Data Mining and Knowledge Management for Marketing

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ABSTRACT: The goal of this paper is to demonstrate the importance of using knowledge management and data mining for supporting marketing decisions. It shows how the data mining techniques and tools can extract hidden purchase patterns that can help to make better decisions by the marketers. Practically, knowledge management and data mining techniques are really useful for marketing especially for organizations which have huge amount purchase transactions. Knowledge management and data mining also can help to increase the profit because of the correct decisions made by marketers. The paper also shows how knowledge management and data mining can be used to provide better answers from huge amount of data of customers and purchase transactions.

KEYWORDS: Knowledge, Data mining, Customer relationship management, Marketing decision, Hidden information.

1 INTRODUCTION

Due to the huge amount of information related to customers and daily purchase transactions, the businesses databases are dramatically increased and become huge. For this reason, knowledge management and data mining (DM) techniques and tools have became important for the marketing decisions. DM can be used to extract useful information of hidden purchase patterns that could be used to support the marketing decisions. Also, DM can help to analyze the overall market [1].

Marketing decisions are very important for any organization to increase the profit. It can affect customers behavior [2]. The marketing is becoming more difficult every day. Nowadays, the business environments are more complex. Marketing decisions are restricted by the surroundings and the society. For that reason, marketing decisions should be standardized which will help marketers to do the business in a professional way [3]. To make any marketing decision more accurate, some tools and techniques should be used. Data mining is important tool to support marketers [4]. Studies showed that DM can improve marketing significantly [5].

Good marketing decisions are based on knowledge about customers. This kind of knowledge is very important and considered as a key for the marketing functions. This critical knowledge can be found in the organization's databases but most of it is hidden [4].

Data Mining tools are used by decision makers to help them to get the useful hidden knowledge in order to make better decisions. DM is just a combination of database and artificial intelligent [6]. The process of data mining can be automated which makes it very common to be used in different areas including the marketing area. Data mining tools usually are used in areas that need to analyze huge amount of data.

One of the most important factors that might affect the marketing decisions is the knowledge management [4]. Last few years , there has been a growing interest in treating knowledge as a significant organizational resource [7]. Many corporations have developed an interest of KM because they realized its importance. Knowledge Management KM is a process of creating and utilizing knowledge [8].. KM processes can be integrated with the corporation system which can helps the marketers to get the knowledge easily [9].

Customer relationship management (CRM) also affects the marketing decisions positively. It is a concept of managing customers in a long-term relationship [4]. CRM tools can be used to analyze purchase behavior of customers. But there are alot of tools in the market that can be used to help in Customer relationship management . For that reason tools should be evaluated before using the right one for the organization [10].

2 RESEARCH METHOD

The research method used for this paper is a literature review [11] on marketing [4, 12-14], data mining [4, 6, 15-18], knowledge management [4, 6, 15-18], and customer relationship management [4, 10, 19-21]. This literature review helped me to build a theoretical foundation of the topic. It improved my understanding and then helped me to identify the main factors of the marketing decisions. In this paper, I present the most important factors that help marketers to achieve the goal which is making better marketing decisions.

3 DATA MINING TOOLS AND TECHNIQUES

The importance of the data mining techniques is coming from the ability to extract useful and hidden information from large databases or data warehousing which is very difficult for any human being to analyze and extract. These tools and techniques can be used to improve the way of making any decision. One example of using data mining tools and techniques is in marketing area. It can extract useful information from old data and gives useful reports about the best time to do a product advertisement. Also based on the statistics provided by the data mining tools, it helps marketers to choose the best media to publish the product advertisement.

DM has several techniques that can provide different types of analysis. One of the DM technique is association analysis. This technique is used to check all the historical related data and compare the old transactions to provide informative reports to be used by the decision makers. Also DM techniques can be used to as market predict techniques to help to predict the market future. These techniques can be used by marketers to help them to make better decisions then increase the future sales [22].

Data mining process is complicated. It is an iterative process with a lot of feedback loops. Sometimes the whole process should be repeated from the beginning. It involves six phases.

- Problem definition.
- Data Preparation.
- Data Exploration.
- Modeling.
- Evaluation.
- Deployment.

Data mining tools and techniques usually deal with data stored in data warehousing. DW is defined as "A data warehouse is a subject-oriented, integrated, time-variant and non-volatile collection of data in support of management's decision making process [23]" . Different modeling techniques are used to design data warehousing. These modeling techniques are not the techniques used to model regular databases. DW can be designed by using dimensional modeling techniques [24]. The dimensional modeling techniques organize all the data into 2 types of tables – fact table and dimension tables. There are 3 types of architectures in dimensional model: star schema, snowflake schema, and galaxy schema [25]. The star schema is the most widely used in designing data warehouses [26].

4 KNOWLEDGE, INFORMATION AND DATA

In order to understand the knowledge management, we should first differentiate between data, information and knowledge. Data is facts. It might be just a description containing numbers or plain texts [27]. Having relationship among data will make information. Knowledge is a pattern formed from given information. That knowledge could be presented in a graphical report.

Knowledge management is a good use of available knowledge which might help any organization to reach its goal and objectives. It is actually a process of creating and sharing knowledge [9]. knowledge is now considered as an important asset which can be managed as physical ones in order to improve performance. Nowadays KM has improved and many methods have been developed which made it easy to deal with knowledge. KM improves companies performance in different areas. It

improves all the decision making process. One of the advantages of knowledge management is that can be automated and integrated with any organization's system. It also can be as a domain-independent system if it is needed [28]. For those reasons companies realized the importance of the KM. Marketing and marketers should get benefit of it to improve their marketing decisions [4]. Useful patterns gained from data mining and Knowledge management would help marketers to make better decisions in a systematic way [8].

5   DATA MINING AND KNOWLEDGE MANAGEMENT TECHNIQUES AND TOOLS

Data Mining (DM) is a combination of databases and (AI) artificial intelligent used to provide useful information to the users which will help them to make better decisions. It is usually used as a decision support system which could be used in different areas including marketing.

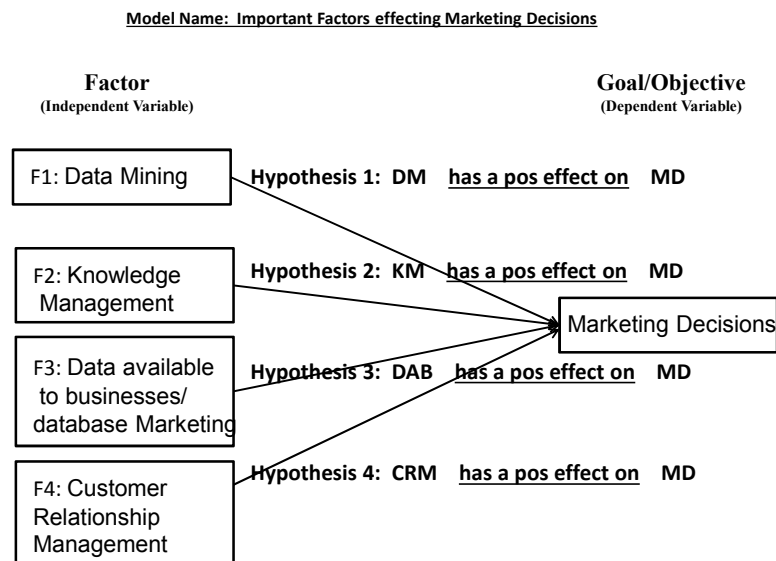## 6   IMPORTANT FACTORS EFFECTING MARKETING DECISIONS

Model Name: Important Factors effecting Marketing Decisions

Factor (Independent Variable)	Goal/Objective (Dependent Variable)
F1: Data Mining	Hypothesis 1: DM has a pos effect on MD
F2: Knowledge Management	Hypothesis 2: KM has a pos effect on MD
F3: Data available to businesses/ database Marketing	Marketing Decisions Hypothesis 3: DAB has a pos effect on MD
F4: Customer Relationship Management	Hypothesis 4: CRM has a pos effect on MD

Fig.1. Important Factors effecting Marketing Decisions

7   EXPLANATION AND DISCUSSION

The model shows the goal which is marketing decision and the main factors that make up the decision. It also shows that all the factors have positive effect on making marketing decision.

7.1   GOAL (MARKETING DECISIONS)

Greene (1960) said, marketing decisions are very important for any organization to increase the profit. The marketing is becoming more difficult every day. According to Chakravarti et al., the environments are more complex. Also as Bell & Zabriskie stated that marketing decision based on demographic data [29]. Gelb & Cheney (1986) stated that marketing decisions are restricted by the surroundings and the society [12]. Aylmer (1970) said, the marketing decisions should be standardized which will help marketers to do the business [3]. Also, Shaw et al., stated that, some other tools and to techniques should be used to support decisions. Data mining is important tool to support marketers [4].

In my opinion , organizations may increase their profit when they have good marketing decisions [13]. Due to the increase of the data of the daily transactions, the environments have became more complex [30]. Also it depends on demographic data . [29]. For that reason some tools like data mining should be used to help marketers to make better

marketing decisions [4]. This kind of tool can be used to help in complex environment and surrounding restrictions [12]. Also I agree that the marketing decision should be standardized to make it easier [3].

7.2   FACTOR 1 (DATA MINING)

Shaw et al. (2011), stated that data mining can play an important role in different areas to help to predict and support the decision makers [4]. According to Bora (2011), data mining tools for decision support [15]. Guozheng et al., (2008) said, DM can be applied in different areas including Marketing [31]. Also, as Ding (2010) said, data mining (DM) can play an important role in improving marketing [16]. According to Guozheng et al., (2008) data mining become more popular because of the contributions that can be made in converting information to knowledge [31]. Also, as Hargreaves & Yi (2012) stated that data mining can be used to predict which can help in marketing area [32].

I think, the huge amount of data of customers, lead to the necessity of using technology like data mining techniques which will help to extract hidden information from that huge data [15]. This will help organizations to take correct decisions then maximize the profit [4]. DM shows that using its tools can improve the decision in different areas which lead marketers to think of using it in marketing [31]. It will enhance marketing decisions made my marketers [16]. DM is unique technique used to convert information to knowledge [31]. Also will help marketers to predict in case they need to do that in norder to make better decisions [32].

7.3   FACTOR 2 (KNOWLEDGE MANAGEMENT)

Shaw et al., (2001) stated that, one of the important factors that might affect the marketing decisions is the knowledge management . [4]. According to Alavi & Leidner, (2001), last few years , there has been a growing interest in treating knowledge as a significant organizational resource [7]. García-Murillo et al., said, (2002) Many corporations   have developed an interest of KM because they realized its importance. Also, it can contribute to the organizations competitive advantage [33]. Palacios et al., (2009) stated that, KM is a process of creating and utilizing knowledge [8]. According to Applegate et al., (1987) KM can be used to design and implement domain-independent systems . [28]. Also, Singh et al., (2003) stated that, KM processes can be integrated with the corporation system [9].

I agree that nowadays , the knowledge management is making any marketing decisions . [4]. The knowledge is very important so we should find a method to deal with it [9]. Everybody realizes the importance of KM [7]. It contribute   the advantages of any corporation [33]. KM together with data mining will help marketers to get more information and take marketing decisions in a systematic way [8]. KM can used for implementing domain-independent systems [28].

7.4   FACTOR 3 (DATA AVAILABLE TO BUSINESSES/DATABASE MARKETING)

Marketers uses data available to them to identify targets and then make customers profiles. This data will help to improve the process of marketing [4]. Database Marketing is used for the mass-market activities. According to Gogan, (1996), database marketing enables marketers to identify patterns in customer behavior and preferences within finer segments [34]. It increases the accuracy of the marketing effort . [35]. Also, Davis (1997) stated that, data helps to improve customer relationship which can improve marketing decisions [36] .

Data available to business and database marketing is one of the most important factors that can affect the marketing decisions in a positive way [4]. I think the data is the base of the marketing decisions [37]. Marketers use data to targets and then make customers profiles. Also this kind of data can be used to identify patterns in customer behavior and preferences within finer segments. Old data and statistics can be used to make appropriate decision. Customer relationship can be maintained by using available data of customers [36] .

7.5   FACTOR 4 (CUSTOMER RELATIONSHIP MANAGEMENT)

Customer Relation management is a concept of managing a long term relationships with customers in an organized way [4]. CRM can help organizations to increase their performance in different areas. It help them to do the marketing business. It help marketers to target the right customers by providing the best customers' profiles for a specific product. It also optimizes the use of customer information to be shared by different department within the organization. CRM also may help to increase the profit by providing information of most valuable customers to provide them more services and then increase the customers satisfaction in order keep the good relationship with them. This makes it very important for the marketers to give a special attention to the CRM to help them to in their business.

CRM has became an important success factor for most of enterprises. For that reason , most of the organizations have given a special attention to the CRM and turn to CRM software to help them to manage their customer relationship in a systematic way. CRM tools can be used to analyze purchase behavior of customers [20]. There are many CRM software in the market that can help organizations in that matter. For that reason tools should be evaluated before using the right one for the organization.

I think Customer relationship management (CRM), is in the top of the factors that affect the marketing decisions positively. Maintaining customers relationships in long term, can help marketers to make more accurate decisions and to the right target [4]. Also, it helps to maintain the updated interests and contacts of most valuable customers[20]. I agree that CRM should be emerged in the IT for more accuracy [21]. This helps to have more tools that can be used to help in Customer relationship management [10]. These tools can improve the process by testing and evaluating customer satisfaction [19].

8   IMPORTANCE OF MODEL/RESEARCH OUTCOME

The developed model emphasizes the important factors that affect the marketing decisions positively especially the data mining and knowledge management factors. This understanding leads me to think about a real case that uses data mining tools and techniques to increase the profit. I picked a product that the sellers usually do a lot of marketing and aim to increase number of customers to get that product. The chosen product is the credit cards. Credit cards sellers usually try to target the correct persons to get their credit cards. They do a lot of telephone calls and advertisements in different media just to increase the sales. By using the star schema design concepts, I assumed the credit cards sales has a fact table which is the credit cards sales table and four dimension tables which are time, location, employee and card type.

8.1   CREDIT CARD SALES COMPETITION

There are many credit cards sellers in the market with different interest rates. This leads the credit cards issuers and sellers to compete each other and offer different types of credit cards with different advantages to grab the customers attentions. This variety of credit cards and the sellers and the high competition among them, makes it difficult for the sellers to reach their customers even the marketing for this product has became difficult. Different types of credit cards should targeted to different people. Credit cards with very good advantages should be offered for special customers. Since these kinds of restrictions have to apply and having huge amount of information about customers, human being and regular database application cannot help the sellers to do an appropriate marketing for their credit cards. Those reasons together make the importance of using data mining tools and techniques to help marketers to target the correct customers to do their business.

7.1   DATA MINING AND WAREHOUSING

To get help and benefit of data mining techniques for the purpose of credit cards marketing then to increase the sales, a data warehouse should be built to allow the seller to apply that data mining techniques. All the data about customers and credit cards from the sellers' regular databases and other sources should be collected and stored in the data warehouse repository.

 I proposed a design for the data warehouse that can be used by any credit card seller to help to apply the data mining techniques. The subject of the Data Warehouse is the Credit Card Sales. It is based on the information about customers and credit cards.

This data warehouse stores the historical and current information about customers and credit cards. Information includes:

- Customer information.
- Credit card information.
- Location.
- Time
- Historical Information about employees who sold and did marketing for any credit cards.
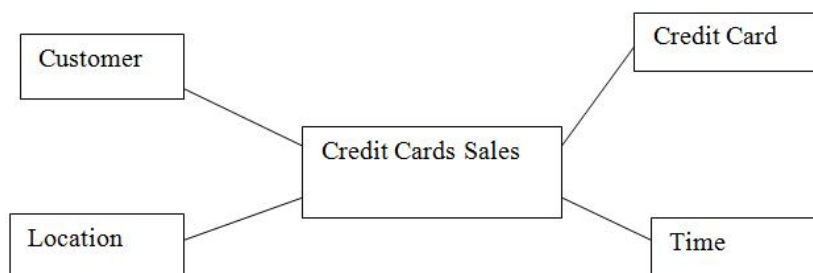
8.2 PROPOSED DESIGN

Fig. 1. Developed Star Schema for the proposed credit cards sales data warehouse

8.3 PROPOSED RESULTS

This proposed design will help the credit cards marketers to take better decisions and target the right customers. Applying the data mining techniques using that design will help to give better answers for better decisions made by marketers. For example:

- What credit cards are the most preferred by customers in general?
- What credit cards are the most preferred by customers in general in a specific location?
- What was the most requested credit card last month?
- What was the most accepted credit card offer by high income customers last year?
- What are the most used credit cards outside the USA?
- What credit cards are the most preferred by low income customers?

9 CONCLUSION

With the increase of data of huge number of daily purchase transactions made by huge number of customers, the use of knowledge management and data mining techniques and tools have became important for the marketing decisions support. It can be used to help marketers to get better answers about customers behavior and hidden purchase patterns in order to make much better marketing decisions.

The developed design showed that the use of data mining tools and techniques may increase the profit. Credit Cards sellers usually do a lot of marketing and aim to increase number of customers to get their products. They usually try to target the correct persons to get their credit cards. They do a lot of telephone calls and advertisements in different media just to increase the sales. The proposed results showed that the marketers can get better answers for some important questions which helps to target the right customers to do their business in marketing.

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