



FINAL REPORT

Making Finance Easier and Accessible for Everyone

Simplify Finance

An outline of the collaboration between a banker and two graduate level programmers under the supervision and guidance of Professor Jonathan Rose in the course: ECE 1778 Creative Applications of Mobile Devices

Haider Nawab, Jingya Wang, Yue Jiang

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1. Introduction

Financial services industry is in a state of flux. Technology companies (often called Fintechs) are taking aim at the lucrative business of banking, brokerage and financial intermediation in other ways. While technology has been transforming financial services since the 1970s the pace of change startups bring with them is gaining traction with consumers (especially Millennials). In turn, existing players are paying attention to this change and figuring out ways to acquire, partner or find other ways to retain their market position.

Simplify Finance is a mobile application prototype built out of the collaboration of Simplify – a social enterprise focused on financial inclusion and literacy and two graduate students at UofT. Haider Nawab is the founder of the social enterprise, he is the industry specialist. Jingya Wang and Yue Jiang are specialist programmers and graduate students in the ECE department at University of Toronto.

2. Motivation & Goal

Financial services and products are complex and boring. It's taboo to discuss anything financial because it's 'personal'. We want to bring out the social aspect in managing finances and creating wealth.

We aim to Simplify Finance, engage the human motivations of achievement and progress while enabling better decision making and faster achievement of goals. We will do this by incorporating behavioral economics concepts, such as nudging and choice architecture. To attract users, we will provide game-like user experience. Users can achieve hearts by making progress toward their goals.

The goal of Simplify Finance is to help users make better decisions and feel secure about their finances by allowing users set up three financial goals, tracking their budgets, providing advices, and rewarding them.

The goal will be achieved by creating decision support tools and a game-like user experience. Nudges, choice architecture and other behavioral economics will be used to guide decisions towards fastest achievement of the stated goals within the budget constraints. Gamification techniques will be used such as awarding hearts for achieving milestones.

3. Overall Design

To achieve the application goal and implement all the required functionalities, the system is designed as the Block Diagram shown in Figure 1.

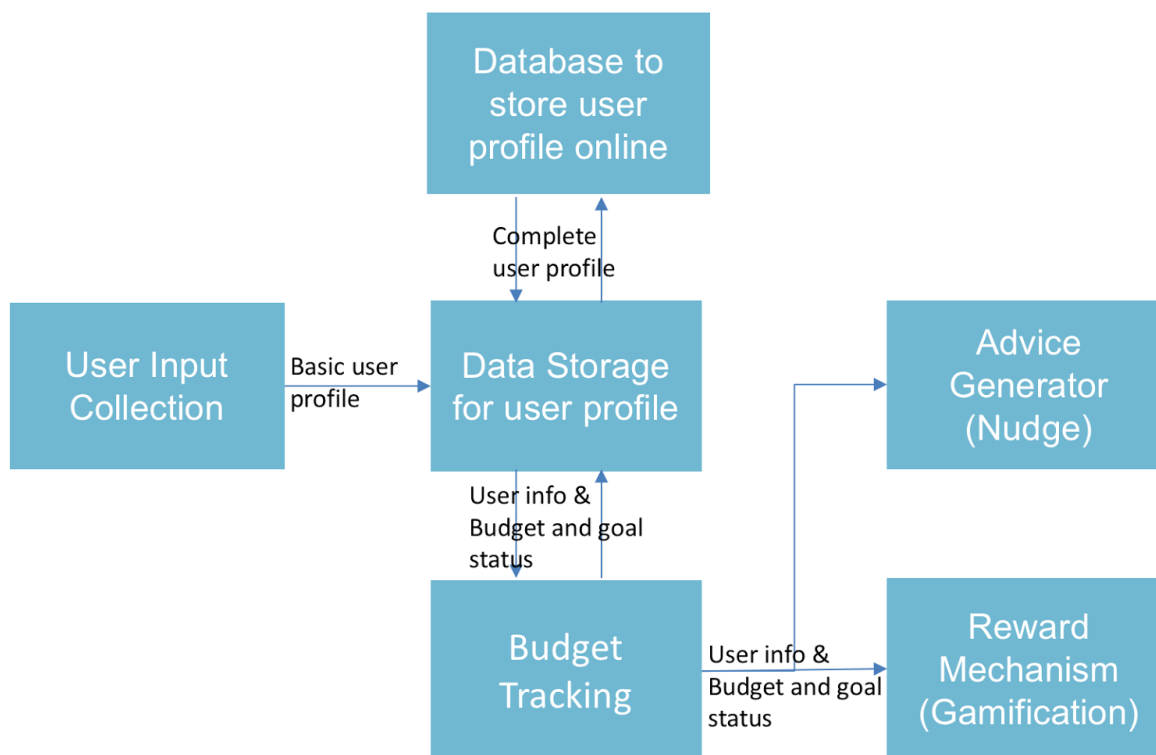


Figure 1. Block diagram of Simplify Finance Application

The overall data flow can be described as follows. The User Input Collection module should be able to collect user input (e.g. financial goals of users, incomes, expenses, etc.) through well-designed User Interfaces. After the basic user information is collected, the Data Storage module should create a user profile with the basic information and store it internally. Database module should connect to the Data Storage module to store and synchronize all users' profiles to allow users access their profiles in different devices. Budget tracking module should use the updated profile to generate budget/goal plan for users and track their progress by recording daily transactions. After the user progress is updated, Advice Generator should be able to generate advices to help users achieve their goals through chat feature. And Reward Mechanism should reward users when they make new goal achievements. The detailed function, input and output of each module can be found in Table 1 below.

Two key decisions are involved in the overall design.

1. Firebase Online Database Service is chosen to achieve online storage for user profiles.
Reasons: 1) Existing online database services will provide better security, compared to self-implemented online database, e.g. OAuth is used in Firebase. Since our application aims to provide secure environment for users to protect

their financial information, the more secure online database service is selected;
 2) predefined APIs of existing online database services will simplify the connection between our application and the online databases.

2. Decision trees are decided as the logic behind the chat feature.
 Reasons: 1) we don't have sufficient data at hand to support a learning bot. For this prototype, we just want to guide the user with some useful advice rather than to answer all questions the user has; 2) Decision tree will provide quick response than learning algorithms due to pre-defined states.

Table 1. Summary of the function, input and output of each module in Block Diagram.

Modules	Function	Input	output	UIs(Figure#)
User Input Collection	This module provides several user interfaces to collect user input.	Information gathered from the user (e.g. goals, incomes, expenses)	User input in certain types (String, int, float, etc.)	#4.2-4.5
Data Storage	This module creates a user profile with gathered information and stores the profile internally.	User input in certain types (String, int, float, etc.)	User Profile (Finance, Goal, Budget, Transaction)	#4.2-4.5
Database	This module stores all user profiles online. It allows users to access their profile using different devices.	User Profile (internal storage)	User Profile (online storage with firebase)	#4.9-4.9
Budget Tracking	This module generates budget plans for the user. And it updates the user progress in their profile.	User Profile and daily transactions	Updated User Profile with new progress	#4.6
Advice Generator	This module generates notifications with advices to help users achieve their goals.	Updated User Profile with new progress	Notifications with advices	#4.7
Reward Mechanism	This module rewards users with hearts when they make new goal achievements.	Updated User Profile with new progress	Hearts to user	#4.3

4. Statement of Functionality

Owe to the contribution from team members, all the intended features work properly for our application. And the following figures in this section will describe them in detail.

4.1 Summary Overview

The pie chart in this summary page contains information about budget value for different categories. The related text and progress bar will show up when particular category is clicked from pie graph. The bottom tab bar shows all the features in our application. It will allow the user easily change to another desired feature.

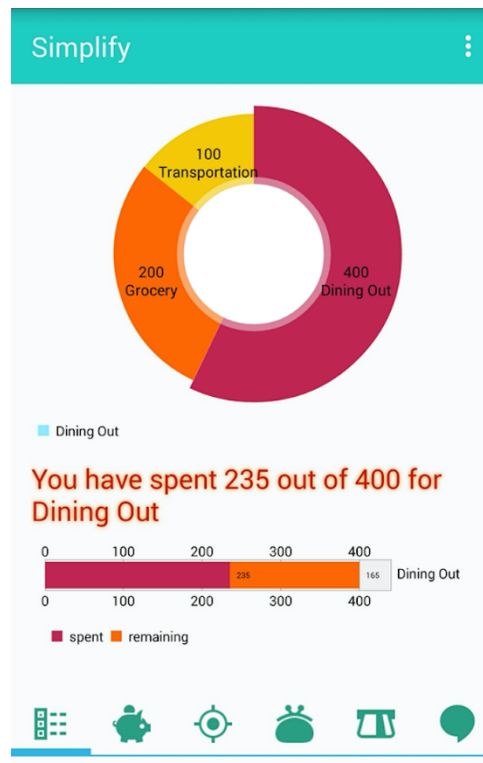


Figure 4.1 Screen shot for the main page of the app

4.2 Goal Setting

Users are prompted to set up goals in the goal feature, default is set to three financial goals which they are trying to achieve. The input form asks users to select a specific dollar value, time bound, asks them to commit how realistic the goal is and whether they have a plan on how to achieve this goal. The methodology used follows the widely used SMART goal setting formula.

The hearts feature in the bottom of view goal page is a reward mechanism indicates how much progress user has achieved for that goal. Reward mechanism is a positive reinforcement feature to encourage users to continually use our app and feel good about making the decisions. We developed a basic rubric for rewarding users for using the applications, awarding hearts (as a proxy for points) for undertaking specific activities such as basic information input, setting up goals, making decisions, achieving milestones such as percentage completion of goals etc.

In future iterations, we will consult our beta users on how to make this feature engaging and a reason to draw users to the application several times every day.

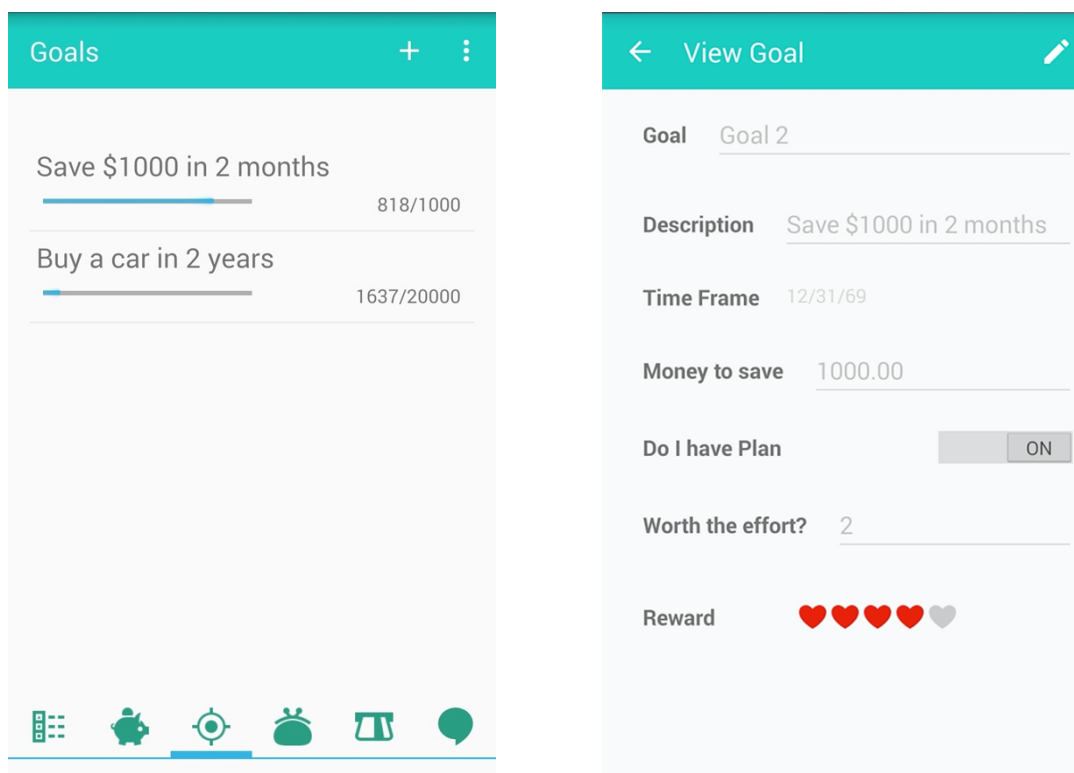


Figure 4.2(l) & 4.3(r) Screen shot for the goal viewing page and the goal setting page

4.3 Inflow/Outflow Setup

Application prompts users to provide basic information about themselves, inflows and outflows of money in the Finance feature. These could include monthly salaries, allowances from parents or the government and outflows such as rent and bill payments that are pre-determined for each month. For the purposes of our project and the first generation prototype, this feature is manual and requires many inputs from the user.

We recognize a need to make this easier for users as this is the introduction to the application in future iterations. A smoother flow could include connecting the application to the user's banking apps (and pulling pre-set information from there) and making the manual input simpler, requiring fewer thumb strokes.

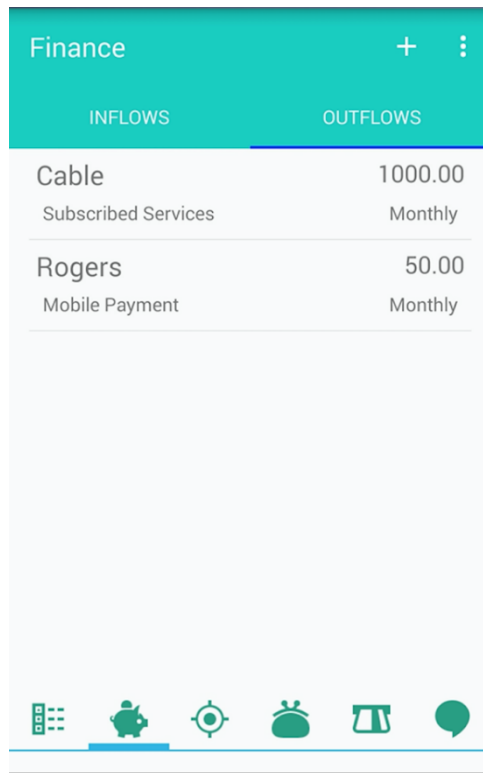
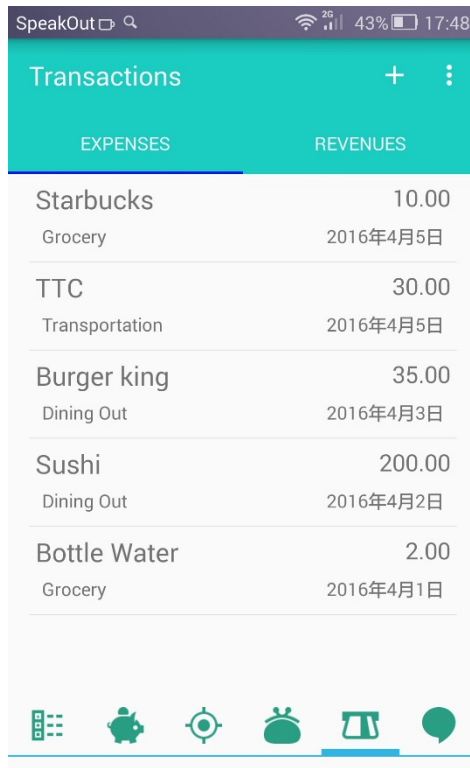


Figure 4.4 Screen shot for inflow/outflow setup

4.4 Transaction

To provide inflows and outflows that are not recurring we have developed a manual transaction input feature. This allows users to record transactions as they occur and updates the budget tracker and the corresponding budget balance. User can also take a picture of receipt or merchandise he bought for further review.

In future iterations, we will make the tracking of money easier and simpler. We view this feature as table stakes. There are many applications that exist in app marketplaces that conduct this functionality.



Transactions	
EXPENSES	REVENUES
Starbucks	10.00
Grocery	2016年4月5日
TTC	30.00
Transportation	2016年4月5日
Burger king	35.00
Dining Out	2016年4月3日
Sushi	200.00
Dining Out	2016年4月2日
Bottle Water	2.00
Grocery	2016年4月1日

Figure 4.5 Screen shot for viewing transaction

4.5 Budgets

Budget feature aggregates information from transaction, inflow/outflow, and goal features to calculate the total amount of money user can spend for each month. User can also add, delete or modify budget categories here and specify their amount of value. From the calendar button on top right corner, user can choose date from previous month to review their budget status.

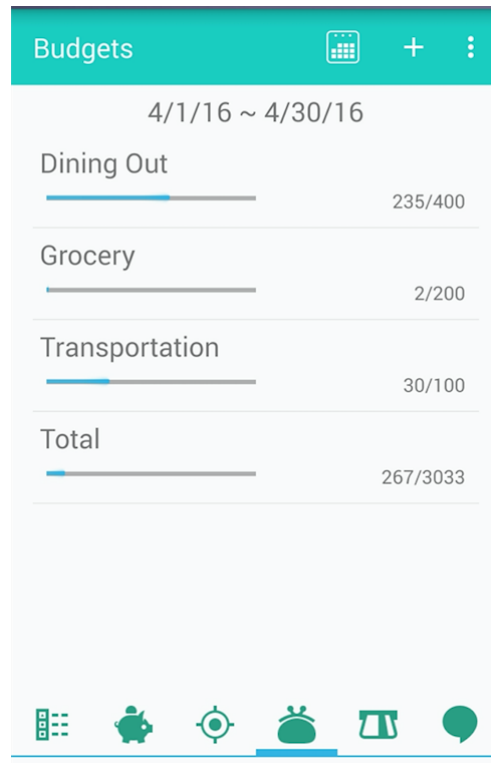


Figure 4.6 Screen shot for viewing budget

4.6 Advice generator

Advice Generator is the unique value proposition for Simplify finance. It takes the form a chat bot that is developed based on a decision tree developed on functional expertise and the information the user provides in the above mentioned features. Based on our market scan and based on the research we have been able to conduct on upcoming apps this feature is transformative in the personal finance applications available on the app marketplaces.

Acting as a personal coach, the advice generator stitches together the personal goals, keeping track of money and most importantly the need to be able to ask questions and get answers for the concerns about money in a safe place. The main purpose of this feature is to provide user some suggestions. An example for that can be referred to Figure 4.6. Besides providing suggestions, the chat feature also contains other states such as adding transactions, direct user to other features, or print user's personal financial information.

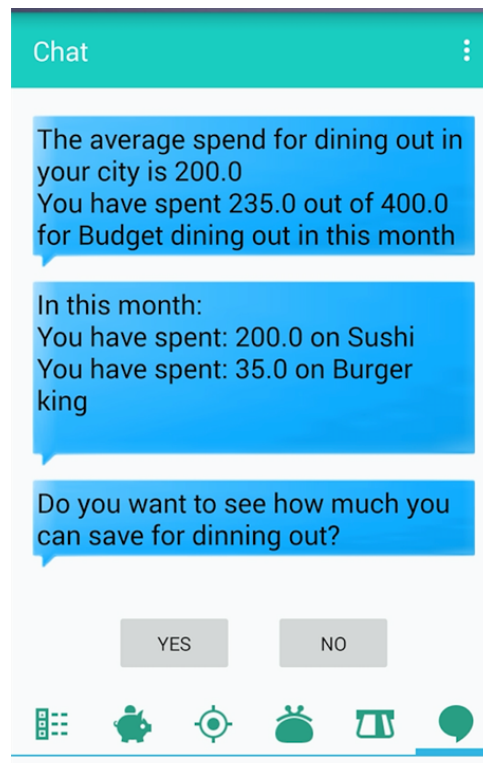
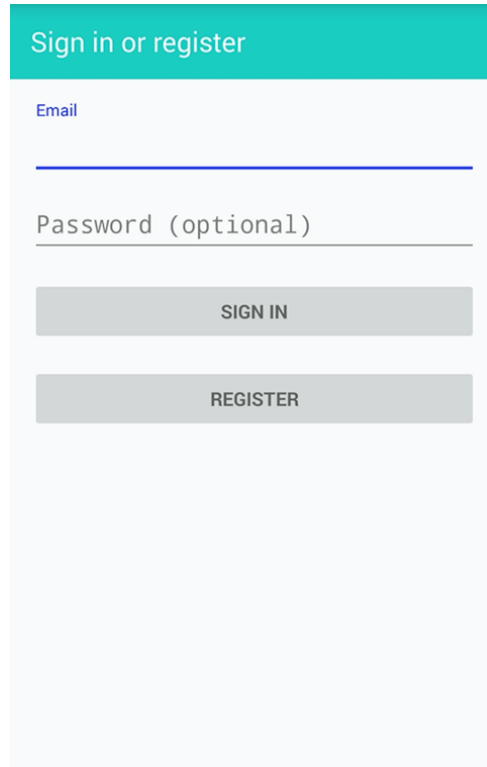


Figure 4.7 Screen shot for the chat feature

4.7 Online Database

User can register or login their own account to synchronize their database with web server. This part allows user to retrieve their information from different android devices.



Sign in or register

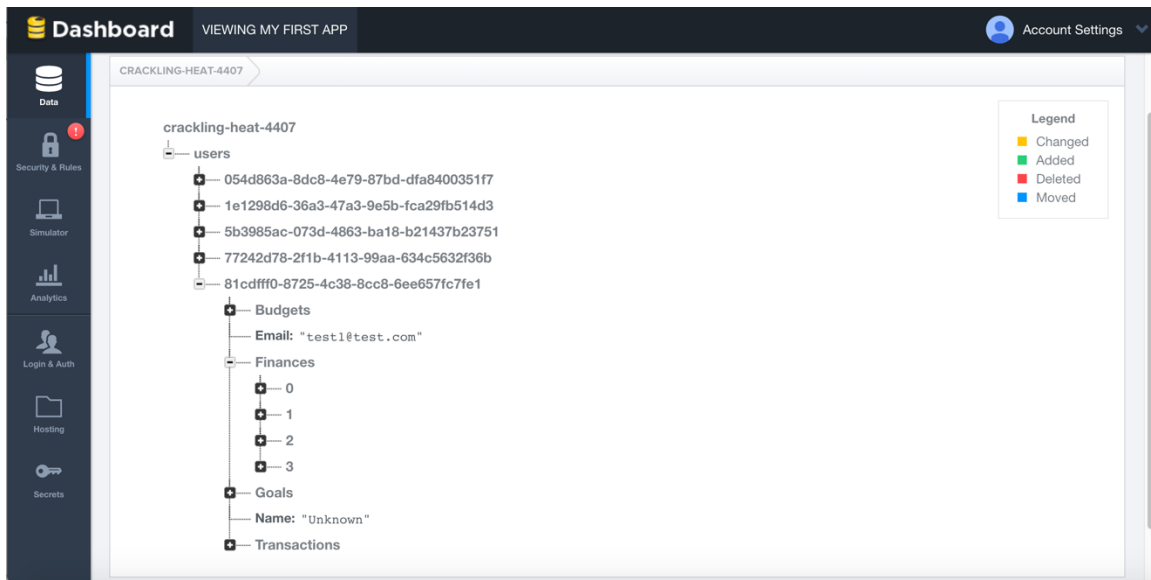
Email

Password (optional)

SIGN IN

REGISTER

Figure 4.8 Screen shot for login/register page



Dashboard VIEWING MY FIRST APP Account Settings

CRACKLING-HEAT-4407

crackling-heat-4407

- users
 - 054d863a-8dc8-4e79-87bd-dfa8400351f7
 - 1e1298d6-36a3-47a3-9e5b-fca29fb514d3
 - 5b3985ac-073d-4863-ba18-b21437b23751
 - 77242d78-2f1b-4113-99aa-634c5632f36b
 - 81cdfff0-8725-4c38-8cc8-6ee657fc7fe1
- Budgets
 - Email: "test1@test.com"
- Finances
 - 0
 - 1
 - 2
 - 3
- Goals
 - Name: "Unknown"
- Transactions

Legend

- Changed
- Added
- Deleted
- Moved

Figure 4.9 Screen shot for the online database using firebase

5. Learnings

It has been a wonderful journey of discovery and progress. We have learnt from each other and come to appreciate the value in collaboration across business and technical aspects on building a mobile application.

Open and frequent communication and a general curiosity helped us build a healthy team dynamic. Given the demands on our schedules, we mostly met online using Google Hangout. Flexibility around each others schedules and efficiency during meetings became the bedrock of our productivity.

The most valuable learning was that great progress can be made when everyone has clarity of tasks and there is a general feeling of comradery. Each of us made valuable contributions and picked up some skills that will serve us well beyond this project.

From technical perspective, we found two key learnings:

1. Should start from designing the overall layout at the beginning if time permits.

In our project, we designed the User Interfaces for different features at the beginning of each spiral without an overall design on the whole application. Consequently, we had to redesign the overall UI layouts in the last stage of the project to make it more user-friendly.

2. The decision trees behind our Chat feature can be implemented in a more dynamic way.

Decision tree is chosen to be the logic for the Chat feature. It turned out to be an effective method to provide interactions with users. The decision trees in our project are hard coded due to the time constraint. Nevertheless, we would rather to implement the decision trees in a more dynamic way. For instance, the content of decision trees can be stored in files, e.g. XML files, and we can define a method to load the files into tree structures at runtime. Whenever the users trigger the chat feature, the application should build a decision tree with a random content file. In this way, users can expect different conversations when they chat with “personalized coach”. In addition, it will make it easier to add more decision trees in the future.

6. Group Member Contributions

As a productive team, each member in our group contributes significantly and evenly into this project. The contribution of each member is summarized in the Table 2 below.

Table 2. Contribution of group members

	Haider	Jingya	Yue
Spiral 1 & 2 (Finance, Goal, Budget, Transaction features)	<ul style="list-style-type: none"> Initial ideas and vision about this application Design Moqup UI screens Logic for budget tracking 	<ul style="list-style-type: none"> Finance feature Transaction feature 	<ul style="list-style-type: none"> Goal feature Budget feature
Spiral 3 & 4 (Chat feature, Reward Mechanism)	<ul style="list-style-type: none"> Content of decision trees for the chat bot 	<ul style="list-style-type: none"> Build tree structure and methods Reward Mechanism 	<ul style="list-style-type: none"> Revise content of decision trees Implementation of decision trees
Spiral 5 & 6 (Online database, Refine UIs)	<ul style="list-style-type: none"> Final Presentation Slides Design 	<ul style="list-style-type: none"> Online database Login/out page 	<ul style="list-style-type: none"> Refine overall layout Summary page
<ul style="list-style-type: none"> The team collaborated to develop the written documents and class presentations. 			

7. Specialist Context

I came to this course with few expectations and lots of hopes. Given the demands on my schedule, I knew I would not be able to dedicate much time to the project. A few months later, I am proud of the result of our labor.

A few highlights are the swiftness and efficiency of my partner's in understanding the concept and delivering a clean, easy to use and understand prototype that works. Moreover, it fuels the conversation about what is possible in future iterations.

Equally important is the critical feedback and constructive guidance we received from Dr. Rose, teaching assistants and also members of the class who shared feedback on what we could do with the application.

As a financial services practitioner, I feel confident that our prototype will enable meaningful progress in building a future that is simpler for the end user and develops on the technology and human trends.

I am excited about where we can take this as we develop partnerships with our network across banks, service providers, technology start-ups and most importantly a user base in Canada and around the world.

8. Future Work

We plan to continue developing Simplify Finance after the final presentation and report is delivered. As mentioned above, we will work towards simplifying the user experience, introducing behavioral nudges and deepening the decision tree for our chat bot.

We will also expand the number of beta testers to implement feedback for real users for future iterations.

One function we would consider introducing, in the next 6 months, is use of machine learning concepts so that the decision tree can learn and adapt its responses based on the inputs users are providing, the questions they are asking etc.

As we have done over the last two years with Simplify the social enterprise, we plan to continue investing in our partner network to seek capabilities and resources to chart our future course.

Over the next few months, we plan to refine our prototype, invest in more development capabilities and start extensively marketing our application on social media networks to develop a user base. To do this, we will consider whether it makes sense to continue bootstrapping or raise funds from investors that are interesting in social impact investments.

Our goal remains to make finance simple and accessible for everyone.