'Next product to offer' for bank marketers

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Abstract While traditional campaign management in the banking industry selects quality customers for a particular product, the 'next product to offer' model selects the products to cater for the needs and priorities of each customer. A CRM research team of the Chinese University of Hong Kong initiated an 11-month joint research project with the Standard Chartered Bank (HK) on the design and implementation of a next product to offer system. The system consists of two major components: (1) data cleansing and fusion, (2) integrating bank strategies with customer information. It is the first of its kind in Hong Kong and a simplified version of the system and its implementation process is reported in this paper.¹

INTRODUCTION

As a leading financial centre, Hong Kong is home to many local and international retail banks with over 1,000 branches located in an area of 1,100 square kilometres. Due to the current economic recession, banks are aggressively looking for new business initiatives in order to survive. The majority of customers still rely on branches as their major channel for banking transactions. One popular development has been to turn branches

from typical service centres into profit centres by selling high-margin products (eg funds and insurance policies). Selling financial products in branches is considered to be most effective because frontline staff have the opportunity of a face-to-face dialogue with the customers. However, it poses two major challenges:

— branch staff usually lack sufficient and up-to-date information about the vast number of customers they have to

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handle and therefore have difficulty in identifying prospects and offering them the right products based on their needs. Even when branch staff are provided with updated and comprehensive customer data, it is difficult to process and analyse the appropriate information and make relevant proposals to the customer in the short space of time they spend with the customer in the branch — sales technique and judgment differ from person to person. How can the bank standardise and align sales processes undertaken by the frontline staff — in terms of targeted products, price discounts and communication messages — with high-level company strategies?

One possible solution is to determine the next product to offer for each customer in the bank's headquarter and then roll out the product recommendations (ie the next product to offer) to the branches or call centres through a computerised sales platform (eg eFinance system of Siebel) for frontline staff implementation. Apart from the sales channel, direct marketing is another valuable channel for exploiting such opportunities. This approach not only creates added value for the bank, but it also significantly improves customer service by reducing nuisance calls and 'junk' mail; and helps the bank to build up good relationships with customers by offering them the right product at the right time with a good price. The design of a rigorous next product to offer model is not a simple task, and it involves four steps as described below.

Understanding the customer

Typical questions raised by bank marketers to better understand customers are: Which product does this customer need? Can he/she afford the products?

Has he/she already bought the product from competitors? How much discount should the bank offer to him/her to close the sale? What is the most effective communication message to stimulate his/her interest in the product? Answers to these questions require updated and rigorous information on customer demographics (eg life stage) and behaviour (eg life style, gambling), their price sensitivity and risk preferences, an understanding of their socioeconomic status (eg income, occupation) and an assessment of their relationship with competitive banks. The banking industry already has more of this kind of information than many other industries, but still a large part of it is either missing or outdated.

Therefore, the challenge is not only to obtain updated information for each customer, but also to use the information to determine the best time to offer the most relevant products. Due to the extensive use of electronic payment methods in Hong Kong, most of the required information is hidden in transaction data, customer profile data in product application forms and even in external databases (eg Hong Kong Government Census, property transaction records, directories of professional organisations). For example, a bank might conclude that a woman may be pregnant if she recently had frequent credit card transactions with maternity-related merchants. This signals a major change in the customer's life and new needs will arise which may present an opportunity to sell a new range of financial services; a credit line to settle medical bills; an insurance policy for the protection of the family; a new home and more aggressive saving objectives for the future. Unfortunately, most of this kind of raw data is not currently available for analysis until it is pre-processed and cleansed. Therefore,

the reaction from the bank to this change is too slow.

Data cleansing and fusion

Data cleansing refers to the standardisation, classification and reorganisation of data into a usable and meaningful form. It is time consuming, but it is the first and most fundamental step in converting raw data into actionable information. This information will subsequently be used and translated into various marketing variables and fed into statistical formulas and marketing rules to determine the next product to offer for each customer. Some of these variables are composite variables; that is, their values depend on many other variables. For example, a person's life stage is determined by his/her age, sex, marital status and age of his/her child. This combination process to produce the composite variables is referred to as data fusion.

Integrating bank strategies with customer information: Next product to offer

A 'customer focused' marketing strategy in response to the changes in the market place is the most important element in deriving a successful next product to offer plan.^{2,3} The strategy will usually be based on internal business requirements as well as a thorough read of the external market situation. The computerised rules (bank strategies) are applied to each customer (customer information) to deduce the selling sequence of products the customer needs and can afford. Based on a combination of customers' preferences and historical data, the marketer will decide whether the selling should be carried out via a direct marketing campaign or through the branches or other sales channels.

Feedback

In order to monitor the system, a feedback loop is designed to track customers' responses and the results are used to review and fine tune the marketing strategies.

The process to build the next product to offer system is summarised in Figure 1.

Traditionally, banks have adopted a product-driven approach in which customers are 'blanket' selected for a particular product based on their affordability. This leads to customers receiving direct marketing calls and materials, which are not relevant to them, and inconsistent with the best practice of customer relationship management (CRM) principles.⁸ On the contrary, the next product to offer concept is the selection of products catering for the specific needs of each customer.⁵ It is a customercentric approach in which different customer attributes are taken into consideration in the product selection process.

A CRM research team of the Chinese University of Hong Kong initiated an 11-month research project for the Standard Chartered Bank (HK) in the design and implementation of a next product to offer system. The project objective is to assist the bank in selling financial products to customers who have 'reasonable levels of income'. The aim of this paper is to share with the readers the authors' 11-month experience of implementing the next product to offer system. Due to the nondisclosure agreement signed between all parties involved, only a simplified and modified version of the implementation process with omissions on operational details is reported. The parameters, rules, measures, bank strategies and examples cited in this paper may be hypothetical and they are used for illustration purposes only. Nevertheless, the underlying

Figure 1: Summary of the processes involved in the project

Table 1: Information required to answer the marketing questions

Marketing questions	Information required to answer the questions	Data sources
Which wealth management products does the customer need? Can the customer afford these products? Has the customer already bought these products? Should any discount be offered? At what level? What is the best communication message?	Life stage, Occupation, Risk preference, Wealth Income class, Social class External product holding with competitive banks, Loyalty Price sensitivity Sex, Behavioural variables such as gambling, travelling, life style	Product application forms, credit card data, payroll data, autopay data, money transfer data, internet banking data, branch banking data, phone banking data, external databases response to past campaigns

principles and the logic of this paper are almost the same as the system the authors built. The paper is organised into four sections. The first is the 'Introduction'. A sketch of the data cleansing and data fusion procedures are summarised in the second section, and the integration of the bank strategies with customer information is presented in the third section. The conclusion is reported in the last section.

DATA CLEANSING AND DATA FUSION

Name, Hong Kong Identity Card number (a unique identification code for each citizen), birthday, gender and

address are legally required to open a bank account in Hong Kong.

Understanding a customer requires more than this basic demographic data, however, and one of the research objectives was to extract important marketing information for each individual customer using all static and dynamic transactional data available in the bank. The key marketing variables to be extracted and the data sources to be used in this study are summarised in Table 1.

Some of the important demographic and socioeconomic information were asked at the time of credit card or loan applications, but such questions were not necessarily answered. Even if they were answered, declared information can easily

become outdated and a customer has no obligation to update his/her latest income status with the bank. Transactional data (eg deposit balances) should be helpful as they are always current and updated. However, many customers also bank with several other banks⁶ and information deduced from a single bank's transactional data is always incomplete. More seriously, some key marketing variables (eg price sensitivity, life stage etc) cannot be directly observed. Instead, these variables can only be deduced by combining information extracted from different sources. Therefore, the greatest challenge is to resolve the missing data problem. The solution consists of two steps, namely, data cleansing and data fusion. While data cleansing includes the standardisation, classification and reorganisation of data into usable and meaningful forms, data fusion combines all quality data into key marketing dimensions to be utilised by bank marketers.

Data cleansing

In this project, there were five major cleansing tasks.

Address cleansing

In Hong Kong, there are no postal (Zip) codes and most of the historical addresses in the bank were not formatted. Therefore, an address-cleansing tool with an extensive address knowledge base was used to convert all the unformatted text addresses into formatted addresses. The formatted addresses were each attached with a geocode used for subsequent address-matching purposes. Moreover, each of the formatted addresses was used to identify the code of its surrounding street block, and the median household income of each street block could be extracted from the Hong Kong Government Census database. Then, the

median household income was used as the criterion to classify addresses (ie into a group of street blocks) into meaningful housing categories (eg prestige, middle class etc), which then became a proxy variable for estimating a customer's social class. The social class variable when combined with other variables could later be used to estimate income.

Householding: Deduction of household relationship

Householding is a process of identifying customers who live together in order to determine the nature of their relationship. Since most customers provided the bank with residential phone numbers as a means of contact, this was a readily available identifier. First, household was defined as a number of different customers sharing the same residential phone number. Then the residential phone number was used as the key to identify members of each household. Once customers were considered as a household, last names, age differences and gender were used to determine their relationship. For example, customers were husbands and wives if their last names were different and their age difference was relatively small (say within ten years). On the other hand, customers were fathers and daughters if their last names were the same and their age difference was relatively large (say, more than 25 years). Householding information when combined with other information could help to update customers' marital status and life stage. Moreover, by using this information, the bank could also design bundled products for families to increase their loyalty to the bank.

Credit card merchants' classification

All credit card merchants worldwide are already categorised into different but

generic business types (eg airlines, hotels etc) when they first join the Visa/MasterCard network/franchise. This worldwide classification scheme is named 'Merchant Classification Code (MCC)'. Since MCC was not tailor-made for Hong Kong, it was necessary to enhance the existing MCC to reflect better the needs of local bank marketers by re-classifying merchants into over 30 categories that are more relevant to conducting business in Hong Kong. For example, merchants in each category were further divided into 'luxury merchant' and 'non-luxury merchant' types based on the range of card spending with each merchant and the mapping against external data sources (eg list of luxury restaurants in tourist guidebooks). This enhanced classification scheme helped to produce many behavioural and lifestyle related variables for customers. For example, frequent transactions with large and frequent spending with luxury merchants indicated that the customer had a luxury lifestyle, and frequent transactions at casinos in Macau implied a pattern of gambling behaviour.

Company classification for autopay and money transfer transactions

Autopay and money transfer services are widely used by bank customers in Hong Kong. These services allow payments to be made from customers to designated recipients through the bank on both a regular (ie autopay) and non-regular (ie money transfer) basis. Typical payment transaction types include: school fees, utility bills, rental, insurance charges, mortgage payments, credit card payments, charity donations, membership fees of professional associations etc. All companies receiving transfer payments electronically from customers were classified by their business categories (ie

banks, insurance companies, schools etc) to allow correct understanding of the meaning of the transaction for updating the customer's status. For example, a school fee payment to a high school suggested that the customer is married and has a child aged between 12 and 17. A payment to another bank allowed the discovery of a customer's hidden relationship and product holdings with competitors.

ATM location classification

Automatic Teller Machines (ATMs) were classified by their locations (ie factory areas, business districts, shopping mall, college, hospitals etc) so that it could be deduced where the customer's office was located and where he or she worked; or where his/her preferred shopping mall(s) were. For example, frequent cash withdrawals from ATMs located near colleges or universities indicated that the customer might be a student or a college lecturer.

Data fusion

Key marketing dimensions can be constructed by fusing various signals and information from both static and transactional data, and they are categorised into five areas: demographics, socioeconomics, relationship variables, wealth and risk preference and behaviour variables.

Demographics

Marital status is always asked and sometimes answered, but the data are often outdated. They could be updated by combining information from a customer's declaration, household relationship projection, the bank's transactional data and external census data provided by the Hong Kong

Government. The fusion process is illustrated with the updating rules below:

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If    declaration = 'married'
    then current marital status = 'married'
Else if (recent declaration = 'single')
    or (declaration of a male customer at age 50 or older = 'single') or
    (declaration of a female customer at age 45 or older = 'single')
    then current marital status = 'single'
Else if Householding relationship = 'husband or wife or father or mother'
    then current marital status = 'married'
Else if Householding relationship = 'brother or sister'
    then current marital status = 'single'
Else if there was school fee payment through autopay
    then current marital status = 'married'
Else if there were repeated credit card transactions of 'maternity/baby product related merchants'
    then current marital status = 'married'
Else if (sex = male and age ( $\geq 33$ ) or (sex = female and age ( $\geq 30$ )
    then current marital status = 'married'
Else if (sex = male and age ( $\leq 27$ ) or (sex = female and age ( $\leq 25$ )
    then current marital status = 'single'
Else current marital status = 'unknown'
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Life stage marketing has been widely used by bank marketers for many years but this information is not usually declared by customers. Fortunately, it can be deduced using a combination of variables: marital status, sex, age and age

of children (if any). Since marital status had already been updated according to the process outlined above, the next step was to determine if the customer's current life stage consisted of a family or not. For some customers, this could be deduced by a declaration of their child's age. Others' family status could be deduced from the bank's transaction data of school fee payments to kindergartens/primary schools/secondary schools/colleges and universities. Observations and projections were also made from the previously mentioned 'Householding' analysis. If the child's age was not observed, it could still be deduced from the mother's age with the help of the knowledge base inferred from the Hong Kong Census data. For example, census data suggested that most mothers aged between 30–35 are likely to have a child less than six years old. If a female customer aged 32 was confirmed 'married', her projected life stage would be 'married with pre-school child'. When a customer was a male and his wife was not identified in the household analysis, the assumption would be that his wife would be five years younger and the child's age deduced according to the census data.

Socioeconomics

Occupation and industry were always asked but seldom answered, unless they were required in certain loan applications. Fortunately, most customers provided the bank with their office phone numbers for contact purposes and some customers even declared details and names of the companies they work for. In Hong Kong, large organisations tend to reserve a block of phone numbers starting with the same prefix (for example, 2609 XXXX is the phone number of a university with 2609 as its prefix). Therefore, the phone number prefixes of

all government departments, public organisations, listed companies and major corporations were deduced and collected and it was subsequently possible to determine in which company a customer worked by matching their office phone numbers with the prefixes. Once it was possible to identify in which company a customer worked through self-declaration or the matching of office phone numbers, the company names were then standardised and classified into different industries. When the industry information was combined with other variables (eg social class, education etc), it was possible to make a calculated guess about occupation. For example, a person working in a hospital and living in prestige housing was likely to be a doctor.

Income class: While income proof is a mandatory requirement for credit card and loan applications, it is not for other product applications (eg deposit products). For some customers, current income could still be observed from their payroll accounts and transactions. However, if income was not declared at the time of application or the declaration was/is simply outdated, the missing income could be projected by running a data mining model (eg logistic regression) with social class, life stage, gender, occupation etc. as the predictor variables.

Relationship variables

Product holdings in competitor banks:

Customers have no obligation to make known to their banks what products they hold with other banks, but these product holdings might be detected from records of electronic payments to other financial institutions (eg bank, insurance companies, fund houses etc) through autopay, money transfers or credit cards. If the payment was made to another bank, the monetary value, the frequency

count and the variability of the payment could be used to identify the products involved in the transaction. Here are some examples:

- if the payment was monthly, the amount was relatively large and it did not vary until the change of interest rate, then it might be related to mortgage
- if the payment was monthly and the amount fluctuated, it might be related to credit card charges
- if the payment was on a monthly, quarterly or annual basis and the amount was relatively small but fixed, it might well be an insurance payment.

Loyalty is a construct to reflect the relationship between the customer and the bank. Loyalty was measured in three ways:

- usage of bank services (ie total number of transactions with the bank)
- credit card usage (ie the frequency and level of spending)
- asset under management (AUM) by the bank.

Usage on each factor was first classified into three levels: high usage, medium usage and low usage, and a factor score (3,2,1) was assigned for usage = (H, M, L) respectively. The loyalty index is the weighted average of these three factor scores. A customer is considered loyal if the loyalty index is greater than a certain cutoff value determined by the bank.

Wallet share and wealth: Wealth is defined as the total AUM from all the banks. Although the authors did not have information on other banks, it could be assumed that the AUM of loyal customers was the lion's share of the targeted AUM since it was accepted that loyal customers tended to deposit the

majority of their assets with the bank to which they were loyal. A knowledge base of the observed AUM of loyal customers was built to project the wealth of non-loyal customers. Loyal customers were first classified by gender, income class and life stage into different segments. Then, the median AUM for each segment was found and used as the benchmark for the total AUM (wealth) for non-loyal customers with a similar profile.

The wallet share captured from a customer is defined as the ratio of a customer's assets managed by the bank relative to his/her total assets managed by all banks in Hong Kong, ie

$$\text{Wallet share} = \frac{\text{Observed AUM of this customer}}{\text{Projected total AUM with all banks}}$$

By definition the wallet share of loyal customers was set to 1, whereas the total AUM of non-loyal customers was the projected wealth deduced using the knowledge base of loyal customers. For example, there were 10,000 loyal customers who were single males with monthly income between US\$3,000 and US\$5,000. The median AUM of these 10,000 loyal customers was US\$500,000. Tom was a non-loyal customer with identical life stage and income class, and his AUM in the bank was only US\$200,000. Thus, the projected total AUM (ie wealth) for Tom was US\$500,000 and his wallet share was $200,000/500,000 = 0.4$.

Risk preference: Risk index (R) is defined as the ratio of high risk asset to the total observed AUM owned by a customer:

$$R = \frac{\text{High risk asset}}{\text{Total observed AUM}}$$

A customer with a large R implied that he/she was risk aggressive. For loyal customers, their portfolio and their AUM

was observed, and R could be computed easily. However, R could not be observed for non-loyal customers, and it had to be scored according to the customer profile (ie gender, life stage and income class).

Behavioural variables

Price sensitivity: This measures how sensitive a customer is to promotion incentives or price discounts. Three factors were considered in measurements:

- special promotional offers from merchants: It is common practice for the bank and certain large merchants to have joint promotional campaigns to offer price discounts on certain items to credit card users. The promotion was either in the form of advertising or via direct marketing. The customer transaction frequency and spending during the campaign period were compared with those of the pre-campaign period, in order to deduce a responsiveness rating
- number of transactions with bank's own merchants: In general, different banks already have hundreds of different merchants to offer small discounts to their respective credit card holders. If the primary motive of using the card was to get discounts from the bank's merchants, then the number of transactions with the bank's merchants would be significantly higher than that of other merchants and the customer would be considered price sensitive
- credit card bonus point redemption.

The price sensitivity index was calculated as a weighted average of the above factors.

Other behavioural variables: In addition to price sensitivity, behavioural scores were constructed for more than 15

Table 2: A sample of the behavioural variables with respect to their determining signals

Variables	Signals
1. Gambling interest	Autopay to the Hong Kong Jockey Club (HKJC), purchase of HKJC cash vouchers, ATM transactions in Macau, card transactions with internet betting vendors and card transactions on Hong Kong cruise liners leaving Hong Kong waters
2. Vacation travel	Travel insurance transactions, card transactions with travel agents, airlines and transactions made overseas
3. Business travel	Travel insurance transactions, card transactions in foreign hotels, airlines (business class)
4. Degree of luxury	Card transactions with high-end merchants and restaurants, hotels and privileged clubs
5. Amusement and entertainment	Card transactions and purchases of cinema, concert and drama tickets and karaoke-related spending
6. Pregnancy	Card transactions of maternity products and/or services outlets
7. Fashion consciousness	Card transactions in boutiques and fashion outlets
8. Health consciousness	Health insurance, card transactions in health clubs, fitness clubs, health product outlets and Chinese medicine outlets
9. Frequent dining	Card transactions in restaurants
10. IT/High technology fans	Card transactions in computer shops, video and audio outlets

variables mainly from credit card transactional data. A sample of key behavioural variables with respect to their determining signals is listed in Table 2.

The above procedures were the sketch of the actual data cleansing and fusion tasks omitting operational minutiae. The cleansed data had been validated by the bank and the results were satisfactory. Though every possible method was tried to replace as many missing values as possible, it would never be feasible to eliminate them completely. The implementation of these procedures was time consuming and occupied some 70 per cent of the total project time.

INTEGRATING MARKETING STRATEGY WITH CUSTOMER INFORMATION

The previous section described how all raw data were formatted, classified and fused to form a set of key marketing variables. The next step was to integrate the bank strategy with the customer information in order to produce a set of computerised rules, which would finally determine the next product to offer to each customer. In order to protect the

interest of the bank involved, its actions and strategies cannot be disclosed. In this section, only a simplified and hypothetical version of the system implemented can be presented. Nevertheless, the logic and the underlying spirit of this illustration are almost the same as the case study.

This paper only focuses on the selling of financial products to wealthy customers through telemarketing campaigns or branches faster than its competitors. For illustration purposes, the products are limited to wealth management products (see Table 3), and the targeted customers considered to fall into the income categories of 'very rich' or 'rich'. The life stage is simplified into 'single', 'married' and 'retired' (see Table 4).

The next product to offer model involves six marketing variables (ie life stage, income class, wealth, risk preference, loyalty and wallet share), and it was necessary to match one of the six products (see Table 3) to each possible combination generated by these six variables. Since the number of combinations is substantial, it is difficult to implement. Even if it could be done,

Table 3 Wealth management products

Code	Investment	Code	Life Insurance
V1	Unit Trust	I1	Investment plan
V2	Guarantee Fund	I2	Saving plan
V3	Bond	I3	Term plan

management would have difficulty understanding the logic and it would also pose an even tougher challenge to implement at the frontline. Therefore, a simpler alternative, which formulates the next product to offer model in four separate stages was proposed. These stages are:

- product recommendations by independent judges
- voting to resolve conflicts among judges
- product prioritisation and de-duplication
- decision on selling by campaign or by branch.

selling high margin products to customers with higher income
selling high-risk products to customers at younger life stage.

Then these bank strategies can be translated into computerised rules, such as:

If Life stage = 'single' and
Income = 'very rich'
then Investment product = 'Unit trust (V1)' and
Insurance product = 'Investment plan (I3)'

These rules are summarised in Table 5.

Stage 1: Product recommendations by independent judges

The key profile variables were treated as judges for the selection of suitable products based on different customer attributes, and three judges were assumed in the model: life stage and income class, wealth and risk preference and existing product holding

Life stage and income

Assume that the marketing strategies based on life stage and income class are:

Wealth and risk preference

Let the marketing strategies based on wealth and risk preference be:

- sell investment products to customers with greater wealth and insurance products to customers with lesser wealth
- Sell high-risk products to customers prepared to take higher risks and vice versa.

Then, the programmable rules corresponding to these strategies are reported in Table 6.

Table 4: Life stage

Code	Life stage
L1	Single
L2	Married
L3	Retired

Existing product holdings

A product upgrade strategy is to migrate a customer's current product holdings to more profitable products. The upgrade rules triggered by existing

Table 5: Product recommendations based on income and life stage

Life stage	Income			
	Very rich		Rich	
	Investment	Insurance	Investment	Insurance
Single (L1)	Unit trust (V1)	Investment plan (I1)	Guarantee fund (V2)	Saving plan (I2)
Married (L2)	Unit trust (V1)	Saving plan (I2)	Guarantee fund (V2)	Term plan (I3)
Retired (L3)	Guarantee fund (V2)	N/A	Bond (V3)	N/A

Table 6: Product recommendations based on wealth and risk preference

Risk preference	Wealth	
	Medium	High
Aggressive	Investment plan (I1)	Unit trust (V1)
Neutral	Saving plan (I2)	Guarantee fund (V2)
Adverse	Saving plan (I2)	Bond (V3)

Table 7: Product recommendations based on current product holdings

Existing product holdings	Upgraded products
Time deposit Guarantee fund Term plan Saving plan	Bond Unit trust Saving plan Investment plan

product holdings are summarised in Table 7.

Stage 2: Voting to resolve conflicts among judges

Since products are selected independently by three judges, their recommendations may or may not be conflicting. If conflicts do arise, the selling sequence will be determined by voting. As an example, consider the conflicts in Figure 2.

Product V1 receives two votes, and products V2 and I2 are tied with one vote. To break the tie, appeal is made to the profit margin principle that priority will be given to the product with the higher margin. If the margin of V2 is higher than the margin of I2, the selling sequence in consensus should be: [V1, V2, I2].

Stage 3: Product prioritisation and de-duplication

After the selling sequence has been decided, product de-duplication rules are added to eliminate some products from further consideration. If a product has already been adopted, this particular product should be deleted from the selling sequence. Moreover, it is difficult to sell expensive products to customers if they do not have good relationships with the bank. Therefore, relationship rules in terms of customer loyalty and wallet share should be incorporated as follows:

If customer = 'non-loyal customer'
or wallet share = 'low'
then remove high margin products
(V1, I1) from the selling
sequence.

As an example, the selling sequence is

Rule		Products selected
R1: (Triggered by life stage and income)	⇒	(V1, I2)
R2: (Triggered by wealth and risk preference)	⇒	(V1)
R3: (Triggered by product holding)	⇒	(V2)
Result: (R1 and R2 and R3)	⇒	(V1 [2], V2 [1], I2 [1])

Figure 2:

(V1, V2, I2) and the customer has already adopted V2. If the customer is loyal and the wallet share is large, the selling sequence after de-duplication should be (V1, I2). However, if the same customer is non-loyal or the wallet share is small, then the selling sequence will be (I2) only because V1 is de-duplicated as a result of the relationship rule.

product penetration rate of corresponding customer segments. As an example, the penetration rate of 'Bond' among various customer segments were extracted from the bank database hypothetically and are given in Table 8.

In other words, if Bond is sold to a loyal customer in segment 1 (ie very rich and single), the estimate on SSP is 10 per cent according to Table 8.

Stage 4: Decision on selling via campaign or branch

After Stage 3, the top priority product in the selling sequence should be known. The next issue is to decide whether to sell it through the branches or through a marketing campaign. It all depends on the successful selling probability (SSP) of this particular product, and the following decision rule should be considered:

If the SSP is reasonably high (say, greater than C1)
then sell this product to the customer via telemarketing campaigns
Else if SSP is not too low (say, $C_2 < SSP < C_1$) and channel preference = 'branch'
then offer this product to the customer next time when he approaches any branch
Else withdrawal
where C_1 and C_2 are cut-off values chosen by the bank.

Even though SSP is generally unknown for a particular customer, it can be approximated by assessing the existing

An example

The full model can also be illustrated with an example. Ms Lee has a platinum credit card, savings, current and payroll accounts with the bank (relationship = 'loyal'). She is married (life stage = L2). She is a specialist doctor who earns a very high income (income = 'very rich'); and she always goes to the nearby branch for service (channel preference = 'branch'). She puts most of her assets (wallet share = 'high', and wealth = 'high') in the bank in the form of a time deposit, and she is considered 'risk averse'. According to the rules above the interference is summarised in Table 9.

Based on the inference, 'Bond' is selected as the next product to offer Ms Lee. As an overall summary, the process of integrating strategy and customer information is illustrated in Figure 3.

CONCLUSION

The availability of detailed customer information and the advance in

Table 8: Unit trust penetration rate by segment

Segment ID	Segmentation criteria		Penetration rates	
	Income	Life stage	Loyal customers %	Non-loyal customers %
1	Very rich	Single	10	4
2	Very rich	Married	6	3
3	Very rich	Retired	2	1
4	Rich	Single	7	3
5	Rich	Married	3	2
6	Rich	Retired	2	1

Table 9: Inference on next product to offer (an example)

Rule	Results
R1: Product selected by income and life stage	⇒ UT and Saving plan
R2: Product selected by wealth and risk preference	⇒ Bond
R3: Product selected by product upgrade	⇒ Bond
Result: Conflict resolved by voting	⇒ Bond [2], UT [1], Saving plan [1]
R4: De-duplication based on relationship with the bank	⇒ Bond [2], UT [1], Saving plan [1]
R5: Selling by branch or by campaign given C1 = 10%, C2 = 5% and SSP of Bond is 6%	⇒ Sell Bond by branch
Conclusion: Bond will be offered next time Ms Lee visits the bank	

technology, coupled with the pressure to survive in times of economic turmoil, have led the banking industry to become more customercentric.⁷ Contrary to the traditional product-driven approach, the next product to offer model allows products to be selected according to the need and priority of each individual customer. Consequently, data from all possible sources (internal, external, transactional and static) are used to understand each customer better. Based on the objectives and strategies of the bank and the intelligence from the data, a system is designed to select the next product to offer. The underlying concept of the approach is also in line with the publication of Stone.⁸ The uniqueness of this approach lies in its ability to incorporate every detail of each customer into the decision-making process. It can also be tailored to suit the selection criteria of different marketing campaigns, and can even automate certain event-triggered marketing programmes (eg the selling of educational funds when

'life event signals' such as suggested pregnancies are detected through credit card transactions). With a feedback mechanism, it can also help marketers to adapt strategies better according to changes in the market.

This work was far from perfect and there is still much room for improvement. However, the authors believe the key learning of this project can be summarised in three areas: information, people and organisation.

Information: In almost every bank, the data quality problem has proved to be the most time consuming and difficult to resolve.^{9,10} A lot of the important information is still being kept on application forms and is not yet fully digitised. Moreover, a lot of the important marketing data has been aggregated in the data warehouse and is only being kept for a very limited time period. This makes analysis very difficult and reduces the accuracy of the model. This problem cannot be completely eliminated but it can be minimised.

Figure 3: Stages for data application

People: The ultimate objective of the bank is to maximise revenue from each customer and to serve them better through 'one to one marketing'. This requires more than just a mapping of the right product to the right customer. Instead, a tailored price (ie discount) with appropriate value-added services and relevant communication messages are also required to implement a successful one to one marketing model. Designing such a comprehensive offer for each customer requires employees from various departments to share this goal, have a good understanding of each others' roles and skills and work closely together. It requires involvement from frontline sales personnel (market understanding and selling), senior management (design of strategies), data analysts (knowledge recovery), marketers (marketing plans) and IT specialists (data warehouse and

technology). The establishment of a common vision, effective communication channels and a harmonious working environment to enable this disparate group of people to work effectively together is one of the critical success factors of this kind of project.^{11,12}

Organisation: Traditionally, banks adopt a productcentric approach to their business, and product managers used to compete with each other for the best customers, which comprise only a small fraction of the bank's entire customer base. Not only does this lead to a conflict of interests, but the needs and potential of the majority of customers are also being neglected. A customercentric approach is designed to solve this problem and at the same time increase revenue by examining the potential of each customer to the bank as a whole. This approach may lead to a change in

the entire company culture and structure, possibly replacing product managers with customer relationship managers.^{13,14} Such changes do not come fast, nor will they be met without resistance.¹⁵ Nevertheless, in the economic downturn and with an enormous pressure for survival, a gradual change is emerging. Banks are moving towards a 'mixture' of product-driven and customercentric approaches where product and other supporting departments are working more closely together to look for 'synergies'. The authors hope that their system will play an important role in capitalising these 'synergies' and lead the organisation to become more customer focused.

Finally, the experience gained from this project was invaluable, and it is hoped that this paper will stimulate more active discussions between academics and practitioners to generate more fruitful results in the future.

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