Research on Predicting Algorithm for Customer Repurchasing Behavior Based on the Perceived Value Model in Network Marketing Environment

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Abstract. With the rapid development of internet technology, network marketing has become a more and more important marketing tool. Customer repurchasing behavior play a important role in benefit acquiring compared with developing the new one. However current achievements in this field mainly focus on the relationship mining and factor definition, few of them pays attention to the behavior predicting. Regarding this problem, this paper construct a behavior predicting model based on perceived value using Bayesian network which can be used not only in behavior modeling but also in predicting field. The simulation result is analyzed in detail to validate the validity of the model proposed in the end

Keywords: customer repurchasing behaviour, perceived value model, network marketing

1. Introduction

As the fastest growing and most valuable new things of 21st century, internet has played a significant role in the production of human society and life. In recent years, with the rapid development of e-commerce in China, many firms have followed the trend and opened online store to provide users with online shopping and other services. Since e-commerce itself has many advantages, so the number of Internet users participate in online trading increased rapidly, and the amount of online transactions raised sharply. There have been some changes on internet users behaviour and psychological characteristics.

At the same time, the social and economy of china are developing rapidly, repurchasing behaviour becomes more and more important for network marketing. Compared with acquiring new customers, it is easier to get benefits through keeping customers. Generally believed that loyalty and customer satisfaction is a key factor in repeat purchasing behaviour. However, some strange phenomenon's like satisfied customers stop buying, and satisfied customers have continued to repeat purchasing can not be explained by this theory. Therefore, researching on the reasons and related factors of customers on repeated purchasing behaviour is of great importance.

2. Related Works

In view of the huge economic benefits in customer repeated purchasing behaviour for network marketing, lots of scholars have made some achievements in this filed. Some of them with representatives can be listed as follows. Atchariyachanvanich[1, 2] develop a purchase-repurchase model for Internet shopping which integrates three theoretical models- the technology acceptance model (TAM), expectation-confirmation theory (ECT), and the model of intention, adoption, and continuance (MIAC). The model consists of three processes: intention to purchase, actual purchase, and intention to repurchase. Sun, Ying[3, 4]developed a process model of repurchase intentions, service experiences and value perception of a reward program influence repurchase behaviour. Zhang, Yixiang[5] [6]formulated and tested a model to explain B2C user

repurchase intention from the perspective of relationship quality. The model was empirically tested through a survey conducted in Northern Ireland.

The achievements mentioned above mainly focus on the relationship between Customer satisfaction and repeated purchasing behaviour, ignored some key factors like user Perceived Value and some other potential problems. so making research on the customer repurchasing behaviour and predict it from the Perceived Value of customer is very important.

This paper proposed a Customer Repurchasing Behaviour predicting algorithm based on Perceived Value Model constructed from taobao purchasing data using Bayesian network, a famous machine learning method for information predicting. Based on the model constructed, the predicting process is described in detail. In the end, the result of simulation experiment is analyzed from several different aspects and some meaningful conclusion is reached.

3. Perceived Value Mode

3.1. Summary of Perceived Value Model

Perceived value[7] is considered as the tradeoffs of perceived benefits and perceived sacrifices. This view is agreed by many scholars in this field. Perceived benefits includes physical state factors, service factors and product-related technical support, quality factor. perceived sacrifices includes the customer at time of purchase to pay for all costs, such as the purchase price, acquisition costs, transportation, installation, order at management, maintenance and the risk of failure or poor performance. The relationship between these factors can be described like figure1.
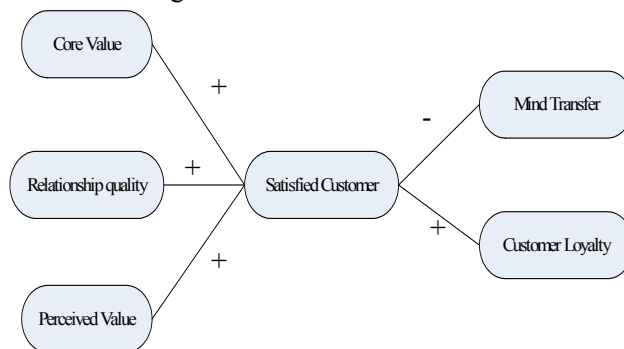

Fig. 1: The relationship between these factors for perceived value model

As a result, enhancing the perceived customer value can increase profits by reducing the perceived benefit or loss to achieve. Perceived value from customers obtained through the study of perception, preferences and evaluation. It is the product, the use of scenarios and have a certain direction of the target customers are experiencing related outcomes.

3.2. Perceived Value Modeling Using Bayesian Algorithm

The model mentioned in figure1 can be further extended for the description of detail relationship, which is the basis of perceived value modelling. The network structure of perceived value can be described like figure2.
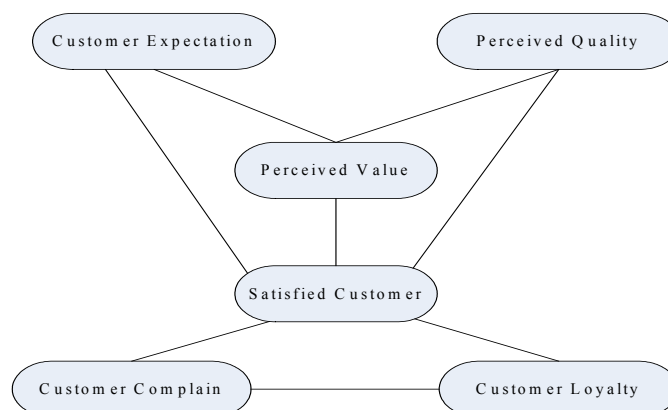
Fig. 2: network description of perceived value and other related factors

According to figure 2, Customer satisfaction at the center of the network, perceived quality, perceived value and customer expectations together determine customer satisfaction, customer satisfaction, decided to customer complaints and customer loyalty. Perceived quality of service experienced by customers is the evaluation of customer satisfaction has a positive impact; perceived value is relative to the price level of quality; customer expectations in customer service experience prior to the formation of its own by advertising, word of mouth and other factors, is customer services provided by the supplier quality expectations. These three interrelated factors that premise, together determine customer satisfaction. When the customer satisfaction, it will reduce complaints and increase loyalty.

To construct this network from the network marketing data, some intelligent learning algorithm must be designed first, Bayesian network is the most suitable candidate for this kind of application.

Bayesian network[8-10] approach in recent years, research in the field of artificial intelligence for probabilistic uncertainty and things used to conditionally dependent on a variety of factors controlling the decision-making. In solving practical problems, we need never complete, inaccurate or uncertain knowledge and information to make reasoning. Probabilistic reasoning, Bayesian network is a technology that uses probability theory to describe the conditions between the different components related to the knowledge arising from uncertainty.

There are three classical algorithms for the automatic constructing of Bayesian network from data source, which can be described as follows.

(1) Probability method. Study to determine the probability that the network structure under the premise of combining sample data set to determine the root of the a priori probability and the conditional probability distribution between nodes in the process. Until more data, Bayesian networks can take advantage of these new data on the network structure and parameters to be updated, but also from the a priori joint distribution to the posterior joint distribution process.
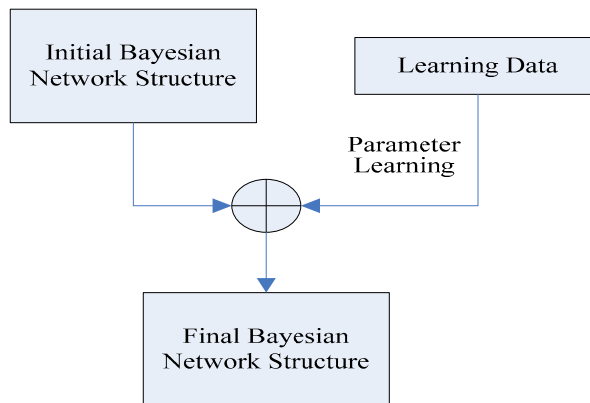

Fig. 3: learning step of bayesian network

(2) Structure learning method. Structure learning is to find a priori knowledge and data fitting for the best Bayesian network structure. Expert knowledge with a large number of problem areas, Bayesian approach to building the network structure obtained by the a priori knowledge, that is variable according to experts on the causal dependencies between the cognitive and directly lays out a variable from the dependent variable to ask if the connection in most cases, there is expert knowledge to obtain a Bayesian network structure is the optimal Bayesian network structure.

(3) parameter learning. Parameter learning algorithm for parameter independent of each other, and the network needs to build a more permanent form 4 Workflow of the Predicting algorithm.

For our needs, the network structure is relatively fixed, the data structure is more clear, suitable for direct use of parameter learning method for network construction, the process can be described like figure 3.

4. Behavior Predicting from Model

According to the model described, some predicting can be made to help improve the frequency of repurchasing. To achieve this goal, some working process must be designed like figure4.
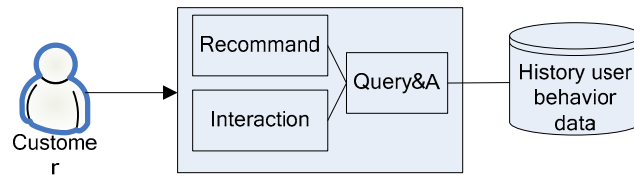

Fig. 4: predicting-aid recommending process

The whole process can be divided into five steps. First, customer forwards the personal information in a shopping site. Then the interaction module will collect the ID and query for the history information from database through Query&A module, which will train the Bayesian network by the history information acquired. Finally when customer views certain good has been bought, the recommend module will predict the probability of repurchasing, and made the recommend accordingly.

5. Experiment Study

Using the model designed, according to the data set of taobao mentioned above, the predicting value can be calculated. Then the predicting result can be compared with the history record to check the validity of our model, 2000 separate history is calculated and the result can be described like table1.

TABLE I. COMPARASION BETWEEN PREDICTING RESULT AND HISTORY DATA

Time of Purchase	Predicting value	Expected Purchase Count	History Count
0	0.2248	400	360
1	0.2174	350	230
2	0.1345	340	320
3	0.0723	320	310
4	0.0544	280	250
5	0.0489	250	220
6	0.0322	210	180
7	0.0225	170	130
8	0.0143	150	100
9	0.0054	90	30
10	0.0023	80	22

Through the result, we can conclude that combination of the customer purchase decision the first time, customers buy twice before and after the interval time distribution, and customer repurchase behavior factors such as customer re-escape probability prediction method can buy better fit the actual sales data. Experimental data also shows that, for this salad and physical health are closely related to consumption of consumer goods, relatively easy to form a certain degree of brand loyalty. With such characteristics of goods, generally the initial high cost of attracting new customers, while a certain brand loyalty of existing customers lower maintenance costs

Using this method to the user's culture and repeat purchase behavior prediction, thereby effectively improving the economic benefits of network marketing, which can be used to enhance marketing management, marketing plan and assess marketing effectiveness with some reference

6. Conclusion and Future Works

Repurchasing Behaviour predicting is a critical research branch in the network marketing. With the rapid development of internet technology, exploring network market through variety of means is of great significance. According to this requirement, this paper proposed a customer repurchasing behaviour predicting method based on perceived value model using Bayesian network. The result of simulation experiment shows that the algorithm can predict the customer's behaviour to some extent. In the future, some other machine learning algorithm will be employed for the improvement of this method.

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