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Assessing the Responsiveness of E-commerce in Data Mining

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Abstract. Information technology is all about storing, manipulating, distributing and processing information. Over the past few years, IT has replaced the conventional modes of businesses with innovative technological tools.Data mining is a set of automated techniques used to extract buried or previously unknown criteria, which makes it possible to discover patterns and relationships. This paper examines the behavior of firm over time using system dynamics model as a basis for setting one of the Information technology situations E-commerce assessing the Responsiveness in the various data mining factors and methods. Based on the literature review, survey results, and discussion with experts, causal relationships among E-commerce performance variables in data mining various factors have been developed. A simulation model was created in order to examine the behavior of the E-commerce model over time. The firm wants to determine the behavior of the E-commerce by using system dynamics (SD). On the basis of these causal relationships, a framework has been modeled using system dynamics approach to capture the dynamic impact of performance variables on the E-commerce integration and responsiveness for a period of ten months. The results of simulation showed that the long run behavior of the company is significantly different, depending on the E-commerce model chosen for the several factors and methods for Data mining. This framework is useful in analyzing the dynamic impact of different policies towards integration and responsiveness of the E-commerce.

Keywords: Data Mining, Information Technology, E-commerce, System Dynamics, Responsiveness.

1. Introduction

E-commerce is buying and selling services and goods over the Internet. Online operations reduce the time and personnel required for business processes. It also reduces costs in areas like labor, document preparation, telephoning, and mail preparation [1]. To understand the effect of responsiveness on the performance of the E-commerce, a SD model has been developed and presented in this paper.

In this paper, initial levels of certain performance variables of the E-commerce in fast moving consumer goods were obtained with the help of experts' opinion. After a period of ten months, levels of these variables were again obtained by taking opinion from the same group of experts. These variables have causal relationships among them. Therefore the level of these variables, after a period of ten months, can be obtained using SDM2 . No significant difference is observed between perceived and simulated level of E-commerce performance variables, hence the SD model is further used to analyze the variables responsible for E-commerce performance improvement under different scenarios. The objective behind developing the SD model is to learning the causal behaviour of variables and its impact on E-commerce performance. These insights are useful as an aid for policy formulation.

2. Research Objectives

There are many main objectives for the research. First, build a SD performance assessment framework model for the E-commerce. Second, identify the performance drivers in E-commerce. Third to understand the effect of responsiveness on the E-commerce, SD has been developed and present in this paper. Forth the objective behind developing the SD model is to learning the causal behaviour of variables and its impact on E-commerce performance. Finally, to investigate and understand the dynamic behaviour that characterizes E-commerce.

3. Literature Review

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[2] System Dynamics Modeling

In this section, we survey articles that are specific to DM implementations in e-commerce. Data mining has also been applied in detecting how customers may respond to promotional offers made by a credit card e-commerce company. Techniques including fuzzy computing and interval computing are used to generate if-then-else rules [2]. Catherine Pilkington (2000) presents a comprehensive overview of the personalization process based on web usage mining [3] . Dale O. Stahl (2000) present a method to build customer profiles in e-commerce settings, based on product hierarchy for more effective personalization [4]. Elaine M. Worzala (2002) describe an approach to predict user behavior in e-commerce sites. [5]. Elizabeth Daniel (2004) propose an algorithm based on sequence alignment to measure similarities between web sessions where sessions are chrono-logically ordered sequences of page accesses [6]. F. Doherty (2009) propose a method to predict presentation resource demands in interactive multimedia catalogs [7]. The article by Hsin-Ginn Hwang (2001) discusses an intelligent frame work called PENS that has the ability to not only notify customers of events, but also to predict events and event classes that are likely to be triggered by customers [8]. J. Cox (2001) propose a methodology to improve the success of web sites, based on the exploitation of navigation-pattern discovery[9].

4. Data Mining

Generally, data mining (sometimes called data or knowledge discovery) is the process of analyzing data from different perspectives and summarizing it into useful information - information that can be used to increase revenue, cuts costs, or both [10]. Technically, data mining is the process of finding correlations or patterns among dozens of fields in large relational databases. [11, 12].

In this section we will explain the data mining methods. One of the important results of related literature review is the fact that the architecture for data mining applied to retail e-commerce. Figure 1 presents the data mining methods. Data Mining [13] methods can be distinguished into two main categories of data mining problems prediction and knowledge discovery. While prediction is the strongest goal, knowledge discovery is the weaker approach and usually prior to prediction. The algorithms in how to use data mining in E-com. in details showed in Figure 2.

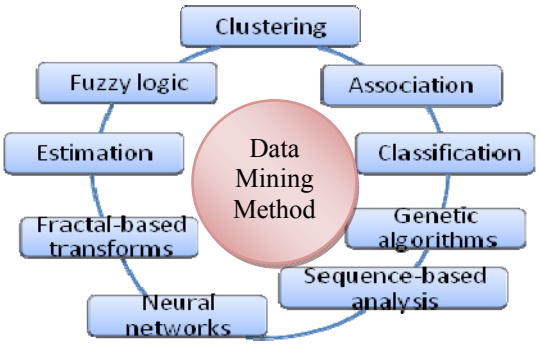

Fig. 1: Data mining methods

In order to use data mining in E-commerce we should Study database schemas which is the first step and then identify performance limitations and then try to perform due diligence on data itself and analyze data . Figure 3 summaries the outline of the Data mining architecture applied to retail e-commerce.

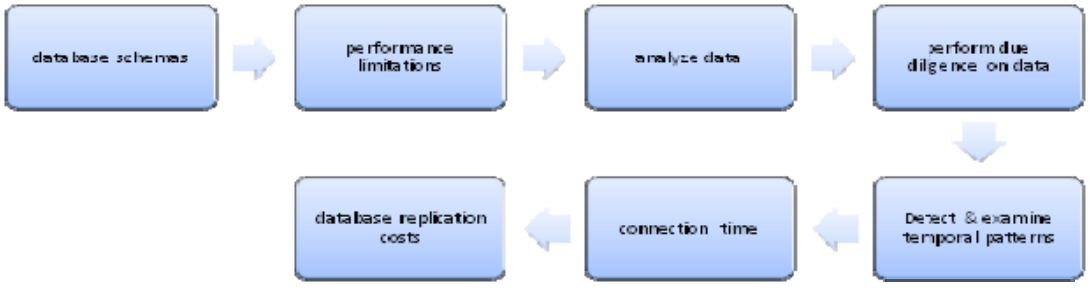

Fig. 2: The algorithms in how to use data mining in E-commerce.

In most cases we might know the goals and the other tasks were the goals are not known to find out the classes based on methods such as clustering before we can go into predictive mining.

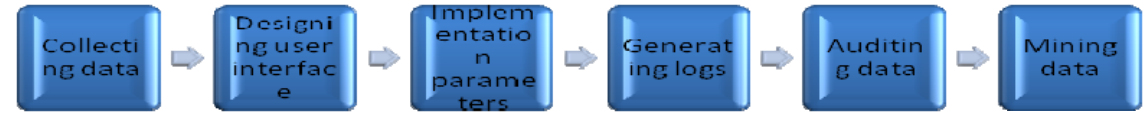

Fig. 3: Data mining architecture applied to retail e-commerce.

Furthermore, the prediction methods can be distinguished into classification and regression while knowledge discovery can be distinguished into: deviation detection, clustering, mining association rules, and visualization [14,15]. Also, in some cases, the number of association rules may be very large. To draw meaningful rules that have real business value, it may be worthwhile to select the statistically most significant set of rules from the large pool of rules generated by a rule-mining algorithm. We note that methods such as principal components analysis and factor analysis could be used to unearth hidden classes or clusters [16]. To categorize the actual problem into one of these problem types is the first necessary step when dealing with Data Mining. Note that Figure 4 describes the basic types of data mining methods. We consider for e.g. text mining, web mining or image mining only as variants of the basic types of data mining which need a special data preparation.

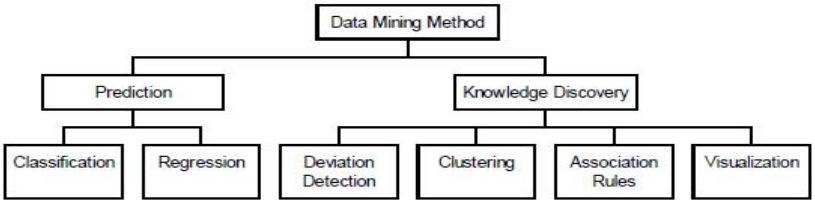

Fig. 4: Types of Data Mining Methods

5. The System Dynamics Approach and Model logic

SD models have been applied to various fields in the natural and social sciences. There are still countless problems and issues where correct understanding is a problem and the dominant theories are event-oriented rather than dynamic in nature. Response analyses are frequently made through computer simulations of dynamic systems. Data mining consists of five major elements like Extract, transform, and load transaction data onto the data warehouse system. Store and manage the data in a multidimensional database system. Provide data access to business analysts and information technology professionals. Analyze the data by application software. And Present the data in a useful format, such as a graph or table. In our model that is show in figure 6.we depend on the most E-commerce variable comment buying and selling. The online operations reduce the time and personnel required for business processes. It also reduces costs in areas like labor, document preparation, telephoning, and mail preparation .

6. Model nomenclature

In our model we use many equations for examples (equations 1-4) as shown in below:

OR (t)[3] = COR4 (t) * ODE5 (t) * PpCu(t) Eq.1 , SOWF6 (t) =INTEG (OR7 (t)) – FR8 (t) Eq.2 , OFR9 (t) = MIN (SOWF (t))/minimum CT10, Ca Eq. 3 , NCu11 = OFR (t)12 / PpCu13(t) Eq. 4

[3] On line operation
[4] Reduce time
[5] Personnel required
[6] Reduce costs
[7] Online operation
[8] Responsiveness
[9] Performance of the E-Com
[10] Time required for responsiveness
[11] Buying and selling
[12] Orders and offers
[13] No of customers

7. Model Polices :

7.1. Policy1: Performance and Data Mining Plan:

The first policy is based on performance to order for reorganizing data and increasing the level of data. Fig. 5 shows the first pattern that demonstrates a sudden step change in data per customer to give a dramatic shock to the system. The system responds well to such change.

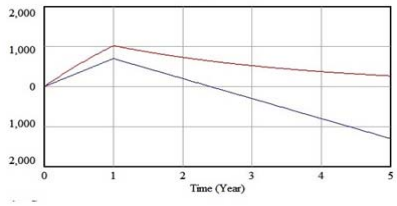

Fig.5: sites per customer graph for sudden change scenario.

Dynamic modelling was performed for the performing and the simulated results were obtained by Vensim software. The correct prediction of system behaviour as a result of dominant policy is changed by preceding efficient policies to utilize the facilities toward stable development and dominant policy is changed by making reasonable changes in the parameters' values or the equations formulation.

By setting knowledge per customer to 1 the customers system immediately responds to the customer rate and new customers shock by increasing the customer level to 10% Fig. 6.

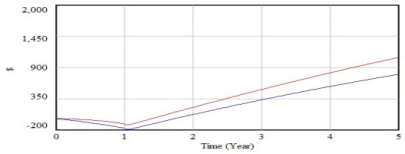

Fig. 6: performance and data mining plan (10%)

7.2. Policy 2: Fixed and Changeable Responsible

Some unpredicted data size or attribute for responsiveness of the database policy in the dynamic model have been reviewed on the basis of the importance (from the results of a questioner designed for this proposes). We assumed that increasing in data in the dynamic effects on the level of mining rate. Fig. 7 shows the data level when the initial value for the mining was 100 sites for the E-commerce and with a rate 1000 site/day.

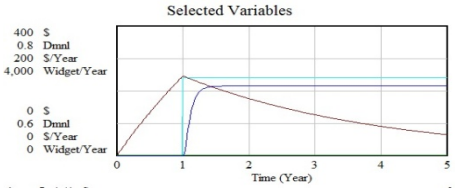

Fig. 7: Data level when the initial value for the mining was 100 sites

The first pattern in Fig. 8 shows that the sites level will be stable for 5 years and then the sites level will be increased. The second pattern in Fig. 10 illustrates the dynamic behaviour when the company's increases the commerce rate to 2000 sites/day.

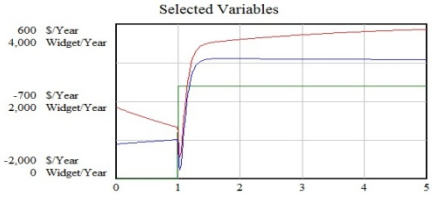

Fig. 8: sites level with 15-25%

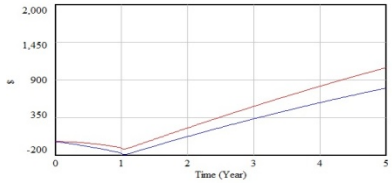

Fig. 9: Different data level rate graph.

Other unpredicted e-commerce for the responsiveness of data policies reviewed when the demand will be decreased while the company stables the ecommerce rate. Fig. 9 shows the data level when the demand is decreased to (50%) with a stable rate.

8. Conclusion:

We have reviewed the basic data mining methods and given an overview on what kind of method is eligible for the considered result. Acquiring new customers, delighting and retaining existing customers, and predicting buyer behavior will improve the availability of products and services and hence the profits .These are classifications based on decision tree induction and conceptual clustering. With these methods we can solve such problems as learning the user model, web usage mining for web site organization, campaign management, and event monitoring. The primary challenge for the next generation of personalization systems is to effectively integrate semantic knowledge from ontology into the various parts of the process.

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