



Project Report

Saving Robot Advisor

April 2020
Version 1.2

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



BEST SAVINGS ACCOUNT

	中國銀行 BANK OF CHINA SMARTSAVER	CIMB FASTSAVER	DBS MULTIPLIER	Maybank SAVE UP	OCBC 360	Standard Chartered BONUSSAVER	Standard Chartered JUMPSTART	UOB ONE
BASE INTEREST	0.25%	1.00% (first \$50k)	0.05%	0.1875%	0.05%	0.05%	2.00% (first \$20k)	0.05%
SALARY CREDITED	0.80% (\$2k - \$5,999) 1.20% (\$6k & above)	—	1.55% - 3.80%	—	+1.20% (at least \$1.8k)	+1.00% (must be >\$3k)	—	1.25% (at least \$2k) + (spend min \$500)
GIRO (BILLS)	0.35%	—	—	+0.30% 1 category	—	—	—	—
CARD SPEND	0.80% - 1.60% (depends on amount spent)	—	(credit salary) + more categories & higher amounts transacted	+0.80% 2 categories	—	—	—	—
INVESTMENTS	—	—	—	+2.75% 3 categories	—	—	—	—
HOME LOAN	—	—	higher interest	—	—	—	—	—
INSURANCE	—	—	—	—	—	—	—	—
EXTRA / BONUS INTEREST	—	1.80% (next \$25k) 1.50% (next \$25k)	—	—	—	—	—	—

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HOME LOAN	—	—	higher interest	—	—	—	—	—
INSURANCE	—	—	—	—	—	—	—	—
EXTRA / BONUS INTEREST	—	1.80% (next \$25k) 1.50% (next \$25k)	—	—	—	—	—	—

BEST CASHBACK CREDIT CARDS 2019

Big Ticket Items	Wedding Travel Reno	True Cashback	HSBC Advance	Standard Chartered Manhattan World	UOB One
Groceries	Sheng Shiong	Citibank Cashback	CIMB BANK Visa Signature	Maybank Family & Friends	
Online Shopping	CIMB BANK Visa Signature	Citibank SMART			
Dining Out & Going Out	Family	CIMB BANK Visa Signature	UOB YOLO		
No Min Spend	Citibank SMART	POSB Everyday	Standard Chartered Spree		

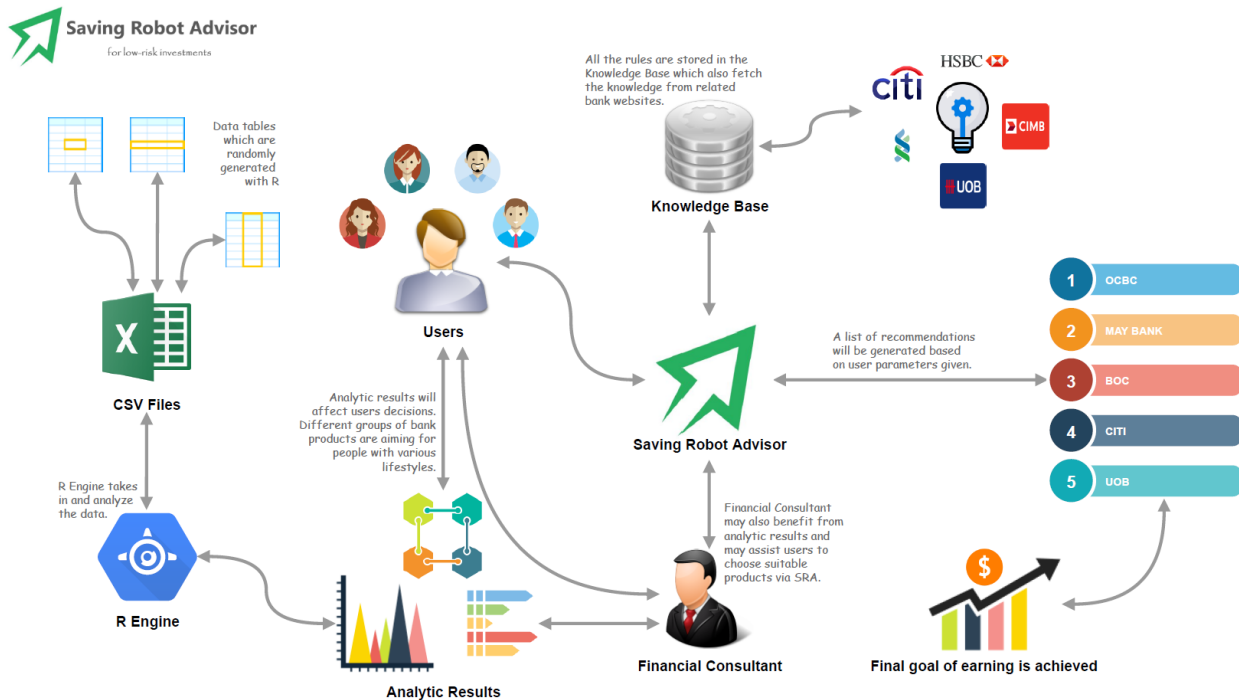
Seedly
seedly.sg

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.

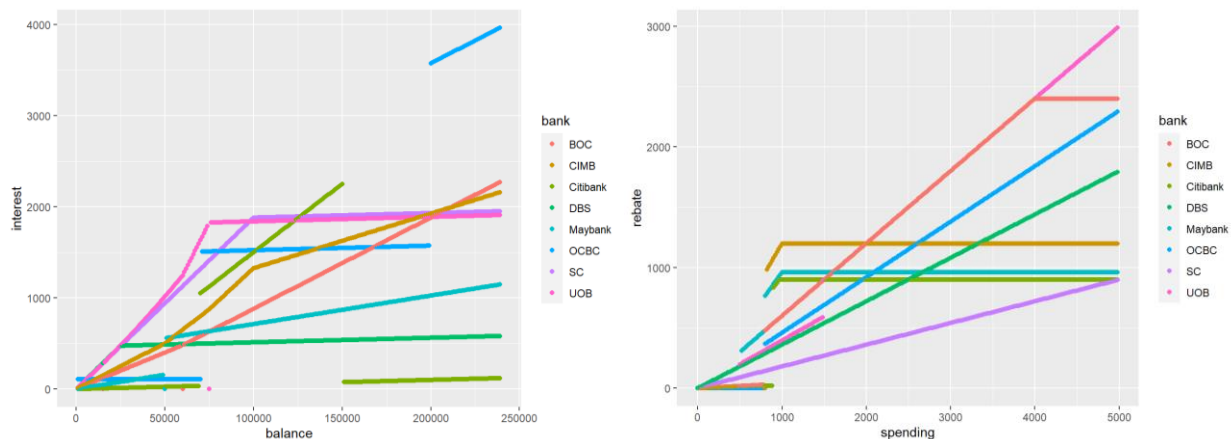


3.1 Knowledge Modeling

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.

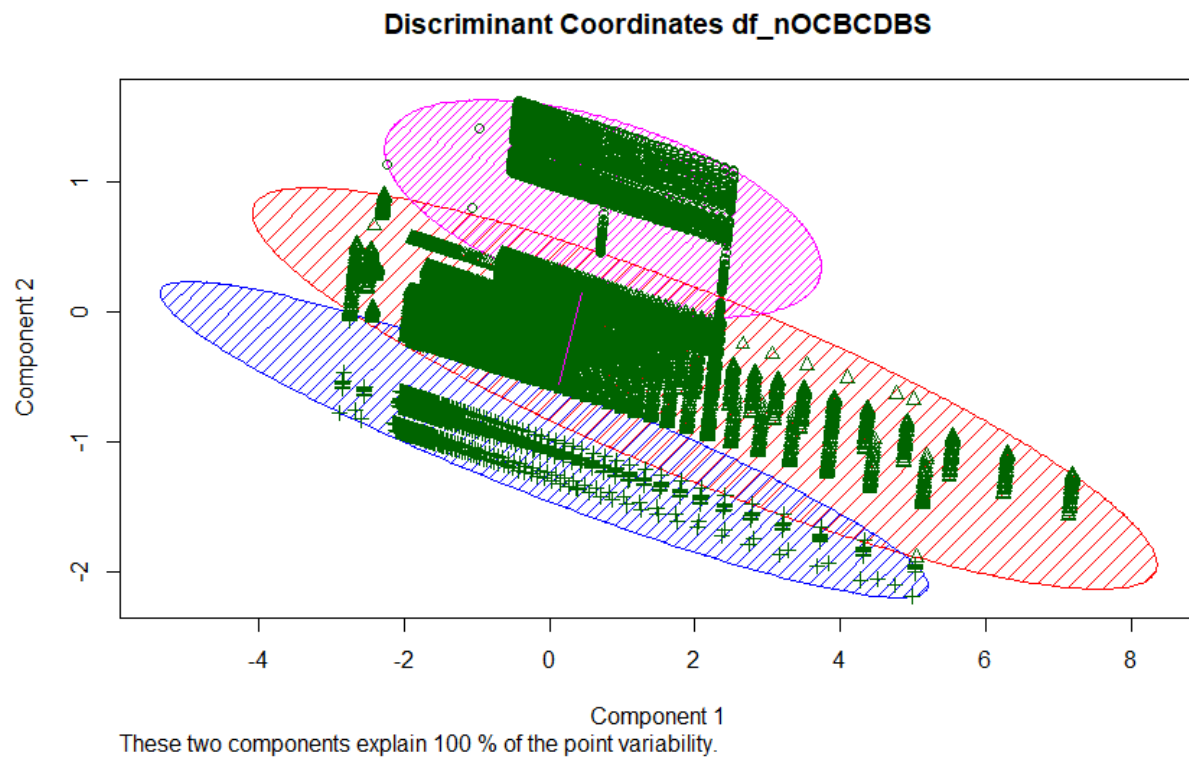


By comparing balance against spending among different banks, we may clearly see that there are “caps” in most of the banks in saving while OCBC is the most suitable choice when having “a lot” in saving account.

At same time, there are also “caps” in spending but more than half banks are linear.

This provides us a rough insight on how current saving accounts and credit cards act.



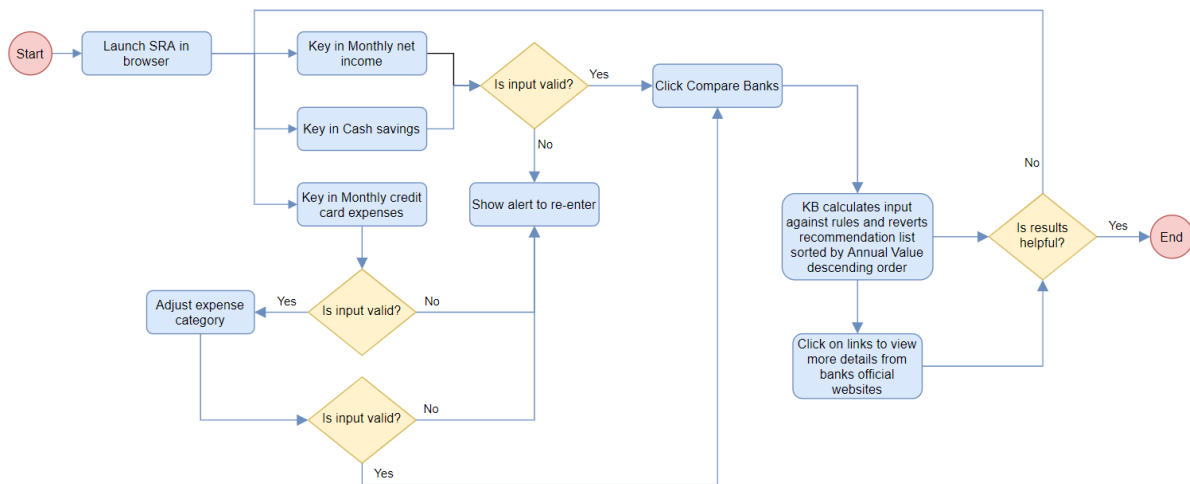


This pattern shows the patterns when combining saving accounts and credit cards of different banks.

They tend to categorize customers into 3 groups.



3.2 Process Flowchart

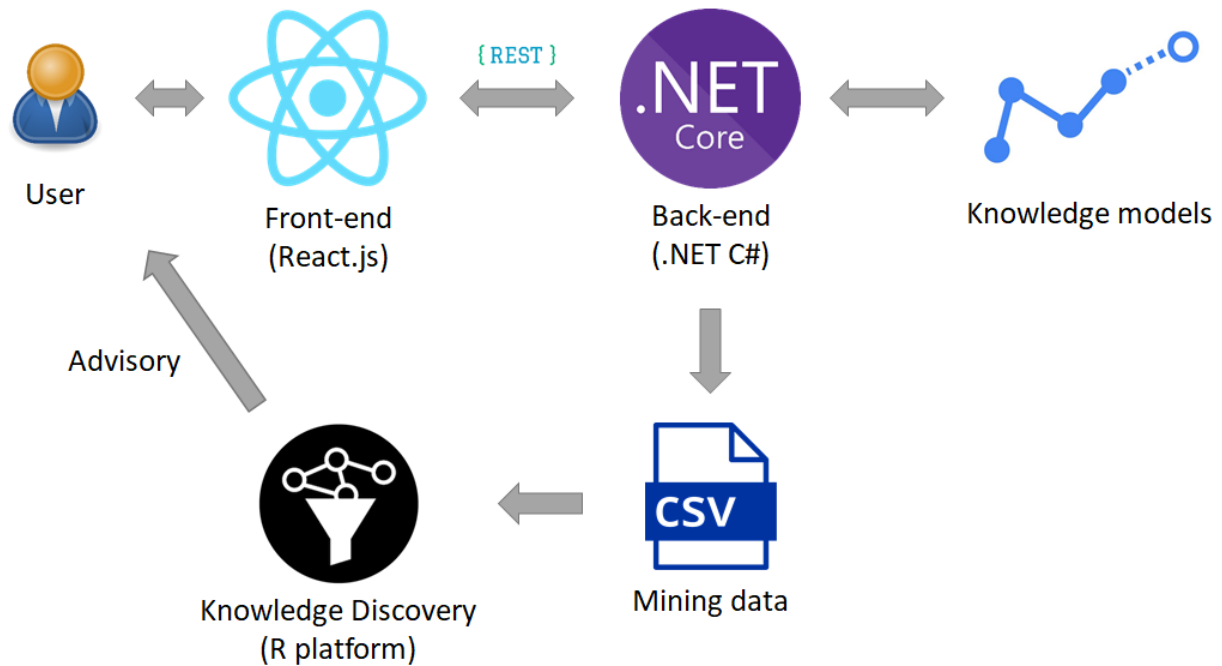


This chart shows the entire process flow of the whole system.

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



3.3 System Implementation

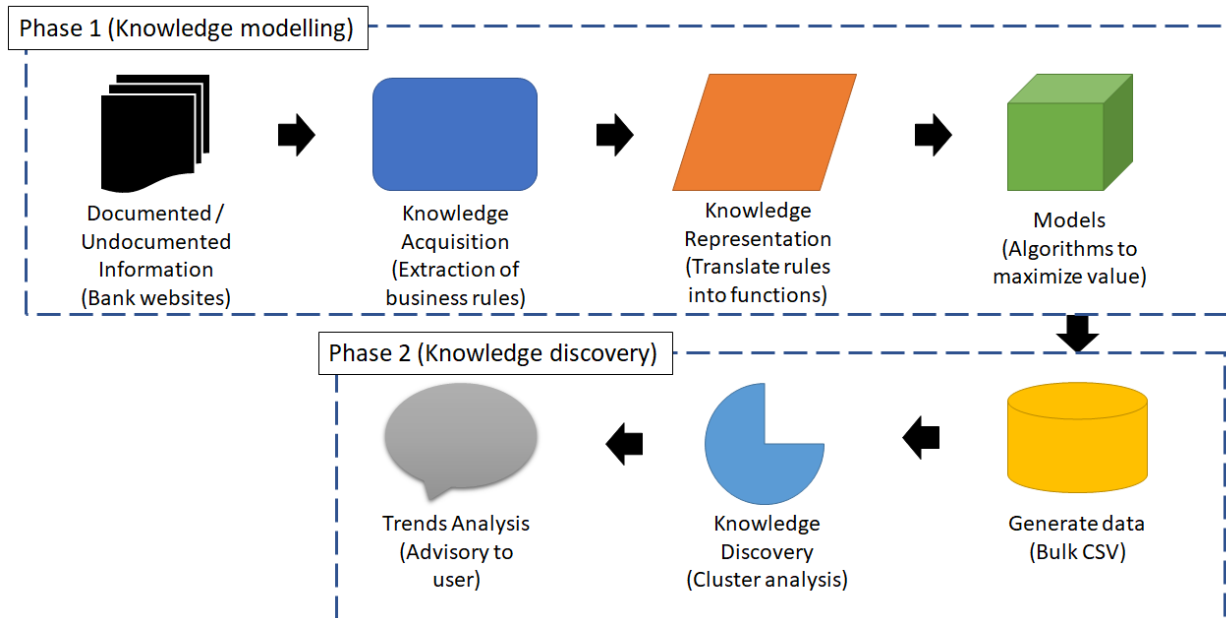


Knowledge models are stored in database as well.

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.

Lectured by GU Zhan (Sam)

zhan.gu@nus.edu.sg

This project report is prepared by NUS ISS IS02PT Group 10

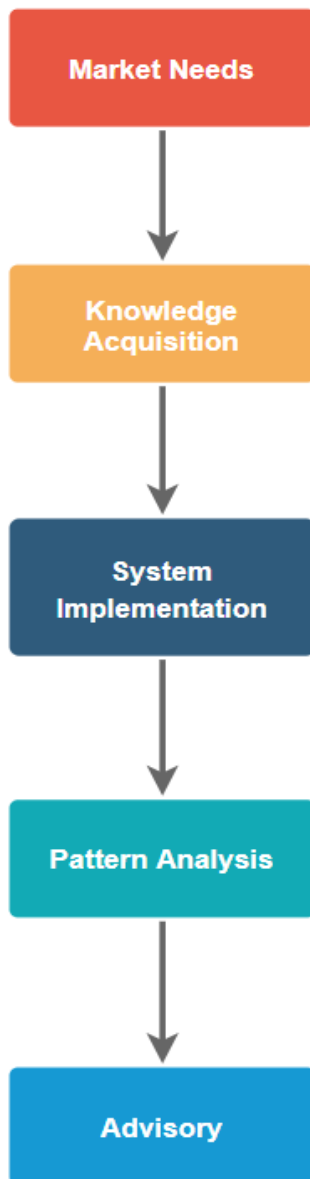
Any enquiry on this report, please contact

xiaoguang_dong@u.nus.edu



APPENDIX A:

Project Proposal



In Singapore, the top financial goal for the emerging affluent was saving for retirement and over 70 per cent of Singapore's emerging affluent used savings accounts to do so. Adding on to this, credit card expenses is another huge pool of transactions which also brings additional earns to customers.

Our knowledge for the system is gained from both official websites of the banks as well as pattern analyzing. Official websites and documentations are translated into rules contained in knowledge base while pattern analyzing results serves the purpose of advisory to customers and financial consultants. The knowledge acquisition is the very first step and foundation of the whole system built-up.

The Saving Robot Advisor System is robust and straight forward. It is a combination of JavaScript frontend, .Net backend and MSSQL database. Plenty of testing has been done prior to go-live. With the concept of easy to use, the system provides users with functionality of minimal guidance needed.

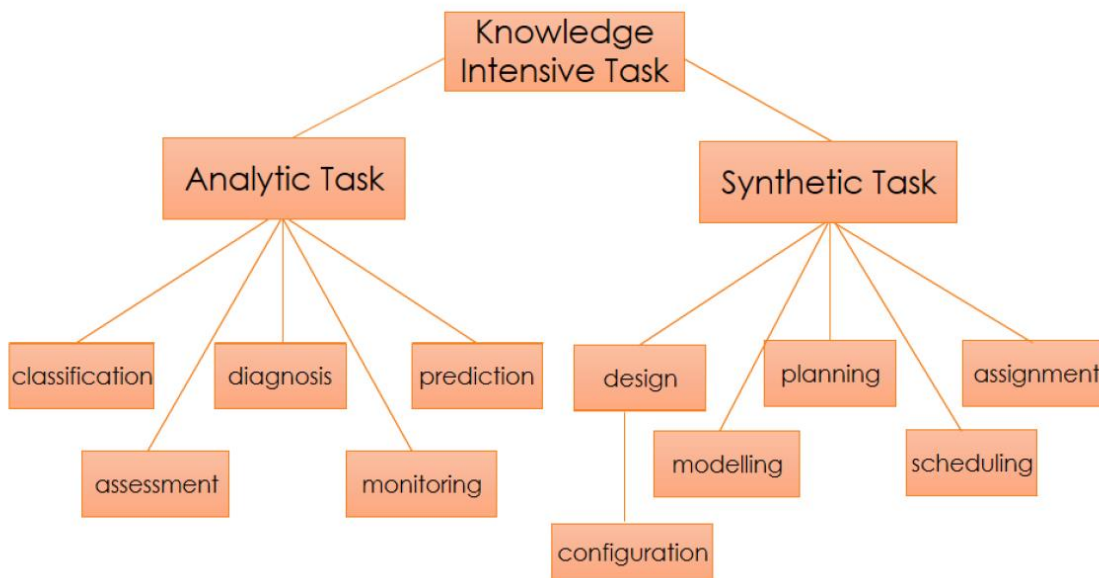
R language has been chosen to perform the analyzing part. The data feed-in comes from two sides: rules in knowledge base built earlier and massive user data generated coving from hundreds to hundred-thousands. With the comprehensive analyzing done, we are confident to say "we know the market, we know the banks and we know the customers".

Advisory is to be provided to bank customers as well as financial consultants. They may filter out the suitable ones among the dazzling product sea.



APPENDIX B:

Mapped system functionalities against knowledge, techniques and skills of modular courses



From MR course, two major knowledge intensive tasks are categorized. The SRA project actually combines Analytic Task and Synthetic Task. Pattern analyzing is the analytic part while bank product advisory belongs to the synthetic part.



1.4 KNOWLEDGE REPRESENTATION

Formal Logic – First Order Logic

[Example] You are investigating a case:

• Given below known intelligence (and common sense):

1. Person “**Sam**” loves animals.
2. Any person who loves animals does not kill an/that animal.
3. All cats are animals



With First Order Logic in mind, rules have been extracted from natural language, frames, formulas and so on.

2.2 KNOWLEDGE MODELS (ACQUIRED → REPRESENTED)

Rules & Decision Table

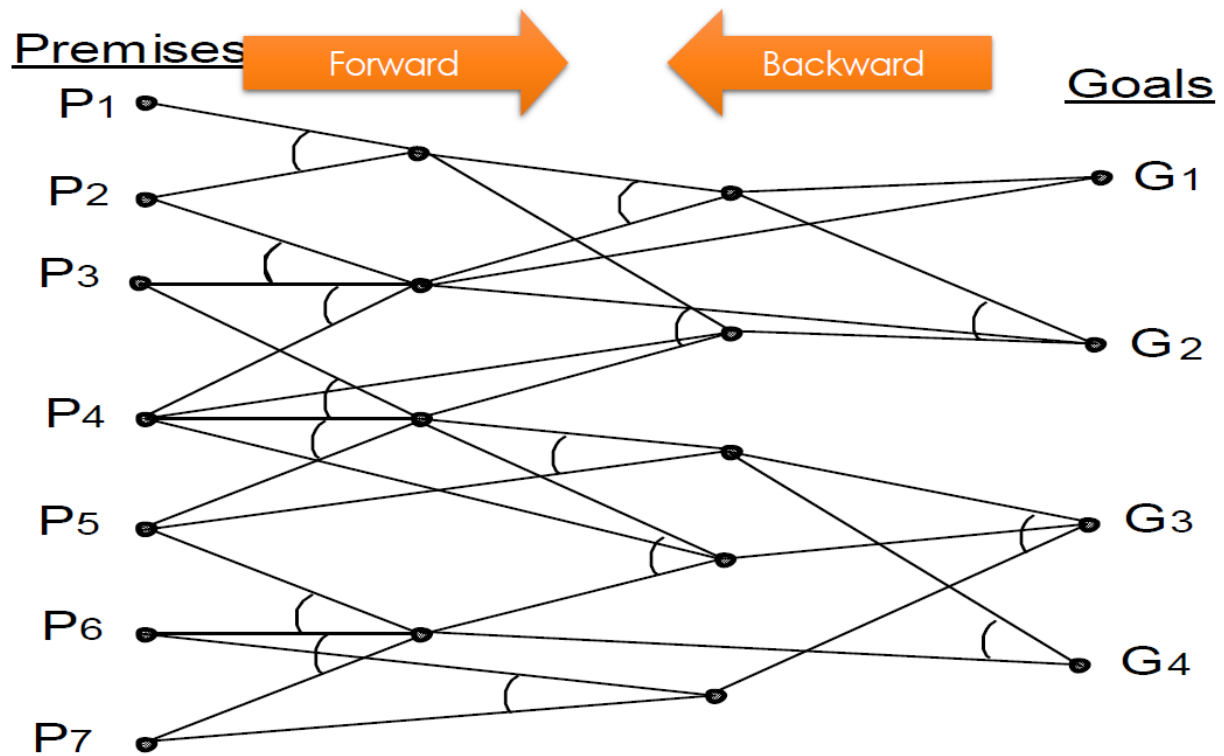
KIE Guided Rules; Decision Table



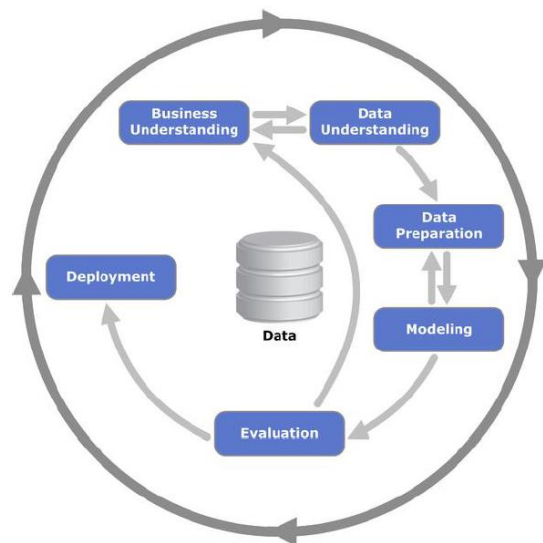
Rule No.	Condition 1	Logical Operand	Condition 2	Sub-goal
F-1	franchise-fee \leq threshold1	AND	royalty \leq threshold2	Franchise = ok
F-2	franchise-fee \leq threshold1	AND	royalty $>$ 20% x franchise-fee	Franchise = not-ok
F-?

During knowledge modeling phase, rule tables are chosen to present the rules. This might be the best way to present the plenty of rules.





Forward chaining as well as its analyzing skills is applied to the project as there is no goal pre-set to the outcome.

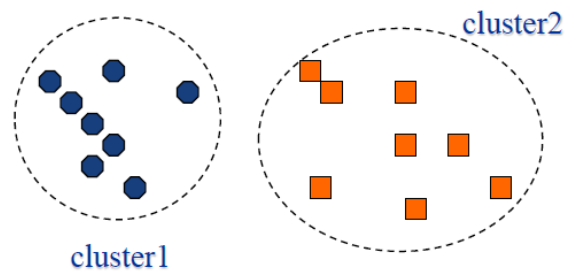


CRISP-DM is applied during the analyzing phase. The data help us to understand more and the understanding also fine-tune the data.

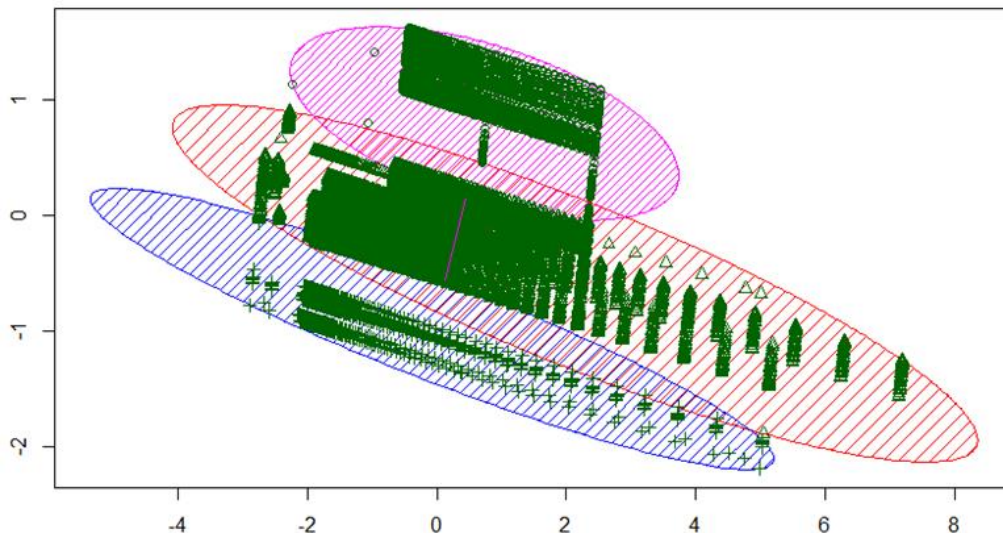


Clustering: Definition

“Partition a database so that records that have similar characteristics are grouped together”



Clustering covered in Reasoning System course is also applied during the analysis phase. Which helped us successfully grouped all the bank products into 3 clusters.





APPENDIX C: User Guide

Please refer to separate documentation naming

[SavingRobotAdvisor User Guide 1.2](#)

