



ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 8.4
IJAR 2022; 8(8): 85-88
www.allresearchjournal.com
Received: 11-05-2022
Accepted: 16-06-2022

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Usage of data mining for customers profiling in supermarkets and grocery stores

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Abstract

Many enterprises super markets and grocery stores have realized the need of applying new technological trends to identify loyal customers and satisfy their customers. The information regarding sales data, get stored into data warehouse and data mining techniques expose the customers internal insight to identifying customer's buying patterns and trends for retaining, promote sales strategy and reduces profitable cost. Data mining is a set of automated techniques used to extract buried or previously unknown pieces of information from large databases, using different criteria, which makes it possible to discover patterns and relationships. Supermarket and grocery stores use data mining for performing analysis to discover patterns or correlations within the set of items and analyze customer's profile. Data mining techniques like clustering, classification can be used to identify customers based on loyalty to super market grocery stores. This paper illustrates the importance of the proposed data mining techniques for identifying loyal customers in grocery stores.

Keywords: Data mining, loyalty, clustering, classification

1. Introduction

The success of any business depends on the ability to understand its customers. Consumers make choices about where to shop based on their preferences for a shopping environment and experience as well as the selection of products at a particular store and distance to travel. They select a store that gives them the best combination of prices, convenience, variety and service, and time and distance to travel to the store, subject to their time and money constraints. Understanding the reasons consumers enter stores for has always been among retailers' greatest aspirations and the frequency of customer visit to purchase from the same grocery store is always required by super markets. There is always a need to design schemes to attract customers and make sure that they always prefer the same grocery store to purchase goods. It is used to invent the system for analysing the habits of the buyer and purchasing behaviour and likings of buyers. The discovery of these analysis and patterns can help the stores to promote the sales strategy by considering need customers. The most useful technique used for this is Data Mining.

2. Data Mining

Data mining is a process for analysing large repositories of data and identifying interesting patterns, correlations and information from databases which is useful to make efficient future decisions. Data mining tools predict future trends and behaviors, allowing businesses to make knowledge-driven decisions that will affect the company, both short term and long term. Data Mining is known as "write many of the reports and queries". Nonetheless, data mining not only query and report creation. It is completed with a specific tool, which performs data processing. Data mining is the mining of the patterns and the information that is important from the large database. Data mining study the data to extract some information from a large volume of data. This new derived information can be utilized in the areas such as decision support, prediction, forecasting and estimation by retailers like grocery stores to make important business decisions, which can help in giving a particular business the competitive edge.

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3. The scope of data mining in grocery stores and supermarkets

The competitive environment in which supermarket and grocery stores operate is forcing them to adopt customer centered strategies. Since a key to the successful development of such a strategy rests with customer relationship management, supermarkets should identify the most profitable ways to build and maintain a loyal customer relationship. Nowadays, the advent of Business Analytics and data mining has created new ways for retailers to metamorphose the vast amount of data they have into valuable knowledge in order to gain customers' insights, and improve customer relationship. In an effort to help supermarkets understand their customers' shopping behavior and the ways to retain valued customers data mining is used by many grocery stores. Numerous customers tends to purchase items regularly, each time they visit supermarket. data mining can help letting know the supermarket about the patterns of customer's orientations. Where the supermarkets are in great competition to preserve its benefits and win more customers, which encourage the market to use new tools to satisfy its customers and increase the company's revenues.

Many researchers have investigated the factors that make consumers enter to a store (Bell, Corsten, & Knox, 2011) [6], and their shopping trip goals (Lee & Ariely, 2006). However, such approaches provide limited information about the specific reasons consumers enter the store for, i.e., the actual products to be purchased. Data Mining helps the supermarket and retail sector owners to know the choices of the customers. Looking at the purchase history of the customers, the data mining tools show the buying preferences of the customers and can identify customers who are loyal.

The implications of data mining in supermarket and grocery store with respect of customer relations are as follows:

3.1 Extraction of relevant customer data

First step of data mining is to pick out the aspect depiction of customer. This involves extraction relevant data of customers of Supermarket which can be used for decision making and discarding irrelevant customer's information such as address, age, income and other basic information. Understanding consumption level of customer and customer trends and also the consumer's home situation will be the goal of data mining.

3.2 Identify customer types

By analyzing consumer behavior, operators of supermarket will group the customer into different class with amount of spending, frequency of visit and stability. On the basis of the consumption level of the customer, some of the supermarket operators will identify type of customer. On the other hand, they establish profitable marketing strategy in order to retain customers, such as cash bask, discount and other policies.

3.3 Customer Target

Supermarket operators contact consumers to identify the aspects of the customer most concern about by analysis to carry out targeted marketing campaigns. From time to time, they make schemes and give offers and communicate with consumer through text messages and mail to send information regarding offers of grocery store and

supermarket of interest to users in order to promote their sales.

3.4 Improve customer relationship management

In this era, there is increasingly excessive competition among grocery stores and supermarket types of promotions are put into use for building a suitable relationship with customer [9, 10].

4. Use of Data mining technique to make profile of customers in super markets

Customer profiling is the important basis for customer relationship management (CRM) and the subsequent development of customer retention strategy. In general, CRM is referred

to as a business practice intended to improve service delivery, build social bonds with customers, and secure customer loyalty by nurturing long-term, mutually beneficial relationships with valued customers selected from a larger pool. Valued customers who repeatedly purchase a great amount of grocery items and remain committed to the particular supermarket over an extended period of time. In general, the longer customers remain with a particular supermarket, the more profitable they become to the supermarket (Reichheld and Sasser, 1990; Lovelock and Wright, 2002).

Using data mining techniques, supermarket shoppers can be segmented into different groups based on the relative importance of factors that describe the shopping experience-factors that distinguish the preferences of consumers in each group from the overall average. Supermarkets and grocery store analysts can utilize data mining techniques to better understand customer profiles and behavior. Among the key areas where data mining can produce new knowledge is the segmentation of customer data bases according to demographics, buying patterns, geographics, attitudes, and other variables. Nikolaos Katsaras, Paul Wolfson, Jean Kinsey And Ben Senauer in the paper Data Mining a Segmentation Analysis of U.S. Grocery Shoppers (2001) built profiles of grocery shoppers based on their preferences for 33 retail US grocery store characteristics. The data was from a representative, nationwide sample of 900 supermarket shoppers collected in 1999. Six customer profiles are found to exist, including (1) "Time Pressed Meat Eaters", (2) "Back to Nature Shoppers", (3) "Discriminating Leisure Shoppers", (4) "No Nonsense Shoppers", (5) "The One Stop Socialites", and (6) "Middle of the Road Shoppers". Each of the customer profiles is described with respect to the underlying demographics and income.

Data mining can also use to analyze POS transactions from customer touch-points to customer learning-points. The common retail POS data are transformed to knowledge about the consumers' purchasing behavior and shopping goals. Hence it can empower the grocery to identify the shopping missions of each store, or channel, and utilize this information to make strategic plans and take effective decisions in order to acquire a larger share of consumers' shopping missions and market share. By discovering patterns in customers' behaviors, enterprise's decision making could also be empowered (Wang & Zhou, 2013).

A well-known example is Tesco, which has reinvented its relation with its customers by using Loyalty Card data

(Humby, Hunt, & Phillips, 2003) [11]. Data Mining-enhanced CRM could help retailers patronage customers' behavior, gain insights, and retain customer's that really add value to the business (Min, 2006).

5. Various techniques of data mining for profiling customers

Fayyad *et al.* (1996) defined two primary goals of data mining: prediction and description. Prediction involves using variables within the database to predict unknown values of other variables of interest, whereas description concentrates on finding patterns in the data which can be interpreted by analysts (e.g., marketers of a company). Descriptive models present main characteristics of data sets in concise form. Within the analytical CRM dimension, data mining techniques are becoming popular ways of analyzing customer data. In fact, the employment of data mining to support CRM analytical dimension is seen as an emerging tendency (Ngai *et al.*, 2009).

There are various types of databases and information repositories in supermarkets and grocery stores on which data mining can be performed. So, to perform data mining several techniques are available to mine data from data warehouse. To identify customers types and for profiling the customers following data mining techniques can be used:

5.1 Customer profiling using knowledge discovery rules

"IF-THEN" rules can give supermarket management clear customer profiles on which to target marketing or promotional actions. With this in mind, we developed more than fifty different rules (including sub-rules) using the Clementine 8.0 Software (2003). Notice that the "IF-THEN" rules produced by a decision tree extract only useful information for formulating a customer retention strategy with a predictive accuracy surpassing 80%. "IF-THEN" rules summarized the grocery customer's shopping pattern with respect to the number of items that the customer purchased per visit, the frequency of visits to a supermarket, and the patronage of a particular supermarket. The volume of grocery purchases at the particular supermarket is influenced by the frequency of grocery shopping and the customer's loyalty (patronage) to that supermarket. To elaborate, the more frequent shopper tends to purchase more items per visit than does the less frequent shopper. Also, one who patronizes a particular supermarket tends to purchase more items per visit than one who does not.

5.2 Customer identification using clustering

Clustering is the task of segmenting the objects into groups called clusters, so that the object within a cluster are "similar" to another and "dissimilar" to objects in other clusters. Similarity is defined of how close the objects are in space, based on a distance function (Phan & Vogel, 2010). Clustering data mining techniques can be used to identify type of customers like valuable and loyal customers by segmenting customers based on some criteria. Clustering techniques are very useful to gain knowledge from a dataset. Clustering analyzes data items without considering a known class label. In general, the class labels are not present in the training data, since they are not known. Therefore, clustering can be used to generate such labels. The items are clustered according to the principle of intraclass similarity maximization and the interclass similarity minimization. It means that clusters are formed so that items within a cluster

have high similarity, but are very dissimilar to items in other clusters. Each cluster that is formed can be seen as a class of items, from which rules can be derived. clustering techniques can be classified into the following categories: partitioning methods, model-based methods and hierarchical methods (Yau and Holmes, 2011).

6. Conclusion

As the development of economy is going on, there is rapid increase in the application of data mining in retail industry, basically in large scale supermarkets. So, it becomes very important to establish appropriate model for data mining technology to provide decision making process in supermarket. We propose a data mining-based framework that discovers patterns in customers' behavior. This framework can change/ improve the nature of retailer-consumer relationships, by giving the retailers the opportunity to realize the shopping missions of consumers during their shopping trip in supermarkets.

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