DEVELOPING RFM MODEL FOR CUSTOMER SEGMENTATION IN RETAIL INDUSTRY

Dr. Priyaranjan Dash
Institute of Business and Computer Studies,
Siksha ‘O’ Anusandhan University,
Bhubaneswar, Orissa
E-Mail: prdashjsp@gmail.com

Suryakanta Mishra
Institute of Business and Computer Studies,
Siksha ‘O’ Anusandhan University,
Bhubaneswar, Orissa
E-Mail: suryakanth.mishra@gmail.com

ABSTRACT

Many of the research tools used by sophisticated consumer marketing companies for new product development fall into the broad category referred to as "market segmentation." Recently some of these segmentation techniques have come under considerable fire. In this article we will design a mathematical model for the segmentation of retail customers. In this paper, we have segmented them based on recency, frequency and monetary (RFM) measures. Data required applying this method gathered from all the Retail Stores of Odisha which is established newly.

Keywords: Customer Segmentation, Relationship Marketing, RFM model, CRM Strategy

1. INTRODUCTION

Ever since Wendell Smith (1956) introduced the concept of market segmentation as a possible means of solving marketing problems, it has received much analytical attention. Segmentation refers to the notion at the consumer group comprising a market for a product is composed of subgroups, each of which has specific and different needs or wants. Typically, members of such subgroups are identified by one or more
“people” characteristics e.g., demographic, sociographic, or personality variables. Once subgroups have been identified, marketers supposedly can improve their marketing efforts by more closely approximating the needs of each subgroup. The basic requirement of an operational market segment is that it exhibit homogeneous characteristics which permit identification, and eventually fulfillment, of a specific consumer want or need, thus resulting in greater profit for the marketer than would otherwise be possible.


Traditional accounting practices focus mainly on measuring tangible assets as a statutory requirement on the balance sheet. However, nowadays it is more usual for intangible assets such as brand, employee and customer relationships to be the critical and often dominant determinants of shareholder value. Unfortunately, standard accounting systems focus on periods instead of individual customers or customer groups. To avoid such twists, customers need to be treated as a bundle of cost drivers.

Relationship marketing constitutes a major shift in marketing theory and practice. Rather than focusing on discrete transactions, it emphasizes the establishment, development and maintenance of long-term exchanges. Such relationships are thought to be more profitable than short-term relationships as a result of exchange efficiencies. This
is especially true of customer relationships However, since not all customers are financially attractive to the firm, it is crucial that their profitability be determined and that resources be allocated according to the RFM value. Although there are many models for this purpose, but most of them are complex and not applicable in small and medium enterprises (SMEs).

RFM is one of the most important technique in customer segmentation which is used frequently in the field of database marketing to evaluate the value of customers indirectly instead of the method of evaluate directly. When it was used to divide customers into groups, companies can decide how to make full use of their limited resources to customer service effectively by segmenting their customers into different groups based on RFM, and then design and implement different customer retention strategies to realize the maximization of their total profits. They also pointed out that the importance of each index in RFM model is different when using it in different industries. Aimed at customers of Retail companies, this paper tries to use stratifying method for segmentation based on RFM model.

2. RFM MODEL FOR RETAIL COMPANIES AND WEIGHTS OF EACH INDEX

RFM model is a smart and useful model used frequently to customer or market classification. It is composed of three indexes namely Recentness-Frequency and Monetary. The three indexes can be used to sales forecasting. RFM model is also appropriate for customer segmentation of Retail companies and consumption behaviors of customers are considered to be the basis of the model in this paper. The comparison of the meaning of each index in RFM model in general and in Retail industry is showed in Table-1.
Table 1: Comparison of the Meaning of Each Index in RFM Model in General Situation and in Retail Industry

<table>
<thead>
<tr>
<th>Model</th>
<th>R: Recentness</th>
<th>F: Frequency</th>
<th>M: Monetary</th>
</tr>
</thead>
<tbody>
<tr>
<td>General RFM model</td>
<td>The number of days between the date of customers’ last purchase in the company and the end of measurement period</td>
<td>The time of customers purchasing the commodities in the company among measurement period</td>
<td>The total amount of money for purchasing the commodities in the company among measurement period</td>
</tr>
<tr>
<td>RFM model in Retail Industry</td>
<td>The number of days between the date of customers’ last purchase in Retail stores and the end of measurement period</td>
<td>The time of customers purchasing in Retail store among measurement period</td>
<td>The total amount of money for purchasing service in Retail stores among measurement period</td>
</tr>
</tbody>
</table>

3. MODEL FOR CUSTOMER SEGMENTATION

In order to segment the customers on the basis of RFM, we make the following assumptions:

The number of cluster of customers per day (m) those making a purchase. The amount of purchase per customer in a cluster in a day (y) is a continuous random variable represented by a frequency function taking integral values within a finite range (0, b) i.e.;

$$0 \leq y \leq b$$

The number of cluster of potential customers visiting into the shopping area per day (M ≥ m) with a finite number of customers within each cluster (N_i) such that

$$\sum_{i=1}^{M} N_i = N$$ denoting the total number of individual customers visiting the shopping area.

The clusters of customers are divided into a finite number of segments, say k. and are separated by the boundary points

$$\theta = y_0, y_1, y_2, y_3, \ldots, y_{k-1}, y_k = b$$

Out of N_i customers in a cluster, we are studying n_i customers (n_i ≤ N_i) such that

$$\sum_{i=1}^{M} n_i = n$$, which is the total number of customers to whom we are studying.

Now, the size of i^{th} segment is given by
\[ p_i = \int_{y_{i-1}}^{y_i} f(\xi) d\xi \quad \text{for } i = 1, 2, 3, \ldots, k. \quad (1) \]

The average number of customers per day is given by
\[ \mu = \int_{a}^{b} g(\xi) d\xi = \sum_{i=1}^{k} p_i \mu_i \quad (2) \]

where \( \mu_i \) is the mean of \( i \)th stratum and is given by
\[ \mu_i = \frac{1}{p_i} \int_{y_{i-1}}^{y_i} g(\xi) d\xi \quad (3) \]

For the \( n_i \) arbitrary with \( \sum_{i=1}^{M} n_i = n \), the variation of the estimate of the population mean of ‘y’ values is given by
\[ V(\bar{y}) = \sum_{i=1}^{M} p_i^2 \frac{\sigma_i^2}{n_i} \quad (4) \]

where \( \sigma_i^2 = \frac{1}{p_i} \int_{y_{i-1}}^{y_i} \xi^2 f(\xi) d\xi - \mu_i^2 \quad (5) \]

We have to find the optimum values of cluster boundaries. Our objective is to make segments of customers on the basis of the amount of purchases made by the individual customers by minimizing the total variation of weighted average of sales \( (4) \), where the weights are the proportion of cluster size with total number of customers, i.e. to minimize the variance function
\[ V(\bar{y})_N = \frac{1}{n} \left( \sum_{i=1}^{k} p_i \sigma_i \right)^2 \quad (6) \]

Where the number of customers falling into a segment are proportional to the variability of purchase of the customers in that segment i.e.

under the condition \( n_i = n \frac{p_i \sigma_i}{\sum_{i=1}^{k} p_i \sigma_i} \quad (7) \)

Differentiating, equation \( (6) \) with respect to \( y_i \) \( (i = 1, 2, 3, \ldots, k-1) \) and equating to zero, we get
\[ p_i \frac{\partial \sigma_i}{\partial y_i} + \sigma_i \frac{\partial p_i}{\partial y_i} + p_{i+1} \frac{\partial \sigma_{i+1}}{\partial y_i} + \sigma_{i+1} \frac{\partial p_{i+1}}{\partial y_i} = 0 \quad (i=1,2,3,\ldots,k-1) \]  

Since, \( \frac{\partial p_i}{\partial y_i} = f(y_i) \), we can write

\[ p_i \mu_i = \int_{y_{i-1}}^{y_i} \xi f(\xi) \, d\xi \]  

(9)

and \( p_i (\sigma_i^2 + \mu_i^2) = \int_{y_{i-1}}^{y_i} \xi^2 f(\xi) \, d\xi \).  

(10)

The optimum points of segmentation are given by

\[ \frac{\sigma_i^2 + (y_i - \mu_i)^2}{\sigma_i} = \frac{\sigma_i^2 + (y_i - \mu_{i+1})^2}{\sigma_{i+1}}, \quad i = 1, 2, 3, \ldots, k-1. \]  

(11)

However, the above equation for obtaining the optimum points of segmentation becomes difficult for \( k > 2 \). An iterative solution to the above sets of equations are given by (Sukhatme and Sukhatme, 1997)

\[ y_i = \frac{\mu_i + \mu_{i+1}}{2}, \quad i = 1, 2, 3, \ldots, K - 1. \]  

(12)

4. SOURCES OF DATA AND DATA ANALYSIS

The present study is based on 180 clusters of customers from different retail stores of Bhubaneshwar, the capital city of Odisha, over a period of three months during February-April, 2010. We consider a quarter to minimize the personal bias towards purchasing attitude due to festive seasons in order to generalize the buying behaviour in common business situations.

(a) RFM Analysis

(i) Monetary Value

In the present study, we analyze for only three segments \( (k = 3) \), viz. Diamond, Gold, Silver customer groups for adopting different targeting and positioning strategies. The following diagram shows the distribution of \( y \).
Graph No - 1
Distribution of Clusters of Customers according to
Amount of Purchase

No. of Clusters

Amount of Purchase

<5000
2001-5000
1001-2000
701-1000
501-700
301-500
101-300
0-100

By using the above model, we get \( \mu_1 = 101 \), \( \mu_2 = 195 \) and \( \mu_3 = 1467 \).

So, the corresponding values of \( y_1 \) and \( y_2 \) are calculated as

\[
y_1 = \frac{\mu_1 + \mu_2}{2} = 148 \quad \text{and} \quad y_2 = \frac{\mu_2 + \mu_3}{2} = 831.
\]

So, we can classify the cluster of customers into three major strata, namely Platinum, Diamond, Gold customers depending upon these \( y \)-values i.e. average amount of purchase per customer within the cluster.

**The Platinum Clusters of customers:** - Average amount of purchase per customer within the cluster of minimum of Rs. 831.

**The Gold Clusters of customers:** - Average amount of purchase per customer within the cluster within the range of Rs.149 to Rs. 830.

**The Silver Clusters of customers:** - Average amount of purchase per customer within the cluster below of Rs.149.
(ii) Frequency

![Frequency of Different Clusters](image)

(iii) Recency

![Recency of Various Clusters](image)

(b) Cluster Assessment Array analysis using degree of different indexes of RFM

High index of Frequency (F) & monetary value (M) in each cluster indicates, value of frequency & monetary value is more than average value, and low index of F & M indicates value of frequency & monetary value is less than average value. But for recency (R), because of its negative influence on an outlet, the low index of R in any cluster indicates that the value of R is more than average value and vice-versa.

Exhibit (i)

<table>
<thead>
<tr>
<th>Platinum</th>
<th>Gold</th>
<th>Silver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Degree of recency
Each cluster represents a market segment. Customer in clusters can have three different pattern of R-F-M viz:

**Recency (low)-Frequency (high) - Monetary value (medium):** This pattern of RFM signifies that such cluster of customers have come and purchased from the retail outlets recently. They frequently came to buy and spend a moderate amount in purchasing. They are the Gold cluster of customers. Since they are loyal even though not very high value customers, they are the most important customers now for the retail stores. So retail stores should design their CRM strategies which may promote the transaction value of such cluster of customers each time they visit the store.

**Recency (high)-Frequency (low)- Monetary value (high):** This pattern of RFM indicates that such customers belong to Platinum clusters. They are very high value but the least loyal customer for the retail stores. So retail stores should design their marketing strategies which can attract such cluster of customers to the store regularly & frequently.

**Recency (medium)-Frequency (medium)- Monetary value (low):** This pattern of RFM indicates that such cluster of customers have come and purchased from the retail outlets recently. They sometimes came to buy and spend an insignificant amount in purchasing. They are the Silver cluster of customers. Since they are mere visitors to the retail outlets and valueless customers, retailers should implement low-cost
strategy for such customers and to keep the cash inflow they may be offered only basic service by the Retailers.

5. CONCLUSION:

One of the most vital control measures while implementing different marketing strategies in a company is assessing the return on market investment. Differentiated marketing strategy encourages to segment markets in the most profitable approach. In this paper, we suggest Recency, frequency & monetary (RFM) model to cluster the customers into three segments such as Gold, Platinum and Silver. Clustering customers into three different groups help the decision-maker to formulate their marketing strategies according to the different market segment.

REFERENCES


