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Application of Data Mining for Customer Behaviour and Customer Relationship Management in Retail Marketing

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ABSTRACT: Data mining is a technique to extract relevant information from the large pool of data sets generated in different fields including business. The essence of Data mining usage in business applications is that it is useful in identifying relevant information and knowledge which can be used for better decision making in business area. This paper studies the use of data mining, as a tool, in understanding customer behaviour and CRM (Customer relationship management) in Retail marketing which also happens to generate huge amount of data in its operations. Retailers can make use of this data in order to segment customers and designing customer-centric marketing strategies for the target market.

KEYWORDS: Data Mining, Retail Marketing, Customer behaviour, Customer Relationship Management (CRM)

I. INTRODUCTION

Data mining is an interdisciplinary subfield of computer science. It is the computational process of discovering patterns in large data sets involving methods at the intersection of artificial intelligence, machine learning, statistics, and database systems. The overall goal of the data mining process is to extract information from a data set and transform it into an understandable structure for further use. Aside from the raw analysis step, it involves database and data management aspects, data pre-processing, model and inference considerations, interestingness metrics, complexity considerations, post-processing of discovered structures, visualization, and online updating [12] [52] [53]. Data Mining is a process of extracting previously unknown, valid, potentially useful and hidden patterns from large data sets [11].

Data Mining is the process of discovering interesting patterns and knowledge from large amount of data. The data sources can include databases, data warehouses, the web, other information repositories, or data that are streamed into the system dynamically [19].

Data mining Applications:

Here is the suggestive list of areas where data mining is widely used:

Financial data analysis, retail marketing, telecommunication industry, biological data analysis, scientific applications, intrusion detection, data mining applications in transportation, data mining applications in medicine, data mining applications in health care and insurance, visual and audio data mining.

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II. RELATED WORK

DATA MINING AND RETAIL MARKETING

Retailing includes all activities involved in selling goods or services directly to the final consumer for personal or non-business use [33]. Any organisation that directs its marketing efforts towards satisfying the final consumer in selling goods and services as a means of distribution is carrying out retailing function [14]. In other words, retailing is the sale of goods and services to the ultimate consumer for personal, family or household use. Retailing involves selling of tangible as well as intangible goods. Retailers are facing dynamic and competitive environment. With increase in globalization and competitiveness, retailers are seeking better market campaign. Retailers are collecting large amount of data. This data collected requires proper mechanisms to convert it into knowledge, using this knowledge retailer can make better business decision. Retail industry is looking strategy where in they can target right customers who may be profitable to them.

Data Mining has its great application in Retailing because it collects large amount data from sales, customer purchasing history, goods transportation, consumption and services etc. It is natural that the quantity of data collected will continue to expand rapidly because of increasing sales. Retail Industry provides a rich source for data mining. Retail data mining can help identifying customer behaviour, discover customer shopping patterns and trends, improve the quality of customer services, achieve better customer retention and satisfaction, enhance goods consumption ratios design more effective goods transportation and distribution policies and reduce the cost of business.

Data mining has the ability to extract hidden predictive information from very large databases of retail sales data. It is a powerful technology with great potential to help retailers focus on the most important information in their data warehouses [6]. Data mining tools predict future trends and behaviours, helps organisations to make proactive knowledge-driven decisions [14]. The automated, prospective analyses offered by data mining move beyond the analyses of past events provided by retrospective tools typical of decision support systems. Data mining tools can answer the questions that traditionally were time consuming to resolve. They prepare databases for finding hidden patterns, finding predictive information that experts may miss because it lies outside their expectations.

Some of the Retail Applications of Data Mining are in following areas:

Customer behaviour and customer relationship management, supply chain management and procurement, storefront operations, alternative sales analysis.

In this paper, I focus on customer behaviour and customer relationship management

Customer Behaviour and Customer Relationship Management

The aim of marketing is to satisfy consumers profitably [33]. Hence, understanding Customer behaviour forms an integral part of marketing. Following are the categories that can be formed to understand customer behaviour and hence manage relationship with the customer. Following are functions organisations need to perform in order to enhance customer relationship management.

Customer behaviour analysis

Customer behaviour analysis is the study of individual, groups, or organisations and the processes they use to select, secure, and dispose of products, services, experiences, or ideas to satisfy needs and the impacts that these processes have on the consumer and society [33]. Data mining enables the organisation to understand the decision-making processes of buyers, both individually and in groups such as how emotions affect buying behaviour. Data mining also

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help organisation to understand what factors influence consumer purchases and the changing factors in our society. It also helps to find customer buying behaviour.

Customer segmentation

Customer segmentation is defined as "the process of dividing customers (or potential customers) in a market into homogeneous groups (or segments) having similar needs and wants" [33]. Homogeneous group means all the members of the groups have almost similar needs i.e. customers of each homogenous group have similar buyer characteristics, for example, age, income, occupation or any such variable. Data mining can be used in grouping or clustering customers based on behaviour. This type of information is useful to define similar customers in cluster, holding on good customers and identify likely responders for target marketing.

Campaign / Promotion strategies effective analysis

Marketing is a mix of 4Ps viz Product, Price, Place & Promotion. Promotion, being an essential 'P' needs appropriate strategies in order to maintain customer relationship [33]. These strategies, in turn, require effective analysis in order to organize a successful marketing campaign. Data mining enables organisations to gauge the success of various campaigns by measuring campaign costs, leads generated and leads converted to customers.

Customer lifetime value

Customer lifetime value (CLV) is a prediction of the net profit attributed to the entire future relationship with a customer. The prediction model can have varying levels of sophistication and accuracy, ranging from a crude heuristic to the use of complex predictive analytics techniques. Data mining enables organisations to make predictions based on CLV.

Customer potential

Customer potential is determined by how much profit a customer can generate in the category. Data mining enables organisations to find expected lifetime value of customers and how much opportunity currently exists with each customer.

Customer loyalty analysis

Customer loyalty analysis helps in understanding customer attrition with respect to various factors influencing a customer and at times one can drill down to individual transactions, which might have resulted in the change of loyalty. Data mining enables the organisation to analyse individual transactions of customers for customer loyalty analysis.

Cross selling

Cross-selling is the action or practice of selling an additional product or service to an existing customer. The objectives of cross-selling can be either to increase the income derived from the client or clients or to protect the relationship with the client or clients. Data mining enables the organisation to customer point of sale data for cross selling an additional product to the customer.

Customer experience management

Customer Experience Management' represents the discipline, methodology and/or process used to comprehensively manage a customer's cross-channel exposure, interaction and transaction with a company, product, brand or service [5].

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Data mining enables the organisation to define strategy that focuses the operations and processes of a business around the needs of individual customers.

Customer demand analysis

Demand analysis is used to identify who wants to buy a given product, how much they are likely to pay for it, how many units they might purchase, and other factors that can be used to determine product design, selling cost, and advertising strategy for a product. Data mining can be extensively used to uncover the dimensions pertaining to demand analysis from the customer's view point.

Customer retention management

Customer retention is the activity that a selling organisation undertakes in order to reduce customer defections. Successful customer retention starts with the first contact an organisation has connection with a customer and continues throughout the entire lifetime of a relationship. A company's ability to attract and retain new customers, is not only related to its product or services, but strongly related to the way it services its existing customers and the reputation it creates within and across the marketplace. Customer retention is more than giving the customer what they expect; it's about exceeding their expectations so that they become loyal advocates for product. Creating customer loyalty puts 'customer value rather than maximizing profits and shareholder value at the centre of business strategy'. The key differentiation in a competitive environment is often the delivery of a consistently high standard of customer service. Data mining helps the organisation to retain existing customers. It also used to develop programs for analysing the reasons for customer attrition.

Customer service level management

Competitive environment enforce upon each organisation to perform well above the benchmark in providing the customer service and thus deriving customer satisfaction at the level of atleast sustaining the market share and thereby business. Data mining can prove helpful in understanding the satisfaction level of customers in order to uncover the level of service provided by the retailer.

Product Pricing

"Price is the exchange values for the product or service" [33]. This exchange value may be in terms of Money (in recent times) or in terms of product or service (in Barter system). "Price may be defined as the exchange of goods or services in terms of money" [33]. Price and sales value together decide the revenue of any business. Price is also the most important determinate of the profitability of the business. Price is not just number on a product. It comes in many forms and performs many functions. We pay the price when we pay price to the labor in the form of Wages; when we pay price of rental house in the form of Rent; when we pay price to a broker in shape of a Commission; when we (company) pay price to salesman in form of Salary; when we pay price on trip in shape of Charges; when we pay price on LIC policy in form of Premium, etc. Data mining can make use of sales data in order to generate product pricing competitively.

Target marketing / Response modelling

A target market is a group of customers towards which a business has decided to aim its marketing efforts and ultimately its merchandise. A well-defined target market is the first element to a marketing strategy. The marketing mix variables of product, place (distribution), promotion and price are the four elements of a marketing mix strategy that determine the success of a product in the marketplace [9, 24]. Data mining is handy in targeting the right customer with the right marketing mix making use of customer's personal data and other billing information.

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III. LITERATURE REVIEW

Vince Killen [47] used data mining tools and find out that these tools are very helpful and faster in data extraction of information for the company. These tools serve as the backbone driving CRM systems and have enabled the measurement frameworks in place today. James et al. (2010) used the online approach for extracting the data of the customers by using automated software and scripts to download the relevant web pages and extracted the appropriate information from the web pages.

Customer satisfaction provides bottom-line business results in the form of increased purchased volumes, repetitive purchases, and generation of new business in the form of references and prospect identification [1]. Activities a business performs to identify, qualify, acquire, develop and retain increasingly loyal and profitable customers by delivering the right product or service, to the right customer, through the right channel, at the right time and the right cost [30].

Saarenvirta (1998) explores customer data mining. (Wong et al., 2004) examines intelligent Data Mining for CRM. Berson, Smith and Thearling (1999) explain about building Data Mining application for CRM, Siragusa (2001) argues about implementing Data Mining for better CRM. Mukhopadhyay and Nath (2001) emphasized on importance of measuring the efficiency of CRM systems and proposed an efficiency model for the same.

Berson et al., (1999) recommended a simple method to evaluate the benefits of a data mining model for the CRM applications. Rigby and Ledingham (2004) suggested a model to calculate the cost of CRM. King et al., (1998) evaluated the fourteen desktop data mining tools. (Collier et al., 1999) describe a methodology for evaluating and selecting data mining software. Runsala (2003) describes a tool called Lou that is considered to overcome the limitations of the various data mining tools like the cost and user friendly aspect of the tools.

Joseph Vella et al., (2012) identify perceived usefulness and perceived ease of use as key elements that are critical in encouraging service providers' intention to use CRM systems. Babita Chopra et al., (2011) throw light on the underlying technology and the perspective applications of data mining in CRM. She suggests as organisation cannot extract valuable information from huge data bases solution lies in the use of Data Mining tools for customer segmentation and profitability, marketing and customer relationship management.

Sheu et al., (2008) found that the consumers past online shopping experience would directly affect their decision-making. Ranjan et al., (2008) demonstrated the effect of data mining in better decision making in human resource management system Yang et al., (2008) use decision tree and association rules to predict cross selling opportunities. Gearj et al., (2007) demonstrated that decision tree diagramming is a demanding yet flexible technique which allows the representation of sequential decisions and subjectively based data in a readily understood form. Wang et al., (2008) found the application of Decision Trees in Mining High-Value Credit Card Customers.

Sarantopoulos (2003) described the development and the validation of a decision tree, which aims to discriminate between good and bad accounts of the customers of a particular retailer based on a sample of orders placed between certain periods of time. Lemmens and Croux (2006) explored the bagging and boosting classification techniques which significantly improved the accuracy in predicting churn. Lima et al., (2009) showed how the domain knowledge can be incorporated in the data mining process for churn prediction by analysing a decision table extracted from a decision tree or rule-based classifier. Velikova and Daniels (2004) presented methods to enforce monotonicity of decision trees for price prediction. Chen and Hung (2009) used decision trees to summarize associative classification rules. Lee and Siau (2001) reviewed data mining techniques. Hou and Tu (2008) found that business with customer relationship management practices is linked to better performance outcomes, including perceptual and financial performance. Jones and Ranchhod (2007) augmented the concepts from technology-enabled customer relationship management towards an exploratory framework, designed to explore the nature of customer attention. Sangle and Verma (2008) identified and analyzed the

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determinants of adoption of customer relationship management in Indian service sector. Ranjan and Bhatnagar (2008) presented the benefit and application of the data mining tools through which the firm achieves competitive advantage by selecting the best suited data mining tool according to their need.

IV. CONCLUSION

Data mining is the process of extracting the hidden information beneath the large data sets obtained from numerous sources ranging from business to science. It can be used as a tool to identify the hidden pattern of information and knowledge through the analysis of data and thereby help in making informed and better decision.

In business, data mining is important for building customer satisfaction through better understanding the behaviour of the customers and appropriately designing business strategies. Customer satisfaction provides bottom-line business results in the form of increased purchased volumes, repetitive purchases, and generation of new business in the form of references and prospect identification. Hence data mining is extensively used in retail sector. This could be partly because retailing also generates large amount of data through sales, customer purchasing history, goods transportation, consumption and service etc. Hence these set of data could be efficiently mined in order to extract useful information required for better decision making in retail business.

Retailing encompasses decision making areas such as understating customer behaviour and CRM. In order to make these decisions, retailers need to mine data which can be generated through customer personal data, billing data, purchase data, sales data, media data etc.

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