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Potential Use of Data Mining Techniques in Information Technology Consulting Operations

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Abstract- The concept of data mining has been around for a while now. It is a process of extraction of useful patterns and information from huge data sets. Many tools and techniques have been developed to make use of the data mining concept in various industries. However before implementing data mining techniques or making any other key decision relating to their I.T infrastructure, the top management of a business would usually consult with an I.T consulting firm to determine the feasibility of adopting new techniques such as data mining into their business operations. An I.T consulting firm, in turn will provide the client with valuable feedback in the form of advice, or cost estimations and potential profits, or even a full-fledged plan on how to implement techniques like data mining into their business. However, the question does arise as to whether I.T consulting firms themselves should implement data mining techniques into their business operations and whether such techniques can help them to provide better services to their clients. I.T consulting firms advise clients on a range of areas related to I.T such as strategic planning, security consulting, networking, systems integration etc. This means that an I.T consulting firms has to manage and sustain a huge network of clients, partners, and service providers. This, then naturally results in a huge amount of data that is to be stored and maintained by the firm. This paper will discuss the concept of data mining, the use of data mining in other industries and its benefits, its potential use by I.T consulting firms, and whether it can help improve I.T consulting operations.

Index Terms- Business, Consulting, Data, Improvement Mining, Techniques.

I. INTRODUCTION TO THE DATA MINING CONCEPT

Plenty of data have become available within the area of scientific research, small businesses, industries and many other areas as a result of rapid innovations in computerization along with digitalization techniques. The exploration in databases and data innovation has offered ascent to a way to store and manipulate this valuable information for further decision making. Data mining is a process of extraction of useful information and patterns from huge data. It is also called as knowledge discovery process, knowledge mining from data, knowledge extraction or data /pattern analysis.

Knowledge Discovery in Database (KDD) is a core part of Data Mining. KDD and Data Mining are often interchangeable because data mining is the key part of the KDD process [1].

Big data brought on a huge increase in the use of more intensive data exploration techniques, partially because of the huge magnitude of the information itself and because the information is often more varied and large in its very dynamics.

With this humungous amount of data, it isn't any longer enough to obtain relatively basic statistical information out of your system. Having a few hundred million records of detailed information on customers, acknowledging that a few million of them live a single location just isn't enough. We want to know whether these few million are from a particular age group and what is their average income to be able to target this particular group more effectively by gauging the specific customer requirements of this group. This is exactly the kind of unique information that data mining can provide.

The data mining concept thus allows organizations to extract meaningful and competitively advantageous information from their data rather than just extracting basic statistical information.

II. KEY TECHNIQUES IN DATA MINING

There are several key techniques that fall under the concept of data mining. These techniques include: Association, Classification, Clustering and Prediction. These are the most common data mining techniques that are mentioned in various books, journal papers and articles [2] [3][4][5][6].

Association aims to establishing relationships between items which exist together in a given record [2][4][7]. These relationships are usually found using association rules between data that might seem to be unrelated at first. An example of an association rule would be, “If a customer buys an ink pen, he is 70% likely to buy an ink bottle as well”. Thus in data mining, the technique of association rules can help businesses to analyze the purchasing behavior of a customer and also help to predict a customer’s purchasing behavior for the future. This will allow businesses to target specific customers with specific advertisements and promotions which will allow the business to maintain sales of specific product categories and at the same time gain customer loyalty.

The classification technique aims at building a model to predict future customer behavior through classifying database records into a number of predefined classes based on certain criteria [2][4][8][9]. Association establishes the relationship between two or more seemingly unrelated items and then the classification builds on the relationship by predicting customer behavior related to those items.

The clustering technique is the task of segmenting a heterogeneous population into a number of more homogenous clusters [2][3][4]. It is basically the grouping of items into categories or "clusters" based on some common characteristics. [10] gives the following example: Consider a group of people who share similar demographic information and who buy similar products from the Adventure Works Company. This group of people represents a cluster of data. Several such clusters may exist in a database. By observing the columns that make up a cluster, you can more clearly see how records in a dataset are related to one another.

The prediction technique, also known as forecasting, is a very useful data mining technique that is able to predict the behavior of a customer more accurately than human-generated rules. The prediction technique creates profiles of users based on their personal information such as age, gender, etc. and also based on their previous shopping behavior. For example, the prediction technique might say if a person of age sixteen visits a shopping website and buys an electric guitar, then he is likely to buy an amplifier as well. This kind of technique can then be implemented to make real time recommendations to customers based on which user profile of the prediction model does the customer fit in.

We have discussed a few common data mining techniques and how they can help businesses improve their services as well as ensure their sustainability in the market. In the following sections, we will discuss how data mining is being used in other industries to improve business operations and we will discuss how the I.T Consulting Industry can potentially benefit from it as well.

III. USE OF DATA MINING IN OTHER INDUSTRIES TO IMPROVE OPERATIONS

Industries like healthcare, online businesses and insurance companies are already using data mining in their day to day operations. One example of data mining being used in the healthcare industry is a healthcare company called Carolinas HealthCare System.

Carolinas HealthCare, which runs more than 900 care centers, including hospitals, nursing homes, doctors' offices, and surgical centers, has begun plugging consumer data on 2 million people into algorithms designed to identify high-risk patients so that doctors can intervene before they get sick[12].

The company is running its data through data mining tools like predictive models. This allows the company to keep track of a patient health and provide care in a specialized manner.

[12] gives an example using the following scenario as to how the use of the predictive models of data mining works: For a patient with asthma, the hospital would be able to assess how likely he is to arrive at the emergency room by looking at whether he's refilled his asthma medication at the pharmacy, has been buying cigarettes at the grocery store, and lives in an area with a high pollen count. The system may also look at the probability of someone having a heart attack by considering factors such as the type of foods she buys and if she has a gym membership.

If we take a look at the insurance industry, more and more insurance companies are starting to utilize data mining tools for optimizing the prices of their products and providing a customized service to each of their customers.

According to [13], price optimization is a data mining tool that lets insurance companies figure out which groups of customers are more likely to accept a price increase and which are more likely to shop around for a new policy.

Thus an insurance company can analyze a customer's behavior using data mining techniques and can either create a new insurance product for that specific customer or offer them a previously used insurance policy based on the analysis of their data. There is clear evidence that data mining is being used to optimize prices by more and more insurance companies.

A 2013 marketplace survey done by Earnix, a global leader in price optimization, found that 26 percent of all auto insurance companies and 45 percent of the large insurance companies (more than $1 billion in annual revenue) in North America currently optimize their prices [13].

Thus, considering the above evidence from the healthcare and the insurance industry, we can clearly see that implementing data mining techniques is helping these industries to provide better care and services to their customers. This in the long run will help these industries to retain more and more customers and also attract new customers to the products and services being offered. Hence, there is no reason to doubt that similar results can be achieved in the I.T consulting industry if I.T consulting firms implement data mining techniques into their business operations.

In the following sections we will discuss the common operations of an I.T consulting firm and try and see how the data mining techniques discussed previously might prove to be useful in I.T consulting operations.

IV. I.T CONSULTING OPERATIONS

I.T. consulting firms typically perform two major operations: Client acquisition and delivery of services to the client. Client

acquisition involves attracting clients who are looking for consultation services regarding their I.T. infrastructure to use the services of one's I.T. consulting firm. Clients can be made aware of an I.T. consulting firms' services through various mediums. These include Television advertisements, newspaper advertisements and online advertisements. An I.T. consulting firm can also tie up with other firms to gain recognition and attract more clients. Social media is another major platform through which an I.T. consulting firm can make its presence known and acquire clients.

According to [11], In order to acquire clients, consultancy firms can offer free advice to clients to give them a taste of what their services is all about. Then they should distribute and promote them through social media networks such as Twitter, LinkedIn and Facebook, etc. along with email distribution, campaigns and free newsletters. As the consultancy firm creates credibility with their marketing strategy, they will gain more clients as a result.

Delivery of service is the main value proposition of an I.T. consulting firm. I.T. consulting firms can advise clients on a variety of issues relating to areas like strategic planning, security consulting, networking, systems integration, data analytics, business intelligence, enterprise resource planning, business process outsourcing and many more. I.T. consulting firms are also hired to plan, design, implement and maintain I.T. infrastructures.

I.T. consulting firms thus provide services covering a wide range of fields related to I.T. This results in a consulting firm having a vast network of clients, partners and service providers. Thus, an I.T. consulting firm generates and maintains large amounts of data. It is thus very much possible that this vast amount of data could hold meaningful and potentially competitively advantageous information that could help an I.T. consulting firm to improve its services.

V. USE OF DATA MINING TECHNIQUES IN I.T CONSULTING OPERATIONS

As discussed in the previous section, an I.T. consulting firm performs two major operations: Client acquisition and Delivery of services to the client. There are several potential ways in which an I.T. consultancy firm can improve its client acquisition operation by implementing data mining techniques.

To improve client acquisition, an I.T. consulting firm can implement prediction techniques on their website and on partner websites to offer potential clients with services they are most likely going to be needing. These offers can show up on a particular website in the form of recommendations, special promotions or discounts. These offers will change dynamically according to the user profile a particular user fits in. This thus will enable the I.T. consulting firm to target specific users with specific offers that they are most likely to accept.

To improve their services offered and the delivery of those services, an I.T. consulting firm can implement the data mining techniques discussed previously in combination to achieve the desired result.

Using the clustering technique, an I.T. consulting firm can create classes or 'clusters' of its clients according to one or more characteristics such as type of industry the client is from, type of service requested etc. After creating these homogenous clusters of their clients, then, using the association, classification and prediction techniques, an I.T. consulting firm can analyze its current client data and predict what kind of service is a particular client group more likely to request for. This will allow the firm to provide customized and specialized service to each client group. The I.T. consulting firm will also thus be able to target each client group with special promotions and discounts on the services the client group is most likely to request for. This customized service to each client will most definitely help to retain the client and will also serve as a means to attract new clients with the offer of customized and specialized services.

VI. CONCLUSION

In this paper, we discussed some of the common data mining techniques available. We further discussed the major operations that an I.T. consulting firm performs in its day to day business. Finally, we discussed how some of the data mining techniques that were discussed in the earlier sections could be implemented into the day to day operations of an I.T. consulting firm.

We have discussed the potential benefits of implementing such techniques such as improved client acquisition and retention, improved services in the form of targeted and customized service to each client, and attracting potential clients by offering services to them in a uniquely customized manner.

However, before embarking on the journey of implementing these data mining techniques, an I.T. consulting firm needs to keep a few things in mind. Feasibility analysis should be conducted to find out whether it is financially viable to implement such techniques. Also, the firm's data should be of a standardized format across all branches in order for data mining techniques to work. The firm thus needs to weigh the potential costs and benefits carefully against one another before making the decision of implementing data mining in their business.

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