Effect of Product Type and Recommendation Approach on Consumers' Intention to Purchase Recommended Products

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Abstract: Many e-stores offer product recommendation service to increase sales and customers' satisfaction. However, the performance of recommendation system will be influenced by the consumers' judgments on recommended products. The purpose of this study is to investigate the effect of product type and recommendation approach on consumers' intention to purchase recommended products. A laboratory experiment was conducted to collect empirical data and ANCOVA was adopted to test the research hypotheses. We found that there are significant interaction effects between recommendation approach and recommended product type on consumers' willingness to buy the recommended products and their disconfirmation of the recommended products, while the consumers' self-monitoring degree was a covariate variable. Before experiencing the products, consumers' willingness to buy search goods recommended by the top-N approach is significantly higher than those recommended by the collaborative-filtering recommendation approach. On the other hand, after experiencing the products, consumers' disconfirmation of the experience goods recommended by the top-N approach is also significantly higher than those recommended by the collaborative-filtering recommendation approach. Besides, among the products recommended by the top-N approach, the disconfirmation of experience goods is significantly higher than that of search goods. The results of this study provide valuable implications for researchers and practitioners.

1 INTRODUCTION

With the prevalence of the Internet, consumers begin to explore the newly found field of e-shopping. However, there is a wide variety of product information on the Internet, and consumers have to spend a lot of effort searching for the information they need. In order to reduce their time and cost spent on looking for information, e-stores offer recommendation mechanism to help consumers to filter out useful information (Zhang et al., 2011). For example, Amazon.com set a precedent for adopting service-oriented strategies by innovative technologies, such as cross-selling and Today's recommendation, to recommend appropriate goods to their customers based on their purchasing history or browsing behavior. The techniques of recommender system can be roughly separated into personalized and non-personalized recommendation techniques. For example, Top-N (i.e., Top N best-selling product) is one of the non-personalized recommendation techniques, and the recom-

mendation approach is based on the most popular products. On the other hand, personalized recommendation is based on each customer's personal interests. For example, collaborative-filtering approach predicts a target consumer's preferences based on a group of consumers whose interests are similar to the target consumer and then recommend to him the products that he/she might like.

The outputs of the recommendation system are goods, but the properties of goods are different. Physical goods can roughly be separated into search goods and experience goods (Nelson, 1970). Search goods mean that consumers are able to acquire complete or most information of the product's main properties before buying it, while experience goods' main properties can only be evaluated after that was consumed or its information acquisition is much more difficult than directly experiencing it. Since the purpose of recommending products to consumers with recommendation systems is to increase sales, our research is aimed at exploring the influence of

recommendation systems and product types on consumers' willingness to buy a product. Besides, consumers may have a kind of expectation before buying a product, and there may be a gap between their expectation and their perceived performance of the product after purchasing it (Venkatesh and Goyal, 2010), and this is called "*disconfirmation*" or "*experience gap*" in this study. If consumers experience significant disconfirmation after buying the recommended product, it will affect their satisfaction of the recommendation mechanism and further influence their re-purchase willingness. As a result, the other purpose of our research is to explore the effect of recommendation system and product type on consumers' disconfirmation after the consumers have experienced the recommended product.

This paper is organized in the following way: we are going to explore related research literature in the next section. The research hypotheses and research methods are proposed in Section 3, and the findings and discussions are described in Section 4. We make a brief conclusion and offer suggestions for future research in the last section.

2 LITERATURE REVIEW

2.1 Recommendation System

The most widely used recommendation approaches are non-personal recommendation, attribute-based recommendation, item-to-item correlation, and people-to-people correlation (Schafer et al., 1999). Non-personal recommendation is mainly based on the Top-N products in the current market, and it does not put users' personal interests into consideration, so every user will receive the same recommendation information. Attribute-based recommendation, also known as content-based approach, is based on the attributes of the products. Users have to specifically "tell" the system their needs so that similarity analysis of their needs and products' attributes will be learned and then the products that meet users' needs will be recommended. Item-to-item correlation is based on the correlation between different products. For example, when a customer purchases coffee beans, usually he will also buy some sugar and coffee-mate. People-to-people correlation, also known as collaborative filtering approach, is based on the correlation between users, using the preference similarity of similar users to find un-experienced products or services that users might be interested in.

For consumers, the process of recommendation systems is a "black box," because they don't understand the internal algorithm of recommender systems. As a result, consumers can only judge from the recommended information when they are evaluating a recommendation (Wang and Benbasat, 2007). Recommended information means all the contents provided by e-stores when they recommend a product to consumers, and it includes recommendation messages generated by recommendation system (e.g. the explanation of the recommendation) and the messages generated from non-recommendation system (e.g. peer reviews). The recommended information is also the main information that affects consumers' buying decision.

2.2 Effect of Product Type on Online Shopping

Products can be classified on the basis of their features. For example, Nelson (1970) used product features to separate products into search goods and experience goods. Search goods mean that through collecting information, consumers are able to find out a product's quality or features before buying it (e.g. books), while experience goods' main properties can only be evaluated after buying or consuming it (e.g. wine). The difference in product types not only affects consumers' message processing but also influences their on-line shopping behavior (Mudambi and Schuff, 2010). Hence, different product types will lead to the difference in the difficulty degree of evaluating an on-line product's quality.

Previous research found that consumers are more willing to buy search goods than experience goods on-line. For example, Chiang and Dholakia (2003) did a survey and found that consumers are more willing to buy books (search goods) than perfume (experience goods) online. Gupta et al., (2004) also found that consumers are more willing to buy books and tickets (search goods) than wine and stereos (experience goods) online. As a result, product type is an important factor that affects consumers' purchase decision (Im and Hars, 2001); (Wang and Lin, 2003). Therefore, we also put the influence of product type into consideration when we are evaluating the effect of recommendation systems.

2.3 Expectancy-disconfirmation Theory

Disconfirmation is the result of the comparison between expectation and performance. Based on the

difference between expectation and performance, there are three kinds of situation: when expectation equals performance, there is no disconfirmation; when expectation is smaller than performance, it is positive disconfirmation; when expectation is greater than performance, it's negative disconfirmation (Anderson, 1973). Before purchasing a product, consumers will establish a comparison standard based on past purchase experience. After the purchase, they will compare the performance of the product with the standard and generate positive or negative disconfirmation, which affects their satisfaction (Cadotte et al., 1987). If there is a gap between a product's performance and a customer's expectation, the customer will change his cognition of the product and exaggerate the gap. As a result, if the performance of a product is lower than expectation, customers tend to give it an even lower rating.

If there is a gap between product performance and customers' expectation, irrespective of the size and direction of the gap, customers will lower their ratings for the product and adopt a general negative attitude toward it, thus reducing their satisfaction. Only when product performance equals customers' expectation customers will feel satisfied. As a result, in the process of purchasing recommended products, consumers will compare their expectation before experiencing the product and perceived performance after actually experiencing the product or service in order to judge if there is difference between expectation and performance. Therefore, we infer that if a customer finds that the performance of the product recommended by the system is very different from his expectation, then his/her satisfaction of the recommendation system will be reduced.

3 RESEARCH METHODS

The purpose of this research is to understand whether recommendation approach and product type will affect consumers' purchase intention and experience gap when they are shopping online. This study focuses on the comparison between Top-N and personalized collaborative-filtering approach (CF) when discussing the effect of recommendation approach. As for exploring the effect of product type, we aim at comparing search goods with experience goods. When evaluating consumers' willingness of purchasing a certain product, besides estimating the degree of their purchase intention after they read recommendation information, we also evaluate their

disconfirmation after they actually used the product; that it, we are going to evaluate the absolute value of the difference in purchase intention before and after they experience the product. The following sub-sections will propose the hypotheses and experimental design of this study.

3.1 Research Hypotheses

When consumers are choosing products, they will search for related information based on their own experience and outer environment. After the process of comparing and judging, consumers' purchase behavior will be formed. Purchase intention means a consumer's subjective purchase tendency of a certain product, and it has been proved to be an important indicator that can predict purchase behavior (Fishbein and Ajzen, 1975). Purchase intention can be defined as the possibility of a customer buying a certain product, and the higher the purchase intension is, the greater the purchase possibility becomes (Schiffman and Kanuk, 1999).

Previous research found that the number of consumers who referred to recommendation was twice more than that of those who didn't refer to recommendation (Senecal and Nantel, 2004), which indicated that consumers' purchase decision would be affected by recommendation. Since personalized recommendation approach is based on consumers' personal interests, while non-personalized recommendation approach is on the basis of people's common preferences, our research suggests that consumers' purchase intention of the products recommended by CF is higher than that of the products recommended by Top-N, and the products recommended by CF can meet consumers' needs better than the products recommended by Top-N. Therefore, we propose hypothesis H1 and H2:

H1: *Consumers' purchase intention of the products recommended by CF is higher than that of the products recommended by Top-N.*

H2: *Consumers' disconfirmation of the products recommended by CF is lower than that of the products recommended by Top-N.*

On the other hand, product type will also affect consumers' cognition of the recommended products, because they are able to find out more about the quality of search goods than experience goods before purchasing them, and consumers are more willing to buy search goods than experience goods on-line (Chiang and Dholakia, 2003); (Gupta et al., 2004). Thus, our research proposed hypothesis H3 and H4:

H3: *Consumers' purchase intention of search*

goods recommended by recommendation systems is higher than that of experience goods.

H4: *Consumers' disconfirmation of search goods recommended by recommendation systems is lower than that of experience goods.*

Since different recommendation approaches adopt different recommendation basis, when recommendation approaches recommend different types of products, there might be different recommendation effect. For example, Aggarwal and Vaidyanathan (2005) found that consumers rate the recommendation result that rule-based recommender agents use on search goods higher than that of they use on experience goods. Thus, our research proposed hypothesis H5 and H6:

H5: *Recommendation approach and product type have significant interaction effect on consumers' purchase intention of recommended products.*

H6: *Recommendation approach and product type have significant interaction effect on consumers' disconfirmation of recommended products.*

The process of recommendation systems recommending products to consumers can be viewed as a process of persuasion. Since every consumer has his own personality, the effect of the persuasion made by recommendation systems on consumers' cognition will be different. However, pervious research didn't put much emphasis on the influence of consumers' different personality on recommendation effect. People generally have different ability to adjust their behavior in order to adapt to the changes in outer environment. The self-monitoring concept which was investigated in previous studies deals with the phenomena of expressive controls (Snyder, 1974). People with high self-monitoring will adjust their own behavior based on the social cues gathered from other people and social context, while low self-monitoring people's behavior is controlled by their own internal states (i.e., beliefs, attitudes, and dispositions) instead of environmental cues (Snyder, 1974).

High self-monitoring people are very sensitive to the outer environment, and they will adjust their behavior so as to adapt themselves to the external expectation, while low self-monitoring people aren't concerned about outer situation and they tend to maintain a consistent behavior model, ignoring the needs of the situation (Snyder and Williams, 1982). As a result, the differences in consumers' self-monitoring degree may affect their willingness to purchase recommended products, because

recommendation is provided by recommender systems (outer environment). Since consumers' self-monitoring degree may affect their purchase intention of recommended products, consumers' self-monitoring degree was adopted as the covariate to explore its effect when we analyze the influence of recommendation approach and product type on consumers' purchase intention and disconfirmation.

3.2 Experiment Design

The purpose of this research is to explore the effect of recommendation approach and product type on consumers' purchase intention and disconfirmation. Thus, a two-factor experiment was conducted to test the hypotheses. Both recommendation approach and product type are the independent variables. Recommendation approach has two levels, i.e., Top-N and CF. Product type also has two levels, i.e., experience goods (healthy drink) and search goods (magazine). Purchase intention and disconfirmation are the dependent variables while self-monitoring degree is the covariate. Three items adapted from previous studies were used to measure the purchase intention (Dodds et al., 1991); (Grewal et al., 1998) and 18-item proposed by Snyder and Gangestad (1986) were used to measure the self-monitoring.

The voluntary subjects were recruited from a medium university in Taiwan. In order to offer recommended products to the subjects in accordance with their preferences, all subjects had to fill out questionnaires about their product preferences when they registered the experimental activity. There were 108 subjects who joined the experiment.

The laboratory experiment was conducted in a lab and the experimental process is as follows: Step 1: the subjects got a paperback questionnaire. They logged in the experimental website and browsed the experiment website after the instructor's introduction. Then the subjects were randomly assigned to Top-N group or CF group by the experimental website. Step 2: the experimental website would adopt different recommendation approach to offer recommended products for subjects based on the group they belonged to, but the number of products was fixed (e.g. three bottles of healthy drink for experience goods and three magazines for search goods). The recommendation order was random in order to avoid order effect. After reading the recommendation messages, the subjects would choose the product he liked most and put it into shopping cart to complete his shopping mission. Step 3: subjects had to fill out their purchase intention degree for each recommended product after shopping, and the evaluation of

purchase intention was calculated by the average of three items. Step 4: After completing the first part of the questionnaire, subjects were arranged to try the recommended products outside the experiment lab. Step 5: After trying the recommended products, subjects finished the second part of post-purchase intention in the questionnaire. Step 6: Each subject got US$3 as reward.

4 DISCUSSIONS

4.1 Sample and Descriptive Statistics

Among the 108 subjects that participated in our experiment, there were more females than males. As for educational background, college and graduate students both accounted for a large proportion, 57% and 42% respectively. The subjects' Internet experience was mostly in the range of 6 to 10 years. As for daily Internet using time, it was mostly with 5 hours, and about half of the subjects had e-shopping experience. Besides, the mode of the number of magazines read by every subject per month was less than 2, and the healthy drink drunk by every subject per week was mostly less than 1.

The average and deviation of the two groups of subjects' purchase intention and disconfirmation of the three search goods and three experience goods recommended by the experiment system are shown in Table 1 and Table 2. The higher the grades are, the stronger purchase intention and disconfirmation are.

Table 1: The subjects' average purchase intention.

Product type	Recommendation approach	
	Top-N	CF
Experience goods	4.666 (0.912)	4.716 (1.029)
Search goods	4.827 (1.073)	4.418 (0.934)

Note: mean (standard deviation)

Table 2: The subjects' average disconfirmation.

Product type	Recommendation approach	
	Top-N	CF
Experience goods	1.189 (0.696)	0.838 (0.644)
Search goods	0.702 (0.465)	0.762 (0.61)

Note: mean (standard deviation)

4.2 ANCOVA Analyses

Two repeated measures ANCOVA were adopted to test the hypotheses proposed by this study. The results of first ANCOVA show that the interaction effect of recommendation approach and product type on the purchase intention is significant ($p < 0.05$), but the covariate variable, self-monitoring, is not significant. Hence, H5 is significantly supported. Since the interaction effect is significant, the simple main effect of recommendation approach was tested at a given level of product type, and vice versa. As Table 1 shows, the average purchased intention toward experiences goods is higher than search goods when the products were recommended by CF approach, but the average purchased intention toward search goods is higher than experience goods when the products were recommended by Top-N approach. However, the differences are non-significant. On the other hand, the effect of recommendation approach is significant in search goods ($p < 0.05$), but not in experience goods. This finding reveals that Top-N outperformed CF approach when the search goods were recommended. This result contradicts the hypothesis H1, so the hypothesis H1 and H3 are not supported.

The results of second ANCOVA show that subjects' disconfirmation is affected by the interaction of recommendation approach and product type ($p < 0.05$), so the hypothesis H6 is significantly supported. In addition, the self-monitoring variable is significant ($p<0.05$). We conducted further simple main effect analysis. As Table 2 shows, the subjects' disconfirmation of the experience goods recommended by Top-N approach is significantly higher than that recommended by CF approach, but the search goods is non-significant. Hence, H2 is partially supported. Furthermore, consumers' disconfirmation of the experience goods is significantly higher than the search goods when the products were recommended by Top-N approach. The findings revealed that H4 is partially supported.

5 CONCLUSIONS

According to the experiment results of this study, the purchase intention will not be affected by product type when the recommendation approach is fixed. However, before consumers consumed a product, their purchase intention of the search goods recommended by the Top-N recommendation approach is significantly higher than that recommended by CF approach. This result implies that consumers in general have certain impression and understanding of search goods, so they are able to evaluate the products before actually using it, and

they tend to accept the products preferred by the great majority instead of the products recommended by the collaborative recommendation. Our research suggests that online shops should offer Top-N recommendation approach for search goods in order to enhance consumers' purchase intention.

In addition, the subjects' disconfirmation of the experience goods recommended by the Top-N approach is significantly higher than that recommended by CF approach. Our findings reveal that the products recommended by the CF approach have higher personalization degree than that of the Top-N approach. On the other hand, the subjects' disconfirmation of the experience goods is significantly higher than search goods when the products were recommended by the Top-N approach. Therefore, this study suggests that online e-stores should recommend experience goods by CF approach in order to reduce consumers' disconfirmation after purchasing the products.

As for the influence of consumers' personality, self-monitoring is not a significant covariate variable when measuring consumers' purchase intention. However, self-monitoring is a significant covariate variable when measuring consumers' dis-confirmation. Thus, our research suggests that consumers' personality can affect the performance of recommendation systems, and we are going to do further analysis and exploration of this issue.

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