



Research on consumers online shopping decision-making and recommendation of commodity based on social media network

Linmeng Liang¹ · Xiaohong Qin¹

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Abstract

With the rapid development of Internet and information technology, e-commerce market has shown a rapid development momentum. Online trading environment of the virtual, making the network trust perception of consumer online shopping decision-making very influential. The social media network application platform is undoubtedly the enterprise used to promote the relationship between consumers and enhance the trust of one of the most convenient channels. Therefore, it is of great significance to explore the factors that influence consumers' online shopping decisions in the social media network. On the basis of predecessors' research, this paper explores the influence of consumers' cognitive ability, relationship intensity and interaction on the decision-making of consumers' online shopping in the social media network from the perspective of network trust. And through the Sina real micro-blog data on the hypothesis of the regression analysis.

Keywords E-commerce · Online shopping decision-making · Social media network relationship strength

1 Introduction

Along with the rapid development of e-commerce, social media network application development is rapid. According to relevant data, due to micro-blog users and online shopping consumers have a high degree of coincidence, in recent years, many power companies to use micro-blog to do their own products to promote sales of the network. Electronic business enterprises to social media network as a tool to promote their own brand of culture, to provide users with product-related knowledge and after-sales service, collecting the latest market consumer information, and establish links with potential users; to enhance their brand competitiveness, Low, return as high as possible marketing purposes.

Social media network platform has its unique advantages, relative to the traditional communication platform, more open environment, user interaction and information accuracy and so on. And especially Sina micro-blog as the media from the era of the most prominent representatives of electricity companies can use its spread quickly and

more accurately spread their own brand concept, the latest information on products developed by enterprises to strengthen ties with consumers and so on, Making the first time users receive the latest information and follow-up services and so on, and to this end to stimulate the purchase of consumer demand, and enterprises to maintain closer ties, enhance the trust relationship. Sina micro-blog to bring network users interactive experience can promote their emotional exchange and trust increase; and micro-blog own interesting to attract users to participate in various activities, desire, and for the harmonious relationship between communication. Therefore, Sina micro-blog for the generation of social media network on the consumer's network trust more and more, and ultimately lead the consumer's online purchasing decision-making behavior.

In this paper, we use network trust as an intermediate variable to analyze how user's cognitive ability, relationship strength and interaction affect consumers' online shopping decision, and use multi-element Level regression of the open Sina micro-blog data set experimental validation.

✉ Linmeng Liang
lianglinmeng@xijing.edu.cn

¹ Business School, Xijing University, Xi'an 710123, China

2 Concept definition

Social media [1] refers to websites and technologies that allow people to write, share, evaluate, discuss, and communicate with each other, and are tools and platforms that people use to share ideas, opinions, experiences and opinions. At present, the mainstream social media applications include QQ space, micro-blog, WeChat, rice chat, blog, forum and social networking sites and so on [2]. Social media is also known as social media, social media, because it contains a large number of user information, is currently more research at home and abroad a direction. Social media in many Internet applications in the sudden emergence of the army, has gradually become an inseparable part of people's lives, its strong attraction to encourage people to spend a lot of time in the social media exchange and sharing. Social media has a greater impact on people's lives, and the way in which their interactions interact has a huge impact on the user's attitudes, thoughts and behavioral wills. People seem to be more and more inseparable from social media.

Different from traditional media magazines, newspapers and the like, the emergence of "social media" has overturned the previous concept of traditional media. Since the era of the media has come, people are no longer blindly receiving news from the media, but more as a media information creator to participate. Social media is based on hypertext and hyperlinks, and as a means of information dissemination, people create more content by means of groups. Compared with traditional one-way browsing, social media makes it possible for users to interact with each other, greatly mobilizing the interest of people to participate and bringing greater social impact. All in all, social media is a new type of online media that gives users a great deal of space to interact more easily and easily.

Social network services are based on the Internet, to provide users with sharing, interactive channels. While the social network is through the network of application services for people to build social network community. The social network should contain four aspects: (1) personal page information; (2) a circle of friends for each person; (3) a group or group to join; and (4) a clear description of the direct and indirect relationships [3]. Social network is a boundary. (1) the main body of the system is the user; the user can choose to open or semi-public personal information; (2) the user can access and comment on friends to share information. (3) users can browse and evaluate the information shared by friends. (4) users can browse and evaluate the information shared by friends [4].

According to the above definition, China has developed a large number of social networking services websites and given them different definitions, such as Tencent games for social games; social shopping themes, such as: Beautiful

Street, Petals Network; for the mobile social networking theme, such as: M chat, WeChat and so on.

3 Decision-making behavior of consumers' online shopping and its influencing factors

3.1 Definition and process of consumers' online purchase decision

Consumers online purchase decision-making refers to the network through the information technology to search for a certain demand to meet the needs of individual users, and analysis; in the same time to meet their own needs and the choice of circumstances, from multiple homogeneous products in the decision whether to buy Or what kind of products to buy, as well as post-purchase evaluation of the entire activities of the process [5].

Consumers online purchase decision-making process refers to the user must purchase products or services in the process must go through the steps, it shows the user from the understanding of the needs of products and services until the assessment and the final decision to purchase the whole process. Consumers online purchase decision-making process is generally composed of the following five parts: demand confirmation › information search › evaluation of choice › purchase decision › post-purchase evaluation.

Different from the traditional line purchase decision-making research, this paper studies the impact of online purchasing decisions from the perspective of social media networks. With the rise of social media and social network, consumer online shopping decision-making by its growing, so to explore the social media network on the impact of consumer online shopping decision-making is of great significance.

3.2 Influencing factors of consumers' online shopping decision

To explore the consumer online shopping decision-making behavior, it is particularly important to first analyze the impact of consumer online shopping decision-making key factors. At present, many researchers and related scholars have made more research on the factors of consumer online shopping decision-making, but relatively more fragmented. In order to study the key factors that influence the decision-making of consumers' online shopping, this paper summarizes, analyzes and collates the literature on the influencing factors of consumers' online shopping decision-making. The main factors that affect consumers' online purchase decision are mostly in the individual characteristics, Transaction interface characteristics and risk awareness and other fields.

3.2.1 (1) Individual characteristics

Based on the existing research, it is found that the individual characteristics of consumers can be divided into: user background information, online buying motive, rationality, customs and online shopping experience.

3.2.2 (2) Product characteristics

Different types of products on consumer online shopping decision-making impact is different, it has a different category attributes, so consumers in the decision to buy what kind of product, will be correspondingly different. Related research also describes the characteristics of the product online shopping decision-making behavior has an important impact [6] [7]. (1) Search products: before buying, more understand the function of the need to purchase products and basic attributes such as quality. (2) experience the product: the main attributes of the product can not search by direct perception or the cost of the cable Higher. Experience products can be divided into; non-durable goods and durable goods. (3) trust products: the quality of products by third parties to protect the product can be trusted, such as medical services [8].

3.2.3 (3) The characteristics of the transaction interface

E-commerce is in the Internet and information technology to electronic trading transactions and related services activities, so the virtual information brought about by the Internet asymmetry makes shopping uncertainty and risk control more difficult.

3.2.4 (4) Risk awareness

On the risk of online shopping research, many scholars have carried out in-depth study of this issue, the relevant research results are more abundant. Due to the virtual nature of the online shopping environment, any aspect of the fraud problem will have the risk of transaction losses, so the online shopping environment, the perception of risk on the consumer online shopping decision-making behavior deeper and wider.

4 Consumer online shopping decision-making based on social media network

This paper studies the impact of social media networks on consumer online shopping decisions. Based on a large amount of relevant literature, we combine our unique environment to form the hypothesis of this study. With the rapid emergence of web 2.0 web applications and various

types of social media, the behavior of past users in the network has changed. Network users are not only “consumers” of information but also become the main “producers” of network information [9]. E-commerce makes online shopping flourish. Consumers are not confined to the traditional offline shopping. According to the data monitoring report on China’s e-commerce market released in the first half of 2014 in China’s e-commerce research, by the end of 2014, the transaction volume in the Chinese e-commerce market Totaling nearly 6 trillion yuan, an increase of one-third over the previous year [10].

4.1 The impact of social media network on consumer online shopping

With the rapid development of e-commerce, social media network applications (for example, Sina Weibo) have also developed rapidly. According to the relevant data, due to the high coincidence of the ages of Weibo users and online shoppers, in recent years, many E-commerce companies use Weibo to promote the online sales of their own products. E-commerce enterprises to social media network as a tool to promote their own brand culture, to provide users with product-related knowledge and after-sales service, collecting the latest market consumer information, and establish contact with potential users; to enhance their own brand competitiveness, to achieve more input Low, return the highest possible marketing purpose [11].

Social media network platform has its unique advantages, relative to the traditional communication platform, more open environment, user interaction and information accuracy and so on. In particular, Sina Weibo, as the most prominent representative of the media age, can quickly and accurately disseminate its own brand concept with its help to disseminate information related to the latest products developed by the enterprise and strengthen the connection with consumers. So that Internet users receive the latest product information and follow-up services as soon as possible, in order to stimulate consumer buying needs, and maintain closer ties with the business and enhance the trust relationship. The interactive experience brought by Sina Weibo to the Internet users can promote the enhancement of their emotional exchanges and trust. The interest of Weibo itself attracts the desire of users to participate in various activities and exchanges and exchanges in a harmonious relationship. Therefore, the social media networks represented by Sina Weibo have a greater and greater impact on consumers ‘online trust, and ultimately lead consumers’ online purchasing decision-making behaviors [12].

4.2 Hypothesis

Consumers online purchase decision-making process is divided into: demand confirmation › information search › evaluation of choice › purchase decision › post-purchase evaluation. While social media networks have had an important impact on the entire process of consumer online shopping decisions.

4.2.1 (1) Consumer cognitive ability

Online shopping process, the consumer is actually a decision-making process. The asymmetry of information brought about by the virtual nature of the Internet makes the control of uncertainty and risk in the shopping process more difficult. Information and its quality is the basis for a correct understanding of things, and information search is to reduce the uncertainty of online purchase and reduce the risk of one of the routes. The purpose of the network information search is to identify and judge the price, function, performance and service of the goods to be purchased, reduce the risks and uncertainties brought by the online purchase, and combine their own needs and a priori knowledge and evaluation index so that Make accurate purchasing decisions, to maximize their own utility. Which on the consumer's own cognitive ability to put forward higher requirements [13].

Consumers in the full understanding and understanding of product knowledge and its application on the basis of whether to buy and how to purchase decisions. Assuming that consumers are not fully grasp the relevant knowledge, consumers can not rationally implement the purchase decision-making or impulse to buy, are often not the most satisfied with the goods. The full knowledge of commodity information knowledge, can enhance the user's perception of network trust, a corresponding reduction in risk perception. Therefore, in the social media network, the consumer's cognitive ability to goods is important to the decision-making of online shopping. The stronger the consumer's cognition ability is a positive correlation with whether they can make the right decision. Relationship.

Hypothesis 1 The stronger the consumer's cognitive ability to the goods, the more profoundly the consumers' understanding of the performance and service of the goods, and the positive influence on the online purchase decision.

4.2.2 (2) Relationship strength

Relationship strength is widely used to measure the quality of the relationship between individual nodes in social networks, which is particularly important in social media networks. In social networks, the degree of intimacy,

tightness, frequency of interaction, and trust between nodes are often used to identify the strength of the relationship between user nodes. According to the strength of the relationship can usually be divided into: strong connection and weak connection; the former means that the nodes have a higher number of connections or interaction frequency is high, such as: the relationship between students, friends; Which means that the connection between user nodes is relatively loose or the connection between nodes is more accidental, for example: the relationship between two strangers.

When people make decisions in the time will be affected by others, the extent of the impact of the size of the individual nodes will increase with the corresponding increase between the trust. For example: in real life, people in the decision-making process by relatives and friends that the impact of strong ties with the unfamiliar weak relations with the impact of the crowd even greater. This is also reflected in the process of consumer online shopping decision-making, by the intensity of their relationship with the larger "friends" a greater impact. Therefore, the following hypotheses are proposed.

Hypothesis 2 The strength of relationship between consumers is positively related to the trust strength of the network. The stronger the relationship strength is, the deeper the influence on the net purchase decision.

4.2.3 (3) Interactivity

In the traditional offline shopping environment, consumer confidence in the establishment of the shop business in the usual long-time exchanges and face to face communication completed. In online shopping virtual trading environment, the interaction between consumers and sellers of electricity refers to the interaction between the Internet as the media and interactive communication process.

The virtual nature of the Internet makes trust is particularly important for consumers to make decisions to purchase, and in the context of asymmetric information, users need to use other means to establish a relationship of trust with the business. When consumers perceive higher risk in the decision-making process, they will be more active in the decision-making before the purchase to collect a relatively large number of goods-related information. And Sina micro-blog as a user to provide a wide range of reliable information sharing platform for goods, micro-blog interaction for consumers to collect information related to the collection of goods provides a simple and convenient way.

Micro-blog interaction is usually reflected in the content interaction and interpersonal interaction in two aspects. The former mainly refers to the general knowledge, including news, practical knowledge, life-related

knowledge, and enterprise-related professional knowledge, industry trends and research reports. The latter mainly refers to the exchange of emotions, such as during the holiday season to send a paste also greetings, and actively respond to consumer online advice and express gratitude to consumers and wishes and so on. Micro-blog content interaction social hot facts, famous aphorisms caused by the resonance of online consumers, to attract consumers in micro-blog participation; general social knowledge, product expertise and industry reports and trends, triggering the consumer The level of product specialization and the level of service awareness; and interpersonal interaction in the emotional communication than e-mail, telephone interviews and other communication tools compared to the obvious advantages, and further enhance the full perception of the trust of consumers.

Hypothesis 3 The interaction between consumers and sellers leads to a great increase of trust. Therefore, the strength of interactivity has an important influence on the decision-making of online purchase.

4.3 Experimental results and analysis

4.3.1 (1) Experimental data set

The data set consists of four parts: (1) 63,641 user information about Sina Microblog; (2) data collected on the 12 different topics microblog data, a total of 84,168; (3) 1,391,718 user-friend relationship; (4) 27,759 microblog forwarding relationship.

4.3.2 (2) Pretreatment of experimental data

Through pre-processing the data set to remove the duplication of microblog on advertising, a total of a total of May 1, 2014 to May 30, 2014 on Meizu main microblog a total of 2174, involving a total of 478 microblog users.

Descriptive statistics of initialized Sina microblog data sets are shown in Table 1:

4.3.3 (3) Experimental results and analysis

In order to verify the influence of Sina Microblog cognitive ability, interactive strength and relationship strength on consumers' online shopping decision, this paper adopts the regression analysis method [14]. Through multi-level hierarchical regression analysis to verify the Sina microblog user's cognitive ability, interaction and relationship strength on its online purchase decision-making impact. In this paper, by controlling the total number of users microblog microblog, the total number of microblog published, concerned about the total number and total number

Table 1 Descriptive statistics of user Sina microblog data

Variable	Mean	SD	Max	Min
Microblog length	68.862	44.94	140	5
User <i>K</i> core	12.97	7.58	31	1
Frequency	4.548	3.574	15	1
Comment no.	166.89	1460.47	27,995	0
Review no.	65.21	422.88	7477	0
Praise no.	39.57	331.84	10,004	0
User fans	4547.72	17,984.28	182,728	12
User Microblog	354.72	321	1741	1
User concern	2455.6	2763.09	11,926	3
User collection	123.7	328.57	3238	0

of collections and other variables, the microblog length, user *K*-core value, frequency, microblog forwarding number, And the willingness of the consumer to purchase the decision-making online; establish the linear regression equation by checking the significant difference of the coefficient *P* to determine whether the relationship is significant, will affect the significant independent variables into the regression analysis method, remove those effects Not significant variables. The specific steps are as follows: First, in the multiple regression equation into the control variables, analysis of its impact is significant; and then import the independent variables (microblog length, user *K*-core value, microblog frequency, microblog forwarding number, microblog Comments Number, microblog praise number) to analyze the impact of the relationship [15].

Method 1 indicates that the control variables in the data (the total number of micro-blog users, the total number of micro-blog users published total number of users concerned about the total number of users and the total number of collections) into the regression equation, by analyzing the regression coefficient of significance to determine the control variables whether it has a significant impact on consumers' online purchase decisions.

Method 2 said the data in the control variables and independent variables (microblog length, user *K* core value, microblog frequency, microblog forwarding number, microblog comments, microblog praise number) have been introduced into the regression equation, By regression analysis of the coefficient of significance to predict the user microblog length, user *K* core value, microblog frequency, microblog forwarding number, microblog comments, microblog praise number of consumers online purchase decisions degree.

The results of the regression analysis show that the *F* statistic is not significant in the regression method when only the control variables (the total number of users microblog users, the total number of user microblog

published, the total number of users concerned and the total number of user collections) The second step will be controlled variables and independent variables (microblog length, user K core value, microblog frequency, microblog forward number, microblog comments, microblog praise number) has been placed in the regression equation, F statistics And the regression method has a good fitting effect. Specific analysis is as follows:

4.3.4 (4) Control variables

Control variables include the total number of fans the user has the user published the total number of microblog users concerned about the number of users and the number of microblog collection. The user has a number of fans, the number of users published microblog, the number of users concerned about the number of users and collections (from Table 2 can be found, the two methods of all control variables significance test results are greater than .05), indicating that the control variables. The impact of consumer online purchase decision to a lesser extent.

4.3.5 (5) Independent variables

- (1) The length of the microblog content published by the user is determined by the consumers' online purchase decision (as shown in Table 2, Method 2: regression coefficient $\beta = 0.351$, significance test $P = 0.003 < 0.05$) Consumer online shopping decisions have a more significant positive impact. Therefore, the longer the user microblog content, the

greater its positive impact on its online purchase decision.

- (2) The user K kernel value is used to determine the relationship between the user's relationship strength and the user's purchase decision (as shown in Table 2, Method 2: regression coefficient $\beta = 1.472$, significance test $P = 0.009 < 0.05$) on consumer bribery decision-making has a significant positive impact. Therefore, the greater the user K kernel value, the greater the positive impact on consumer network trust and online decision making.
- (3) The frequency of microblog users (as shown in Table 2, Method 2; regression coefficient $\beta = 2.165$, significance test $P = 0.012 < 0.05$), microblog forwarding number (as shown in Table 2, Regression coefficient $\beta = 0.247$, significance test $P = 0.018 < 0.05$), the number of microblog comments (as shown in Table 2: Regression coefficient $\beta = 0.341$, significance ($P = 0.023 < 0.05$), the number of microblog being praised (as shown in Method 2 in Table 2: regression coefficient $\beta = 0.194$, significance test $P = 0.026 < 0.05$) which has a positive and positive effect on consumers' online purchase decisions, and these parameters can be characterized as the interaction between users. Therefore, the higher the frequency of user interaction, the higher the perceived network trust of individuals, and the more positive impact on online purchase decision.

Table 2 Regression analysis results

	Consumer online shopping decision			
	Method 1		Method 2	
	Beta	Sig.	Beta	Sig.
Control variables				
Total number of user fans	.081	349	.043	413
The total number of user's microblog	.007	274	.104	182
The total number of user concerns	.121	163	.097	804
Total number of user collections	.053	819	.081	798
Independent variable				
Microblog length			.351	.003
User K Core Value			1.472	.009
Frequency			2.165	.012
Microblog forwarding number			247	.018
Microblog comments			341	.023
Microblog praise number			194	.026
F	1.927	194	137.184	.000
R^2	.098		694	
Adjusted R^2	.075		708	

5 Collaborative recommendation method based on social network

With the exponential growth of product information in e-commerce, how to effectively use user historical data to accurately predict user’s preference and provide users with the most valuable product recommendation poses a challenge. However, since the traditional collaborative filtering recommendation algorithm mainly produces recommendation results based on the historical user’s rating information of the target user, it has the problems of sparsity of data, cold start-up and low accuracy. In order to improve the efficiency of recommendation system, this chapter starts with recommending collaborative filtering algorithm based on user history score, and combines social networks to consider the trust of users to calculate the direct and indirect trust in the process of delivery to improve the selection accuracy of the nearest neighbor set of target users. Improve the efficiency of the proposed algorithm, increase the system’s recommended satisfaction.

5.1 User trust based on social networks

The main idea of traditional collaborative recommendation algorithm is based on the assumption that “similar users have similar preferences”. However, due to the sparsity of user history score data [16], there is a large error factor in calculating the similarity between users, and the similarity between users can’t be measured accurately. Suppose that in a recommended data set, two users u_b, u_c belong to the user u_a neighbor set. In the past history recommendation, user u_b, u_c recommended 10 times each. Through user feedback that u_c , only two of the 10 results recommended by the user u_b are in line with the user u_a interest, and the result of u_c the 10 recommendations that meets u_a the interest preference has 8 times. This indicates that the user u_a trust in the given recommendation is much higher than the recommendation u_c given. In daily life, people also tend to adopt recommendations made by relatives and friends. In social networks, the degree of trust in recommendation has a greater influence on the purchase decision of target users [17].

Therefore, based on the similarity of user ratings, this paper uses the trust relationship among users in social networks as another basis for selecting the nearest neighbor. Considering the transfer of trust in social networks involves both direct and indirect trust. Direct trust is the direct connection between two network user nodes. This article shows that there is a certain number of co-opted items between two users. Indirect trust is that there is no direct connection between two network user nodes, but it is

connected by other nodes in the network. The transport embodies the transitivity of trust [18].

5.1.1 (1) Direct trust

This article defines the relationship between direct trust between users as Fig. 1:

Among $item_1, item_2, \dots, item_n$, said the user u_a and the user u_c common score of the project set; $t_{dir}(a, c)$ for the user u_a and the user u_c direct trust; $r_{a,n}$ for the user u_a rating of the project $item_n$.

All user u_c evaluation items set I_c , and $j \in I_c$:

$$P_{a,j} = \bar{r}_a + \frac{(r_{c,j} - \bar{r}_c) \times sim(a, c)}{|sim(a, c)|} \tag{1}$$

Where $P_{a,i}$ represents the predictive score of user u_c on the project by user u_a, \bar{r}_a and \bar{r}_c represent the average rating of user u_a and user u_c respectively, $r_{c,j}$ represents user u_c rating on item $j, sim(a, c)$ represents the similarity between user u_a and user u_c [19].

According to the error between the predicted value of the system and the real value, we can get the formula of direct trust between users as follows:

$$t_{dir}(a, c) = \frac{\sum_{i=1}^{|I_c|} Pr e_{a,c}^j}{|I_c|} \tag{2}$$

Where: $t_{dir}(a, c)$ is the recommended direct trust size of u_c to u_a . And:

$$Pr e_{a,c}^j = \begin{cases} 1, & r_{a,j} \neq 0 \text{ and } |P_{a,j} - r_{a,j}| \leq \mu \\ 0, & \text{other} \end{cases} \tag{3}$$

Of which: $Pr e_{a,c}^j$ user u_c on the user u_a in the project j on the size of the ability to predict; $p_{a,j}$ and $r_{a,j}$ respectively represent the predicted value and the actual value of user u_c for item j [20]. The constant μ is used to indicate the user’s direct trust calculation the reference size, this paper takes $\mu = 1.0$.

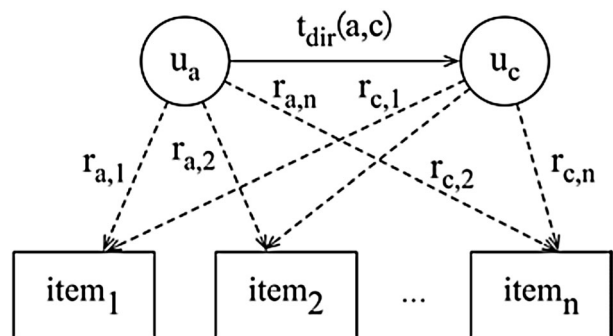


Fig. 1 Direct trust in social networks diagram

5.1.2 (2) Indirect trust

In social networks, the indirect trust between users reflects the transitive nature of trust. Assuming there is no common score between users u_b and u_c , the direct trust between users is 0; however, it is obviously not entirely correct to describe the user's trust. Therefore, the definition of user trust in this article is a combination of direct trust with indirect trust. Figure 2 shows the indirect trust relationship of users in social networks:

Where: Set U_B is a set of neighbors common to User u_a and User u_c . $t_{ind}(a, c)$ is user u_a indirect trust to user u_c [21].

Based on the above analysis, this paper defines that in social networks, only two reachable trust relationships are considered, that is, only two users whose direct trust is zero are established by only one intermediate user. Therefore, the indirect node trust calculation formula as shown in formula (4) below:

$$t_{ind}(a, c) = \frac{\sum_{b \in U_B} t_{dir}(a, b) \times t_{dir}(b, c)}{|U_B|} \quad (4)$$

Where $t_{ind}(a, c)$ represents the indirect trust of user u_a to user u_c . $t_{dir}(a, b)$ indicates user u_a direct trust in user u_b . $t_{dir}(b, c)$ indicates user u_b direct trust in user u_c .

$$U_B = \{u_i | t_{dir}(a, u_i) \neq 0 \text{ and } t_{dir}(u_i, c) \neq 0\}$$

is U_B A set of all users that are reachable from node u_a to u_c in step.

5.1.3 (3) User integrated trust

In this paper, the integrated trust $T(a, c)$ is obtained by integrating the direct and indirect trust of individual nodes in social networks. The formula is as shown in formula (5):

$$T(a, c) = \chi t_{dir}(a, c) + (1 - \chi) t_{ind}(a, c) \quad (5)$$

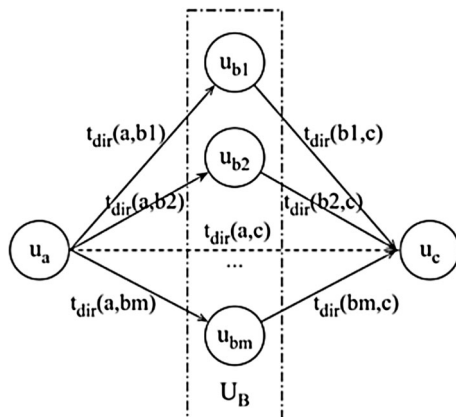


Fig. 2 Indirect relationship in the social network diagram

Where χ represents the degree of direct trust has been valued. And $\chi \in (0, 1)$, this paper takes $\chi = 0.8$.

Collaborative recommendation method.

5.2 Collaborative recommendation method

Because people are generally more inclined to accept recommendations from friends or acquaintances, the final recommendation will vary depending on the degree of trust, even if the user preferences favor similar users with similar degrees of neighbors. The similarity of the fused user preferences and the trust between users are of great importance to the recommendation accuracy of the algorithm. Therefore, a collaborative recommendation method based on social networks is proposed in this paper, the recommended process diagram as shown in Fig. 3 [22].

5.2.1 (1) User similarity calculation

At present, the mainstream similarity calculation methods are cosine similarity, modified cosine similarity and Pearson coefficient similarity calculation method, this paper uses the modified cosine similarity formula to calculate:

$$sim(a, b) = \frac{\sum_{i \in I_{a,b}} (r_{a,i} - \bar{r}_a)(r_{b,i} - \bar{r}_b)}{\sqrt{\sum_{i \in I_a} (r_{a,i} - \bar{r}_a)^2} \sqrt{\sum_{j \in I_b} (r_{b,j} - \bar{r}_b)^2}} \quad (6)$$

Where $sim(a, b)$ represents the similarity between users a and b ; $I_{a,b}$ represents the set of items scored by user a and user b together. $r_{a,i}$ is user a score for item i . \bar{r}_a and \bar{r}_b respectively represent the average scores of user a and user b for their scoring item sets; I_a and I_b represent the respective score item sets for users a and b respectively [23].

5.2.2 (2) Produce recommendations

In this paper, the recommended weights will be introduced to synthesize the user preference similarity and user trust. The recommended weight calculation method is shown in Eq. (7).

$$w(a, c) = \frac{2sim(a, c) \times T(a, c)}{sim(a, c) + T(a, c)} \quad (7)$$

Where $r_{a,i}$ indicates that the user u_a predicts the item i based on the user u_c ; $r_{c,i}$ represents user u_c rating of item i ; \bar{r}_a and \bar{r}_c represent the mean scores of all the items evaluated by u_c and u_a respectively. Select the score $top - N$ result of more than added to the list, thus the end of the entire recommendation.

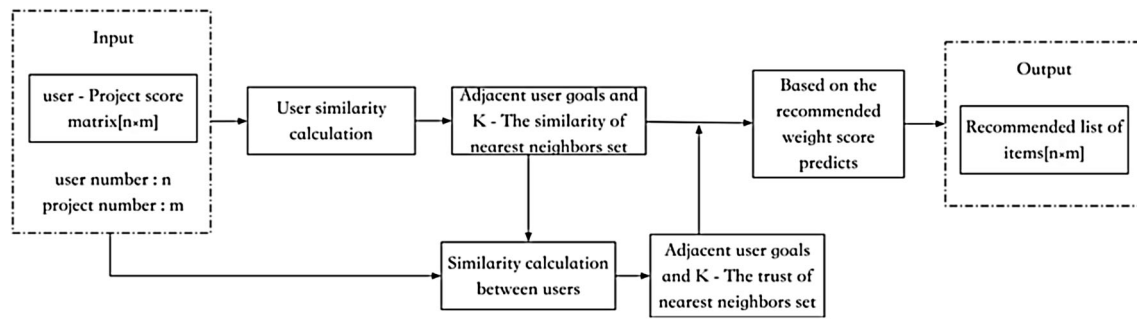


Fig. 3 Based on social network collaborative recommendation process diagram

5.3 Experiment and result analysis

5.3.1 (1) Experimental data sets

This section USES a 100 K open dataset from the MovieLens site provided by GroupLens research group from the university of Minnesota. Its content mainly includes from 943 users to 1682 movies about 100,000 evaluation score information, each registered user to watch the movie score values are given, and the evaluation of at least 20 films; The score is between 1 and 5: “1” means “don’t like”, “2” means “don’t like”, “3” means “generally like”, “4” means “liking”, “5” means “very much”. In the experiment, the data set is randomly divided into two parts: the training set and the test set, and the training set makes the recommendation result for the simulation algorithm. The test focuses on hidden information to detect the accuracy of the algorithm. In this experiment, the entire dataset was randomly assigned to the test set of 20% of the seats, and the remaining 80% was the training set of the experiment [24].

5.3.2 (2) Evaluation index

Considering the advantages and disadvantages of the recommendation algorithm, it can be evaluated by several indexes. In this paper, the efficiency and performance of the algorithm are validated by means of the average ranking and absolute error of the system.

- (1) Mean absolute error. The recommendation accuracy of the recommendation system is measured by calculating the absolute value between the user’s actual score and the predicted score using the recommendation algorithm. The smaller the MAE value, the more accurate the recommendation results are; On the contrary, the worse.

Suppose the predicted user evaluation set is $\{p_1, p_2, \dots, p_N\}$, the real user evaluation set is $\{q_1, q_2, \dots, q_N\}$, The average absolute error MAE

formula is shown in formula (8):

$$MAE = \frac{\sum_{i=1}^n |p_i - q_i|}{n} \quad (8)$$

Among them: n represents the number of items being graded; p_i represents the system prediction score; q_i represents the true score of the data set.

- (2) Average sort score. By calculating the accuracy of the project’s recommended position in the list. The formula is shown in formula (9):

$$r_i = L_i / N \quad (9)$$

Among them: N represents the number of items that are not graded; L_i represents the ordinal number of the project in the recommended list. When the system ranking is smaller, it is suggested that the recommendation result can meet the user’s interest preference better. For all user - items, the average value of sorting is calculated, That is, the average sort divided by \bar{r} , This value is used to measure the accuracy of the recommendation method. When \bar{r} is smaller, the algorithm is more efficient.

5.3.3 (3) Comparison of algorithm accuracy

In order to verify the accuracy of the proposed method, it has advantages over other similar algorithms, CF-USER, CF-ITEM and CF-Trust support were compared. The experimental results are shown in Fig. 4.

Experimental results show that the proposed method is compared with three other algorithms, as shown in Fig. 4, when the same number of user neighbors are set, the MAE value of this algorithm is lower than other algorithms. Moreover, when the nearest neighbor number is 40, the algorithm recommended by the algorithm is optimal. It can be found that the accuracy of the proposed method is gradually stable.

5.3.4 (4) The average sorting comparison of the algorithm

The average sorting results of each algorithm are shown in Fig. 5. By Fig. 5 can be found that increase in proportion of the training set as the data set, the algorithm of the decrease of the average ranking points also slowly and calculated by the method of average ranking points than the other three algorithms. To sum up, the method of this paper is higher than the other methods [25].

6 Conclusions

In order to explore the impact of social media networks on consumer online shopping decisions to enable e-commerce companies to take what kind of marketing to promote consumer online shopping so as to enhance the effectiveness of e-commerce business. This article picks up the real data of Sina Weibo and finds out that consumers have the cognitive ability in the social media network. The strength and interactivity of Internet have an important influence on people's network trust and online purchase decision. The research hypothesis is validated through the real microblog data, and the consumer's cognitive ability is obtained. The interaction between the relationship intensity and the negligence has a positive and positive impact on the consumer online shopping decision-making.

The development of e-commerce, the expansion of information network products, users can not accurately find the goods in line with their preferences, personalized recommendation system to better solve this problem. Although collaborative filtering recommendation technology will help consumers make online purchase decisions, they still have some problems such as low recommendation accuracy, cold start and data sparseness. This article made a deep study, got some research results.

- (1) Microblog users published the greater the length, indicating that the consumer's cognitive ability, the

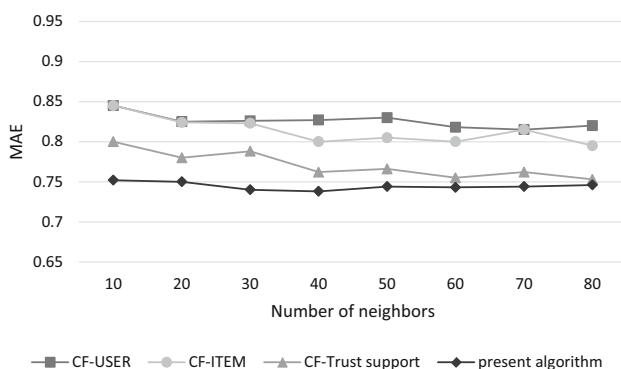


Fig. 4 MAE comparison of recommendation algorithm

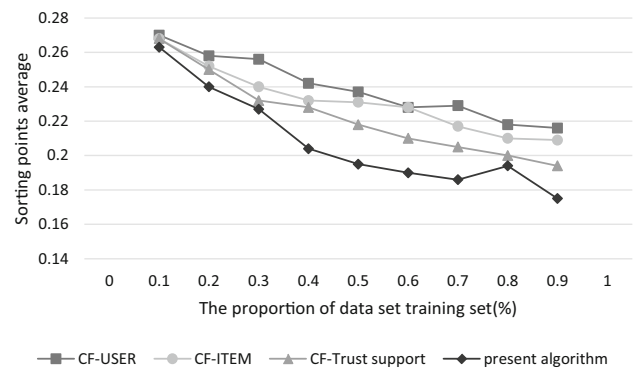


Fig. 5 The average ranking points of the algorithm

relevance of commodity-related information and its effectiveness is relatively sufficient. Therefore, the stronger the consumer's cognitive ability, the corresponding will promote online consumer decision-making purchase.

- (2) The size of user K kernel indicates the degree of user's concentration. The larger the value is, the closer the relationship is between user and user. The stronger the relationship is, the stronger the trust degree Regression analysis showed that the relationship between the intensity of the impact of consumer online shopping decision-making is positively correlated.
- (3) Users of the microblog frequency, microblog forwarding number, microblog comments, microblog praise number can be a direct reflection of the user interaction between the strength. The regression analysis results show that the higher the value, the greater the degree of trust on the network, that is, the positive impact of interaction on online shopping decision.

This article has two deficiencies. First, this paper can't fully study the impact of social media networks on consumers' online purchasing decisions. Only from a few local aspects, it has some limitations. The future research direction is to conduct a qualitative and quantitative analysis of consumer online shopping behavior based on the factors that affect the decision-making of online shopping by social media broadcasters. Second, the social media network platform and e-commerce platform are mostly independent, it is difficult to obtain a standard data set with both e-commerce and social media networks. The verification of this article is another way, first of all, Similarity of a user similar to the class, then the two data sets required to integrate the data set to verify, there are some shortcomings. Future work is to integrate E-commerce and E-media platform data to further verify the work of this

paper and to consider the impact of other social behaviors on the recommendation quality.

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Linmeng Liang is working as lecturer at the Business School, the Xijing University. His research interest addresses Electronic Commerce, Management Science and Eco-Economy.



Xiaohong Qin holds a Ph.D. degree and working as associate professor at the Business School, the Xijing University. His research interests includes Management Science and Eco-Economy.