Optimal Merchandise Selection Strategy in E-Store Promotional Webpage: A TOPSIS based Approach

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ABSTRACT

In many e-commerce cases, the number of the goods which can be displayed in the promotional webpage is very limited. The sellers cannot put all the goods displayed in the front webpage of the promotion, and they won’t waste the valuable opportunity to randomly place some ones. It is an urgent problem for the sellers that how to pick out the most appropriate goods to be laid out in the front promotional webpage among the number of merchandise. In order to provide the optimal strategy to the sellers, we firstly analyze their major concerns in promotional activities: to pursue the maximum profit, to dominate the extensive market, and to win the best reputation. We also make a study of the promotional characteristics, including the effect of earning power and cross selling, the influence of price discount and the reputation based on customer sentiment analysis. Then, an EPR (Earning power-Price discount - Reputation) model based TOPSIS is built, and the extended genetic algorithm is used to solve the problem. At last, an experiment is carried out in this paper to show the effectiveness of the solution.

KEYWORDS
Cross Selling, Customer Sentiment, EPR Model, Extended Genetic Algorithm, TOPSIS

INTRODUCTION

Every seller is eager to make the full use of the exhibition opportunity of the front promotional webpage, but also bothered by its limited capacity. And for the large quantity of the candidate merchandise, how to select the most suitable goods to lay out in the front promotional webpage is the most prudent decision-making problem for the sellers. At the first sight, the goods with high earning power will be tended to display for maximum profit. But after our analyzing the e-commerce promotional characteristics, that is not the only one option. A lot of sellers want to take the competitive advantage of price discount in the promotional activities to meet their long-term goal, which is to dominate the market. At the same time, more and more sellers pay close attention to word-of-mouth advertising since it is the most beneficial. This finding can be explained by the possibility that customer satisfaction often generates free propaganda and saves subsequent marketing costs. As a consequence of the study, we think of the promotional goods selection problem from these three aspects. First, the earning power of the product is always the key factor that the sellers care about most. From an intuitive point of view, the earning power is that the sale price of this commodity subtracts all the cost of manufacturing, production, etc.. However, this is just the direct profit that can be seen in the e-commerce, but some products also have some other indirect profit. For example, if a commodity...
is sold, it has no effect on the sale of other goods, that is to say, its deal is in isolation. It only has its native profit because of no feedback and no return from others. While in many transactions, there exit a lot of cross selling (Brijs et al., 2000; Wong et al., 2003). In short, the purchase of commodity A would boost the same customer to buy commodity B in the same e-store. In this way, commodity A not only has its own original earning power, but also has derivative earning power which is reflected from the follow-up transactions. The original earning power and the derivative earning power are both considered in this paper. Second, there are always lots of price-sensitive consumers in the commercial activities (Maryam N. & Jamal S., 2010), and the price discount (Cheng, 2012) is also the focus of the promotional activities which is to highly attract customers’ attention. The sellers are always prone to use the competitive price to get the large number of customer, and to dominate the market further. Third, the customer satisfaction is another hotspot issue we should think it over. Different from shopping in the traditional store, customer cannot touch or experience the goods from the e-store face to face, so the evaluation by the former buyers has been highlighted to a very important position. The customers pay close attention to the e-store’s reputation based on customer sentiment analysis (Zhang et al., 2012). Therefore, the mutual information in e-commerce becomes a core issue not only to the buyers but also to the sellers (Zhang et al., 2015; Zhang et al., 2015). As a consequence, the e-stores have to rack their brains to raise the reputation so that the customers would be attracted to the e-store and they could make up for the deficiency of missing the customers’ demand of live experience. In many business matters, the promotional merchandise selection strategy is a very complex problem that we should consider many relevant aspects of it. From our study, a description of the above three index analysis is demonstrated in the next part, and the corresponding mathematical model, called EPR (Earning power-Price discount-Reputation) model, is also established to obtain the optimal solution. And then an extended genetic algorithm is used to solve the model, and the validity of the method is shown by an experiment.

LITERATURE REVIEW

Many scholars have been concerned about the e-commerce transaction and have made research on the decision-making of the goods selection in the promotional activities. Brijs et al. (Brijs, Swinnen, Vanhoof & Wets, 2000; Brijs, Swinnen & Vanhoof, 1999) put forward a PROFSET model based on cross selling to solve the commodity selection of the vending machine. In PROFSET model, the index of support of the frequent item set is used to identify the customer’s intention. But PROFSET model is pointed out that it is just suitable for the small group of the goods. Wang et al. (Wang & Yen & Su, 2002) proposed another selection method by using the “Hub - authority” algorithm. “Hub - authority” algorithm is a typical algorithm to solve the problem of Web page ranking in search engines. The advantage of using this algorithm is that it can handle the sorting problem of a large number of commodities. But the algorithm only adapts to deal with the problem of single product sold per time. Wong et al. (Wong, Fu & Wang, 2003; Wong, Fu & Wang, 2005) presented to calculate the cross selling effect by association rule technology. Both the support and the confidence of association rule are used in their model. Nevertheless, the literature has still not measured the correlation of the merchandise and been limited to the retail sales of the single commodity transaction. Yang (2001) considered the effect of cross selling in the product allocation, but their model just was regarded as a bag model, and they only gave the heuristic algorithm to simplify the problem. Cheng (2012) developed the promotional items selection methods using the simple genetic algorithm to improve multi-items sales performance. The method took the effect of cross selling and the price discount into account, but didn’t consider the important and special effect of the reputation in e-retailing. Kaishev et al. (Kaishev & Nielsen & Thuring, 2013) demonstrated a methodology in cross-selling of financial services products. While expected profit maximization and mean-variance optimization are considered as alternative optimality criteria, but it aims to get the solution of optimal customer selection. The above work has done research on the merchandise selection commerce problem and
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