



Project Report

Saving Robot Advisor

April 2020
Version 1.3

IS02PT-GRP-10-SavingRobotAdvisor



1.0 Project Summary

The Saving Robot Advisor is a minimum viable product. It is mainly focused on saving interests as well as credit cash back.

To bear “easy for everyone to access” in mind, the Saving Robot Advisor requires no username or password to start with. Main functional page will be directly shown to users. The designers keep the application easy to access and direct in outcome.

Research shows over 70 per cent of Singapore’s emerging affluent used savings accounts. In other words, majority of the population who with monthly income between S\$5,000 and S\$10,600 are using saving accounts. Then how to choose a proper account will not be a small issue anymore. This is where the team starts to think about the project’s direction.

Besides saving interests, the team notice that credit cards’ cash back is another part which maximize daily earn. There are hundreds of credit cards on the market. To choose the ones suit different life styles is another headache. Thus the second main function kicks in and combined with saving account choosing.

The Saving Robot Advisor is focused on absolute monetary value which is saving interests plus credit rebate. There will be no points or miles in the scope. Bank wise, all banks on the market are taken into consideration. Users won’t miss anyone.

The system has identified the highest interest savings account and cash back credit card from each bank. Based on that, 8 savings accounts and credit cards pairs are shortlisted through primary and secondary research.



2.0 Market Research

Based on the bank's Wealth Expectancy Report 2019, published on Thursday (Dec 19) surveyed 10,000 emerging affluent, affluent, and high-net-worth individuals across Asia – including 976 from Singapore – on their saving and investment habits.

For Singapore, it defined the emerging affluent as those with monthly incomes between S\$5,000 and S\$10,600.

Affluent individuals were those with monthly incomes above S\$10,600, while high-net-worth individuals were those with assets worth S\$1.3 million and above.

In Singapore, the top financial goal for the emerging affluent was saving for retirement, while the affluent prioritised saving for their children's education and high-net-worth individuals prioritised property investments.

Over 70 per cent of Singapore's emerging affluent used savings accounts to do so, with just over 20 per cent using real estate investment trusts (Reits).

*From 'Singapore's emerging affluent prioritise saving for retirement, while high-net-worth individuals focus on property investments.' - The Straits Times



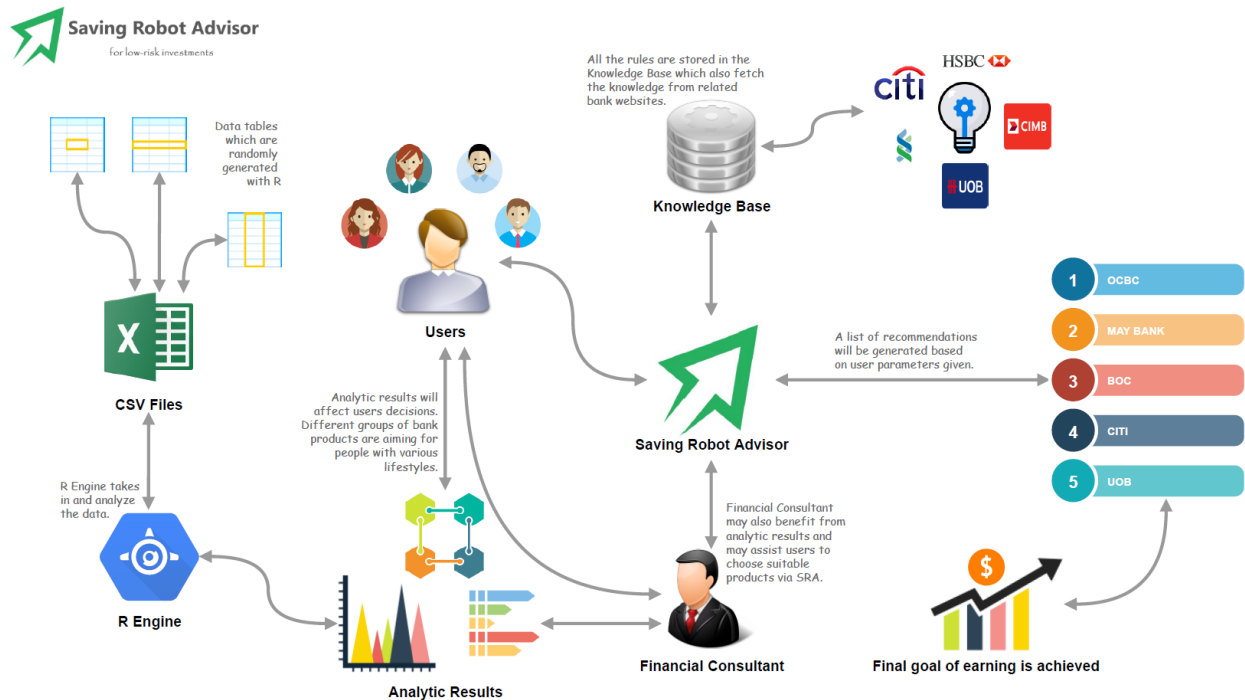


With the huge need noticed, the team starts to search the market to see if there is already a same product existing. However, there isn't even a close one.

Thus the team decides to develop the Saving Robot Advisor to fill the missing gap and help the public to choose their suitable saving/credit account easily.



3.0 System Design



This is a rule based system.

Knowledge base contains all the rules which come from official websites of the banks.

Analyzing results will provide theoretical support to users and financial consultants during choosing banking products.



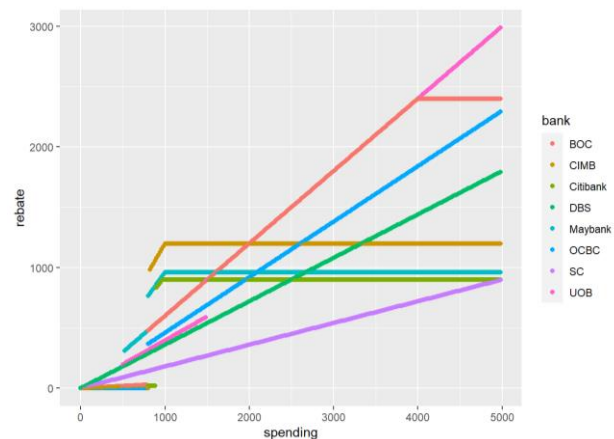
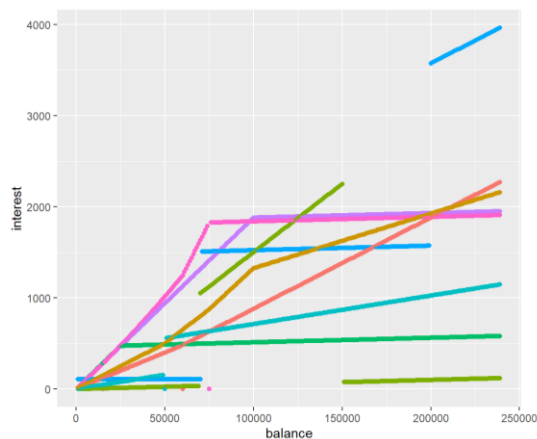
3.1 Knowledge Modeling

By asking 2 questions:

1. Is there a simple best choice for everyone?
2. Is there any pattern among different packages?

We start the knowledge discovery.

Interest and Rebate at a glance



Simulation runs for different bank to study how interest and rebate various. To study the trend of interest, income is fixed at 5000 and spending is fixed at 1500. To study the trend of rebate, income is fixed at 5000 where balance is fixed at 10000.

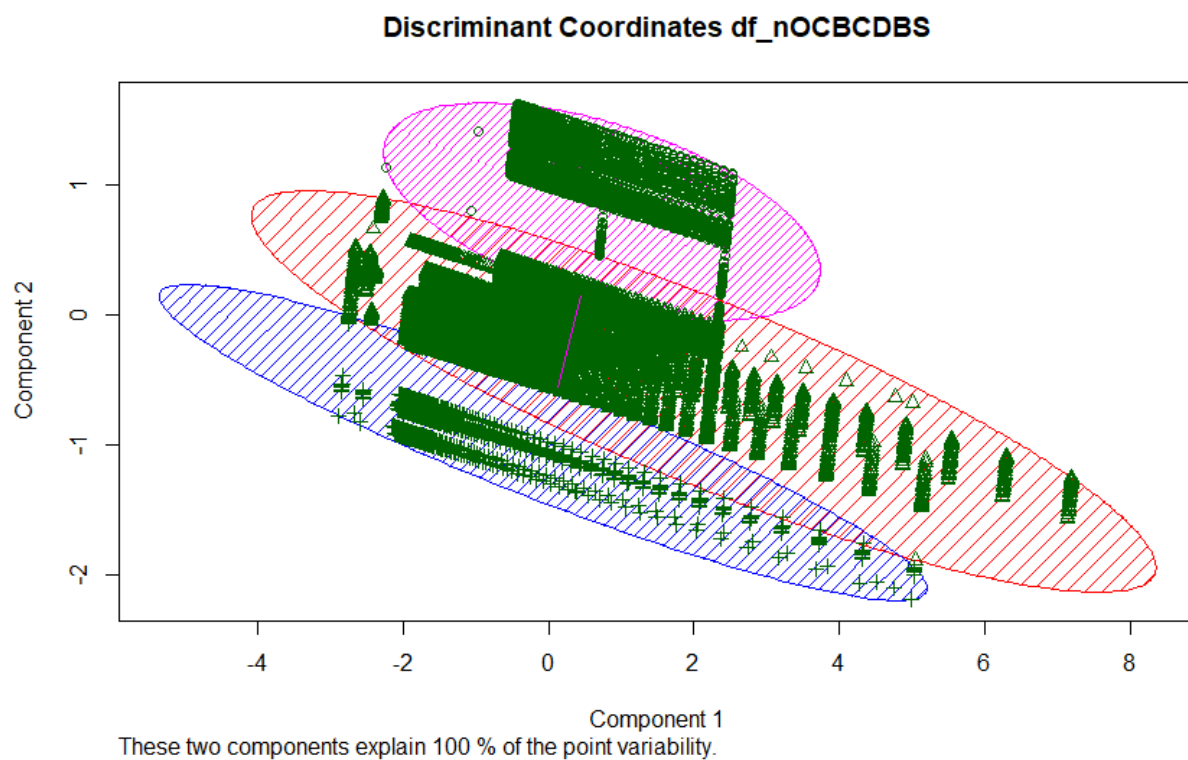
By comparing balance against spending among different banks, we may clearly see that there are “caps” in most of the banks in interest return, while OCBC is the most suitable choice when having “a lot” in saving account.

At same time, there are also “caps” in rebate, but more than half banks do not have cap while the rebate rate are typically smaller.



Clustering Analysis

To scale up the knowledge discovery, massive simulation is conducted. 600k simulated data are generated with Income 0-10k, balance 1k-100k, spending 200-10k, the spending distribution are random sampled. Clustering analysis is conducted on the simulation data to understand different nature of the saving account and credit card offered by different banks.

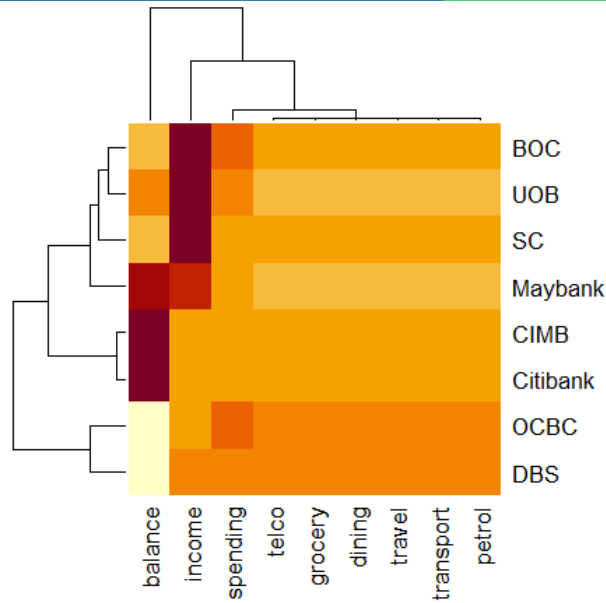


It shows that the packages could be cluster into 3 different groups. To future understand nature behind the grouping, correlation analysis is conducted

Correlation Analysis

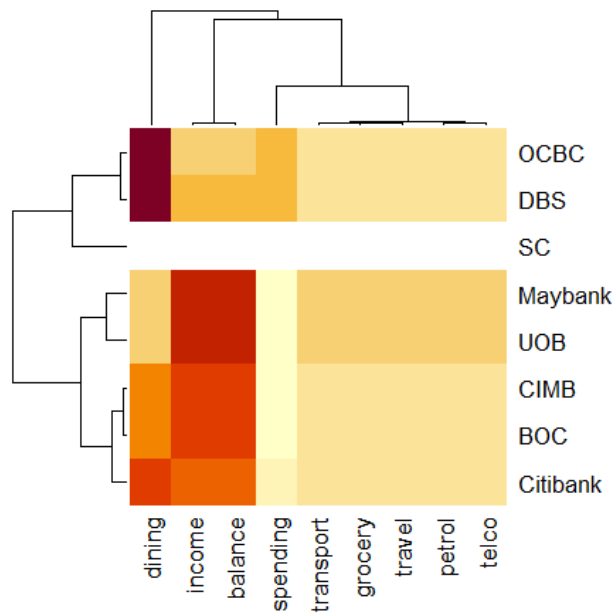
Interest rate and rebate rate's correlation with inputs are studied with heatmap as shown below






Interest Rate Correlation heatmap with different variable

It can be seen from the interest rate heat map that interest rate for bank of BOC, UOB and SC are strongly related to income credit to the saving account, whereas interest rate for Maybank, CIMB and Citibank are strongly correlate to balance. OCBC and DBS shows weak dependency.



Rebate Rate Correlation heatmap with different variable

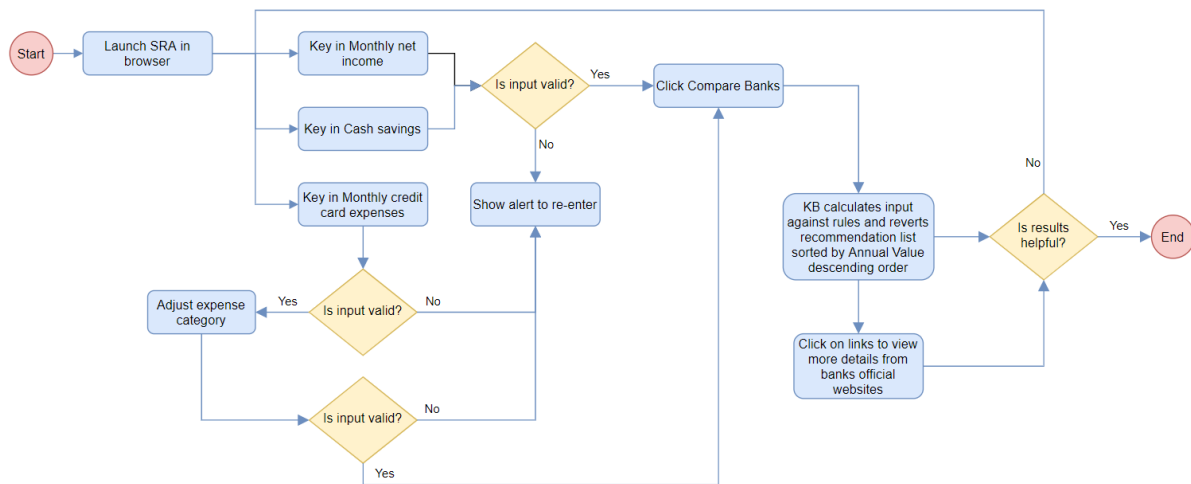




It can be seen from the rebate rate heat map that rebate rate for Maybank and UOB are strongly relate to income and balance, whereas OCBC and DBS's rebate rate are strongly depends on the spending on dining. The rest perform in between these 2 categories.



3.2 Process Flowchart

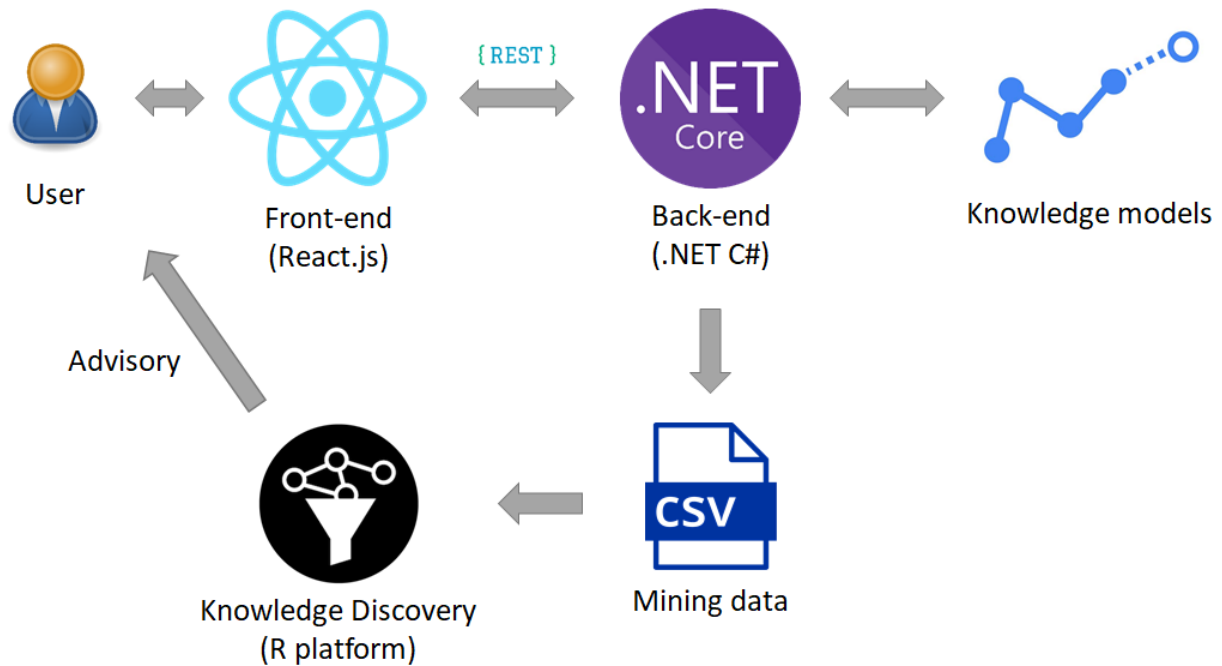


This chart shows the entire process flow of the whole system.

Users may adjust their input multiple times in order to get the most suitable combinations.



3.3 System Implementation

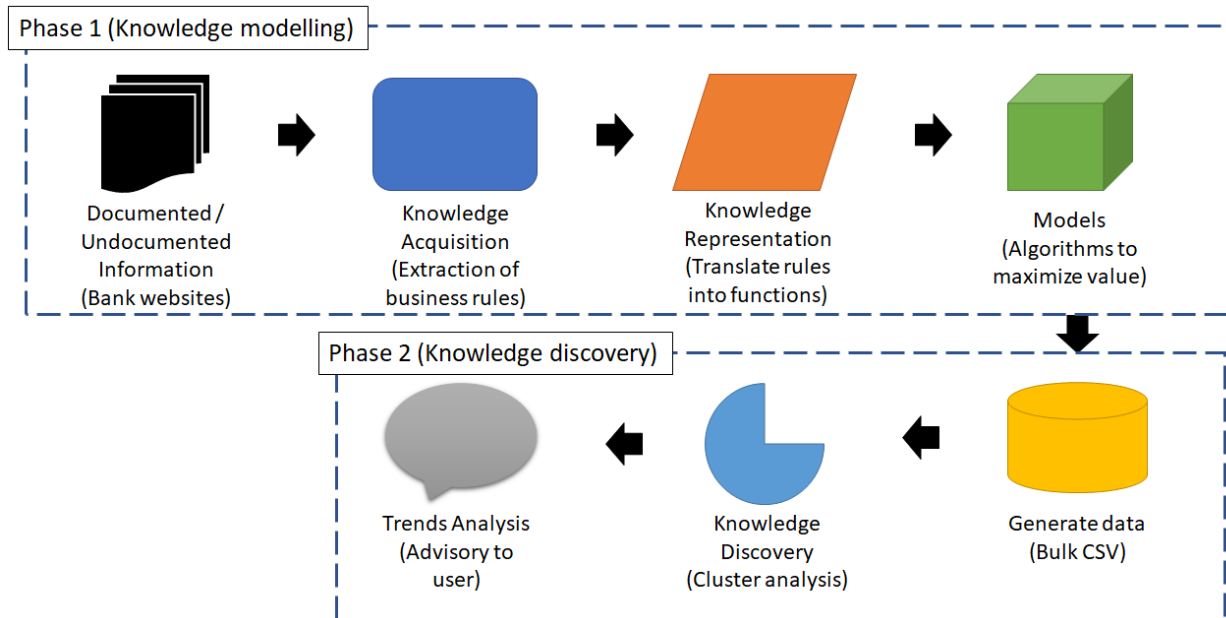


Knowledge models are stored in database as well.

We use R language to analyze patterns of customers based on randomly generated salary/expense data.



3.4 Knowledge Acquisition Process



Knowledge acquisition is from both structured source and unstructured source.

Structured source are like bulk csv files generated for pattern analyzing.

Unstructured source are for example interest rate in banks' official websites.



3.5 Business Rule Sample

Bank of China

Saving Interest Rules:

1	WHEN 'Deposit' < 5000 THEN 'Basic Interest' = 0.25%
2	WHEN 'Deposit' >= 5000 AND 'Deposit' < 20000 THEN 'Basic Interest' = 0.275%
3	WHEN 'Deposit' >= 20000 AND 'Deposit' < 50000 THEN 'Basic Interest' = 0.35%
4	WHEN 'Deposit' >= 50000 AND 'Deposit' < 100000 THEN 'Basic Interest' = 0.4%
5	WHEN 'Deposit' >= 100000 THEN 'Basic Interest' = 0.475%
6	WHEN 'Deposit' <= 60000 AND 'Card Spend' >= 1500 THEN 'Bonus Interest' = 1.6%
7	WHEN 'Deposit' <= 60000 AND 'Card Spend' >= 500 AND 'Card Spend' < 1500 THEN 'Bonus Interest' = 0.8%
8	WHEN 'Deposit' <= 60000 AND 'Salary Credit' >= 6000 THEN 'Bonus Interest' = 1.2%
9	WHEN 'Deposit' <= 60000 AND 'Salary Credit' < 6000 AND 'Salary Credit' >= 2000 THEN 'Bonus Interest' = 0.8%
10	WHEN 'Deposit' <= 60000 AND 'Monthly Payment Count' >= 3 AND 'Each Payment Amount' >= 30 THEN 'Bonus Interest' = 0.35%
11	WHEN 'Deposit' > 60000 AND ['Card Spend' >= 500 OR 'Salary Credit' >= 2000 OR ('Monthly Payment Count' >= 3 AND 'Each Payment Amount' >= 30)] THEN 'Bonus Interest' = ('Deposit' – 60000)*0.1%

Credit Rules:

1	WHEN 'Monthly Spend' < 800 THEN 'Base Cash Rebate' = 'Monthly Spend'*0.3%
2	WHEN 'Monthly Spend' >= 800 THEN 'Family Cash Rebate' = 'Dining and Movies Charges'*10% + 'Family Club Merchants'*5% + 'Public Transport Transactions'*3% + 'Supermarket, Online purchases and Hospital'*3% + 'Other Spend'*0.3%



4.0 System Development Tools



JavaScript: Frontend implementation

R Language: Analyzing

.Net: Backend implementation

SQL: Database & Knowledge Base



5.0 About

NUS-ISS

This Machine Reasoning course is a part of Graduate Certificate in Intelligent Reasoning Systems, Master of Technology in Intelligent Systems offered by NUS-ISS.

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