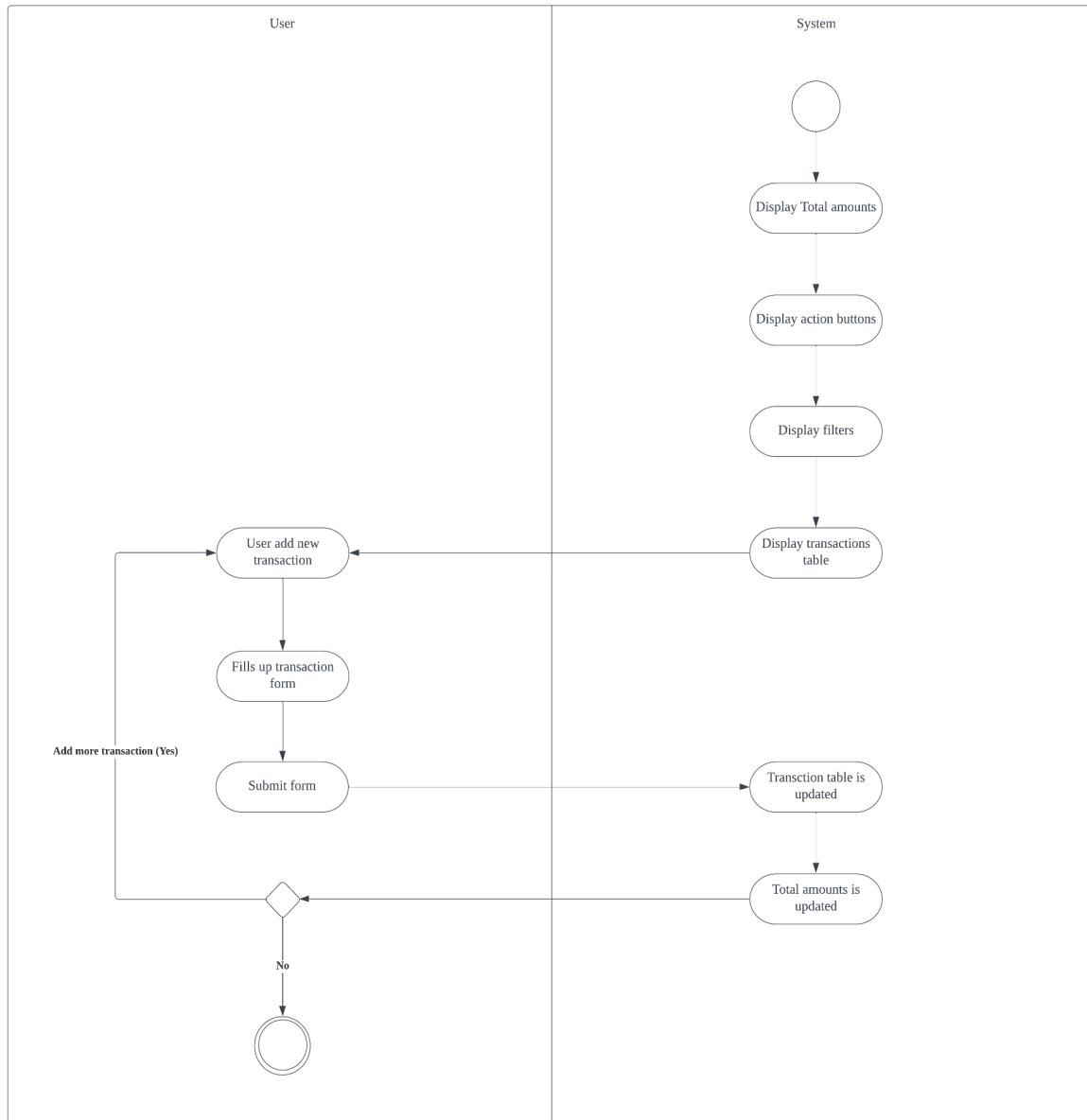


Figure 8-2a

This diagram shows the process when a user adds a new transaction record. This helps in understanding the flow of data when a transaction is managed and provides a clear picture of how transactions are handled in the system.

8.2.2 Activity Diagram - Uploading a document

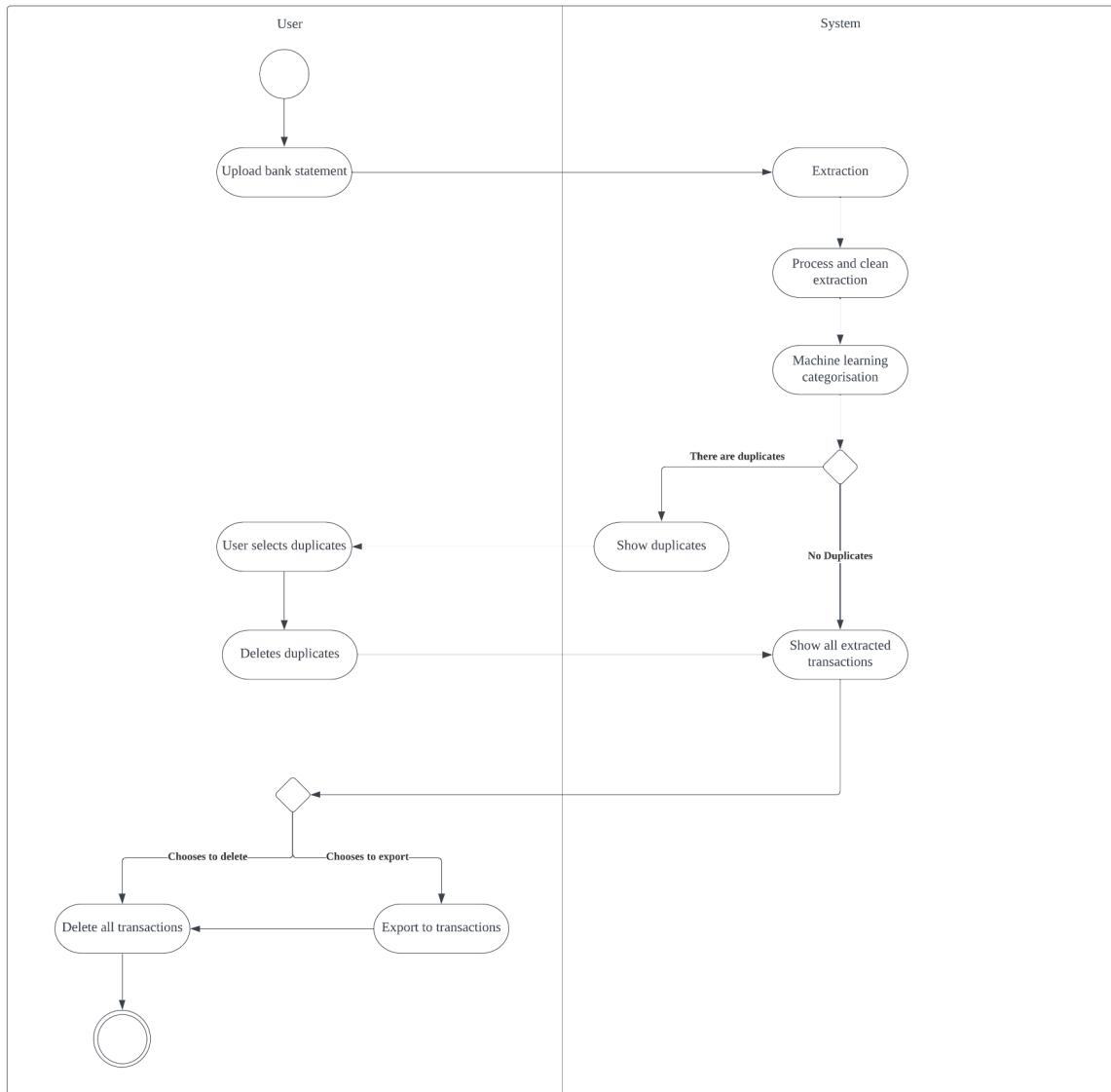


Figure 8-2b

This diagram highlights the process of uploading a document, extracting data from it, cleaning it up, applying machine learning, checking for duplicates, and transferring the data to the transaction records. This clearly explains how the system handles document upload and data extraction, which can be crucial for debugging and improving this feature.

8.2.3 Activity Diagram - Creating a Forecast

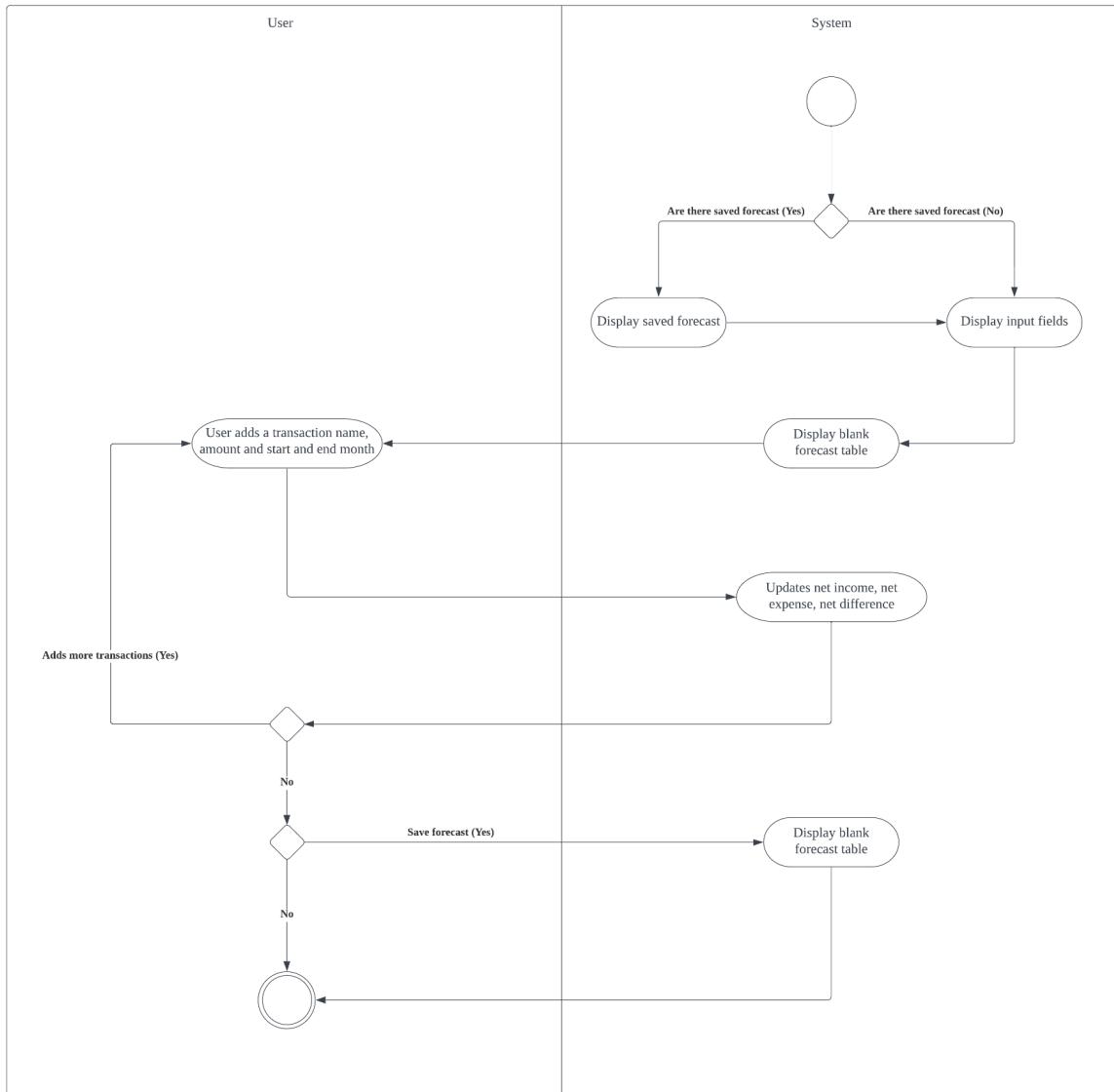


Figure 8-2c

This diagram shows the user's interactions with the forecast feature, including adding forecast entries. This helps understand how the forecasting feature works, how data flows when a forecast is made, and what controls must be in place to handle the data correctly.

8.3 Decomposition Diagrams

Decomposition diagrams are used for analysis to depict a system's hierarchical and functional structure. They break down complex systems into smaller, more manageable parts. This helps in understanding the system and communicating its functionality.

8.3.1 Decomposition Diagrams - Non-registered users

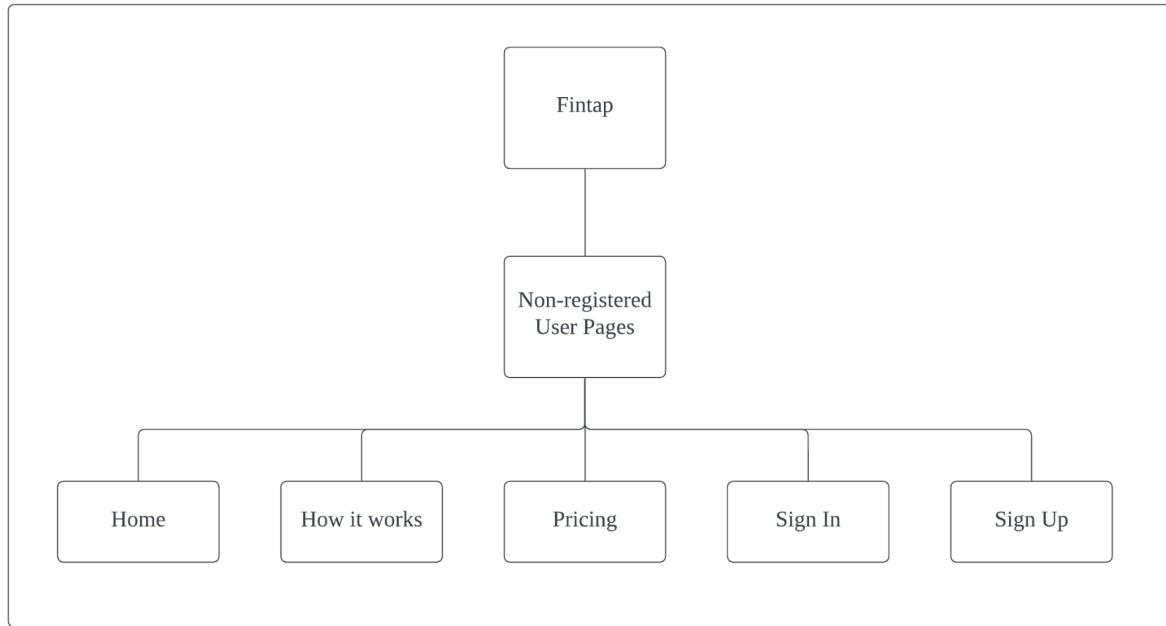


Figure 8-3a

The decomposition diagram above shows the pages accessible to users who have not yet registered or logged into the system.

8.3.2 Decomposition Diagrams - Registered users

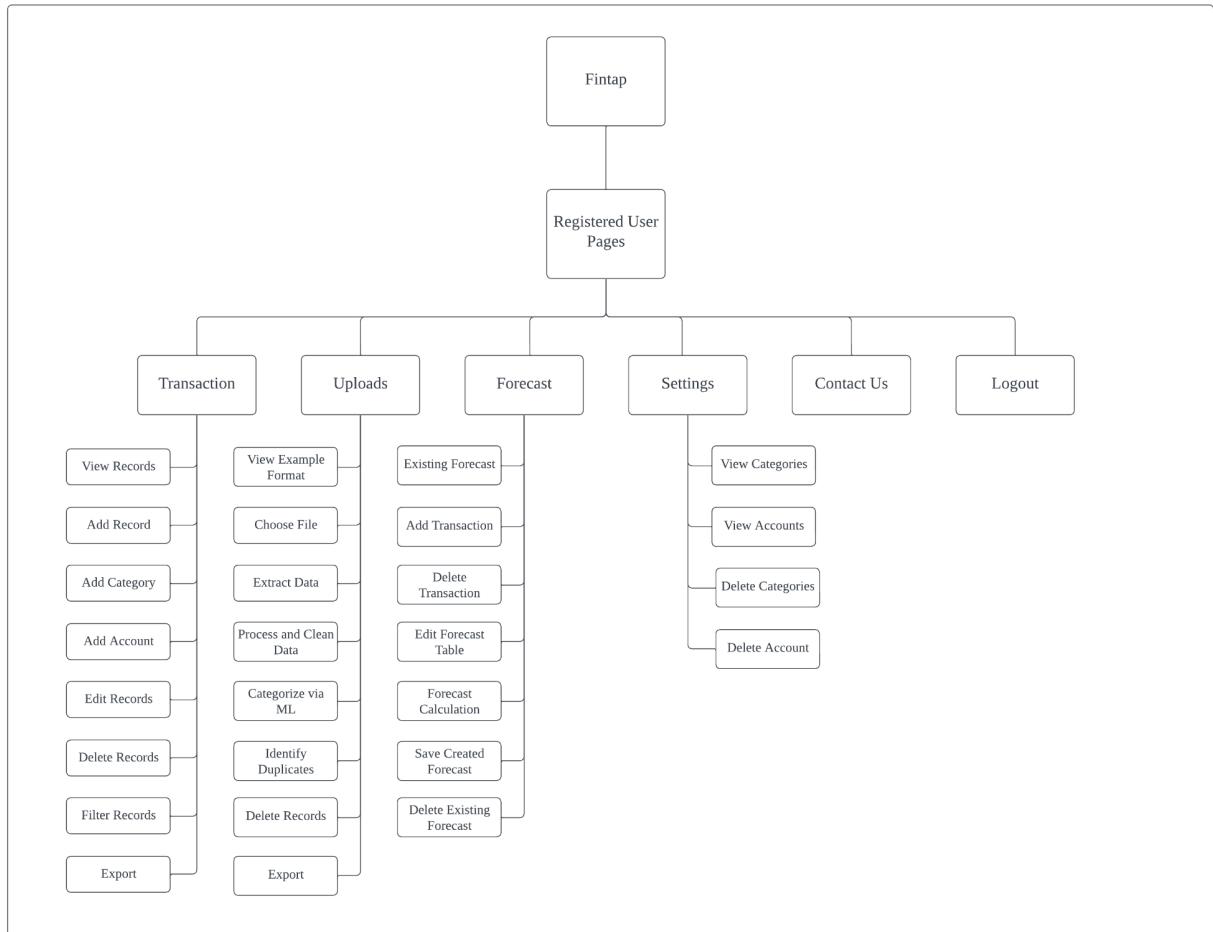


Figure 8-3b

The decomposition diagram above shows the set of pages and functionalities that are accessible only to users who are registered and currently logged into the system.

8.4 Data Flow Diagrams (DFD)

DFD helps illustrate how data flows throughout the Fintap System. Below are the DFD of critical components.

8.4.1 DFD - General process

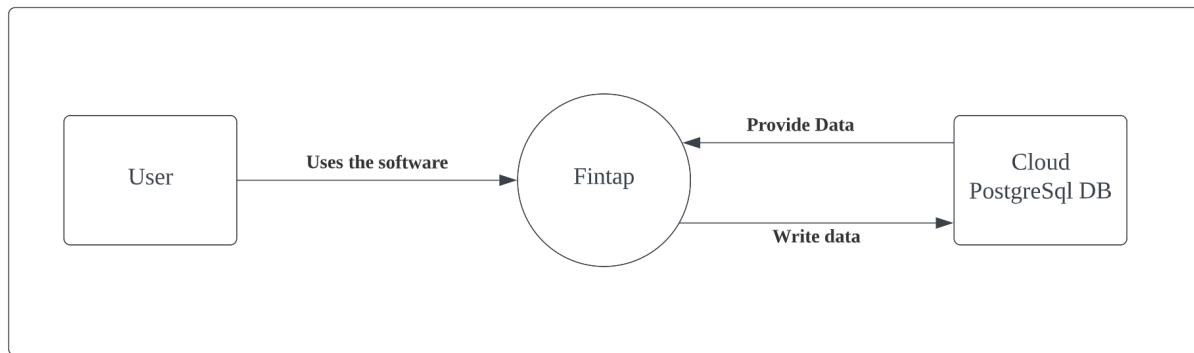


Figure 8-4a

The DFD above shows the general flow of data in Fintap' system

8.4.2 DFD - Sign In / Sign Up

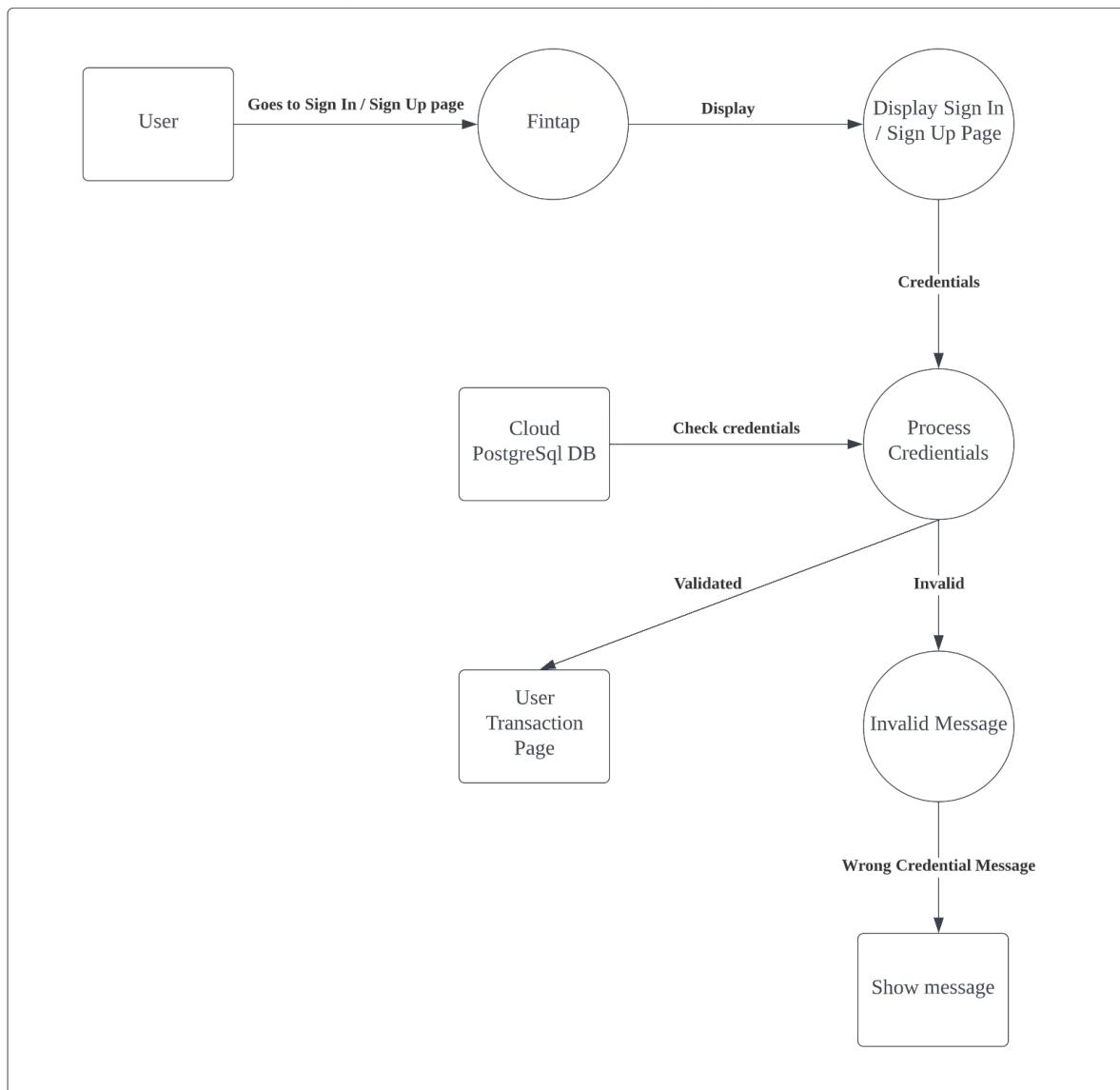


Figure 8-4b

In the DFD above User provides registration/sign-in details that flow into the system. The system processes these details to either validate or invalidate and proceeds to show the appropriate response

8.4.3 DFD - Managing Categories and Accounts

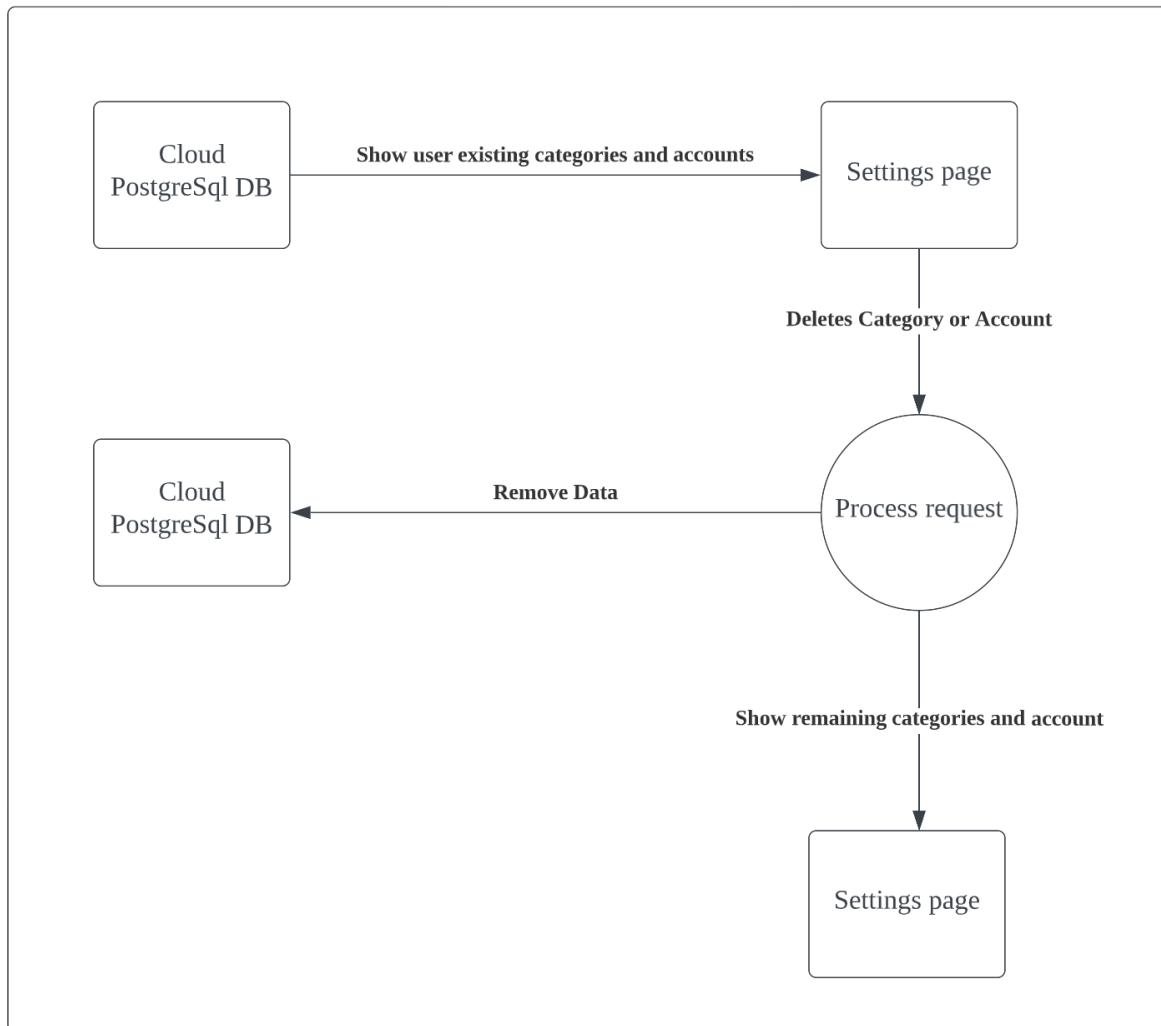


Figure 8-4c

The database shows the categories and accounts associated with the user. The user can then select a category or account to delete; this information flows into the system. The system processes the request and removes the selected category or account from the 'Categories' or 'Accounts' table.

8.4.4 DFD - Transaction Page

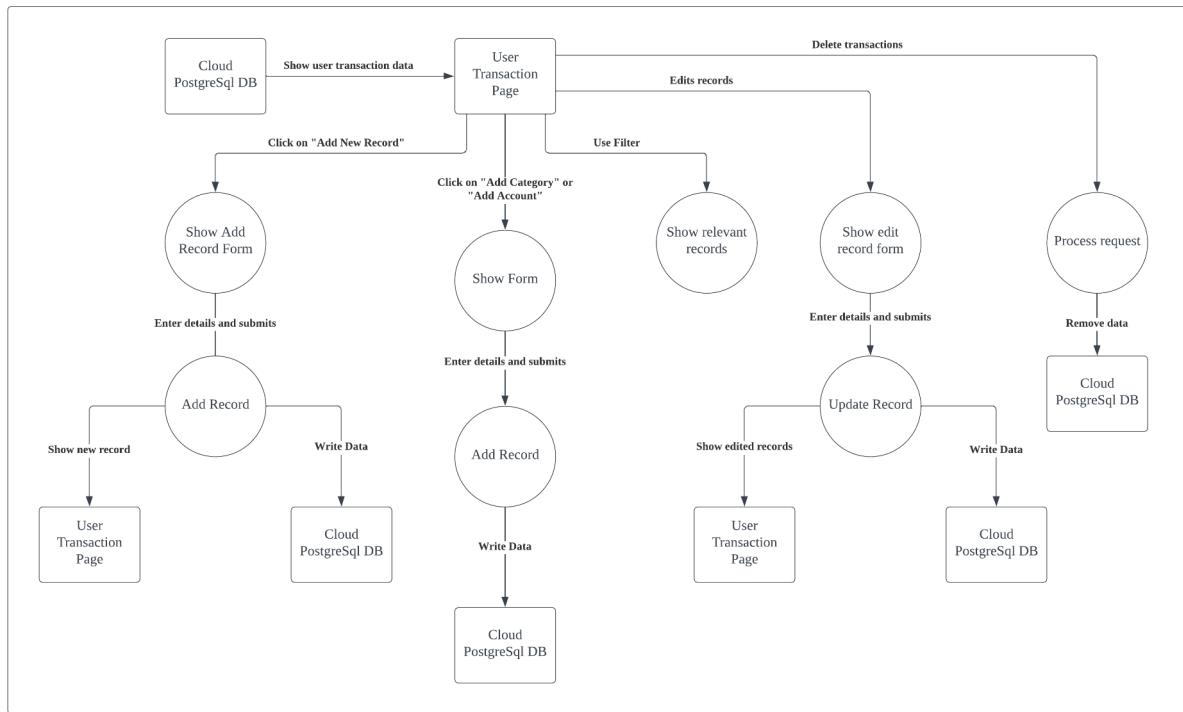


Figure 8-4d

The database shows the transaction records associated with the user. The user chooses to add, edit, or delete transactions. The user can also add categories and accounts here.

The data flows into the system, which interacts with the 'Transaction Records' table to fetch, add, update, or delete transaction records as per the user's request.

As for adding categories/account, the data flows into the system and interact with the Category and Account table.

8.4.5 DFD - Uploads Page

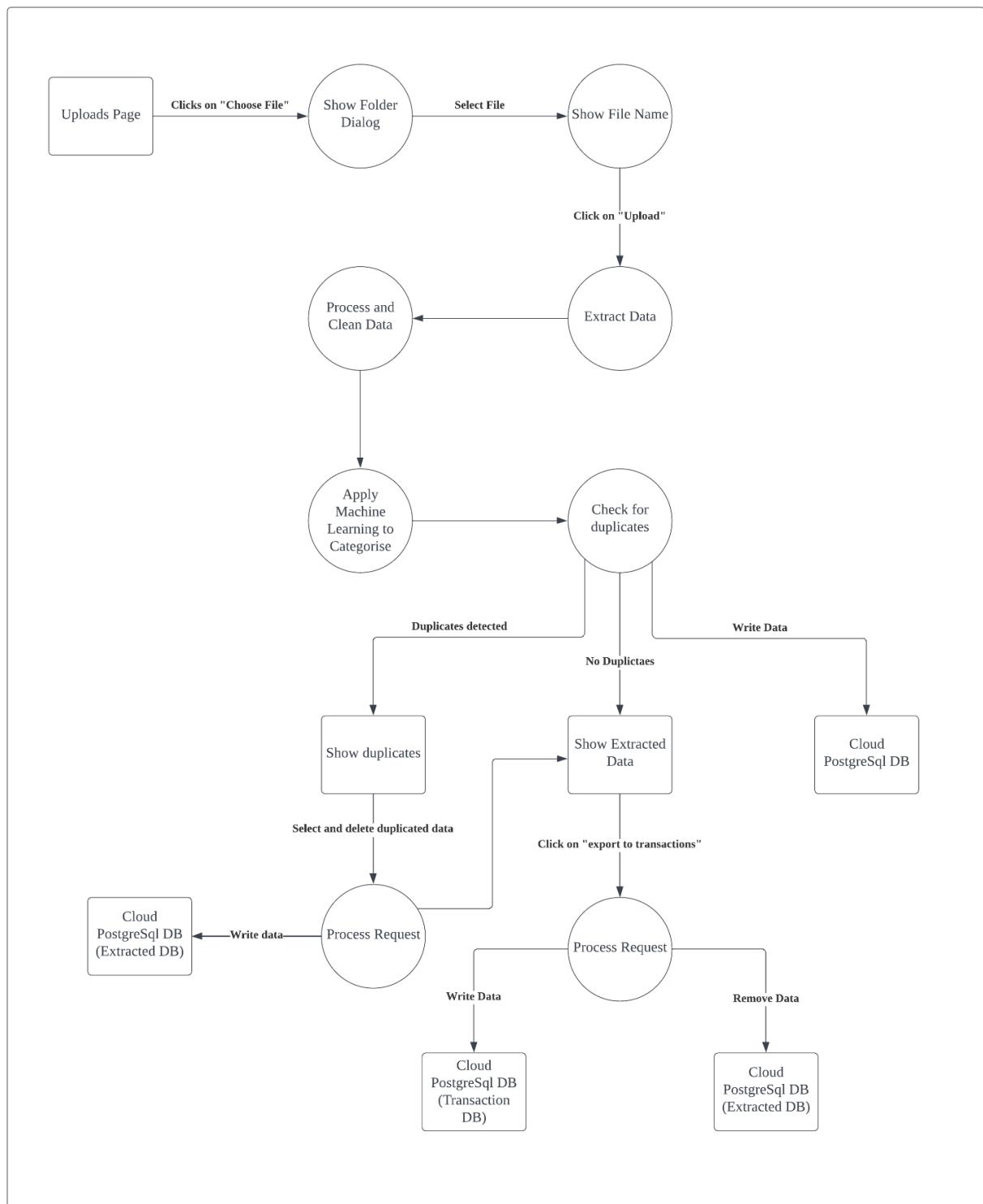


Figure 8-4e

The user selects a document to upload on this page. The data (document) is sent to the system, which processes the document. The system then extracts data from the document, process and clean the data, apply machine learning for categorization, and stores the cleaned data in the 'Extracted Data' table. The system also checks for possible duplicates before storing the extracted data.

8.4.6 DFD - Forecasting Page

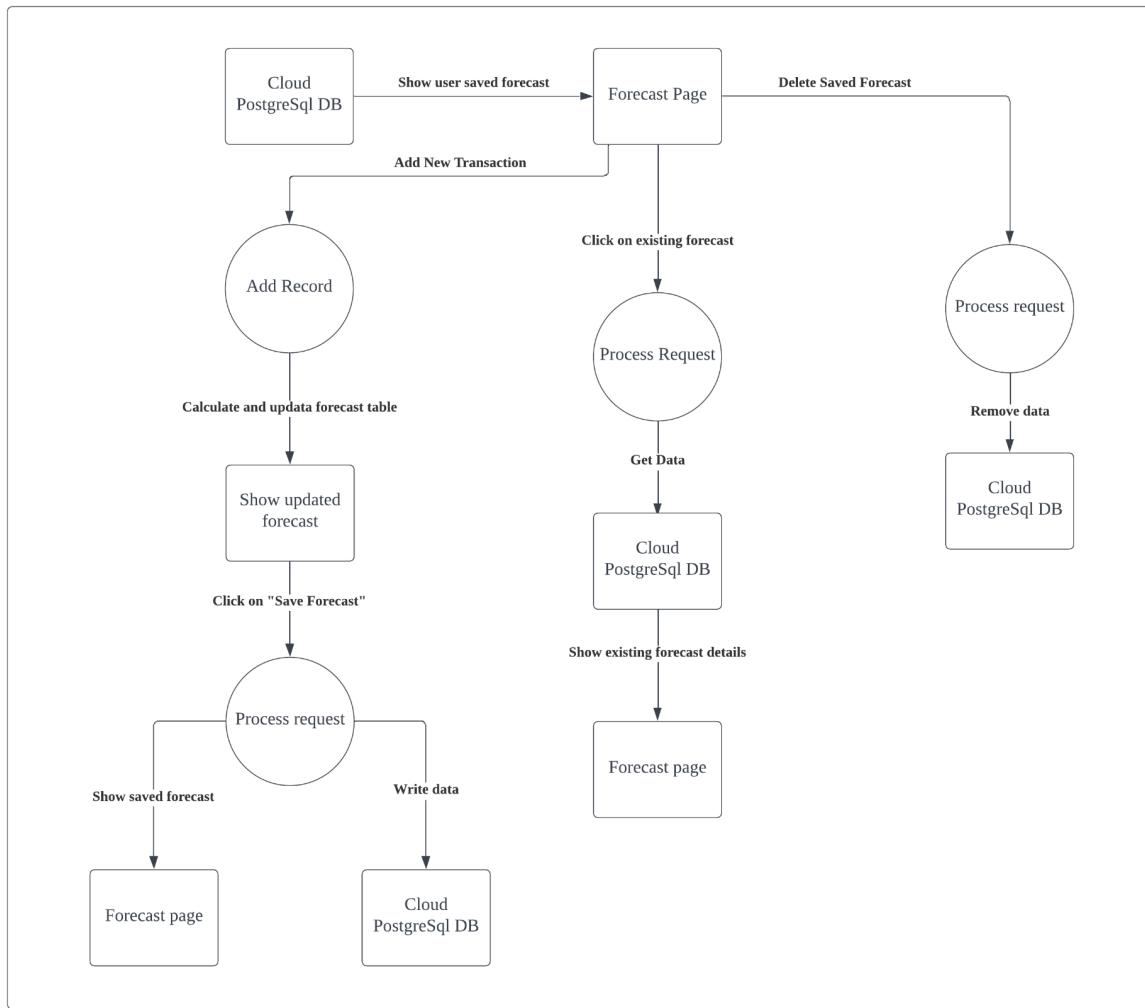


Figure 8-4f

The database shows the saved forecast associated with the user. The user interacts with the forecast page by adding, deleting, or selecting forecast entries. These requests flow into the system, which processes these requests by interacting with the 'Forecast' table. The system adds new entries and removes or shows selected entries based on the user's actions.

8.5 Entity-Relationship (ER) diagrams

A vital tool in database design and system analysis is the entity-relationship (ER) diagram. It illustrates the leading players, their characteristics, and the connections between them in order to represent how data is organized within a system visually. The ER diagram provides an intuitive and thorough knowledge of how data elements interrelate and interact within a system, acting as a blueprint for creating databases. In order to ensure an effective database design, it helps define the data that has to be saved, how it should be grouped, and how these groupings link to one another.

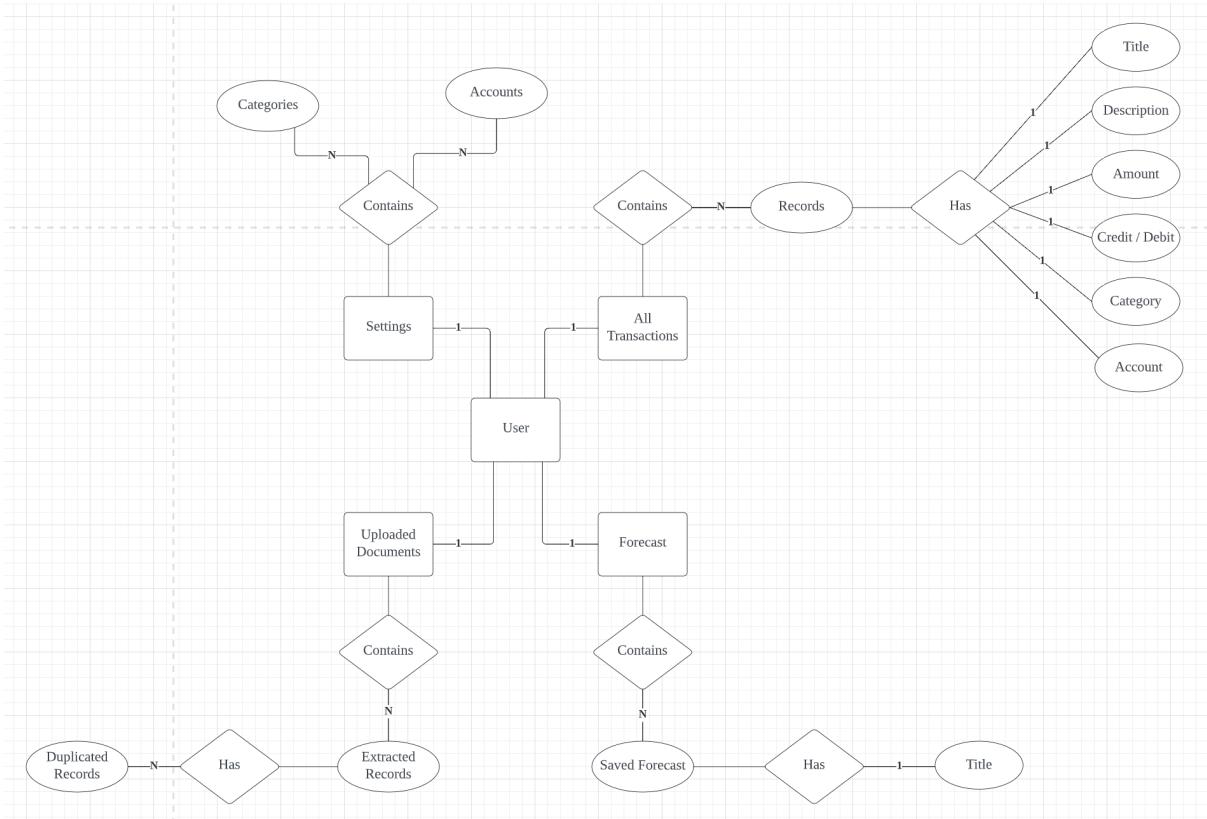


Figure 8-5a

8.6 Data Dictionary

A data dictionary contains information about the data stored within the database; its purpose is to provide a centralized source of information about the data structure within the database.

Django, a web framework for Python, is used to develop this software. Django uses an Object-Relational Mapping (ORM) system to manage database interactions. Below are some of Django's built-in authentication and authorization system and components.

The tables below belong to two categories:

Django's ORM

1. Authenticate Group
2. Authenticate Group Permissions
3. Authenticate Permissions
4. Authenticate User
5. Authenticate User Groups
6. Authenticate User User Permission
7. Django Admin Log
8. Django Content Type
9. Django Migrations
10. Django Session

FinTap

1. Accounts
2. Categories
3. Uploaded Document
4. Extracted Data
5. Forecast
6. Transaction Records

Authenticate Group				
Attribute	Key Type	Data Type	Length	Nullable
id	Primary	integer	32	NO
name	-	character varying	150	NO

Table 8-6a

Information about user groups. Groups are used to categorize users and assign them permissions

Authenticate Group Permissions				
Attribute	Key Type	Data Type	Length	Nullable
id	Primary	bigint	64	NO
group_id	-	integer	32	NO
permission_id	-	integer	32	NO

Table 8-6b

Stores permission associated with each group

Authenticate Permissions				
Attribute	Key Type	Data Type	Length	Nullable
id	Primary	integer	32	NO
name	-	character varying	255	NO
content_type_id	-	integer	32	NO
codename	-	character varying	100	NO

Table 8-6c

Stores information about permissions in the application. Permissions are related to the actions users can perform.

Authenticate User				
Attribute	Key Type	Data Type	Length	Nullable
id	Primary	integer	32	NO
password	-	character varying	128	NO
last_login	-	timestamp with time zone		YES
is_superuser	-	boolean		NO
username	-	character varying	150	NO
first_name	-	character varying	150	NO
last_name	-	character varying	150	NO
email	-	character varying	254	NO
is_staff	-	boolean		NO
is_active	-	boolean		NO
date_joined	-	timestamp with time zone		NO

Table 8-6d

Stores user account information, such as username, password, email, first name, last name, and other metadata. Primarily used for managing user authentication in a Django application.

Authenticate User Groups				
Attribute	Key Type	Data Type	Length	Nullable
id	Primary	bigint	64	NO
user_id	-	integer	32	NO
group_id	-	integer	32	NO

Table 8-6e

An intermediary table that represents the many-to-many relationship between auth_user and auth_group. Stores the group memberships for each user, allowing users to belong to multiple groups.

Authenticate User User Permission				
Attribute	Key Type	Data Type	Length	Nullable
id	Primary	bigint	64	NO
user_id	-	integer	32	NO
permission_id	-	integer	32	NO

Table 8-6f

An intermediary table that represents the many-to-many relationship between auth_user and auth_permission. It stores the individual permissions assigned to each user, on top of the permissions they inherit from their groups.

Django Admin Log				
Attribute	Key Type	Data Type	Length	Nullable
id	Primary	integer	32	NO
action_time	-	timestamp with time zone		NO
object_id	-	text		YES
object_repr	-	character varying	200	NO
action_flag	-	smallint	16	NO
change_message	-	text		NO
content_type_id	-	integer	32	YES
user_id	-	integer	32	NO

Table 8-6g

Stores logs generated by the Django admin site, such as create, update, and delete actions performed by admin users. It is used for tracking changes and maintaining an audit trail of admin actions.

Django Content Type				
Attribute	Key Type	Data Type	Length	Nullable
id	Primary	integer	32	NO
app_label	-	character varying	100	NO
model	-	character varying	100	NO

Table 8-6h

Stores information about the content types (classes / models) in the application. Each record represents a Django model and contains a reference to the app and model names. This table is often used with permissions, as each permission is associated with a specific content type.

Django Migrations				
Attribute	Key Type	Data Type	Length	Nullable
id	Primary	bigint	64	NO
app	-	character varying	255	NO
name	-	character varying	255	NO
applied	-	timestamp with time zone		NO

Table 8-6i

Keeps track of the database migrations applied to the application. Migrations are a way to change the database schema over time while preserving existing data. Each record in this table represents a migration that has been applied.

Django Session				
Attribute	Key Type	Data Type	Length	Nullable
session_key	Primary	character varying	40	NO
session_data	-	text		NO
expire_date	-	timestamp with time zone		NO

Table 8-6j

Stores session data for users in a Django application. Sessions enable the software to store arbitrary data for each user, such as authentication information, user preferences, or temporary data. Session data is stored in the database and linked to a unique session ID, which is then stored in a user's browser as a cookie.

Below are data dictionary records specifically to serve the purpose of the expense tracker and planner's functionality

Accounts				
Attribute	Key Type	Data Type	Length	Nullable
id	Primary	bigint	64	NO
name	-	character varying	100	NO
user_id	-	integer	32	NO

Table 8-6k

Stores information about various accounts (Cash, DBS, HSBC, etc) that come along with the website and also accounts created by the users.

Categories				
Attribute	Key Type	Data Type	Length	Nullable
id	Primary	bigint	64	NO
name	-	character varying	100	NO
user_id	-	integer	32	NO

Table 8-6l

Stores information about various categories (Food, Travel, Shopping, etc) that come along the website and also categories that the users can create to classify transactions.

Uploaded Document				
Attribute	Key Type	Data Type	Length	Nullable
id	Primary	bigint	64	NO
file	-	character varying	100	NO
file_type	-	character varying	10	NO
uploaded_at	-	timestamp with time zone		NO
user_id	-	integer	32	NO

Table 8-6m

Stores information about uploaded documents for extraction and categorisation

Extracted Data				
Attribute	Key Type	Data Type	Length	Nullable
id	Primary	bigint	64	NO
title	-	character varying	255	NO
description	-	text		NO
amount	-	numeric	10	NO
data_type	-	character varying	255	NO
category	-	character varying	255	NO
account	-	character varying	255	NO
date	-	date		NO
processed_at	-	timestamp with time zone		NO
document_id	-	bigint	64	NO

Table 8-6n

Stores information about data extracted from uploaded documents

Forecast				
Attribute	Key Type	Data Type	Length	Nullable
id	Primary	bigint	64	NO
name	-	character varying	255	NO
data	-	jsonb		NO
user_id	-	integer	32	YES
id	-	bigint	64	NO
title	-	character varying	255	NO
amount	-	numeric	10	NO
date	-	date		NO
user_id	-	integer	32	NO

Table 8-6o

Stores information about financial forecasts created by users.

Transaction Records				
Attribute	Key Type	Data Type	Length	Nullable
id	Primary	bigint	64	NO
title	-	character varying	100	NO
amount	-	numeric	10	NO
user_id	-	integer	32	NO
date	-	date		NO
debit_credit	-	character varying	1	NO
category_id	-	bigint	64	YES
account_id	-	bigint	64	YES
description	-	text		YES

Table 8-6p

Stores information about financial transactions.

8.7 Class Diagram

A class diagram describes a system's structure by showing the system's classes, attributes, methods, and relationships among objects.

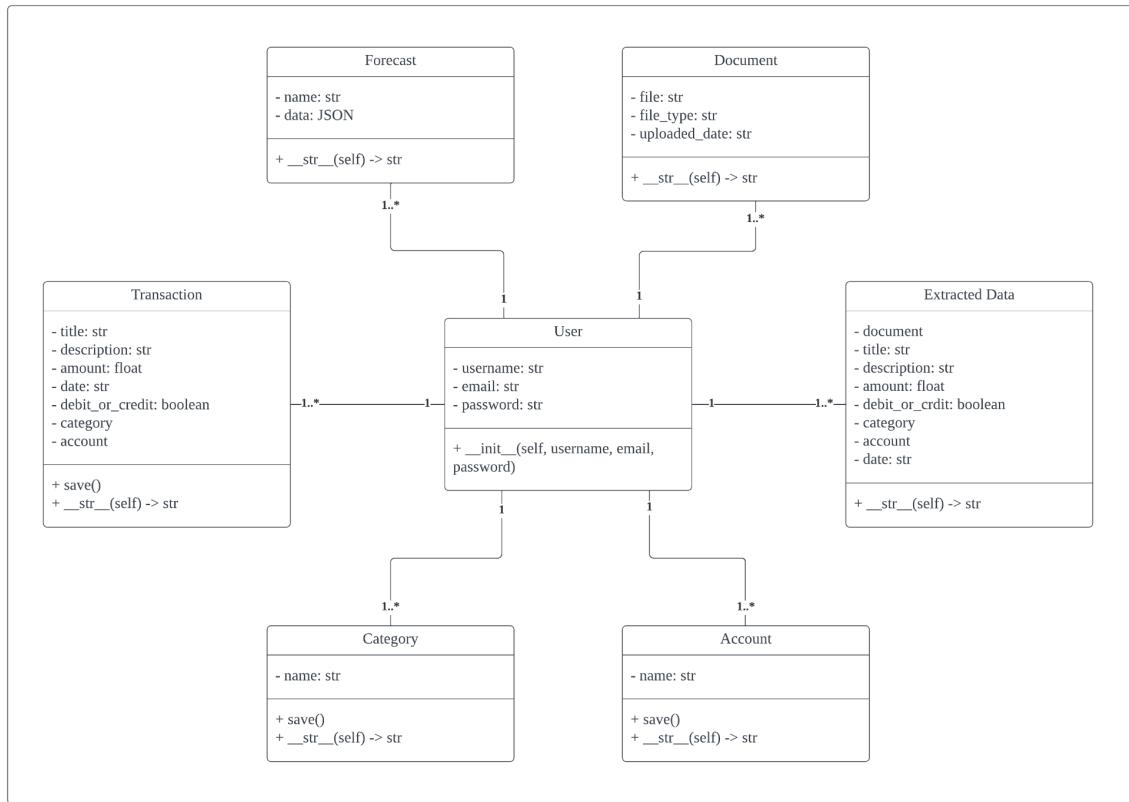


Figure 8-7a

Each class corresponds to a database table, and each attribute corresponds to a field. Understanding this structure can be very helpful for developers when working on views, forms, and other parts of the Django application that interact with the database.

8.8 Sequence Diagram

Sequence diagrams show how processes operate with one another and in what order. They help us understand Use Case Scenarios and can be used for Forward and Reverse Engineering

8.8.1 Sequence Diagram - Registration

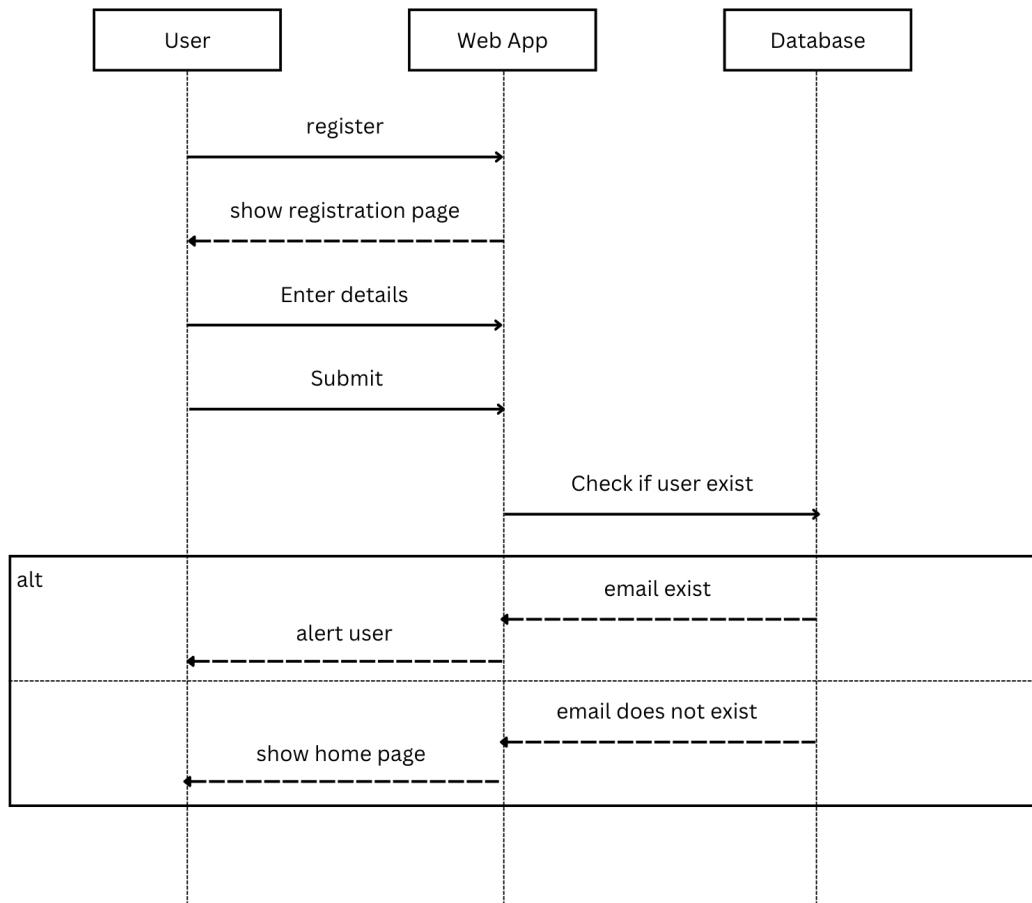


Figure 8-8a

This diagram shows the sequence of events during user registration. It includes the user entering necessary details, the system validating this information

8.8.2 Sequence Diagram - Sign In

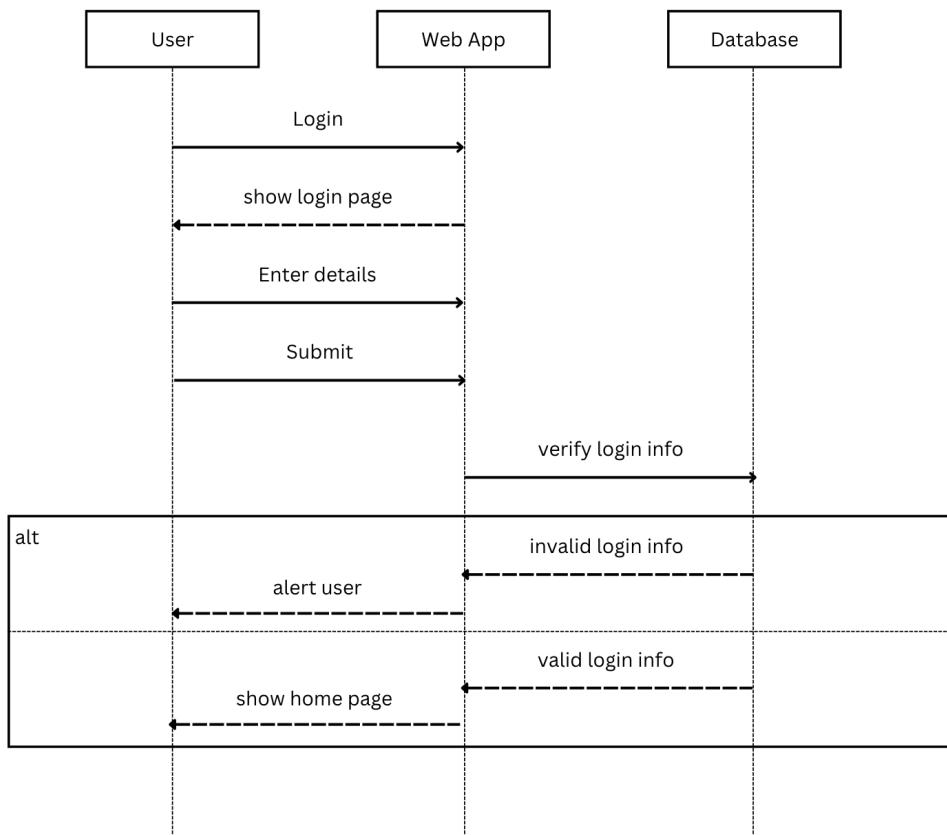


Figure 8-8b

This illustrates the process that occurs when a user tries to log in to the application. It shows interactions between the user, the web app, and the database handling authentication.

8.8.3 Sequence Diagram - Transactions

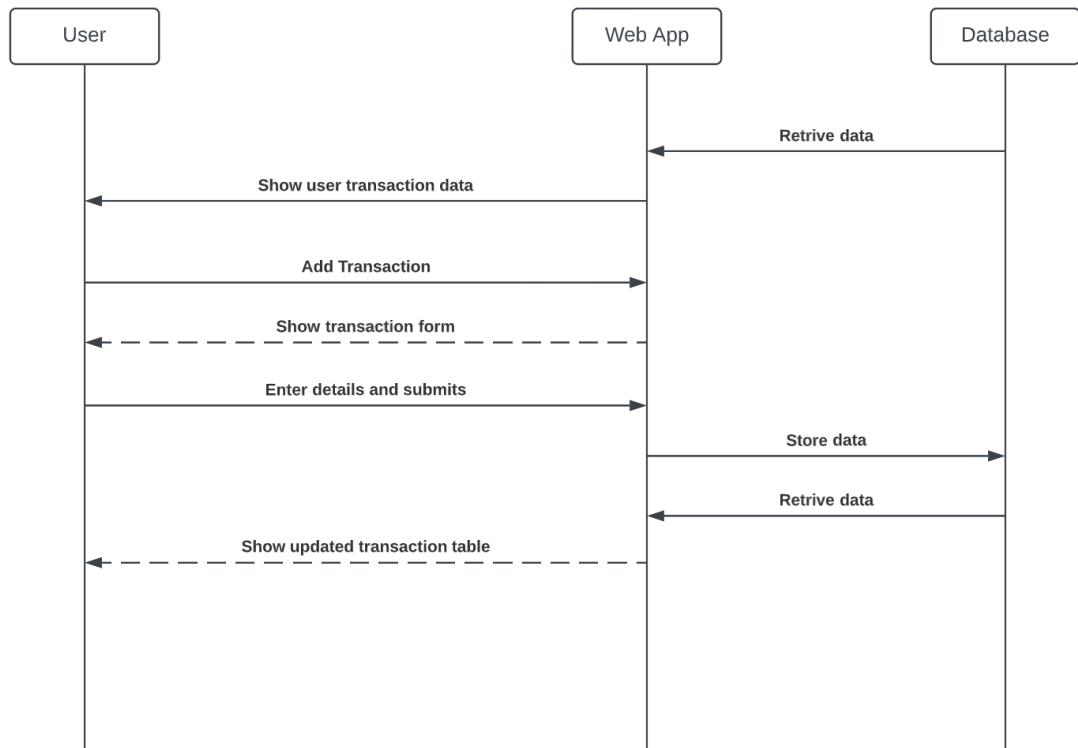


Figure 8-8c

This diagram depicts the process of adding a new transaction to the system. It shows interactions between the user, the user interface, and the database.

8.8.4 Sequence Diagram - Uploading a Document

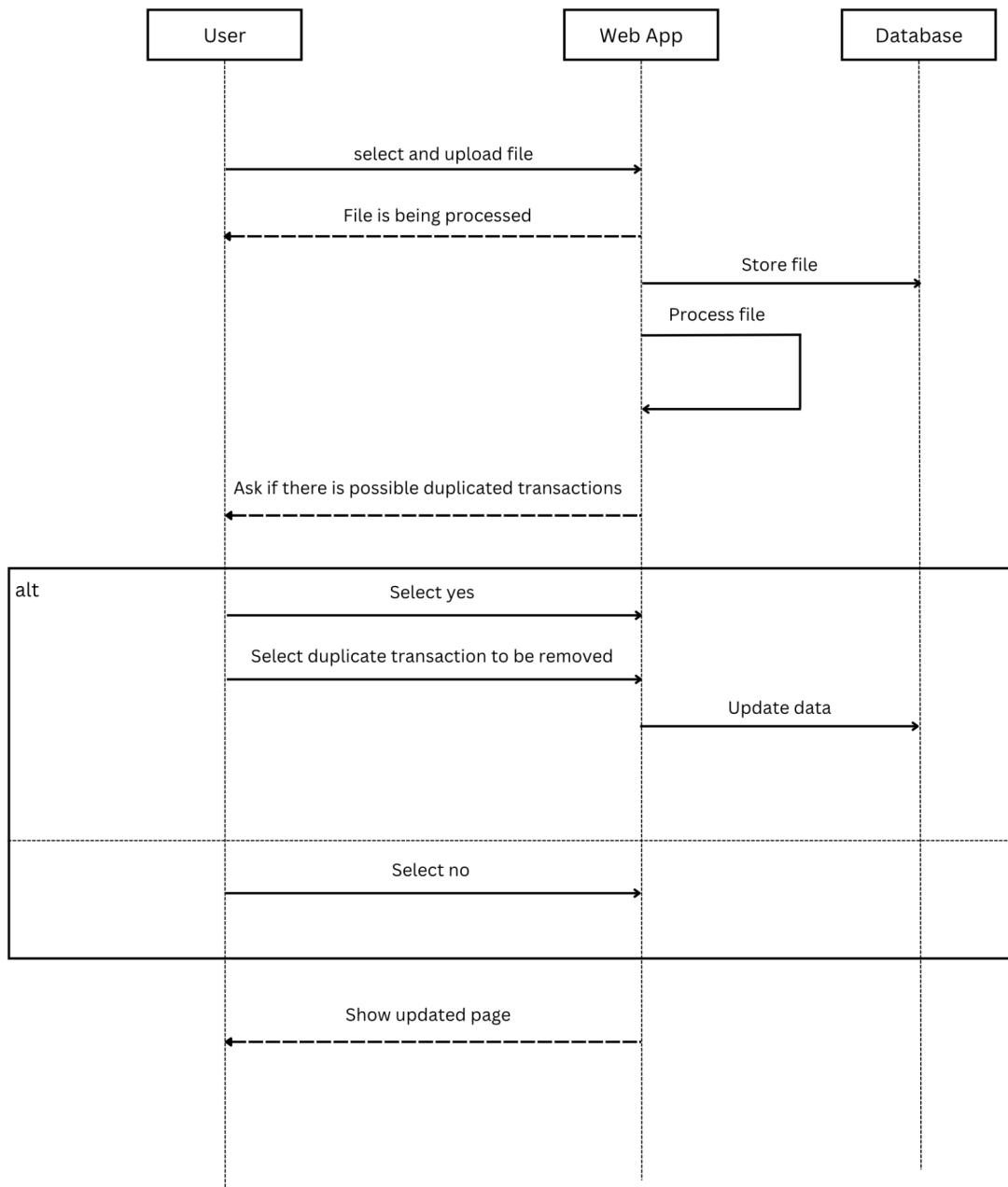


Figure 8-8d

This diagram showcases the interactions when a user uploads a document to the system.

8.8.5 Sequence Diagram - Creating a new forecast

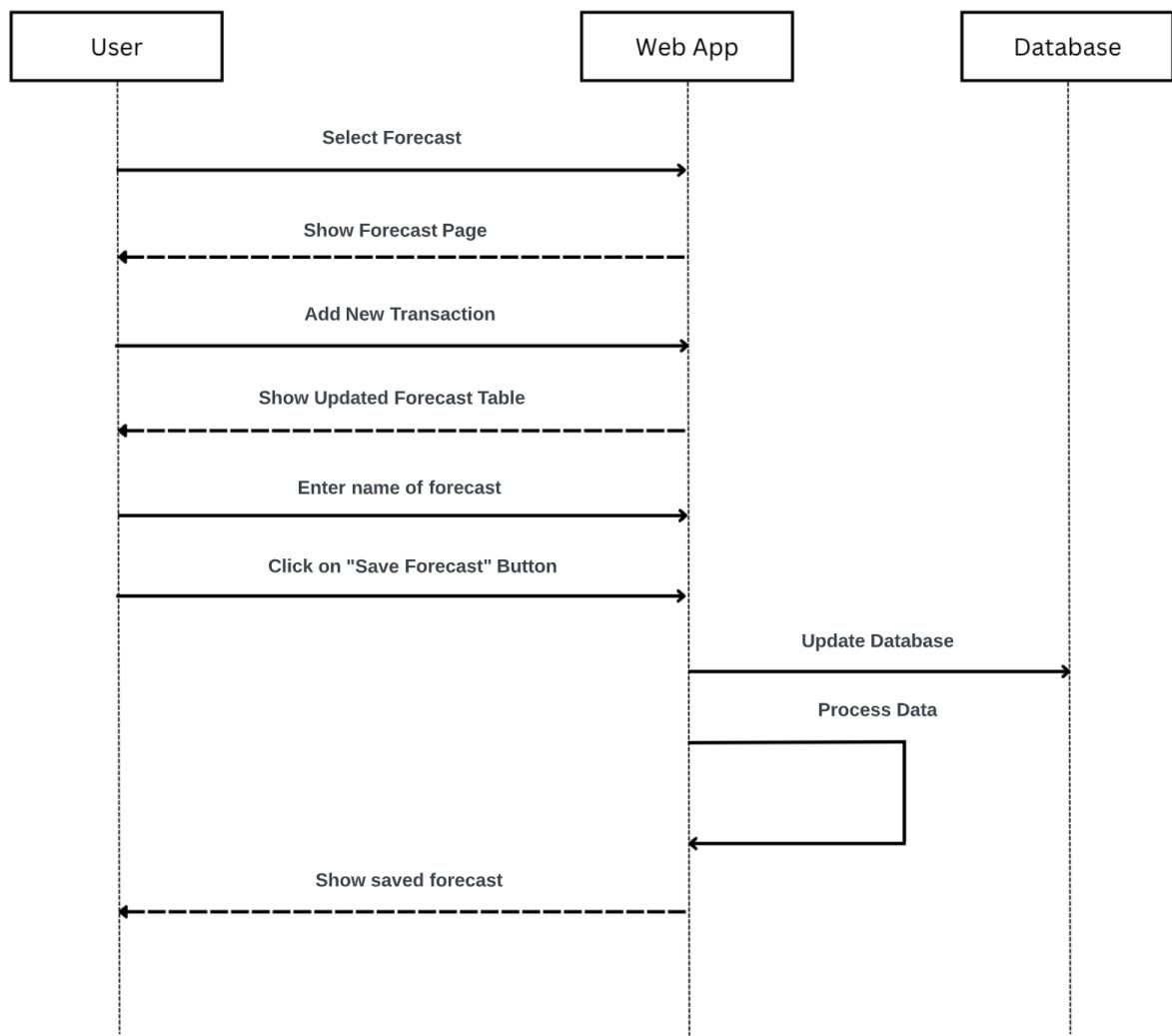


Figure 8-8e

This diagram details the events when a user interacts with the forecast page. It includes the system processing existing forecast and the user creating a new forecast.

8.9 CRUD Matrix

A CRUD matrix provides an overview of the operations that can be performed on each table in the database.

The CRUD matrix helps document and understand the system's functionality and access permissions. In addition, it allows the developer to map the specific actions or functions that can be performed on each entity, helping to ensure that all the necessary operations are accounted for.

Entities (Models / Classes)	User	Account	Category	Transaction	Document	Extracted Data	Forecast
Calling Item / Process (Functions)							
sign_up()	C						
sign_in()	R						
import_transactions()		C	C	C			
transactions_chart_data()		R	R	R			
add_account()		C					
accounts()		R					
edit_account()		U					
delete_account()		D					
add_category()			C				
categories()			R				
edit_categories()			U				
delete_categories()			D				
add_transaction()				C			
transactions()				R			
edit_transactions()				U			
delete_transactions()				D			
uploaded_documents()					CR	CR	
handle_duplicates()						CD	
delete_all_extracted_data()						D	
delete_individual()						RD	
save_forecast()							C
get_forecast()							R
delete_forecast()							D

Figure 8-8f

9. Database Information

9.1 Relational and Non-Relational database

In the early stages of development, Mongo db was used for the software's database; however, upon further development, It was discovered that having a fixed schema is more suitable for financial data due to its consistency.

9.2 System type - PostgreSQL relational database management system (DBMS)

PostgreSQL is ACID (Atomicity, Consistency, Isolation, Durability) compliance which is crucial for software that handles financial data ensuring that users get accurate and reliable information. It is also scalable and can easily accommodate increasing data storage and queries.

9.3 Chosen service provider - <https://render.com>

I elected to use a cloud-based database, which offers high availability and reliability. Render achieves this by distributing the database across multiple nodes so should some nodes fail, others will be available; hence the software remains accessible.

A cloud-based database also provides automatic backups and recovery, which is invaluable in case of data loss or corruption.

9.4 Railway vs. Render

Railway.app and Render.com are both cloud database service providers. While Railway's setup is straightforward, the company has yet to optimize its service for users outside of the United States, slowing the service speed. Railway offers paid options with better speed, but currently, the company does not accept credit cards outside the states.

On the other hand, Render has clusters in Singapore, making the speed of the database faster and more reliable.

The screenshot shows the render.com web interface for managing databases. At the top, there's a navigation bar with links for Dashboard, Blueprints, Env Groups, Docs, Community, Help, and a New + button. On the right, it shows a user profile for Samuel Wong with options to Read the docs or Connect.

The main content area displays a database named "expense_tracker_db_v2" which is currently running on a "Standard" plan. The left sidebar has tabs for Info (which is selected), Metrics, Recovery, and Logs.

General

- Name: expense_tracker_db_v2 [Edit](#)
- Created: 12 days ago
- Status: Available
- PostgreSQL Version: 15
- Region: Singapore (Southeast Asia)
- Read Replica: [Add Read Replica](#)
- Storage: 0.40% used out of 16.0 GiB

Instance Type

Standard RAM 1 GB CPU 1 Storage 16 GB [Change Instance Type](#)

Figure 9-1a

10. Wireframes

Given that they provide a visual framework for the application or website, wireframes are an essential component of the design and development process. Your product is reduced, and low-fidelity outlines provide a preliminary idea of its layouts, structures, and features.

They serve as a road map for what goes where and aid in defining the user experience, element location, and information architecture. Before diving into intricate design and code, developers and designers can communicate their ideas and concepts more effectively by using wireframes, allowing for iterative feedback and modifications.

By identifying possible usability problems early in the development process, this early alignment can save a lot of time and money.

The wireframe shows a registration form titled 'Create new Account'. At the top right are 'Sign In' and 'Sign Up' buttons. Below the title is a link 'Already Registered? Login'. The form consists of four text input fields labeled 'NAME', 'EMAIL', and 'PASSWORD', and a dropdown menu for 'DATE OF BIRTH'. A large 'sign up' button is at the bottom.

NAME	<input type="text"/>
EMAIL	<input type="text"/>
PASSWORD	<input type="text"/>
DATE OF BIRTH	<input type="button" value="Select"/> ▾
<input type="button" value="sign up"/>	

Figure 10a

FinTap

[Sign In](#) [Sign Up](#)

Login

Sign in to continue

EMAIL

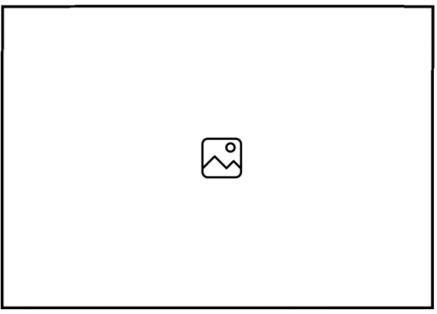
PASSWORD

login

Figure 10b

FinTap

[Sign In](#) [Sign Up](#)



FinTap - tap into financial freedom today

FinTap ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.

sign up

Figure 10c

FinTap		Transactions	Set Budget	View Reports	Financial Forecast	Support	Sign Out	
Transactions		Add Income	Upload	Add Expense	Export	<input type="text" value="Search"/> ≡		
Title	Description				Amount	Date	Actions	
Transport	Transport				\$105.00	15 Nov 2022	Edit	
Shopping	Shopping				\$326.15	17 Nov 2022	Edit	
Housing Payment	Housing Payment				\$1200.45	30 Nov 2022	Edit	

Figure 10d

FinTap		Transactions	Set Budget	View Reports	Financial Forecast	Support	Sign Out	
Transactions		Add Income	Upload	Add Expense	Export	<input type="text" value="Search"/> ≡		
Title	Description				Amount	Date	Actions	
Transport	Transport				\$105.00	15 Nov 2022	Edit	
Shopping	Shopping					17 Nov 2022	Edit	
Housing Payment	Housing Payment					30 Nov 2022	Edit	

Record New Expense

Add Transaction

Figure 10e

11. Screenshots of Interface (Web)

From systems that interact with the program to persons who utilize it, interface design outlines how the program or software communicates with itself.

Understanding the requirements and expectations of the end-user was the primary factor in the choice to build the program to be contemporary, user-friendly, clean, and straightforward. A simple, contemporary design can significantly improve user experience and usability.

Users frequently anticipate an easy and flawless software experience in the digital age. These expectations are met with a modern, uncluttered interface, which gives the program a comfortable, user-friendly feel. In addition, users' cognitive burden is reduced through simplicity and clarity in design, freeing them to concentrate on activities without being distracted by extraneous features or material.

Furthermore, a clean design is both aesthetically beautiful and practical. It reduces distractions, highlights crucial elements, and increases usability in general. Users may discover what they need more quickly by removing extraneous components, which boosts efficiency and happiness.

Finally, a straightforward and user-friendly design appeals to a broader audience, including those who might not be tech-savvy. Bridging the divide between users with different degrees of digital literacy improves the software's inclusivity and accessibility.

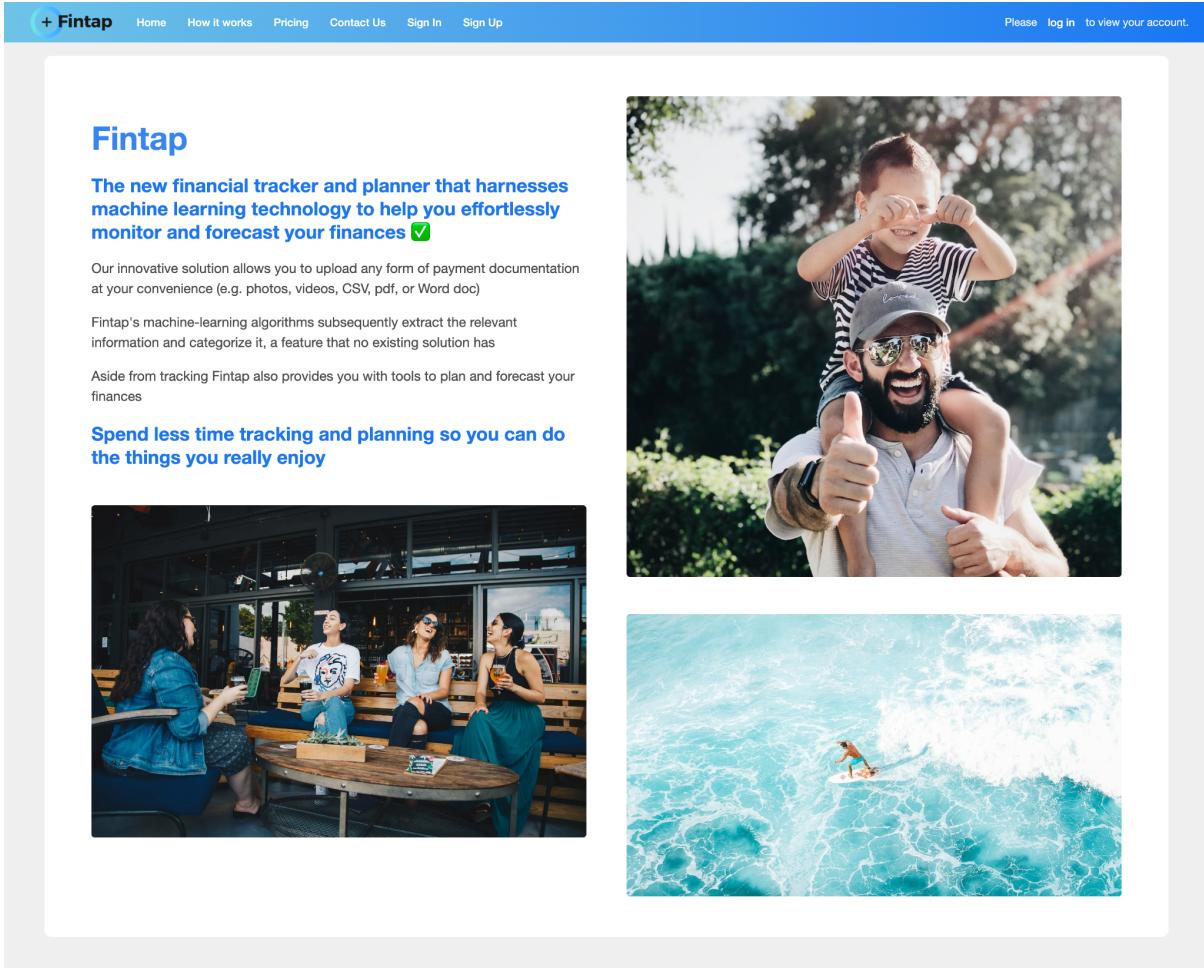
11.1 Interface Design - Home Page

The home page is intended to be appealing, instructive, and user-friendly and serves as an introduction to the Fintap service and what it offers.

Users may easily concentrate on the information offered because the page is straightforward and uncluttered.

Users are given just enough information to comprehend the service without being overwhelmed by the text and visuals on the page, which are clean and succinct.

Overall, this page's design works well because it combines clear, succinct language with a simple, responsive layout, which makes it simple for users to comprehend what Fintap offers and why they should be interested.



The screenshot shows the Fintap home page. At the top, there is a blue header bar with the Fintap logo, navigation links for Home, How it works, Pricing, Contact Us, Sign In, and Sign Up, and a message for users to log in to view their account. The main content area has a white background. On the left, there is a section titled "Fintap" with a sub-section titled "The new financial tracker and planner that harnesses machine learning technology to help you effortlessly monitor and forecast your finances" followed by a checkmark icon. Below this, there are three paragraphs of text: "Our innovative solution allows you to upload any form of payment documentation at your convenience (e.g. photos, videos, CSV, pdf, or Word doc)", "Fintap's machine-learning algorithms subsequently extract the relevant information and categorize it, a feature that no existing solution has", and "Aside from tracking Fintap also provides you with tools to plan and forecast your finances". To the right of this text is a large, high-quality photograph of a smiling man with a beard giving a thumbs-up while a young boy sits on his shoulders and covers his eyes with his hands. Below this main image are two smaller photographs: one showing four people sitting outdoors at a cafe, and another showing a person surfing on a wave.

Figure 11-1a

11.2 Interface Design - How It Works Page

The primary purpose of this page is to succinctly explain to users how the service works in two simple steps, reinforcing the ease and simplicity of the process.

The information is broken down into two simple steps, making it easy for users to understand and follow.

The "How It Works" page effectively communicates how simple it is to use Fintap's service, reinforcing the ease of use and innovation as key selling points.

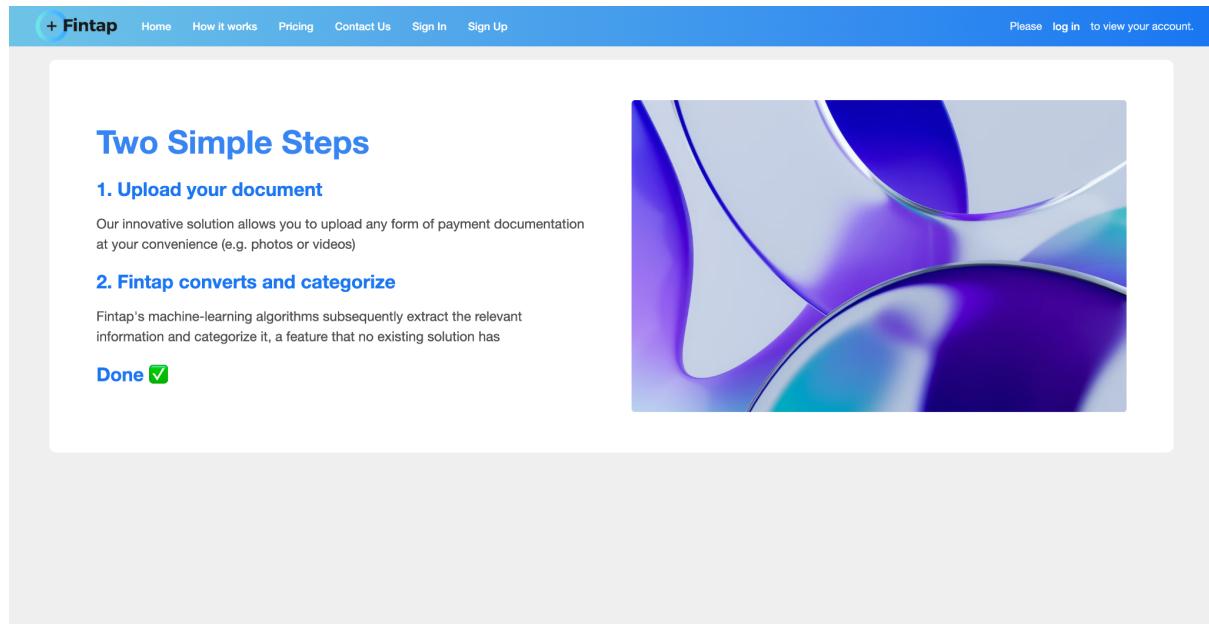


Figure 11-1b

11.3 Interface Design - Pricing Page

The primary purpose of this page is to explain the pricing options to the users, helping them to make an informed decision about which level of service to choose.

The two-column layout makes it easy to compare the features of each pricing tier.

This "Pricing" page effectively communicates the pricing options for Fintap's service, making it easy for users to understand the offerings and benefits of each plan and encouraging them to sign up for the service.

The screenshot shows a two-column pricing interface for Fintap. At the top, there is a blue header bar with the Fintap logo and navigation links for Home, How it works, Pricing, Contact Us, Sign In, and Sign Up. To the right of the header, a message says "Please log in to view your account." Below the header, the main title "Simple pricing for your needs" is displayed in blue, followed by a subtitle "Gain control of your finances. Start for free!"

The left column, titled "FinTap Plus", lists the following features:

- Priority access to new features
- Faster conversion and categorization speed
- Direct support line

Below these features is a text input field labeled "Enter your email" and a blue button labeled "Join Waiting List".

The right column, titled "Starter", lists the following features:

- Free forever and ever
- Standard processing speed
- Normal support

Below these features is a blue button labeled "Get Started".

Figure 11-1c

11.4 Interface Design - Contact Us Page

The screenshot shows the 'Contact Us' page of the Fintap website. At the top, there is a blue header bar with the Fintap logo and navigation links for Home, How it works, Pricing, Contact Us, Sign In, and Sign Up. A message 'Please log in to view your account.' is displayed on the right. The main content area has a white background and features a form titled 'Contact Us'. It includes three input fields: 'Name' (with a placeholder box), 'Email' (with a placeholder box), and 'Message' (with a larger text area). Below the message area is a blue 'Send Message' button.

Figure 11-1d

11.5 Interface Design - Sign In Page

The screenshot shows the 'Sign In' page of the Fintap website. The layout is similar to the Contact Us page, with a blue header bar, navigation links, and a login message. The main content area is titled 'Sign In' and includes a welcome message 'Welcome back! Consistency is key to success.'. It features two input fields: 'Username' (placeholder box) and 'Password' (placeholder box). Below these is a blue 'Login' button. A link 'Forgot Password?' is located just below the password field.

Figure 11-1e

11.6 Interface Design - Sign Up Page

The screenshot shows the sign up page for the Fintap website. At the top, there is a blue header bar with the Fintap logo and navigation links for Home, How it works, Pricing, Contact Us, Sign In, and Sign Up. On the right side of the header, there is a message: "Please log in to view your account." Below the header, the main content area has a white background. It features a title "Sign Up" in bold, followed by a subtitle "Your journey to financial freedom start here!". There are four input fields labeled "Username:", "Email:", "Password:", and "Password confirmation:". Each field has a corresponding empty text input box below it. A blue "Register" button is positioned at the bottom of these fields. At the very bottom of the page, there is a small link: "Already have an account? Log in here."

Figure 11-1f

11.7 Interface Design - Transaction Page (New user no transactions)

This is the transaction management page, where users can view, add, edit, and delete financial transactions. This page also allows users to filter transactions by date, category, and account, add new categories or accounts, and bulk edit or delete selected transactions.

The page has a clean, organized layout that makes it easy for users to navigate and understand the functionalities available to them. In addition, the tables, forms, and buttons are designed intuitively, allowing users to perform complex actions effortlessly.

The page represents a well-rounded, user-friendly, and highly functional tool for financial transaction management. Its thoughtful design and broad feature set make it an excellent choice for individuals seeking better control over their finances.

The screenshot shows the Fintap Transaction Management Page. At the top, there's a blue header bar with the Fintap logo, navigation links (Transactions, Upload, Forecast, Settings, Contact Us, Logout), and a welcome message "Welcome, Samuel!". Below the header is a large white content area titled "Transaction". At the top of this area are four summary boxes: "Total amount: 0" (blue), "Total credit: 0" (green), "Total debit: 0" (red), and "Avg 6m expenses: 0.0" (grey). Below these are several blue rectangular buttons: "Add New Record", "Add Category", "Add Account", "Select All", "Edit Selected", "Delete Selected", and "Export Transactions". Underneath these buttons are two dropdown menus: "All Categories" and "All Accounts", both with a dropdown arrow icon. Below the dropdowns are two input fields for "Start Date" and "End Date", each with a calendar icon, followed by a "Filter" button. To the right of these are time range buttons: "Now", "3m", "6m", "9m", "12m", and "Expense" (which is highlighted in blue) and "Income". At the very bottom of the content area, a small message says "No transactions found."

Figure 11-1g

11.7.1 Interface Design - Transaction Page (Add a new record form)

The screenshot shows the Fintap application interface. At the top, there is a blue header bar with the Fintap logo and navigation links: Transactions, Upload, Forecast, Settings, Contact Us, and Logout. On the right side of the header, it says "Welcome, Samuel!". Below the header is a main content area. On the left, there's a sidebar titled "Transaction" with several summary boxes: "Total amount: 0" (blue), "Total credit: 0" (green), "Total debit: 0" (red), and "Avg Curr: 0" (grey). Below these are buttons for "Add New Record", "Add Category", "Add Account", and "Select All". There are also date filters: "Start Date: dd/mm/yyyy" and "End Date: dd/mm/yyyy", followed by "Filter", "Now", and "3m" buttons. Further down are dropdowns for "All Categories" and "All Accounts". A message "No transactions found." is displayed. On the right side, there is a large modal window for adding a new transaction. It contains fields for "Title", "Description", "Amount", "Type" (set to "Credit"), "Date" (set to "dd/mm/yyyy"), "Category" (set to "Food"), and "Account" (set to "Cash"). Below these fields are two blue buttons: "Add" and "Cancel".

Figure 11-1h

11.7.2 Interface Design - Transaction Page (User with transactions)

The screenshot shows the Fintap Transaction Page. At the top, there are four summary boxes: 'Total amount: 5312.71' (blue), 'Total credit: 5624.84' (green), 'Total debit: 312.13' (red), and 'Avg 6m expenses: 0.0' (grey). Below these are several buttons: 'Add New Record', 'Add Category', 'Add Account', 'Select All', 'Edit Selected', 'Delete Selected', and 'Export Transactions'. There are also date range inputs ('Start Date: dd/mm/yyyy' and 'End Date: dd/mm/yyyy'), a 'Filter' button, and time range buttons ('Now', '3m', '6m', '9m', '12m'). To the right of these are 'Expense' and 'Income' buttons. Below these buttons are two dropdown menus: 'All Categories' and 'All Accounts'. The main area contains a table of transaction details with columns: Select, Title, Description, Amount, Type, Category, Account, Date, and Actions (Edit, Delete). The table lists various transactions such as Amex payment, Withdrawal, Food at canteen, Daniel paying me back, Interest, Rebalancing account, Paying Penn, Withdrawal, Rebalancing account, Paying Marcus for food, CPF, Cash withdrawal, Buying cake, Mustafa food, and Food.

Select	Title	Description	Amount	Type	Category	Account	Date	Actions
<input type="checkbox"/>	Amex payment	amex credit card payment	152.13	Debit	Credit Card Payment	Amex	Aug. 17, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Withdrawal	bedok 72 cash withdrawal	80.00	Debit	Withdrawal	Posb	Aug. 17, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Withdrawal	bedok 72 cash withdrawal	80.00	Debit	Withdrawal	Posb	Aug. 12, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Food at canteen	paynow transfer to lam may fong	6.80	Credit	Food	Cash	Sept. 13, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Daniel paying me back	incoming paynow ref 0629790 from lim zhenghao daniel transfer mobile	59.00	Credit	Food	Cash	Sept. 13, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Interest	interest earned	0.35	Credit	Food	Cash	Sept. 13, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Withdrawal	bedok 72 cash withdrawal	80.00	Credit	Food	Cash	Oct. 13, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Rebalancing account	136 49334 5 bankfunds transfer	100.00	Credit	Food	Cash	Oct. 13, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Rebalancing account	136 49334 5 bankfunds transfer	1128.51	Credit	Food	Cash	Oct. 13, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Paying Penn	paynow transfer to penn ong	60.00	Credit	Food	Cash	Nov. 13, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Withdrawal	bedok 72 cash withdrawal	80.00	Credit	Food	Cash	Nov. 13, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Rebalancing account	136 49334 5 bankfunds transfer	562.65	Credit	Food	Cash	Nov. 13, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Credit card payment	Credit card payment	1607.14	Credit	Food	Cash	Dec. 13, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Credit card payment	Credit card payment	1622.29	Credit	Food	Cash	Dec. 13, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Paying Marcus for food	paynow transfer to marcus wong chicken rice was cold	10.00	Credit	Food	Cash	Dec. 13, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	CPF	cpf se or collections via giro	126.00	Credit	Food	Cash	Jan. 13, 2023	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Cash withdrawal	bedok interchange cash withdrawal	80.00	Credit	Food	Cash	Jan. 13, 2023	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Buying cake	paynow transfer to nutty nut	91.00	Credit	Food	Cash	Jan. 13, 2023	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Mustafa food	paynow transfer to mustafa abbas	5.00	Credit	Food	Cash	Feb. 13, 2023	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Food	paynow transfer	6.10	Credit	Food	Cash	Feb. 13, 2023	<button>Edit</button> <button>Delete</button>

Figure 11-1i

11.7.3 Interface Design - Transaction Page (Add a new category form)

The screenshot shows the Fintap Transaction page. At the top, there are four summary boxes: 'Total amount: 5312.71' (blue), 'Total credit: 5624.84' (green), 'Total debit: 312.13' (red), and 'Avg 6m expenses: 0.0' (grey). Below these are several buttons: 'Add New Record', 'Add Category', 'Add Account', 'Select All', 'Import Transactions', and dropdowns for 'Start Date' and 'End Date'. A modal window titled 'Category Name:' is open, containing a text input field, a 'Save' button, and a 'Cancel' button. The main table below lists transactions with columns for Select, Title, Description, Amount, Type, Category, Account, Date, and Actions (Edit, Delete). One transaction is highlighted in grey.

Select	Title	Description	Amount	Type	Category	Account	Date	Actions
<input type="checkbox"/>	Amex payment	amex credit card payment	152.13	Debit	Credit Card Payment	Amex	Aug. 17, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Withdrawal	bedok 72 cash withdrawal	80.00	Debit	Withdrawal	Posb	Aug. 17, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Withdrawal	bedok 72 cash withdrawal	80.00	Debit	Withdrawal	Posb	Aug. 12, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Food at canteen	paynow transfer to lam may fong	6.80	Credit	Food	Cash	Sept. 13, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Daniel paying me back	incoming paynow ref 0629790 from lim zhenghao daniel transfer mobile	59.00	Credit	Food	Cash	Sept. 13, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Interest	interest earned	0.35	Credit	Food	Cash	Sept. 13, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Withdrawal	bedok 72 cash withdrawal	80.00	Credit	Food	Cash	Oct. 13, 2022	<button>Edit</button> <button>Delete</button>

Figure 11-1j

11.7.4 Interface Design - Transaction Page (Add a new account form)

This screenshot is identical to Figure 11-1j, showing the Transaction page with an open 'Add Account' modal. The modal has a 'Category Name:' input field, a 'Save' button, and a 'Cancel' button. The main table below lists transactions with columns for Select, Title, Description, Amount, Type, Category, Account, Date, and Actions (Edit, Delete).

Select	Title	Description	Amount	Type	Category	Account	Date	Actions
<input type="checkbox"/>	Amex payment	amex credit card payment	152.13	Debit	Credit Card Payment	Amex	Aug. 17, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Withdrawal	bedok 72 cash withdrawal	80.00	Debit	Withdrawal	Posb	Aug. 17, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Withdrawal	bedok 72 cash withdrawal	80.00	Debit	Withdrawal	Posb	Aug. 12, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Food at canteen	paynow transfer to lam may fong	6.80	Credit	Food	Cash	Sept. 13, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Daniel paying me back	incoming paynow ref 0629790 from lim zhenghao daniel transfer mobile	59.00	Credit	Food	Cash	Sept. 13, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Interest	interest earned	0.35	Credit	Food	Cash	Sept. 13, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Withdrawal	bedok 72 cash withdrawal	80.00	Credit	Food	Cash	Oct. 13, 2022	<button>Edit</button> <button>Delete</button>

Figure 11-1k

11.7.5 Interface Design - Transaction Page (Date Filter)

The screenshot shows the Fintap Transaction page. At the top, there are four summary boxes: 'Total amount: 5312.71' (blue), 'Total credit: 5624.84' (green), 'Total debit: 312.13' (red), and 'Avg 6m expenses: 0.0' (grey). Below these are several action buttons: 'Add New Record', 'Add Category', 'Add Account', 'Select All', 'Edit Selected', 'Delete Selected', and 'Export Transactions'. A date range selector allows users to choose 'Start Date' and 'End Date' from 'dd/mm/yyyy' dropdowns, with a 'Filter' button. There are also quick links for 'Now', '3m', '6m', '9m', and '12m', along with 'Expense' and 'Income' buttons. On the left, a sidebar titled 'All Categories' lists various transaction types like Food, Shopping, Transport, Misc, Interest Earned, Internal Transfer, Credit Card Payment, Withdrawal, and Tax. A 'Select' checkbox is checked for all categories. The main table lists transactions with columns for Description, Amount, Type, Category, Account, Date, and Actions (Edit, Delete). One transaction is highlighted in blue.

Description	Amount	Type	Category	Account	Date	Actions	
amex credit card payment	152.13	Debit	Credit Card Payment	Amex	Aug. 17, 2022	<button>Edit</button> <button>Delete</button>	
bedok 72 cash withdrawal	80.00	Debit	Withdrawal	Posb	Aug. 17, 2022	<button>Edit</button> <button>Delete</button>	
bedok 72 cash withdrawal	80.00	Debit	Withdrawal	Posb	Aug. 12, 2022	<button>Edit</button> <button>Delete</button>	
Food at canteen	6.80	Credit	Food	Cash	Sept. 13, 2022	<button>Edit</button> <button>Delete</button>	
Daniel paying me back	incoming paynow ref 0629790 from lim zhenghao daniel transfer mobile	59.00	Credit	Food	Cash	Sept. 13, 2022	<button>Edit</button> <button>Delete</button>
Interest	interest earned	0.35	Credit	Food	Cash	Sept. 13, 2022	<button>Edit</button> <button>Delete</button>
Withdrawal	bedok 72 cash withdrawal	80.00	Credit	Food	Cash	Oct. 13, 2022	<button>Edit</button> <button>Delete</button>

Figure 11-1l

11.7.6 Interface Design - Transaction Page (Category Filter)

This screenshot shows the same Transaction page as above, but with a different filter applied. A modal dialog is open over the 'All Categories' sidebar, listing specific categories: Food, Shopping, Transport, Misc, Interest Earned, Internal Transfer, Credit Card Payment, Withdrawal, and Tax. The 'All Categories' checkbox is checked. The main table displays the same set of transactions as Figure 11-1l, but the rows are sorted differently, with the first transaction ('amex credit card payment') now at the bottom of the list.

Description	Amount	Type	Category	Account	Date	Actions	
amex credit card payment	152.13	Debit	Credit Card Payment	Amex	Aug. 17, 2022	<button>Edit</button> <button>Delete</button>	
bedok 72 cash withdrawal	80.00	Debit	Withdrawal	Posb	Aug. 17, 2022	<button>Edit</button> <button>Delete</button>	
bedok 72 cash withdrawal	80.00	Debit	Withdrawal	Posb	Aug. 12, 2022	<button>Edit</button> <button>Delete</button>	
Food at canteen	6.80	Credit	Food	Cash	Sept. 13, 2022	<button>Edit</button> <button>Delete</button>	
Daniel paying me back	incoming paynow ref 0629790 from lim zhenghao daniel transfer mobile	59.00	Credit	Food	Cash	Sept. 13, 2022	<button>Edit</button> <button>Delete</button>
Interest	interest earned	0.35	Credit	Food	Cash	Sept. 13, 2022	<button>Edit</button> <button>Delete</button>
Withdrawal	bedok 72 cash withdrawal	80.00	Credit	Food	Cash	Oct. 13, 2022	<button>Edit</button> <button>Delete</button>
amex credit card payment	152.13	Debit	Credit Card Payment	Amex	Aug. 17, 2022	<button>Edit</button> <button>Delete</button>	

Figure 11-1m

11.7.7 Interface Design - Transaction Page (Account Filter)

The screenshot shows the Fintap Transaction page. At the top, there are four summary boxes: 'Total amount: 5312.71' (blue), 'Total credit: 5624.84' (green), 'Total debit: 312.13' (red), and 'Avg 6m expenses: 0.0' (grey). Below these are several buttons: 'Add New Record', 'Add Category', 'Add Account', 'Select All', 'Edit Selected', 'Delete Selected', and 'Export Transactions'. A date range selector shows 'Start Date: dd/mm/yyyy' and 'End Date: dd/mm/yyyy', with a 'Filter' button and time range buttons for 'Now', '3m', '6m', '9m', and '12m'. Below this is a dropdown menu titled 'All Categories' with a sub-menu 'All Accounts' containing options: Cash, Credit, Debit, None, DBS, Amex, and Posb. The main table lists transaction details:

Select	Title	Description	Amount	Type	Category	Account	Date	Actions
<input type="checkbox"/>	Amex payment	amex credit card payment	152.13	Debit	Credit Card Payment	Amex	Aug. 17, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Withdrawal	bedok 72 cash withdrawal	80.00	Debit	Withdrawal	Posb	Aug. 17, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Withdrawal	bedok 72 cash withdrawal	80.00	Debit	Withdrawal	Posb	Aug. 12, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Food at canteen	paynow transfer to lam may fong	6.80	Credit	Food	Cash	Sept. 13, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Daniel paying me back	incoming paynow ref 0629790 from lim zhenghao daniel transfer mobile	59.00	Credit	Food	Cash	Sept. 13, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Interest	interest earned	0.35	Credit	Food	Cash	Sept. 13, 2022	<button>Edit</button> <button>Delete</button>

Figure 11-1n

11.8.1 Interface Design - Upload Page (Potential duplicates detected)

This page is structured to handle document uploads, extract data, identify potentially duplicate data, and offer users a range of operations to manage the extracted information.

The interface offers users a file upload functionality with an intuitive, easy-to-use interface. A modal popup also shows the DBS/POSB format, triggered by a simple button click. This aids users in understanding the format required for successful data extraction.

The interface identifies potential duplicates in the data and offers users options to manage them. For example, users can select which duplicates to delete or affirm that there are no duplicates. This feature helps maintain data integrity and reduces redundancy.

The screenshot shows the Fintap application interface. At the top, there's a blue header bar with the Fintap logo, navigation links for Transactions, Upload, Forecast, Settings, Contact Us, and Logout, and a welcome message "Welcome, Samuel".

The main content area has a white background. It starts with a section titled "Upload Documents" containing a file input field ("Choose file"), a radio button group for "File type" (selected "DBS/POSB", unselected "General"), and a blue "Upload" button. Below this is a link "Click here to view DBS/POSB format".

Next is a section titled "Extracted Data" with a sub-section "Total Transactions Extracted:" followed by a table header row with columns: Title, Description, Amount, Data Type, Category, Account, Date, and Delete. Below the table are two buttons: "Delete All Extracted Data" and "Export To Transactions".

The final section is titled "Potential Duplicates" and lists several items, each preceded by a checkbox. Some items are partially visible as ellipses. At the bottom of this section are two buttons: "Delete Selected" and "No Duplicates".

Figure 11-1o

11.8.2 Interface Design - Upload Page (Extracted data)

The page provides a clear and comprehensive display of the extracted data in a tabular format. Each row corresponds to a unique data entry, and each column represents a different data attribute. This layout makes it easy for users to understand their data. Furthermore, each data entry can be individually deleted, allowing users to manage their data.

Its robust feature set and thoughtful design significantly enhance the user experience and effectiveness in handling data.

The screenshot shows the Fintap application interface. At the top, there is a blue header bar with the Fintap logo, navigation links (Transactions, Upload, Forecast, Settings, Contact Us, Logout), and a welcome message "Welcome, Samuel!". Below the header, the main content area has a title "Upload Documents" and a file upload section. It includes a file input field ("Choose file"), a dropdown for "File type" (DBS/POSB or General), and a blue "Upload" button. A link "Click here to view DBS/POSB format" is also present. The next section, "Extracted Data", displays a table of transaction data. The table has columns: Title, Description, Amount, Data Type, Category, Account, Date, and Delete. The data consists of 20 rows of transaction details. At the bottom of this section are two buttons: "Delete All Extracted Data" and "Export To Transactions". The final section, "Potential Duplicates", states "No duplicates found".

Title	Description	Amount	Data Type	Category	Account	Date	Delete
None	interest earned	0.35	Credit	Interest Earned	None	Aug. 31, 2022	<button>Delete</button>
None	incoming paynow ref 0629790 from lim zhenghao daniel transfer mobile	59.00	Credit	Misc	None	Aug. 31, 2022	<button>Delete</button>
None	136 49334 5 bankfunds transfer	562.65	Credit	Internal Transfer	None	Aug. 27, 2022	<button>Delete</button>
None	credit card i payment	1607.14	Debit	Credit Card Payment	None	Aug. 27, 2022	<button>Delete</button>
None	bedok 72 cash withdrawal	80.00	Debit	Withdrawal	None	Aug. 26, 2022	<button>Delete</button>
None	paynow transfer to lam may fong	6.80	Debit	Food	None	Aug. 26, 2022	<button>Delete</button>
None	cpf se or collections via giro	126.00	Debit	Tax	None	Aug. 25, 2022	<button>Delete</button>
None	paynow transfer to marcus wong chicken rice was cold	10.00	Debit	Food	None	Aug. 25, 2022	<button>Delete</button>
None	paynow transfer	6.10	Debit	Food	None	Aug. 22, 2022	<button>Delete</button>
None	bedok 72 cash withdrawal	80.00	Debit	Withdrawal	None	Aug. 17, 2022	<button>Delete</button>
None	amex i payment	152.13	Debit	Credit Card Payment	None	Aug. 17, 2022	<button>Delete</button>
None	bedok 72 cash withdrawal	80.00	Debit	Withdrawal	None	Aug. 12, 2022	<button>Delete</button>
None	paynow transfer to mustafa abbas	5.00	Debit	Food	None	Aug. 12, 2022	<button>Delete</button>
None	paynow transfer to nutty nut	91.00	Debit	Food	None	Aug. 10, 2022	<button>Delete</button>
None	bedok interchange cash withdrawal	80.00	Debit	Withdrawal	None	Aug. 9, 2022	<button>Delete</button>
None	136 49334 5 bankfunds transfer	100.00	Debit	Internal Transfer	None	Aug. 8, 2022	<button>Delete</button>
None	136 49334 5 bankfunds transfer	1128.51	Credit	Internal Transfer	None	Aug. 5, 2022	<button>Delete</button>
None	credit card i payment	1622.29	Debit	Credit Card Payment	None	Aug. 5, 2022	<button>Delete</button>
None	bedok 72 cash withdrawal	80.00	Debit	Withdrawal	None	Aug. 2, 2022	<button>Delete</button>
None	paynow transfer to penn ong	60.00	Debit	Misc	None	Aug. 1, 2022	<button>Delete</button>

Figure 11-1p

11.9.1 Interface Design - Forecast Page (New user with no existing data)

The forecasting page provides a comprehensive and interactive interface for users to create, manage, and view financial forecasts.

The design is intuitive and easy to use. Users can effortlessly add transactions, insert or delete columns and rows, and save their forecasts for future use.

The core of this page is the dynamic forecasting table. It allows users to visualize their financial data over time, making it an excellent tool for personal or business budgeting and financial planning.

The screenshot shows the Fintap Forecast page. At the top, there is a navigation bar with links for Transactions, Upload, Forecast, Settings, Contact Us, and Logout. On the right side of the header, it says "Welcome, Samuel!". Below the header, the main content area has a title "Forecast" and a sub-section "Add Transactions". It displays a message: "Average expenses for the last 6 months: \$591.26". Below this are input fields for "Transaction name", "Amount", "Start", "End", and a large blue "Add" button. Underneath these are buttons for "Enter new column name", "Add", "Enter column Name", "Delete", "Enter Transaction Name", and "Delete". The main feature is a dynamic forecasting table with columns labeled from 1 to 12. The table has three rows: Net Income (all values 0.00), Net Expense (all values 0.00), and Net Difference (all values 0.00). Below the table is a "Save Forecast" section with an "Enter forecast name" input field and a large blue "Save Forecast" button.

Months:	1	2	3	4	5	6	7	8	9	10	11	12
Net Income	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Expense	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Difference	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Figure 11-1q

11.9.2 Interface Design - Forecast Page (Inputting transaction data)

The forecast page enables users to name transactions, assign amounts, and specify the range of months for the transactions. This helps users see the immediate effect of individual transactions on their overall forecast.

The screenshot shows the Fintap interface with a blue header bar containing the Fintap logo, navigation links (Transactions, Upload, Forecast, Settings, Contact Us, Logout), and a welcome message "Welcome, Samuel". The main content area is titled "Forecast" and contains a section for "Add Transactions" with fields for Transaction name, Amount, Start, End, and an "Add" button. Below this are buttons for "Enter new column name", "Add", "Enter column Name", "Delete", and "Enter Transaction Name", "Delete". A large table displays monthly financial data from January 2024 to February 2024. The table has columns for Months (1-12) and two additional columns for Jan 2024 and Feb 2024. Transaction categories include Net Income, Net Expense, Net Difference, Salary, Car Loan, BNPL iPhone, Japan Trip, School Fees, and Raph's Birthday Present. The table shows various amounts such as 5000.00, -880.00, 4120.00, etc. At the bottom, there is a "Save Forecast" section with a "Save Forecast" button.

Months:	1	2	3	4	5	6	7	8	9	10	11	12	Jan 2024	Feb 2024
Net Income	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00
Net Expense	-880.00	-880.00	-5080.00	-1130.00	-1130.00	-1130.00	-4380.00	-880.00	-880.00	-880.00	-880.00	-880.00	0.00	0.00
Net Difference	4120.00	4120.00	-80.00	3870.00	3870.00	3870.00	620.00	4120.00	4120.00	4120.00	4120.00	4120.00	5000.00	5000.00
Salary	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000
Car Loan	-880	-880	-880	-880	-880	-880	-880	-880	-880	-880	-880	-880	-880	-880
BNPL iPhone		-250	-250	-250	-250									
Japan Trip							-3500							
School Fees				-3750										
Raph's Birthday Present					-200									

Figure 11-1r

11.9.3 Interface Design - Forecast Page (Viewing saved forecast)

The screenshot shows the Fintap interface with a blue header bar. On the left is the Fintap logo, followed by navigation links: Transactions, Upload, Forecast, Settings, Contact Us, and Logout. To the right of the header is a welcome message: "Welcome, Samuel".

The main content area is titled "Forecast". It displays a table for "Expenditure Plan 1" with columns for Transaction name, Amount, Start, and End. Buttons for "Add" and "Delete" are available for these columns.

Below this is a section titled "Add Transactions" with a note: "Average expenses for the last 6 months: \$591.26". It includes input fields for "Enter new column name", "Add", "Enter column Name", "Delete", and "Enter Transaction Name", along with a "Delete" button.

A monthly forecast table follows, with columns labeled from 1 to 12 and "Jan 2024" and "Feb 2024". The table includes rows for Net Income, Net Expense, and Net Difference, showing values like 5000.00, -880.00, and 4120.00 respectively across the months.

At the bottom is a "Save Forecast" section with an "Enter forecast name" input field and a "Save Forecast" button.

Figure 11-1s

11.10 Interface Design - Setting page

The settings page provides an interface to manage user-defined categories and accounts, which can be crucial to any financial or budgeting application.

The page is clean and straightforward, with distinct sections for managing categories and accounts, making it easy for users to understand and navigate.

The screenshot shows the Fintap settings page with a blue header bar containing the Fintap logo, navigation links (Transactions, Upload, Forecast, Settings, Contact Us, Logout), and a welcome message "Welcome, Samuel!". The main content area is divided into two sections: "Manage Categories" and "Manage Accounts".

Manage Categories

Name	Action
Food	<button>delete</button>
Shopping	<button>delete</button>
Transport	<button>delete</button>
Misc	<button>delete</button>
Interest Earned	<button>delete</button>
Internal Transfer	<button>delete</button>
Credit Card Payment	<button>delete</button>
Withdrawal	<button>delete</button>
Tax	<button>delete</button>

Manage Accounts

Name	Action
Cash	<button>delete</button>
Credit	<button>delete</button>
Debit	<button>delete</button>
None	<button>delete</button>
DBS	<button>delete</button>
Amex	<button>delete</button>
Posb	<button>delete</button>

Figure 11-1t

12. Programming Language / Framework Selection

For this project I used Django/Python, HTML, JavaScript, and CSS for the following reasons:

12.1 Django/Python

Model-template-views (MTV) is an architectural design pattern used by the high-level Python web framework Django. It is made to make the process of creating applications go as smoothly as possible for developers. It handles a lot of the hassle associated with web development, allowing you to concentrate on building your app without inventing the wheel. Python is the ideal language for web development because of its readability and simplicity.

12.2 HTML

The preferred markup language for building web pages is HTML. It offers the fundamental framework for websites, which other technologies like CSS and JavaScript can then improve and alter.

12.3 JavaScript

JavaScript is necessary for developing interactive website features. It can calculate, manipulate, and validate data and update and edit both HTML and CSS.

12.4 CSS

Multiple web pages' styles and layouts can be managed simultaneously with CSS. Text styles, table sizes, and other elements of web pages that were previously only allowed to be set in the HTML can now be defined using CSS.

Combining Django/Python, HTML, JavaScript, and CSS provides a comprehensive set of tools to develop a scalable, secure, and maintainable web application.

13. System Testing

Software testing is an essential part of ensuring the quality of the software. It involves running the software through various tests to uncover any errors or bugs that may be present. The testing process also ensures that the software meets the requirements that were established during the analysis and design phase. By comparing the expected and actual values of functions within the program, testers can pinpoint areas that need improvement. The ultimate goal of testing is to uncover as many errors as possible and fix them before the software is released for use.

13.1 Testing Type - Black Box

Black box testing is ideal for this project and the Django framework because it focuses on the application's functionality without considering the internal code structure. In this testing approach, the application is treated as a 'black box,' emphasizing inputs and outputs.

This aligns perfectly with Django's loose coupling and high cohesion philosophy, where each component should function independently. With black box testing, we can validate whether each feature works as expected based on the requirements without needing knowledge of the underlying code.

This also makes it particularly useful for validating Django's Model-View-Template structure, where each component has a distinct role. Furthermore, black box testing can effectively simulate user interactions, ensuring that the application provides the correct output for a given input. This type of testing is particularly suitable for web applications built with Django, where user-friendliness and adherence to specified functionalities are paramount.

13.2 Testing Plan

Test Case No.	Test Details
TC-01	Registration is successful if user inputs the appropriate credentials
TC-02	Registration is unsuccessful if user inputs the wrong credentials
TC-03	Signing In is successful if user inputs the appropriate credentials
TC-04	Signing in is unsuccessful if user inputs the wrong credentials
TC-05	There are pre defined categories and accounts
TC-06	Required and non-required fields in transaction form functions correctly
TC-07	The total amounts calculates correctly
TC-08	All filters work and information is correct
TC-09	Exporting transactions work
TC-10	Bulk edit works
TC-11	Individual edit works
TC-12	Individual delete works

TC-13	Bulk delete works
TC-14	Upload page accepts videos
TC-15	Upload page accepts photos
TC-16	Extracted information matches with the uploaded information. If there are no duplicated data it will show the extracted data.
TC-17	Duplicates are detected
TC-18	Delete in uploads works
TC-19	Individual deleting of extracted data works
TC-20	Export to transaction and deleting the data works
TC-21	Calculation in saved forecast is accurate
TC-22	Columns can be deleted but header and first three rows cannot be deleted
TC-23	Adding new column in the forecast table works
TC-24	Saving a forecast as “Testing save forecast”
TC-25	Clicking on a saved forecast will display the data in that saved forecast

Test Case No.	TC-01
----------------------	-------

Description	Registration is successful if user inputs the appropriate credentials
Test Data	Username: samuel Email: samuel@gmail.com Password: s9416911
Expected Result	Sign up successful. Redirected to transaction page
Conclusion	Pass

+ Fintap Home How it works Pricing Contact Us Sign In Sign Up Please log in to view your account.

Sign Up

Your journey to financial freedom start here!

Username:

samuel

Email:

samuel@gmail.com

Password:

.....

Password confirmation:

.....

[Register](#)

[Already have an account? Log in here.](#)

+ Fintap Transactions Upload Forecast Settings Contact Us Logout You have successfully registered! Welcome!

Transaction

Total amount: 0

Total credit: 0

Total debit: 0

Avg 6m expenses: 0.0

Add New Record

Add Category

Add Account

Select All

Edit Selected

Delete Selected

Export Transactions

Start Date: End Date: Filter Now 3m 6m 9m 12m

Expense

Income

All Categories

All Accounts

No transactions found.

Test Case No.	TC-02
----------------------	-------

Description	Registration is unsuccessful if user inputs the wrong credentials
Test Data	Username: sam Email: sam@gmail.com Password: 123
Expected Result	Does not redirect to transaction page
Conclusion	Pass

Sign Up

Your journey to financial freedom start here!

Username:

Email:

Password:

Password criteria:

- At least 8 characters long
- Contain at least one letter
- Contain at least one digit
- Cannot a commonly used password

Password confirmation:

[Register](#)

[Already have an account? Log in here.](#)

Test Case No.	TC-03
----------------------	-------

Description	Signing In is successful if user inputs the appropriate credentials
Test Data	Username: samuel Email: samuel@gmail.com Password: s9416911
Expected Result	Redirected to transaction page
Conclusion	Pass

The screenshot shows the Fintap login interface. At the top, there's a blue header bar with the Fintap logo and navigation links: Home, How it works, Pricing, Contact Us, Sign In, and Sign Up. To the right of the sign-in links, it says "Please log in to view your account." Below the header, the main content area has a heading "Sign In" and a sub-heading "Welcome back! Consistency is key to success." It features two input fields for "Username" (containing "samuel") and "Password" (containing "*****"). A blue "Login" button is centered below the fields. A small link "Forgot Password?" is located just below the password field.

The screenshot shows the Fintap transaction management interface. At the top, there's a blue header bar with the Fintap logo and navigation links: Transactions, Upload, Forecast, Settings, Contact Us, and Logout. To the right of the navigation, it says "Welcome, samuel!". Below the header, the main content area has a heading "Transaction". It displays four summary boxes: "Total amount: 0" (blue), "Total credit: 0" (green), "Total debit: 0" (red), and "Avg 6m expenses: 0.0" (grey). Below these are several buttons: "Add New Record", "Add Category", "Add Account", "Select All", "Edit Selected", "Delete Selected", and "Export Transactions". There are also date range filters: "Start Date: dd/mm/yyyy" and "End Date: dd/mm/yyyy", a "Filter" button, and time period buttons for "Now", "3m", "6m", "9m", and "12m". At the bottom, there are two dropdown menus: "All Categories" and "All Accounts", and buttons for "Expense" and "Income". A message at the very bottom states "No transactions found."

Test Case No.	TC-04
----------------------	-------

Description	Signing in is unsuccessful if user inputs the wrong credentials
Test Data	Username: samuel Email: samuel@gmail.com Password: 123
Expected Result	Stay on the sign in page. Invalid credential message is shown
Conclusion	Pass



Sign In

Welcome back! Consistency is key to success.

Username:

Samuel

Password:

Login

[Forgot Password?](#)

Test Case No.	TC-05
----------------------	-------

Description	There are pre defined categories and accounts
Test Data	-
Expected Result	<p>The following predefined categories should be seen: Food, Shopping , Transport, and Misc</p> <p>The following predefined account should be seen: Cash, Credit, and Debit</p>
Conclusion	Pass

The screenshot shows the Fintap application interface. At the top, there is a blue header bar with the Fintap logo, navigation links (Transactions, Upload, Forecast, Settings, Contact Us, Logout), and a welcome message "Welcome, samuel!". Below the header, there are two main sections: "Manage Categories" and "Manage Accounts".

Manage Categories:

Name	Action
Food	<button>delete</button>
Shopping	<button>delete</button>
Transport	<button>delete</button>
Misc	<button>delete</button>

Manage Accounts:

Name	Action
Cash	<button>delete</button>
Credit	<button>delete</button>
Debit	<button>delete</button>

Test Case No.	TC-06
----------------------	-------

Description	Required and non-required fields in transaction form functions correctly
Test Data	Leave amount fill and date fill empty
Expected Result	Unable to add a new transaction and alert message is shown
Conclusion	Pass

The screenshot shows the Fintap application's Transaction page. On the left, there are summary boxes for 'Total amount: 0' and 'Total credit: 0'. Below them are buttons for 'Add New Record', 'Add Category', and 'Expense/Income' filters. A dropdown menu shows 'All Categories' and 'All Accounts'. The main area displays the message 'No transactions found.' A modal window is open, prompting for transaction details: Title ('Test'), Description (''), Amount (''), Type ('Credit'), Date ('dd/mm/yyyy'), Category ('Food'), and Account ('Cash'). The 'Amount' field is empty and highlighted with a red border, with an error message 'Please fill in this field.' above it.

This screenshot shows the same Transaction page after the 'Amount' field has been populated with the value '10'. The error message 'Please fill in this field.' is no longer visible. The rest of the modal window and the application interface remain the same as in the previous screenshot.

Test Case No.	TC-07
----------------------	-------

Description	The total amounts calculates correctly
Test Data	10500 in Credit 9000 in Debit
Expected Result	Total net amount = 1500 Total credit = 10500 Total debit = 9000 Avg 6months expense = $9000 / 6 = 1500$
Conclusion	Pass

The screenshot shows the Fintap application interface. At the top, there is a navigation bar with links for Transactions, Upload, Forecast, Settings, Contact Us, and Logout, along with a welcome message "Welcome, samuel!". Below the navigation bar is a large central area titled "Transaction". This area contains several summary boxes: "Total amount: 1500.00" (blue), "Total credit: 10500.00" (green), "Total debit: 9000.00" (red), and "Avg 6m expenses: 1500.00" (grey). Below these boxes are several buttons: "Add New Record", "Add Category", "Add Account", "Select All", "Edit Selected", "Delete Selected", and "Export Transactions". Further down are date filters: "Start Date: dd/mm/yyyy" and "End Date: dd/mm/yyyy", a "Filter" button, and time range buttons for "Now", "3m", "6m", "9m", and "12m". There are also "Expense" and "Income" buttons. At the bottom, there is a table listing transactions:

Select	Title	Description	Amount	Type	Category	Account	Date	Actions
<input type="checkbox"/>	Testing calculation		10500.00	Credit	Food	Cash	May 13, 2023	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Testing calculation debit		9000.00	Debit	Food	Cash	May 13, 2023	<button>Edit</button> <button>Delete</button>

Test Case No.	TC-08
----------------------	-------

Description	All filters work and information is correct
Test Data	Date filter (Feb 2023) Expense (Debit items only) Income (Credit items only) Category (Food) Account (Amex)
Expected Result	All filters works as expected
Conclusion	Pass

Test: Date filter (Feb 2023)

The screenshot shows the Fintap application's Transaction page. At the top, there are four summary boxes: "Total amount: -2969.00" (blue), "Total credit: 0" (green), "Total debit: 2969.00" (red), and "Avg 6m expenses: 1732.33" (grey). Below these are several buttons: "Add New Record", "Add Category", "Add Account", "Select All", "Edit Selected", "Delete Selected", and "Export Transactions". Underneath these buttons are date selection fields: "Start Date: dd/mm/yyyy" and "End Date: dd/mm/yyyy", followed by a "Filter" button and time-based filters ("Now", "3m", "6m", "9m", "12m"). There are also category filters for "Expense" and "Income". Below these filters is a dropdown menu for "All Categories" and another for "All Accounts". The main area contains a table of transaction data:

Select	Title	Description	Amount	Type	Category	Account	Date	Actions
<input type="checkbox"/>	-	credit card payment	2136.00	Debit	Credit Card Payment	None	Feb. 4, 2023	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	-	cash withdrawal	50.00	Debit	Withdrawal	None	Feb. 5, 2023	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	-	amex credit card payment	536.00	Debit	Credit Card Payment	None	Feb. 6, 2023	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	-	paynow food	75.00	Debit	Interest Earned	None	Feb. 7, 2023	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	-	internal transfer	123.00	Debit	Interest Earned	None	Feb. 8, 2023	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	-	food people	41.00	Debit	Interest Earned	None	Feb. 9, 2023	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	-	food canteen	8.00	Debit	Interest Earned	None	Feb. 10, 2023	<button>Edit</button> <button>Delete</button>

Test: Expense (Debit items only)

The screenshot shows the Fintap application's Transaction page. At the top, there are four summary boxes: "Total amount: -10.00" (blue), "Total credit: 0" (green), "Total debit: 10.00" (red), and "Avg 6m expenses: 1.67" (grey). Below these are the same set of buttons and filters as the previous screenshot. The main area contains a table of transaction data:

Select	Title	Description	Amount	Type	Category	Account	Date	Actions
<input type="checkbox"/>	Test 1		10.00	Debit	Tax	DBS	April 20, 2023	<button>Edit</button> <button>Delete</button>

Test: Income (Credit items only)

Transaction

Total amount: 2392.81
Total credit: 2392.81
Total debit: 0
Avg 6m expenses: 0.0

Add New Record
Add Category
Add Account
Select All
Edit Selected
Delete Selected
Export Transactions

Start Date:
End Date:
Filter
Now
3m
6m
9m
12m
Expense
Income

All Categories
All Accounts

Select	Title	Description	Amount	Type	Category	Account	Date	Actions
<input type="checkbox"/>	None	136 49334 5 bankfunds transfer	562.65	Credit	Internal Transfer	None	Aug. 27, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	6 Months		60.00	Credit	Food	DBS	Dec. 10, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	None	136 49334 5 bankfunds transfer	1128.51	Credit	Internal Transfer	None	Aug. 5, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Today		10.00	Credit	Food	DBS	May 12, 2023	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	amex		10.00	Credit	Food	Amex	May 11, 2023	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	None	hao daniel transfer mobile paynow	59.00	Credit	Internal Transfer	None	Aug. 27, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	None	136 49334 5 i bankfunds transfer	562.65	Credit	Internal Transfer	None	Aug. 27, 2022	<button>Edit</button> <button>Delete</button>

Test: Category (Food)

Transaction

Total amount: 200.00
Total credit: 200.00
Total debit: 0
Avg 6m expenses: 1.67

Add New Record
Add Category
Add Account
Select All
Edit Selected
Delete Selected
Export Transactions

Start Date:
End Date:
Filter
Now
3m
6m
9m
12m
Expense
Income

All Categories
All Accounts

Select	Title	Description	Amount	Type	Category	Account	Date	Actions
<input type="checkbox"/>	6 Months		60.00	Credit	Food	DBS	Dec. 10, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	12 Months		120.00	Credit	Food	DBS	May 12, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	Today		10.00	Credit	Food	DBS	May 12, 2023	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	amex		10.00	Credit	Food	Amex	May 11, 2023	<button>Edit</button> <button>Delete</button>

Test: Account (Amex)

Transaction

Total amount: 10.00
Total credit: 10.00
Total debit: 0
Avg 6m expenses: 1.67

Add New Record
Add Category
Add Account
Select All
Edit Selected
Delete Selected
Export Transactions

Start Date:
End Date:
Filter
Now
3m
6m
9m
12m
Expense
Income

All Categories
All Accounts

Select	Title	Description	Amount	Type	Category	Account	Date	Actions
<input type="checkbox"/>	amex		10.00	Credit	Food	Amex	May 11, 2023	<button>Edit</button> <button>Delete</button>

Test Case No.	TC-09
Description	Exporting transactions work
Test Data	Transactions: Testing calculation, 10500, Credit, 2023 05 13 Testing calculation, 9000, Dedit, 2023 05 13
Expected Result	Transactions are exported in a CSV file
Conclusion	Pass

Downloads				
Name	Size	Kind	Date Added	
transactions (1).csv	147 bytes	CSV Document	Today at 7:07 PM	
transactions (1).csv			Today at 6:40 PM	
			Today at 6:38 PM	
			Today at 6:36 PM	
			Today at 6:35 PM	
			Today at 6:35 PM	
			Today at 6:34 PM	
			Today at 6:28 PM	

File content:

Title	Description	Amount	Debit/Credit	Date
Testing calculation		10500.00	Credit	2023-05-13
Testing calculation debit		9000.00	Debit	2023-05-13

Test Case No.	TC-10
Description	Bulk edit works
Test Data	Two transaction with no Account type
Expected Result	After bulk edit both should be Amex
Conclusion	Pass

Before

Select	Title	Description	Amount	Type	Category	Account	Date	Actions
<input type="checkbox"/>	None	hao daniel transfer mobile paynow	59.00	Credit	Internal Transfer	None	Aug. 27, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	None	136 49334 5 i bankfunds transfer	562.65	Credit	Internal Transfer	None	Aug. 27, 2022	<button>Edit</button> <button>Delete</button>

Input

The screenshot shows a modal dialog box for editing a transaction. The form fields are:

- Title: (empty)
- Description: (empty)
- Type: Credit (selected from dropdown)
- Category: Internal Transfer (selected from dropdown)
- Account: Amex (selected from dropdown)
- Date: dd/mm/yyyy (input field)

At the bottom of the dialog are two buttons: **Update** and **Cancel**.

Result

Select	Title	Description	Amount	Type	Category	Account	Date	Actions
<input type="checkbox"/>	None	hao daniel transfer mobile paynow	59.00	Credit	Internal Transfer	Amex	Aug. 27, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	None	136 49334 5 i bankfunds transfer	562.65	Credit	Internal Transfer	Amex	Aug. 27, 2022	<button>Edit</button> <button>Delete</button>

Test Case No.	TC-11
Description	Individual edit works
Test Data	Both transactions are under the Amex account
Expected Result	One should be changed to DBS
Conclusion	Pass

Before

Select	Title	Description	Amount	Type	Category	Account	Date	Actions
<input type="checkbox"/>	None	hao daniel transfer mobile paynow	59.00	Credit	Internal Transfer	Amex	Aug. 27, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	None	136 49334 5 i bankfunds transfer	562.65	Credit	Internal Transfer	Amex	Aug. 27, 2022	<button>Edit</button> <button>Delete</button>

Input

Edit Transaction

Title:
None

Description:
136 49334 5 i bankfunds transfer

Amount:
562.65

Type:
Credit

Date:
27 / 08 / 2022

Category:
Internal Transfer

None
✓ Amex
DBS

Save Changes

Result

Select	Title	Description	Amount	Type	Category	Account	Date	Actions
<input type="checkbox"/>	None	hao daniel transfer mobile paynow	59.00	Credit	Internal Transfer	Amex	Aug. 27, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	None	136 49334 5 i bankfunds transfer	562.65	Credit	Internal Transfer	DBS	Aug. 27, 2022	<button>Edit</button> <button>Delete</button>

Test Case No.	TC-12
Description	Individual delete works
Test Data	There is a total of three records
Expected Result	After deleting one there should only be two records left
Conclusion	Pass

Before

Select	Title	Description	Amount	Type	Category	Account	Date	Actions
<input type="checkbox"/>	2	136 49334 5 i bankfunds transfer	562.65	Credit	Internal Transfer	DBS	Aug. 27, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	1		1.00	Credit	Food	None	May 14, 2023	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	3	hao daniel transfer mobile paynow	59.00	Credit	Internal Transfer	Amex	Aug. 27, 2022	<button>Edit</button> <button>Delete</button>

Result

Select	Title	Description	Amount	Type	Category	Account	Date	Actions
<input type="checkbox"/>	2	136 49334 5 i bankfunds transfer	562.65	Credit	Internal Transfer	DBS	Aug. 27, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	1		1.00	Credit	Food	None	May 14, 2023	<button>Edit</button> <button>Delete</button>

Test Case No.	TC-13
Description	Bulk delete works
Test Data	There is a total of 2 records
Expected Result	After bulk deleting there should be no records left
Conclusion	Pass

Before

Select	Title	Description	Amount	Type	Category	Account	Date	Actions
<input type="checkbox"/>	2	136 49334 5 i bankfunds transfer	562.65	Credit	Internal Transfer	DBS	Aug. 27, 2022	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	1		1.00	Credit	Food	None	May 14, 2023	<button>Edit</button> <button>Delete</button>

Input

Confirm Delete								
Select	Title	Description	Amount	Type	Category	Account	Date	Actions
<input checked="" type="checkbox"/>	2	136 49334 5 i bankfunds transfer	562.65	Credit	Internal Transfer	DBS	Aug. 27, 2022	<button>Edit</button> <button>Delete</button>
<input checked="" type="checkbox"/>	1		1.00	Credit	Food	None	May 14, 2023	<button>Edit</button> <button>Delete</button>

Result

Start Date: <input type="text"/> dd/mm/yyyy	End Date: <input type="text"/> dd/mm/yyyy	<button>Filter</button>	<button>Now</button>	<button>3m</button>	<button>6m</button>	<button>9m</button>	<button>12m</button>	<button>Expense</button>	<button>Income</button>
<input type="button" value="All Categories"/>	<input type="button" value="All Accounts"/>	No transactions found.							

Test Case No.	TC-14
Description	Upload page accepts videos
Test Data	Upload a mp4 video
Expected Result	Video is successfully uploaded
Conclusion	Pass

Upload Documents

File: august_transactions.mp4

File type:

- DBS/POSB
- General

Upload

[Click here to view DBS/POSB format](#)

Test Case No.	TC-15
Description	Upload page accepts photos
Test Data	Upload a png screenshot
Expected Result	Image is successfully uploaded
Conclusion	Pass

Upload Documents

File: - Screenshot...t 8.23.25 PM

File type:

- DBS/POSB
- General

Upload

[Click here to view DBS/POSB format](#)

Test Case No.	TC-16
Description	Extracted information matches with the uploaded information. If there are no duplicated data it will show the extracted data.
Test Data	Uploaded partial screenshot of bank statement with
Expected Result	Description, Amount, Credit or Debit and Date extracted to be the same as the screenshot There should be no duplicates
Conclusion	Pass

Input

FRI, 26 AUG 2022

68089712,BEDOK S A3/72 >

Cash Withdrawal

SGD **-80.00**

PayNow Transfer To: LAM MAY FONG OTHR >
PayNow Transfer

FAST / PayNow Transfer

SGD **-6.80**

THU, 25 AUG 2022

CPF SE SES9416911 >

Payments or Collections via GIRO

SGD **-126.00**

PayNow Transfer To: MARCUS WONG OTHR >
Chicken rice was cold

FAST / PayNow Transfer

SGD **-10.00**

Result

Extracted Data

Total Transactions Extracted: 4

Title	Description	Amount	Data Type	Category	Account	Date	Delete
-	bedok 72 cash withdrawal	80.00	Debit	Withdrawal	None	Aug. 26, 2022	<button>Delete</button>
-	paynow transfer to lam may fong	6.80	Debit	Food	None	Aug. 26, 2022	<button>Delete</button>
-	cpf se or collections via giro	126.00	Debit	Tax	None	Aug. 25, 2022	<button>Delete</button>
-	paynow transfer to marcus wong chicken rice was cold	10.00	Debit	Food	None	Aug. 25, 2022	<button>Delete</button>

Test Case No.	TC-17
Description	Duplicates are detected
Test Data	Video of transactions in August
Expected Result	Potential duplicates are shown to the user
Conclusion	Pass

Potential Duplicates

- None - bedok 72 cash withdrawal - 80.00 - ...
- None - paynow transfer to mustafa abbas transfer2 bedok 72 cash withdrawal - 80.00 - ...
- None - bedok interchange cash withdrawal - 80.00 - ...
- None - bedok interchange cash withdrawal - 80.00 - ...
- None - 136 49334 5 bankfunds transfer - 1128.51 - ...
- None - 136 49334 5 bankfunds transfer - 1128.51 - ...
- None - credit card i payment - 1622.29 - ...
- None - credit card i payment - 1622.29 - ...

[Delete Selected](#)

[No Duplicates](#)

Test Case No.	TC-18
Description	Delete in uploads works
Test Data	Uploaded march bank statement
Expected Result	There will be no records after deletion
Conclusion	Pass

Before

Title	Description	Amount	Data Type	Category	Account	Date	Delete
-	salary	5000.00	Credit	Interest Earned	None	March 1, 2023	<button>Delete</button>
-	interest earned	15.00	Credit	Interest Earned	None	March 2, 2023	<button>Delete</button>
-	paynow transfer	65.00	Credit	Interest Earned	None	March 3, 2023	<button>Delete</button>
-	credit card payment	1432.00	Debit	Credit Card Payment	None	March 4, 2023	<button>Delete</button>
-	cash withdrawal	250.00	Debit	Withdrawal	None	March 5, 2023	<button>Delete</button>
-	amex credit card payment	453.00	Debit	Credit Card Payment	None	March 6, 2023	<button>Delete</button>
-	paynow food	42.00	Debit	Interest Earned	None	March 7, 2023	<button>Delete</button>
-	internal transfer	754.00	Debit	Interest Earned	None	March 8, 2023	<button>Delete</button>
-	watch shop	95.00	Debit	Interest Earned	None	March 9, 2023	<button>Delete</button>
-	foodie toothy	55.00	Debit	Interest Earned	None	March 10, 2023	<button>Delete</button>

[Delete All Extracted Data](#) [Export To Transactions](#)

After

Title	Description	Amount	Data Type	Category	Account	Date	Delete
Delete All Extracted Data Export To Transactions							

Potential Duplicates
No duplicates found

Test Case No.	TC-19
Description	Individual deleting of extracted data works
Test Data	Uploaded march bank statement with 10 records
Expected Result	After deleting one record there should be nine left
Conclusion	Pass

Before

Total Transactions Extracted: 10	
Title	Description
-	salary
-	interest earned
-	paynow transfer
-	credit card payment
-	cash withdrawal
-	amex credit card payment
-	paynow food
-	internal transfer
-	watch shop
-	foodie toothy

Result

Total Transactions Extracted: 9	
Title	Description
-	interest earned
-	paynow transfer
-	credit card payment
-	cash withdrawal
-	amex credit card payment
-	paynow food
-	internal transfer
-	watch shop
-	foodie toothy

Test Case No.	TC-20
Description	Export to transaction and deleting the data works
Test Data	March bank statement with nine transactions
Expected Result	Upload page will be empty and transaction page will now have nine records
Conclusion	Pass

Before - Transaction page

The Transaction page shows a single row of data with the following details:

Title	Description	Amount	Data Type	Category	Account	Date	Delete
-	interest earned	15.00	Credit	Interest Earned	None	March 2, 2023	<button>Delete</button>

Below the table, there is a message: "No transactions found."

Before - Uploads page

The Uploads page displays a table of nine transaction records extracted from March 2023. The table includes columns for Title, Description, Amount, Data Type, Category, Account, Date, and Delete buttons.

Title	Description	Amount	Data Type	Category	Account	Date	Delete
-	interest earned	15.00	Credit	Interest Earned	None	March 2, 2023	<button>Delete</button>
-	paynow transfer	65.00	Credit	Interest Earned	None	March 3, 2023	<button>Delete</button>
-	credit card payment	1432.00	Debit	Credit Card Payment	None	March 4, 2023	<button>Delete</button>
-	cash withdrawal	250.00	Debit	Withdrawal	None	March 5, 2023	<button>Delete</button>
-	amex credit card payment	453.00	Debit	Credit Card Payment	None	March 6, 2023	<button>Delete</button>
-	paynow food	42.00	Debit	Interest Earned	None	March 7, 2023	<button>Delete</button>
-	internal transfer	754.00	Debit	Interest Earned	None	March 8, 2023	<button>Delete</button>
-	watch shop	95.00	Debit	Interest Earned	None	March 9, 2023	<button>Delete</button>
-	foodie toothy	55.00	Debit	Interest Earned	None	March 10, 2023	<button>Delete</button>

Result - Transaction page

The Transaction page now shows an empty table with the following header:

Title	Description	Amount	Data Type	Category	Account	Date	Delete
-------	-------------	--------	-----------	----------	---------	------	--------

Below the table, there is a message: "No transactions found."

Result - Uploads page

The Uploads page displays a table of nine transaction records extracted from March 2023. The table includes columns for Title, Description, Amount, Data Type, Category, Account, Date, and Actions (Edit, Delete) buttons.

Select	Title	Description	Amount	Type	Category	Account	Date	Actions
<input type="checkbox"/>	-	interest earned	15.00	Credit	Interest Earned	None	March 2, 2023	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	-	paynow transfer	65.00	Credit	Interest Earned	None	March 3, 2023	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	-	credit card payment	1432.00	Debit	Credit Card Payment	None	March 4, 2023	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	-	cash withdrawal	250.00	Debit	Withdrawal	None	March 5, 2023	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	-	amex credit card payment	453.00	Debit	Credit Card Payment	None	March 6, 2023	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	-	paynow food	42.00	Debit	Interest Earned	None	March 7, 2023	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	-	internal transfer	754.00	Debit	Interest Earned	None	March 8, 2023	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	-	watch shop	95.00	Debit	Interest Earned	None	March 9, 2023	<button>Edit</button> <button>Delete</button>
<input type="checkbox"/>	-	foodie toothy	55.00	Debit	Interest Earned	None	March 10, 2023	<button>Edit</button> <button>Delete</button>

Test Case No.	TC-21
Description	Calculation in saved forecast is accurate
Test Data	Credit \$1000 from month 1 - 7 Debit -\$500 from month 6 -12
Expected Result	All rows and columns calculation to be correct
Conclusion	Pass

Months:	1	2	3	4	5	6	7	8	9	10	11	12
Net Income	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	0.00	0.00	0.00	0.00	0.00
Net Expense	0.00	0.00	0.00	0.00	0.00	-500.00	-500.00	-500.00	-500.00	-500.00	-500.00	-500.00
Net Difference	1000.00	1000.00	1000.00	1000.00	1000.00	500.00	500.00	-500.00	-500.00	-500.00	-500.00	-500.00
Credit 1000	1000	1000	1000	1000	1000	1000	1000					
Debit -500						-500	-500	-500	-500	-500	-500	-500

Test Case No.	TC-22
Description	Columns can be deleted but header and first three rows cannot be deleted
Test Data	Entering “Months” in the delete column textfield Entering “Net Difference”, “Net Expense”, and “Net Income” in the delete row textfield
Expected Result	The header and first three rows cannot be deleted
Conclusion	Pass

All columns have been deleted. Attempting to delete the column titled “Months”



Forecast

2 [Delete](#) 2.2 [Delete](#)

Add Transactions

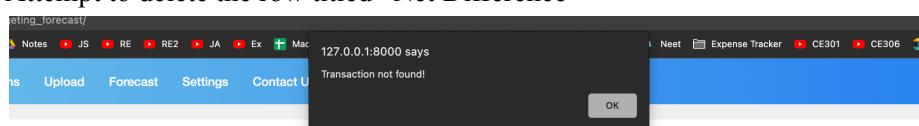
Average expenses for the last 6 months: \$513.50

Transaction name	Amount	Start	End	Add	
Enter new column name	Add	Months:	Delete	Enter Transaction Name	Delete

Months:

Net Income
Net Expense
Net Difference

Attempt to delete the row titled “Net Difference”



Forecast

2 [Delete](#) 2.2 [Delete](#)

Add Transactions

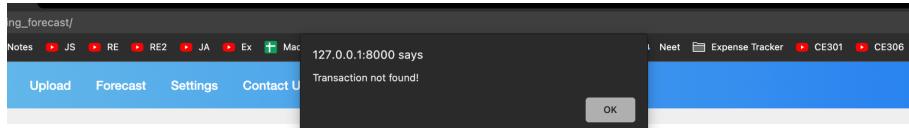
Average expenses for the last 6 months: \$513.50

Transaction name	Amount	Start	End	Add	
Enter new column name	Add	Enter column Name	Delete	Net Difference	Delete

Months:

1	2	3	4	5	6	7	8	9	10	11	12
Net Income	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Expense	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Difference	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Attempt to delete the row titled “Net Expense”



Forecast

2 [Delete](#) 2.2 [Delete](#)

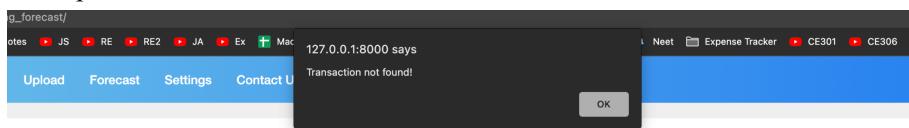
Add Transactions

Average expenses for the last 6 months: \$513.50

Transaction name	Amount	Start	End	Add	
Enter new column name	Add	Enter column Name	Delete	Net Expense	Delete

Months:	1	2	3	4	5	6	7	8	9	10	11	12
Net Income	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Expense	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Difference	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Attempt to delete the row titled “Net Income”



Forecast

2 [Delete](#) 2.2 [Delete](#)

Add Transactions

Average expenses for the last 6 months: \$513.50

Transaction name	Amount	Start	End	Add	
Enter new column name	Add	Enter column Name	Delete	Net Income	Delete

Months:	1	2	3	4	5	6	7	8	9	10	11	12
Net Income	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Expense	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Difference	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Test Case No.	TC-23
Description	Adding new column in the forecast table works
Test Data	Adding a new column titled “New Column”
Expected Result	A new column should appear after the column named 12
Conclusion	Pass

Before

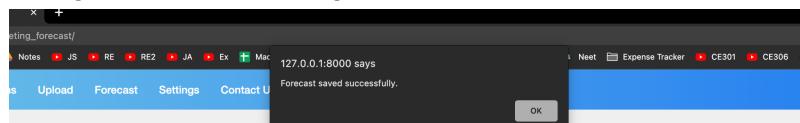
Months:	1	2	3	4	5	6	7	8	9	10	11	12
Net Income	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Expense	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Difference	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

After

Months:	1	2	3	4	5	6	7	8	9	10	11	12	New Column
Net Income	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Expense	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Difference	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Test Case No.	TC-24
Description	Saved forecast works
Test Data	Saving a forecast as “Testing save forecast”
Expected Result	An alert should appear showing that the forecast has been saved. After clicking on “Ok” the saved forecast will be shown
Conclusion	Pass

Saving a forecast as “Testing save forecast”



Forecast

Add Transactions

Average expenses for the last 6 months: \$513.50

Transaction name	Amount	Start	End	Add	
Enter new column name	Add	Enter column Name	Delete	Enter Transaction Name	Delete

Months:	1	2	3	4	5	6	7	8	9	10	11	12
Net Income	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Expense	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Difference	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Save Forecast

Testing save forecast	Save Forecast
-----------------------	---------------

Result after clicking on “Ok”

Forecast

Testing save forecast	Delete
-----------------------	--------

Add Transactions

Average expenses for the last 6 months: \$513.50

Transaction name	Amount	Start	End	Add	
Enter new column name	Add	Enter column Name	Delete	Enter Transaction Name	Delete

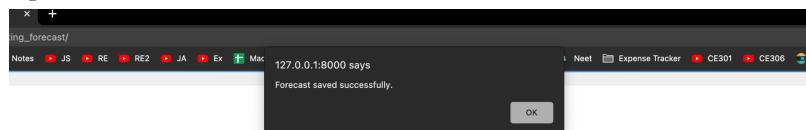
Months:	1	2	3	4	5	6	7	8	9	10	11	12
Net Income	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Expense	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Difference	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Save Forecast

Enter forecast name	Save Forecast
---------------------	---------------

Test Case No.	TC-25
Description	Clicking on a saved forecast will display the data in that saved forecast
Test Data	Creating a saved forecast with one transaction called “Salary” where the amount is \$5000 from month 2 - 7 and saving it as “Salary Forecast”
Expected Result	Clicking on the save forecast will display the data in the save forecast section
Conclusion	Pass

Input



Forecast

Testing save forecast [Delete](#)

Add Transactions

Average expenses for the last 6 months: \$513.50

Transaction name	Amount	Start	End	Add	
Enter new column name	Add	Enter column Name	Delete	Enter Transaction Name	Delete

Months:	1	2	3	4	5	6	7	8	9	10	11	12
Net Income	0.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	0.00	0.00	0.00	0.00	0.00
Net Expense	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Difference	0.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	0.00	0.00	0.00	0.00	0.00
Salary		5000	5000	5000	5000	5000	5000					

Save Forecast

[Salary Forecast](#) [Save Forecast](#)

Saved forecast can be seen

Forecast

Testing save forecast [Delete](#) [Salary Forecast](#) [Delete](#)

Add Transactions

Average expenses for the last 6 months: \$513.50

Transaction name	Amount	Start	End	Add	
Enter new column name	Add	Enter column Name	Delete	Enter Transaction Name	Delete

Months:	1	2	3	4	5	6	7	8	9	10	11	12
Net Income	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Expense	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Difference	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Save Forecast

[Enter forecast name](#) [Save Forecast](#)

Result after clicking on saved forecast

Forecast

Testing save
forecast Delete Salary Forecast Delete

Add Transactions

Average expenses for the last 6 months: \$513.50

Transaction name	Amount	Start	End	Add
------------------	--------	-------	-----	-----

Enter new column name Add Enter column Name Delete Enter Transaction Name Delete

Months:	1	2	3	4	5	6	7	8	9	10	11	12
Net Income	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Expense	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Difference	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Save Forecast

Enter forecast name Save Forecast

Months:	1	2	3	4	5	6	7	8	9	10	11	12
Net Income	0.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	0.00	0.00	0.00	0.00	0.00
Net Expense	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Difference	0.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	0.00	0.00	0.00	0.00	0.00
Salary	5000	5000	5000	5000	5000	5000	5000					

Test Log

Test Case No.	Result	Test Case No.	Result	Test Case No.	Result
TC-01	Pass	TC-11	Pass	TC-21	Pass
TC-02	Pass	TC-12	Pass	TC-22	Pass
TC-03	Pass	TC-13	Pass	TC-23	Pass
TC-04	Pass	TC-14	Pass	TC-24	Pass
TC-05	Pass	TC-15	Pass	TC-25	Pass
TC-06	Pass	TC-16	Pass		
TC-07	Pass	TC-17	Pass		
TC-08	Pass	TC-18	Pass		
TC-09	Pass	TC-19	Pass		
TC-10	Pass	TC-20	Pass		

14. Technical Achievement

The primary objectives of this project was to develop a financial tracker and planner with the following functionalities:

- Reduce the amount of manual input by the user
- Provide forecasting functionality
- Create an interface that is intuitive and simple

I am pleased to report that the solution developed fulfills the defined objectives above.

14.1 Reduce manual input by extracting data - PyTesseract [34]

One of the primary goal of this software was to reduce the amount of manual input required by users, thereby lowering the resistance to tracking finances. This has been accomplished as the system is able to extract data from the user's bank statement and goes on to automatically categorize transactions.

To fulfil this objective I used modified an open source Optical character recognition (OCR) package for Python called PyTesseract, which can identify and interpret the text contained in photos.

PyTesseract essentially makes it possible to transform the image-based text into machine-readable text.

First, I used bank statements to train the OCR engine. With the help of this training, the software could identify particular financial terms and patterns regularly found in bank statements. In order to ensure that only necessary information was kept, I then created a data cleaning technique that using regular expression eliminated unnecessary data, such as ornamental components or uninformative text. This enabled the software to automatically extract data from bank statements, removing the need for manual data entry and improving accuracy.

14.2 Reduce manual input by using Machine Learning for categorisation - Random Forest [35]

The Random Forest package is a machine-learning algorithm for classification and regression tasks. It operates by constructing multiple decision trees during training and outputting the result that is the most likely outcome.

I modified the Random Forest package to categorize the extracted data from bank statements. Initially, I trained the Random Forest algorithm on a labeled dataset containing numerous financial transactions, each assigned to a specific category such as 'Withdrawal,' 'Credit Card Payment,' and 'Food,' to name a few. The model learned from this data recognizes patterns and associations between the characteristics of a transaction and its category.

After training, the model was integrated into the software and automatically categorized new transactions based on their features. For instance, a transaction with the description 'Bank Bill' could be categorized as 'Credit Card Payment,' while a transaction that contains the word 'Cash' might be categorized under 'Withdrawal.'

This classification approach enabled the software to organize the user's financial data efficiently, facilitating easier tracking and planning of finances.

14.3 Forecasting Functionalities

The other primary objective of the Financial Tracker and Planner was to provide users with the capability to plan and forecast their finances efficiently. This objective has been fully achieved through code developed entirely from scratch through the combination of Python and JavaScript.

Python and JavaScript have been essential in fulfilling the objective of providing forecasting functionalities, with Python handling the back-end data manipulation and storage and JavaScript controlling the front-end interactivity.

To improve the user interface and interaction, JavaScript was employed extensively. First, it produced and maintained the data tables in the user interface. For instance, JavaScript enabled users to add and remove rows and columns dynamically, tailoring their financial planning to meet their unique needs. In addition, anytime a user adds, alters, or deletes data, JavaScript code immediately updates the summary of earnings, expenses, and net difference. As a result, far less manual input is needed from the user, simplifying and streamlining financial planning.

On the other hand, the application's core was built using Python, in particular, the Django framework. It was in charge of overseeing user requests, database operations, and the security and integrity of data. For instance, Python code was written from scratch to manage the saving, retrieval, and deletion of user forecasts. Thanks to this security measure, only authorized users can view or alter their forecasts.

In conclusion, Python and JavaScript have proven essential to attaining the project's goals. The software became more user-friendly and intuitive thanks to JavaScript's user interface enhancements and interactivity enhancements. Python oversaw the back-end activities concurrently, assuring data security, functionality, and integrity.

14.4 Create an interface that is intuitive and simple

Regarding the user interface, the platform is intuitive and simplifies financial management. We have successfully minimized the learning curve by employing user-centered design principles, allowing users to navigate our software easily. The design and functionality of the interface directly address the project's objective of creating an intuitive platform, thus reducing the user's burden in managing their finances.

In order to create a user experience that is simple and intuitive, HTML and CSS were used extensively and all of which were created from scratch. These codes give the Financial Tracker and Planner program an aesthetically pleasing and user-friendly interface.

The primary language used to organize the content of the web pages was HTML. Numerous HTML files were created each one being a unique page in Fintap. Making sure that every page is its own HTML file guarantees that debugging and future enhancements can be done easily.

In addition, the HTML code structure used in each templates is straightforward and basic, making the material easier to grasp and increase accessibility.

On the other side, CSS improved the website's visual appeal. The CSS code also guarantees the responsiveness of the application—which adapts its layout to the size of the user's screen. This feature makes the program more accessible and user-friendly on many platforms, whether the user uses a desktop, tablet, or mobile device.

In conclusion, HTML and CSS have been influential in achieving the goal of developing a clear and straightforward user experience for the Financial Tracker and Planner application.

14.5 Open Source Libraries / Packages Used

In order to achieve the goals set forth for this project, numerous open-source libraries and packages were also used. These libraries, used in tandem with code written from scratch, were essential in developing the various functionalities of our financial tracker and planner. Here's an overview of these libraries and how they were utilized in this project:

1. **Psycopg2** - It was used in this project to handle database operations such as data storage, retrieval, and management of financial transactions. It allowed the software to interact with the PostgreSQL database seamlessly, offering robust, database-driven functionalities. [36]
2. **PyPDF2** - this Python library was used to read and extract text from the user's PDF bank statements. It played a critical role in the data extraction phase of the application, where it allowed for seamless reading and processing of PDF documents. [37]
3. **Moviepy** - is a Python module for video editing that can cut, concatenate, and composite video clips, apply masks, and even add titles. This was used so that users can upload videos of their bank statements for processing. [38]
4. **OpenCV** - (Open Source Computer Vision Library) was used for preprocessing the images of the bank statements before running OCR using PyTesseract. It helped improve the accuracy of data extraction by enhancing the images and making them more OCR-friendly. [39]
5. **Nltk** - The Natural Language Toolkit (nltk) was used in this project to process the machine-readable text obtained from the OCR phase. Specifically, nltk was used to filter out unimportant words and phrases, and to identify financial terms and patterns in the text data. It enhanced the efficiency of data categorization and data cleaning techniques in the project. [40]
6. **Pdf2image** - this library was used to convert the PDF bank statements into images. As PyTesseract OCR works primarily with images, pdf2image was essential in preparing the bank statements for OCR-based text extraction. [41]

Each of these libraries contributed significantly to the success of the project. They added value to different aspects of the financial tracker and planner - from data extraction and categorization to database operations and user interface enhancements. By leveraging these open-source packages, we were able to develop a comprehensive, robust, and user-friendly solution for financial management.

15. Project Management

15.1 Project Management - Agile

Releases		
> E3-1 Project Requirements & Objectives	<div style="width: 100%;"><div style="width: 100%;"> </div></div>	DONE
> E3-13 Software planning & design	<div style="width: 100%;"><div style="width: 100%;"> </div></div>	DONE
> E3-14 Developing key features	<div style="width: 100%;"><div style="width: 100%;"> </div></div>	DONE
> E3-15 Testing, refinement and planning next steps 01	<div style="width: 100%;"><div style="width: 100%;"> </div></div>	DONE
> E3-70 Update Requirements, Software plans and designs	<div style="width: 100%;"><div style="width: 100%;"> </div></div>	DONE
> E3-71 Completion of Individual Software Components	<div style="width: 100%;"><div style="width: 100%;"> </div></div>	DONE
> E3-72 Components Integration	<div style="width: 100%;"><div style="width: 100%;"> </div></div>	DONE
> E3-73 Testing, refinement and planning next steps 02	<div style="width: 100%;"><div style="width: 100%;"> </div></div>	DONE
> E3-74 Soft Launch Preparation	<div style="width: 100%;"><div style="width: 100%;"> </div></div>	DONE
> E3-144 Official Documentation & Refinement	<div style="width: 100%;"><div style="width: 100%;"> </div></div>	DONE
+ Create Epic		

I utilized Jira, an Agile project management tool, to organize my workflow effectively. As for the project methodology, Agile was used for this. Using Agile allows me to break down the project into several Epics, each representing a significant phase or component of the project.

1. **Project Requirements and Objective:** This epic was the foundation of the entire project. At this stage, I defined the project's requirements and objectives in consultation with my supervisors. This set the direction for the project, serving as my guiding principle throughout the execution. Regular communication and feedback from my supervisors ensured that the project was aligning with its intended goal and meeting its requirements.
2. **Software Planning and Design:** This epic was critical as it involved creating a detailed roadmap for software development. It involved creating use cases, descriptions, activity diagrams, and decomposition diagrams. Additionally, I also crafted data flow diagrams, ER diagrams, class diagrams, sequence diagrams, and wireframes. These diagrams were instrumental in visualizing the system's architecture, understanding the flow of data, and planning the interactions and relationships between different components of the system. This comprehensive planning and design phase set the stage for an efficient and effective development process.

3. **Developing Key Features:** In this epic, I strategically focused on developing the core features of the expense tracker first. This approach was chosen to ensure that the most critical and potentially challenging aspects of the project were addressed early, leaving ample time for refinement and troubleshooting. The key features included tasks related to data extraction, machine learning-based categorization, financial forecasting, and database setup.
4. **Testing, Refinement, and Planning Next Steps:** This epic was centered around ensuring the quality of the developed features. It included testing, refinement, and planning the following steps, one of which was a crucial transition from MongoDB to another database to improve data rendering.
5. **Updating Requirements, Software Plans, and Designs:** As the project evolved, it became necessary to revisit and update the initial plans and designs to reflect the project's progress. Having completed the critical features of the expense tracker, the project's scope expanded to incorporate more standard features expected in any robust expense tracking system. This included functionalities like adding, editing, and deleting expenses, categorizing transactions manually, and user-friendly navigation. Each new feature was meticulously planned and integrated into the system's overall design.
6. **Testing, Refinement, and Planning Next Steps:** This epic was essential as it encapsulated a crucial aspect of the development process – quality assurance. Upon completion of the standard features and front-end development, rigorous testing was undertaken to ensure the system's reliability and efficiency. The testing phase helped uncover potential glitches and areas of improvement in the system, which were subsequently refined. This continuous cycle of testing and refinement was instrumental in enhancing the system's overall performance.
7. **Soft Launch:** The soft launch phase was critical to the project's completion. The system was operational and opened to a few friends for use. Their interaction with the system provided valuable data that could be used to assess the system's performance in a real-world scenario. It also presented an opportunity to observe how users interacted with the system, highlighting any unforeseen user experience issues.
8. **Official Documentation and Refinement:** This final epic was dual-purposed, focusing on the project's official report and further refinement of the system. I created a comprehensive report that detailed the project's requirements, design, development process, testing procedures, and user guides. This documentation is a valuable resource for understanding the project's lifecycle and can act as a reference for future developments or maintenance tasks.

15.2 Project Management - Maintaining Momentum

Maintaining momentum throughout the project was crucial to meet deadlines and delivering a quality product. This momentum was sustained through regular check-ins and updates with my supervisors. These touchpoints acted as platforms where I could showcase my progress, discuss potential challenges, brainstorm solutions, and gather valuable insights.

A sustained momentum also enabled me to spot issues quickly and immediately adjust. For example, identifying the need to switch from MongoDB, a NoSQL database, to PostgreSQL, a relational database. MongoDB, while excellent for handling unstructured data, could have been more efficient when handling complex queries and transactions, which became increasingly important as the project evolved. Conversely, PostgreSQL offered advanced functionalities like complex queries, transactional integrity, and reliability, making it a more suitable option.

The transition was challenging. I had to redesign the database schema to fit a relational model, migrate existing data, and rewrite parts of the application to work with the new database. However, with continuous support and guidance from my supervisors, I was able to navigate these challenges and successfully implement the change.

This shows the Agile methodology's inherent flexibility, encouraging an iterative development approach and embracing changes. It allowed me to adapt quickly, optimize the application based on new insights, and ensure the delivery of a robust, flexible, and efficient expense tracker.

15.3 Project Management - Risk Assessment

Regular risk assessments were integral to the project's planning and execution stages. For example, during the initial planning phase, I identified the development of key features of the expense tracker as a potential risk area. Given the complexity of these features, which included data extraction, machine learning-based categorization, financial forecasting, and database setup, there was a significant likelihood of encountering unforeseen challenges. If not addressed promptly, these challenges could lead to delays, potentially jeopardizing the project's timely completion.

To mitigate this risk, I prioritized developing these critical features from the project's onset. This approach allowed ample time to tackle complexities, troubleshoot issues, and refine each feature to ensure optimal functionality. In addition, this early attention to the high-risk areas ensured a smooth progression of the project, as potential setbacks were addressed well in advance.

This experience underscored the importance of proactive risk assessment and management in project planning. It allowed me to anticipate potential issues and helped me devise effective strategies to address them. This, in turn, ensured the project's timely completion without compromising on the quality of the final product.

This process taught me that risk assessment is not a one-time task but a continuous process. It is about being vigilant, prepared, and adaptable to ensure the project stays on track, even when facing unforeseen challenges.

15.4 Project Management - Conclusion

The Agile methodology proved particularly suitable for this project due to its inherent flexibility and focus on iterative development and continuous feedback.

In the early stages of the project, while setting out the project's requirements and objectives, I appreciated Agile's emphasis on adaptability and change. This flexibility allowed me to adjust the project's direction as I gathered more information, understood the problem better, or encountered unforeseen challenges. It became beneficial when transitioning from MongoDB to PostgreSQL, as the methodology allowed for such significant shifts without derailing the entire project.

Agile's iterative nature was beneficial during the development of the critical features. I could focus on one feature at a time by breaking down the development process into smaller, manageable tasks within each epic, ensuring quality and functionality. After each iteration, I could test, gather feedback, and refine the feature, resulting in a more reliable and user-friendly product.

The regular feedback cycles in Agile were instrumental in maintaining a high standard of work. By having frequent check-ins with my supervisors, I could ensure that the development was on the right track and align the project's progress with the expectations. In addition, this regular communication facilitated the timely identification of any potential issues, allowing for swift action to keep the project on track.

16. Implementation Plan

For the implementation of Fintap Pilot Implementation is considered the most suitable for several reasons:

16.1 Minimized Risk:

In the Pilot Implementation method, the entire system is initially deployed to a small group of users. This ensures that bugs, issues, or unanticipated problems can be identified and addressed in a controlled environment. In addition, as the expense tracker system is likely to handle sensitive financial data, this approach minimizes the risk of widespread issues.

16.2 User Feedback and System Refinement:

Pilot Implementation allows for early user feedback, which can be extremely valuable. This initial group of users can provide insights into how intuitive the system is, what features are most valuable, and where improvements could be made. The feedback can refine and improve the system before it is rolled out to a larger audience.

16.3 Performance Testing:

The phased rollout allows for performance testing and optimization. It allows one to observe how the system performs under real-world conditions but on a smaller scale. If the system performs well with the pilot group, it is a good indicator that it will handle a full rollout.

16.4 Resource Management:

Pilot implementation requires fewer resources upfront compared to an immediate full-scale implementation. In addition, this approach allows the organization to manage and allocate resources more efficiently, as not all system components are deployed simultaneously.

In conclusion, the pilot implementation provides a safe and controlled environment to test, refine, and gradually introduce the new expense tracker system. In addition, it offers an opportunity to learn and make changes before committing to a full-scale deployment, thus reducing risk and increasing the likelihood of a successful implementation.

17. Legalities and Ethics

17.1 Legalities

In the development of this project, open-source libraries have been significantly used to achieve the desired functionality and outcomes. Therefore, it is crucial to acknowledge the role of these libraries and the benefits their open-source nature has provided for this project.

The first noteworthy library is by Tesseract. This Python library is a wrapper for Google's Tesseract-OCR Engine, which is instrumental in recognizing and reading the text embedded in images. The second significant library utilized is the Random Forest algorithm from the sci-kit-learn library, a machine-learning library in Python. The Random Forest algorithm was applied to perform predictive tasks in the project.

It is essential to highlight that Pytesseract and the Random Forest algorithm from the sci-kit-learn library are open-source. Open-source software grants the freedom to use, study, share, and modify the software, which has been a crucial factor in enabling the progress and completion of this project. Thanks to the open-source community; such tools are readily available for us to use in our academic pursuits.

In line with good academic and legal practices, both the Pytesseractm Random Forest and other relevant libraries have been appropriately cited in the references of this report, acknowledging the hard work of the developers who have contributed to these projects. This acknowledgment not only gives credit where it is due but enables anyone reviewing this project to trace back the tools used, contributing to the spirit of transparency and collaboration underpinning the open-source community.

It is with gratitude that I leverage these open-source resources for the benefit of my project. I believe in the principles of the open-source movement—sharing, transparency, and collaboration—and I hope my project, too, can contribute to this ongoing learning and development cycle

17.2 Ethics

In the Ethics section of this report, I would like to address the crucial aspect of privacy and data security. As the developers of the expense tracker application, I am acutely aware of the sensitive nature of the data handled by the software. Nevertheless, financial information is a significant part of an individual's life, and we must maintain robust protocols to protect this data.

Firstly, the database infrastructure uses PostgreSQL, a highly respected open-source relational database system renowned for its robustness and security. Regarding whether a system administrator can see passwords, the answer is no. I have implemented password hashing in PostgreSQL, which means that when a password is stored in the database, it is converted into an unreadable hash. Even in the unlikely event that the database is breached, the attacker would only see the hashed passwords, which are virtually impossible to convert back into the original plain text.

Furthermore, we encourage our users to choose challenging passwords. Password complexity is a significant factor in safeguarding accounts, and we have set stringent password requirements that involve a combination of letters, numbers, and minimum length.

We have decided to use Render, a reputable cloud service provider, for our database needs. Render provides robust security measures ensuring that our application benefits from industry-standard security protocols, offering peace of mind for our users.

In addition to the inherent security, the cloud-based database benefits from automatic backups. This means that in the unlikely event of data loss or a system failure, we can quickly restore data with minimal impact on our users. These automatic backups, coupled with Render's state-of-the-art security protocols, create a secure environment for user data.

Lastly, in extracting data from bank statements, we have carefully programmed our system to remove credit card information immediately. We do not store, process, or transmit sensitive data beyond the initial extraction process, further bolstering our commitment to user privacy and data protection.

In conclusion, I want to emphasize my deep understanding of the ethical implications of handling sensitive user data. The privacy and security of our users are paramount, and I continuously strive to uphold these values while providing a helpful, efficient service.

18. Conclusion

The primary objective of this project was to design, develop, and implement an intuitive, user-friendly expense tracker which harnesses the power of machine learning to categorize financial data. I am proud to report that this has been accomplished this task, building an efficient and robust system from scratch using various technologies like JavaScript, Python, HTML, and CSS.

The end product successfully aligns with the initial objective. We have a functioning expense tracker that allows users to upload payment documentation, which is parsed, and the relevant information extracted and categorized. This system provides an excellent platform for users to monitor and forecast their finances effortlessly.

Additionally, the system provides an intuitive, responsive, and user-friendly interface, thanks to the meticulous use of HTML and CSS for frontend development. Various templates were created for different functionalities, ensuring a seamless and enjoyable user experience.

18.1 Enhancements

While the current system works efficiently, there is always room for improvement. Here are some potential enhancements that could be implemented in future versions:

- **Expand on the number of different banks format accepted by the system:** To increase the versatility and usefulness of the system, we could work on expanding the number of bank statement formats that our system can parse and understand.
- **Support for unstructured payment document format:** Currently, the system works best with structured data. We could improve our machine learning algorithms to handle unstructured payment documents in the future, further enhancing the system's capabilities.
- **Develop the website into an app:** Given the increasing reliance on mobile devices, developing a mobile application version of the expense tracker could significantly increase its accessibility and usability. This would allow users to manage their finances on the go.
- **Continuously improve the user experience:** User experience is critical to the success of any application. We will continue to gather user feedback, monitor user behavior, and make iterative improvements to ensure that our expense tracker is not just functional but also a joy to use.

18.2 Personal Experience

Embarking on this project has been an exciting and enriching journey, both technically and personally. One of this project's most challenging and rewarding aspects was learning and integrating new technologies. I had to quickly ramp up on different technologies, especially databases, which were previously unfamiliar territory. Understanding how databases work, how to set them up, and how to interact with them using programming languages was a steep learning curve but also an incredibly satisfying achievement.

Improving my existing knowledge of Python and JavaScript was another significant part of this journey. While I had a solid foundation in these languages, the requirements of this project pushed me to explore their advanced features and capabilities. This deepened my understanding and appreciation of the flexibility and power of these languages.

Of course, no development project is complete without its fair share of bugs and unexpected issues. Debugging was often challenging, but it also provided opportunities to think creatively, devise innovative solutions, and learn from my mistakes. These experiences have enhanced my problem-solving skills and taught me the value of patience and perseverance in software development.

Finally, I would like to extend my heartfelt thanks to Mdm Malar and Dr Loo. Their guidance and support throughout this project have been invaluable. They provided technical advice and feedback and motivated and encouraged me to keep learning, exploring, and pushing my boundaries. This project would not have been the same without their mentorship, and I am profoundly grateful for that.

In conclusion, this project has been a landmark in my journey as a software developer. The knowledge gained, the skills developed, and the experiences garnered will be stepping stones for my future endeavors in this field.

Appendix A1 - Interview Transcript

Appendix A1.1 - Interview Transcription (Small Business Owner)

Q: Thank you for taking the time to help me with this interview. Can you share a bit about yourself and what you do?

A: Absolutely, I'm glad to share. My name is Wei, and I run a small café in Singapore. I've been in the F&B industry for about ten years now, starting as a barista and working my way up. Five years ago, I took the plunge and opened my own place. It's been challenging, especially in the recent COVID-19 pandemic times, but it's also incredibly rewarding. I love serving our community and seeing customers enjoy the space we've created.

Q: Has covid 19 affected you financially, and if so, please elaborate

A: Absolutely, the COVID-19 pandemic has had a significant financial impact on my business. We tried shifting to online deliveries, but the competition was tough, and the profit margins were slimmer. I've had to use a lot of my savings to keep the business afloat, and it's still a day-to-day struggle.

Q: Did you have sufficient emergency funds to assist you during this period

A: To be honest, no, I didn't have sufficient emergency funds. My business largely depended on daily income. When the pandemic hit and the lockdown was imposed, it was a struggle. We quickly exhausted our limited savings. This experience has shown me the importance of having an emergency fund, not just in my personal life but also in my business.

Q: Why did you not have sufficient emergency funds?

A: Most of my earnings went back into the business for growth and expansion. I did have a small cushion, but it was intended for short-term setbacks, not a pandemic-scale event. This was a wake-up call to reevaluate my financial planning and consider the importance of a substantial emergency fund.

Q: What actions could you have taken to be better prepared?

A: In hindsight, there are several things I could have done differently. Firstly, I could have diversified my income sources. I relied heavily on the physical presence of my customers, and when that was not possible, my income suffered. Venturing into online sales and delivery earlier could have mitigated some of the losses. Secondly, I should have prioritized setting aside money for an emergency fund, even if it meant slower business growth. Lastly, I could have looked into business interruption insurance, which could have provided some financial relief during the lockdown.

Q: A survey shows that 1 in 2 adults in Singapore do not know how much they spend every month. What do you think of this?

A: That's somewhat surprising and also concerning. As a business owner, tracking income and expenses is fundamental. I bring the same discipline to my personal finances. Knowing where your money goes each month is crucial to managing your financial health. It allows you to identify unnecessary expenditures, cut back on them, and use that money more efficiently, such as building an emergency fund or investing for growth.

Q: Do you personally track your expenses? If so, what tools do you use

A: Yes, I do track my personal and business expenses. For my business, I use accounting software called QuickBooks, which keeps track of all income, expenses, invoices, and taxes. For my personal expenses, I use a budgeting app on my phone called Tally Pro. It allows me to categorize my expenses, set budgets, and even gives me reminders when I'm close to my spending limit in a certain category. It's been very helpful in managing my finances effectively.

Q: What are your thoughts on Buy Now Pay Later? Have you used it in the past, or are you currently using it?

A: I've had a negative experience with Buy Now, Pay Later. I used it a few times for business-related purchases as they were offering good deals and thinking it would help manage my cash flow. However, it ended up causing more stress than relief. The problem came when business was slow, and the repayments became a burden. I found myself in a cycle of debt that was hard to break out of. It might be useful for some, but for me, it was a lesson learned. I now prefer to save up for big purchases and avoid incurring unnecessary debts.

Q: What do you think will buy now and pay later positively or negatively affect the younger generation's financial habits in the coming years?

A: I worry that Buy Now, Pay Later schemes might have a negative effect on the younger generation's financial habits. It's easy to see the allure of getting something immediately without paying upfront, but it can also foster a mindset of instant gratification without understanding the consequences. There's a risk of young people getting into debt or developing poor financial habits like overspending. I believe it's crucial to educate the younger generation about the importance of budgeting, saving, and

Q: On that note, what can the younger generations do to cultivate better financial habits? What learns can you pass on to them?

A: I believe that the best way to cultivate good financial habits is to start early. The younger generation should be taught the importance of saving and investing from a young age. One key lesson I'd pass on is the concept of "paying yourself first". This means setting aside a portion of your income for savings or investments before spending on anything else. It's also crucial to understand the value of money and the concept of delayed gratification - sometimes it's worth waiting and saving up for something instead of buying it immediately with credit.

Q: Circling back to over the economic landscape, do you feel that the prices of goods and services have increased, and what are your thoughts on Goods and Service Tax (GST) increasing from 7 to 9%

A: Yes, I've definitely noticed an increase in the prices of goods and services over the past few years. It's understandable, given the economic impact of the pandemic and other global factors, but it does add to the cost of running a business. As for the GST increase, while I understand the rationale behind it - to fund public services and help the nation cope with long-term spending needs - it does add an extra burden on small businesses like mine. We either have to absorb the additional cost, which affects our bottom line, or pass it on to our customers, which might affect our competitiveness.

Q: What are your thoughts if there is a solution that allows you to take a photo or video of your payment receipt, upload it, and the software will categorize and track your expenses from there? Could you see yourself using a service like this?

A: That actually sounds like a great idea! I find tracking my expenses tedious is the manual data entry. Having a tool that automatically categorizes and tracks expenses just by taking a photo of a receipt would certainly streamline the process. However, I would want to ensure that this service is secure and respects my privacy. If it meets those criteria, I could definitely see myself using a service like this to manage my business expenses.

Q: You mentioned that you track your finances or try to, but do you have a financial plan for your future? If yes, why, and if no, why? Is having a financial plan essential?

A: For my business, I definitely have a financial plan in place - it's a necessity to ensure the sustainability and growth of the venture. However, when it comes to my personal finances, I must admit that I've not been as disciplined. The main reason is the lack of time - running a small business is a demanding job.

Q: What are your thoughts if the software can help you quickly show you a financial forecast with a few clicks of a button, and it will also use data from your tracked expenses and income?

A: That would be an invaluable tool for me. I often find myself spread thin across various aspects of the business, and financial forecasting can be complex and time-consuming. A software that simplifies this process and provides accurate forecasts based on my income and expenses would be very helpful.

Q: How much every month can you pay for a service like this?

A: As a small business owner, my monthly expenses are always a consideration. However, if this software can save me time and provide me with actionable insights that could help my business grow, I'd be willing to invest in it. If it's robust and reliable, I could see myself paying up to SGD 50 a month for a service like this.

Q: Do you want to see any features in this new financial tracker and planner?

A: For a financial tracker and planner, I would appreciate features that can help me manage both my business and personal finances. It would be great if the software could integrate with my existing accounting tools, sync with my bank accounts securely, and provide automated expense categorization. I'd also love to see some sort of predictive analytics or forecasting feature that would help me anticipate future expenses and revenues, and maybe even suggest ways to optimize cash flow.

Q: Thank you so much for your time. Are there any final words you would like to share?

A: Thank you for taking the time to understand my needs. If I may, I'd like to share some advice for the younger generation. When it comes to financial health, the earlier you start, the better off you'll be. Time is one of the most valuable assets you have. Start tracking your expenses, save, and invest wisely as early as you can - the compounding effect can make a significant difference in your financial stability in the future. Your software can play a crucial role in helping people get started and stay on track.

Appendix A1.2 - Interview Transcription (Civil Servant)

Q: Thank you for taking the time to help me with this interview. Can you share a bit about yourself and what you do?

A: Of course, my name is Francis, and I work in the public sector. I'm a civil servant with the Ministry of Education, where I'm part of a team that develops curriculum policies for schools. It's a job that requires a lot of coordination and understanding of the educational needs of our students. Even though the job can be demanding at times, it's fulfilling to contribute to the education of our future generations.

Q: Has covid 19 affected you financially, and if so, please elaborate

A: In my case, the pandemic has not affected me financially. I work for the government, and we didn't face any salary cuts or layoffs. However, it has affected how I use my income. With the travel restrictions, I haven't been able to go on my annual vacation abroad, so I've been saving more. I've also been more cautious about my spending given the economic uncertainty and have been trying to build a more robust emergency fund.

Q: Did you have sufficient emergency funds to assist you during this period

A: Yes, I did. The government sector was stable throughout the pandemic, and my income was not disrupted aside from bonus hahaha. However, the uncertainty of the situation made me appreciate the fact that I had an emergency fund. I also made a point of adding to it during this period, as the pandemic showed me that you can never be too prepared for unforeseen situations.

Q: Why did you not have sufficient emergency funds? (Not relevant to interviewee)

Q: What actions could you have taken to be better prepared? (Not relevant to interviewee)

Q: A survey shows that 1 in 2 adults in Singapore do not know how much they spend every month. What do you think of this?

A: I think I am one of the two who doesn't track hahaha! I've set up automatic payments for most of my bills, so I rarely worry about overspending. That said, I realize it's not the best practice. It's always good to have a detailed understanding of where one's money is going, and I plan to start tracking my expenses soon to gain better control over my personal finance.

Q: Do you personally track your expenses? If so, what tools do you use (Not relevant)

Q: What are your thoughts on Buy Now Pay Later? Have you used it in the past, or are you currently using it?

A: I've seen the Buy Now, Pay Later option while shopping online, but I have never used it. I've always been skeptical about such schemes. While they may seem convenient and attractive, I worry about the potential for overspending especially since I already have a few credit cards.

Q: What do you think will buy now and pay later positively or negatively affect the younger generation's financial habits in the coming years?

A: It's a bit of a double-edged sword. On one hand, if used responsibly, Buy Now, Pay Later can be a useful tool for managing cash flow and making necessary purchases. However, there's a danger that it could lead to bad financial habits, like overspending and accumulating debt, especially if young people are not fully aware of the repercussions. It could undermine the important concept of saving for what you need.

Q: On that note, what can the younger generations do to cultivate better financial habits? What learns can you pass on to them?

A: I think financial literacy should be a crucial part of education. The younger generation needs to understand not just the basics of saving and spending, but also more complex concepts like interest rates, loans, and investments. One lesson I'd pass on is to always live within your means. Avoid debt as much as possible, and if you must borrow, make sure it's for things that will appreciate in value or provide a return, like education or a home. And always, always have a budget - it's the foundation of good financial management.

Q: Circling back to over the economic landscape, do you feel that the prices of goods and services have increased, and what are your thoughts on Goods and Service Tax (GST) increasing from 7 to 9%

A: In my observation, the cost of living has indeed gone up, which is perhaps an inevitable result of economic progression and inflation. Regarding the GST increase, it's a mixed feeling for me. On one hand, I understand that this increase is necessary for funding growing public expenditures, especially in areas like healthcare and infrastructure. However, as a consumer, it does mean higher costs, which is a concern, especially for lower-income households. I think it's important that the government has appropriate measures in place to help those who might be

Q: What are your thoughts if there is a solution that allows you to take a photo or video of your payment receipt, upload it, and the software will categorize and track your expenses from there? Could you see yourself using a service like this?

A: Honestly, that sounds quite convenient. It would definitely cut down on the time spent manually entering each expense. I might consider using it.

Q: You mentioned that you do not track your finances, but do you have a financial plan for your future? If yes, why, and if no, why? Is having a financial plan essential?

A: My job provides a certain level of stability and predictability, so I haven't felt the immediate need for a detailed financial plan. However, I do realize that this might not be the best approach. I'll definitely be looking into creating a financial plan soon.

Q: What are your thoughts if the software can help you quickly show you a financial forecast with a few clicks of a button, and it will also use data from your tracked expenses and income?

A: I think a software like that could be very beneficial, especially for someone like me who doesn't currently have a financial plan in place. It would take away some of the intimidation factor and could help me to understand my financial situation better. Having a clear view of my financial future based on my current income and expenses could prompt me to make necessary changes or confirm that I'm on the right track.

Q: How much every month can you pay for a service like this?

A: Given that I have a stable income, I could allocate some budget for a service that would help me manage my finances better. However, it would depend on how user-friendly and effective the service is. If it provides clear value, I'd be willing to pay up to 20 dollars which is around the price of Netflix right haha.

Q: Do you want to see any features in this new financial tracker and planner?

A: I think a user-friendly interface is crucial. It should be simple enough for someone like me without a finance background to understand. A feature that can suggest ways to cut unnecessary costs or save more based on my spending habits would also be helpful.

Q: Thank you so much for your time. Are there any final words you would like to share?

A: My advice to everyone, is it's never too early or too late to start. While job stability can provide some comfort, it's still essential to plan for unforeseen circumstances. The tool you're developing can be a great aid in achieving this. It's not just about earning, but also about saving, spending wisely, and investing for your future.

Appendix A1.3 - Interview Transcription (Freelancer)

Q: Thank you for taking the time to help me with this interview. Can you share a bit about yourself and what you do?

A: Sure, I'm Ravi, a freelance illustrator based in Singapore. I've been freelancing for about four years now, after graduating from NAFA. I work on a variety of projects, from children's books to advertising campaigns, and even mural designs. The freelance lifestyle can be unpredictable, but I love the freedom it gives me to work on diverse projects and express my creativity.

Q: Has covid 19 affected you financially, and if so, please elaborate

A: Yes, COVID-19 has greatly impacted my financial situation. A lot of my income came from art shows, exhibitions, and live events. With all those being cancelled or moved online, my income took a major hit. I had to find new ways to sell my work, like setting up an online shop and doing more social media marketing, which was challenging. Additionally, many people, facing their own financial issues, have cut back on buying non-essential items like art, which has affected my sales.

Q: Did you have sufficient emergency funds to assist you during this period

A: Unfortunately, no. My income was unpredictable even before the pandemic. I tried to set aside some money for emergencies, but it wasn't sufficient for a crisis of this magnitude. With most events cancelled and people cutting back on buying art, my income dropped drastically. I had to rely on grants and assistance programs for artists during this time. I've learnt from this experience and plan to prioritise building an emergency fund as soon as my income stabilizes.

Q: Why did you not have sufficient emergency funds?

A: My income is quite unpredictable and fluctuates depending on the number and size of projects I get. This makes it challenging to consistently set aside money for an emergency fund. Additionally, living in a city like Singapore, the cost of living is high, and I often found my expenses catching up to my earnings.

Q: What actions could you have taken to be better prepared?

A: Being overly dependent on art shows and exhibitions left me vulnerable when those events were cancelled. I could have explored other revenue sources, like online sales or teaching art classes. I also should have been more disciplined about setting aside money as an emergency fund, even if it was just a small amount from each project. Finally, I could have done a better job of reducing my expenses and living below my means to save more money.

Q: A survey shows that 1 in 2 adults in Singapore do not know how much they spend every month. What do you think of this?

A: I must admit, I do not consistently track my expenses. My income varies greatly from month to month. Sometimes I'm so focused on finding the next gig and creating new work that I neglect the financial management aspect. Also, the fluctuating income makes it challenging to set a consistent budget.

Q: Do you personally track your expenses? If so, what tools do you use (Not relevant)

Q: What are your thoughts on Buy Now Pay Later? Have you used it in the past, or are you currently using it?

A: I've used Buy Now, Pay Later a couple of times. My experience has been somewhat positive. It allowed me to make purchases without having to wait for a big project payout. However, it's a service I've learned to use cautiously. The temptation to overspend or purchase non-essential items is real. It's also crucial to keep track of the repayment dates to avoid late fees. I wouldn't recommend it for regular use.

Q: What do you think will buy now and pay later positively or negatively affect the younger generation's financial habits in the coming years?

A: I have mixed feelings about this. I believe that if used wisely, Buy Now, Pay Later can be a beneficial tool for the younger generation, teaching them about credit and installment payments. However, without proper understanding and discipline, it could potentially lead to harmful financial habits, like impulse buying and falling into unnecessary debt. I think the key lies in education - young people need to be taught how to use such financial tools responsibly, understanding the terms, and being aware of the risks.

Q: On that note, what can the younger generations do to cultivate better financial habits? What learns can you pass on to them?

A: In the creative industry, financial stability can often take a backseat to pursuing your passion. However, it's important to remember that good financial habits are crucial for any career. I would advise the younger generation to diversify their income streams wherever possible, especially in freelance or gig economy roles. Also, having a clear understanding of your regular expenses and setting aside a portion of income for emergencies is essential. Lastly, don't shy away from discussing money matters - be it negotiating a fair price for your work or seeking advice on managing finances.

Q: Circling back to over the economic landscape, do you feel that the prices of goods and services have increased, and what are your thoughts on Goods and Service Tax (GST) increasing from 7 to 9%

A: The fluctuations in the prices of goods and services directly impact my cost of living and operating. I've certainly felt the pinch with prices creeping up over the years. The increase does add an additional burden. It means I'll have to plan my finances even more carefully to accommodate these rising costs.

Q: What are your thoughts if there is a solution that allows you to take a photo or video of your payment receipt, upload it, and the software will categorize and track your expenses from there? Could you see yourself using a service like this?

A: That does sound like it could simplify the process of tracking expenses. I often have many small, art-related expenses that can be hard to keep track of. Being able to just take a photo of a receipt and have a tool handle the categorizing and tracking would be helpful. I would be interested to try it out, as long as it's straightforward to use and respects user privacy.

Q: You mentioned that you tried to track your finances, but do you have a financial plan for your future? If yes, why, and if no, why? Is having a financial plan essential?

A: I believe having a financial plan is essential, especially for someone like me with an unpredictable income. However, the challenge is that finance isn't my area of expertise, and I'm not quite sure where to start. There's a lot to consider: saving for retirement, budgeting for daily expenses, planning for slow periods in work, and even investing. It can be quite overwhelming. I think what I need is some guidance or tools that can help demystify the process and make financial planning more accessible to people like me.

Q: What are your thoughts if the software can help you quickly show you a financial forecast with a few clicks of a button, and it will also use data from your tracked expenses and income?

A: The idea sounds appealing. As someone who doesn't have a strong background in finance, anything that simplifies financial forecasting is a plus. Being able to see a projection of my financial future based on my actual income and expenses could provide a much-needed sense of stability and control in my financial planning. It might also help me understand the impact of my current spending habits and motivate me to make any necessary changes.

Q: How much every month can you pay for a service like this?

A: I could possibly spend around 5 to 10 dollars a month, but it would really need to prove its worth.

Q: Do you want to see any features in this new financial tracker and planner?

A: My income fluctuates quite a bit, so a feature that can help me plan for lean months would be beneficial. This could be something like an alert when I'm spending at a rate that might lead to problems if my income dips. It would also be nice if it had a simple, intuitive interface that didn't require a lot of financial jargon to understand. Lastly, I'd like a feature that allows me to set financial goals and tracks my progress towards them, whether that's saving for a big purchase or building up an emergency fund.

Q: Thank you so much for your time. Are there any final words you would like to share?

A: Thanks for including me in this conversation. I'd like to say to young people and fellow freelancers: don't be intimidated by financial planning. It's a crucial part of life, especially when you don't have a fixed salary. Start tracking your expenses, understand your spending habits, and make a plan. It's okay to start small. And remember, it's not just about saving, but also about making your money work for you.

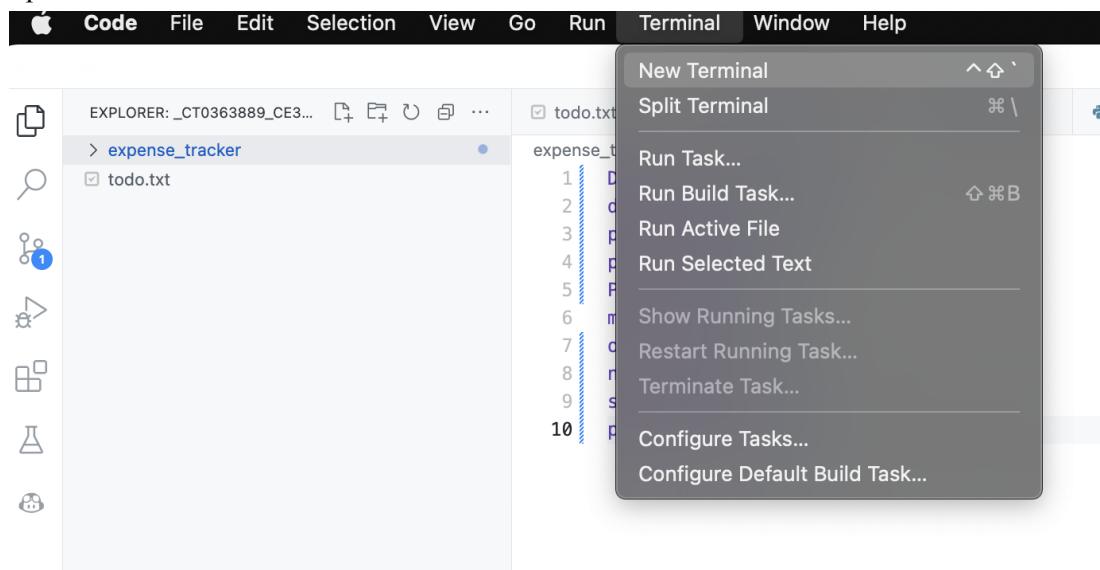
Appendix A2 - How to run the program

1. Make sure you have Python and Pip (Python's package manager) Installed on your system or virtual environment. Pip is usually included with Python.

Link to download Python 3: <https://www.python.org/downloads/>

2. Open the folder contain the code using a text edit (I use Vscode).

Open a new terminal in vscode



3. Make sure you are in the root folder of the source code. The root folder contains the a file called manage.py

```
(base) sam@Sams-MacBook-Pro-2 expense_tracker % ls
expense_tracker      manage.py          node_modules
main                  media             package-lock.json
                      package.json     postcss.config.js
                                      requirements.txt
                                      tailwind.config.js
```

4. In the terminal running “pip install -r requirements.txt”

Doing so will install all the dependencies of the project. The output after running the command should be similar to the screenshot below

```
● (base) sam@sams-MacBook-Pro ~ expense_tracker % pip install -r requirements.txt
Collecting Django==3.2.4
  Using cached Django-3.2.4-py3-none-any.whl (7.9 MB)
Collecting django-database-url==0.5.0
  Using cached django-database-url-0.5.0-py2.py3-none-any.whl (5.5 kB)
Collecting psycopg2==2.9.1
  Using cached psycopg2-2.9.1.tar.gz (379 kB)
Collecting pytesseract==0.3.8
  Using cached pytesseract-0.3.8.tar.gz (14 kB)
Collecting PyPDF2==1.26.0
  Using cached PyPDF2-1.26.0.tar.gz (77 kB)
Requirement already satisfied: moviepy==1.0.3 in /Users/sam/opt/anaconda3/lib/python3.9/site-packages (from -r requirements.txt (line 6)) (1.0.3)
Requirement already satisfied: opencv-python==4.7.0.72 in /Users/sam/opt/anaconda3/lib/python3.9/site-packages (from -r requirements.txt (line 7))
Requirement already satisfied: nltk==3.6.2
  Downloading nltk-3.6.2-py3-none-any.whl (1.5 MB)
    [██████████] | 1.5 MB 3.4 MB/s
Collecting scikit-learn==0.24.2
  Downloading scikit_learn-0.24.2-cp39-cp39-macosx_10_13_x86_64.whl (7.3 MB)
    [██████████] | 7.3 MB 117 kB/s
Collecting pdf2image==1.16.0
  Downloading pdf2image-1.16.0-py3-none-any.whl (10 kB)
Requirement already satisfied: asgiref<4,>=3.3.2 in /Users/sam/opt/anaconda3/lib/python3.9/site-packages (from Django==3.2.4->-r requirements.txt (line 1)) (3.5.2)
Requirement already satisfied: sqlparse>=0.2.2 in /Users/sam/opt/anaconda3/lib/python3.9/site-packages (from Django==3.2.4->-r requirements.txt (line 1)) (0.4.3)
Requirement already satisfied: pytz in /Users/sam/opt/anaconda3/lib/python3.9/site-packages (from Django==3.2.4->-r requirements.txt (line 1)) (2021.3.4)
Requirement already satisfied: Pillow in /Users/sam/opt/anaconda3/lib/python3.9/site-packages (from pytesseract==0.3.8->-r requirements.txt (line 4)) (9.0.0)
Requirement already satisfied: numpy>=1.17.3 in /Users/sam/opt/anaconda3/lib/python3.9/site-packages (from moviepy==1.0.3->-r requirements.txt (line 6)) (1.21.5)
Requirement already satisfied: imageio<3.0,>=2.5 in /Users/sam/opt/anaconda3/lib/python3.9/site-packages (from moviepy==1.0.3->-r requirements.txt (line 6)) (2.5.0)
Requirement already satisfied: decorator<5.0,>=4.0.2 in /Users/sam/opt/anaconda3/lib/python3.9/site-packages (from moviepy==1.0.3->-r requirements.txt (line 6)) (4.4.2)
Requirement already satisfied: prolog<1.0.0 in /Users/sam/opt/anaconda3/lib/python3.9/site-packages (from moviepy==1.0.3->-r requirements.txt (line 6)) (0.1.10)
Requirement already satisfied: requests<3.0,>=2.8.1 in /Users/sam/opt/anaconda3/lib/python3.9/site-packages (from moviepy==1.0.3->-r requirements.txt (line 6)) (2.29.1)
Requirement already satisfied: tqdm<5.0,>=4.11.2 in /Users/sam/opt/anaconda3/lib/python3.9/site-packages (from moviepy==1.0.3->-r requirements.txt (line 6)) (4.44.0)
Requirement already satisfied: imageio-ffmpeg>=0.2.0 in /Users/sam/opt/anaconda3/lib/python3.9/site-packages (from moviepy==1.0.3->-r requirements.txt (line 6)) (0.4.8)
Requirement already satisfied: joblib in /Users/sam/opt/anaconda3/lib/python3.9/site-packages (from nltk==3.6.2->-r requirements.txt (line 8)) (1.1.0)
Requirement already satisfied: regex in /Users/sam/opt/anaconda3/lib/python3.9/site-packages (from nltk==3.6.2->-r requirements.txt (line 8)) (2.22.3,15)
Requirement already satisfied: click in /Users/sam/opt/anaconda3/lib/python3.9/site-packages (from nltk==3.6.2->-r requirements.txt (line 8)) (8.0.4)
Requirement already satisfied: scipy>=0.19.1 in /Users/sam/opt/anaconda3/lib/python3.9/site-packages (from scikit-learn==0.24.2->-r requirements.txt (line 9)) (1.7.3)
Requirement already satisfied: threadpoolctl>=2.0.0 in /Users/sam/opt/anaconda3/lib/python3.9/site-packages (from scikit-learn==0.24.2->-r requirements.txt (line 9)) (2.2.0)
Requirement already satisfied: certifi>=2017.4.17 in /Users/sam/opt/anaconda3/lib/python3.9/site-packages (from requests<3.0,>=2.8.1->moviepy==1.0.3->-r requirements.txt (line 6)) (2021.10.8)
Requirement already satisfied: idna<4,>=2.5 in /Users/sam/opt/anaconda3/lib/python3.9/site-packages (from requests<3.0,>=2.8.1->moviepy==1.0.3->-r requirements.txt (line 6)) (3.3.0)
Requirement already satisfied: charset-normalizer=>2.0.0 in /Users/sam/opt/anaconda3/lib/python3.9/site-packages (from requests<3.0,>=2.8.1->moviepy==1.0.3->-r requirements.txt (line 6)) (2.0.4)
Requirement already satisfied: urllib3<1.27,>=1.21.1 in /Users/sam/opt/anaconda3/lib/python3.9/site-packages (from requests<3.0,>=2.8.1->moviepy==1.0.3->-r requirements.txt (line 6)) (1.26.9)
Building wheels for collected packages: psycopg2, pytesseract, PyPDF2
  Building wheel for psycopg2 (setup.py) ... done
  Building wheel for pytesseract (setup.py) ... done
  Building wheel for PyPDF2 (setup.py) ... done
```

5. Alternative go to your terminal or command prompt and paste the dependencies

```
pip3 install Django
pip3 install dj_database_url
pip3 install psycopg2
pip3 install pytesseract
pip3 install PyPDF2
pip3 install moviepy
pip3 install opencv-python
pip3 install nltk
pip3 install scikit-learn
pip3 install pdf2image
```

6. After installing the dependencies paste the database config stated below:

```
export
DATABASE_URL=postgres://expense_tracker_db_v2_user:QHotQPCZ8uIFNzUGjnpG9I1R
NdUY3U7H@dpg-ch6bnkbhp8u9bo1qb0sg-a.singapore-postgres.render.com/expense_tracker
db_v2
```

7. Finally enter: “python manage.py runserver”

Or If you are using Python 3 enter: “python manage.py runserver”

8. Online the local host link shown in the terminal

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