

Influence of opinion leaders on consumer behavior intention in social business platform

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Abstract. In order to effectively analyze the influence of opinion leaders on consumers' behavioral intention in social commerce platform, this paper uses multi-layer fuzzy neural network model to research it. First of all, relevant concepts and characteristics of influence of opinion leaders on the consumers' behavioral intention in the social commerce platform are introduced. Secondly, the multi-layer fuzzy neural network model is introduced to build an analysis algorithm based on the intelligent learning model for influence of opinion leaders on consumers' behavioral intention in social commerce platform to achieve the adaptability of the model. Finally, the experimental analysis on field survey data shows that the proposed method is more superior in convergence speed and accuracy.

Key words. Social commerce, Opinion leader, Consumer, Fuzzy neural network.

1. Introduction

The so-called “opinion leader” refers to the “active leader” who often provides information, opinions and comments to others in the interpersonal communication network and influences others' cognition and attitude. As the intermediary formed or step filtered in the process of formation of the mass communication effect, the “opinion leader” transmits information to the receiver to form two-level spread of information transmission.

With the development of internet technology, there has been a boom in e-commerce around the world. E-commerce has brought about tremendous changes in human society and has created another brand new social existence for human beings. Mankind has begun to shift from traditional consumption to the use of the network and virtual space, and such mode of consumption is changing traditional purchasing way of consumer. As a brand new mode of consumption, online shopping is getting

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more and more attention from merchant and consumers. Many companies in the face of huge business opportunities in e-commerce have established and developed their own shopping and service sites and have taken advantage of network media for sales of products and services. Compared with traditional shopping, online shopping can effectively save social resources, broaden information channels, improve service efficiency and reduce the consumption in intermediate link for manufacturers and consumers. Therefore, online consumers have also shown more and more attention and interest in the new shopping channel of online shopping. However, Hoffman's research shows that most of online retailers were dissatisfied with the actual results after one year of operation, which is demonstrated in a survey report which indicates that most of online retailers were unable to earn enough profits. Sally's survey and analysis on European and American shopping sites confirms that trust is a key determinant for consumer to decide to purchase product in the e-commerce. Because consumers are facing more and more choices in the e-commerce environment, and the operation of a shopping site will be in a dilemma once the customers no longer trust in the shopping site.

Virtual community emerges in the context of enhancing the trust of online consumer and the emergence of virtual communities create social phenomenon for e-commerce store in the original chaos, resulting in online virtual groups and network interactivity. Positive image or "consumer favorite" imagination is created through the management of the virtual community, which is also directly related to possibility in creation of advantage of shopping website different from its competitors. Therefore, it is important to research the influence of opinion leaders in the virtual community on the purchase intentions of consumers for making the virtual community of e-commerce online shop into a real platform for the interaction between e-commerce enterprises and consumers, realizing the value added of the virtual community and promoting the development of shopping websites.

2. Relevant theory of opinion leaders on e-commerce platform

2.1. Concept of opinion leader on e-commerce platform

E-commerce platform is to achieve the information transmission in the network environment through setting personal 140-word update and instant sharing in the network community, WAP and other client text, provided that the information shall be shared on the basis of user relationship, namely the e-commerce platform relation shall be established with the e-commerce platform owner to become the first portal for proving the e-commerce platform services. E-commerce platform formally entered the horizons of the mainstream Internet population in China. As a new media method generated in the Web2.0 environment, e-commerce platform has low barriers to entry, strong capacity of information exchange, characteristic of one-to-N communication and good performance in the instant messaging, independent choice form and information sharing capability.

The term "opinion leader" was first proposed by Lazarsfeld, the famous American

pioneer communicator in 1940s, and his book named *People's Choice* shows that he found a main information source and access to the majority of voters free from the influence on mass media from "Ely Survey" and that influence is from the other group of voters who are referred to as "opinion leaders" by Lazarsfeld. "The so-called opinion leaders refer to those authority figures popular with the masses and influencing the masses by spreading the information obtained from the media and combined with their opinions to people around after contacting with the mass media for the first time on behalf of the masses". Therefore, the effect is accompanied by the horizontal transmission (namely such a process: mass media – opinion leaders – the masses) of information.

2.2. Characteristics of opinion leaders on e-commerce platform

The opinion leaders on e-commerce platform have the following characteristics: First, they contact with the mass media extensively and frequently to obtain information. Second, the universal opinion leaders exist in all walks of life and are subject to equal relation rather than leader-member relation. At the same time, the position of opinion leaders is not static, and in some cases opinion leaders and their roles are exchangeable. Opinion leaders are potential industry experts, their viewpoints will be valued and supported by many people in this field, and they are true opinion leaders in this respect only with that outside world does not know much about him. Under these circumstances, the original opinion leader will be affected by the change in other areas. The relationship between effects and influencers varies according to the specific situation. Finally, opinion leaders are willing to share information and views on events in a broad community. Silent and isolated individuals can not effectively affect others. Opinion leaders need a great deal of information to spread the information and their viewpoints to others to influence others' attitudes. Their communication is often more persuasive, receptive and credible than the direct public communication.

3. Model for influence of opinion leaders on consumers' behavior intentions

3.1. Model structure

The model is built for venture investment evaluation process on the basis of characteristics of influence of opinion leaders on consumers' behavior intentions and fuzzy neural network, as shown in Fig. 1.

The fuzzy neural network model for influence of opinion leaders on consumers' behavior intentions as shown in Fig.1 has four levels in total, of which fuzzy function block and neural network function module build the model in the way of series system, that is to say, output of the fuzzy function block is input of the neural network function module. From the perspective of structure of the entire fuzzy neural network model for influence of opinion leaders on consumers' behavior intentions, it

comprises input layer, fuzzy calculation layer, inference layer and the output layer[10, 11].

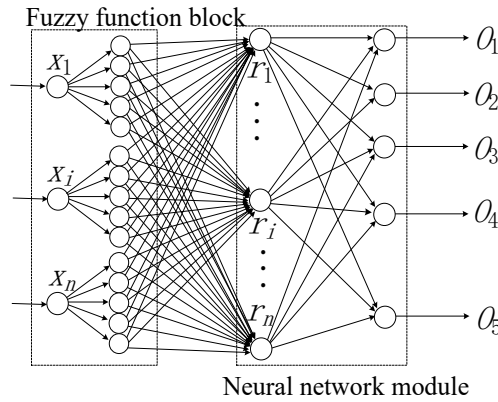


Fig. 1. Fuzzy neural network model for influence of opinion leaders on consumers' behavior intentions

According to the structure shown in Fig.1, we can see that the model consists of two-level functional blocks: (1) neural network with five-level hidden layer; (2) ordinary neural network. The neural network requires that the input of the model shall be a real value. However, as mentioned in the previous section, there are qualitative and quantitative factors in the input. Even if the quantitative input is adopted, there are dimensional and order-of-magnitude differences in their values. Therefore, it is inappropriate to directly take the data as input of the model for learning. In order to facilitate the learning of the network model and obtain more accurate results, the inputs of hidden nodes are divided into four grades according to their factor states, namely, excellent, good, moderate and poor. The different grades are expressed as the different values, namely 5, 4, 3, 2 respectively. At the same time, the outputs of the model are also divided into four grades, namely excellent, good, moderate and poor, and they are respectively corresponding to the these conclusions: preferential investment, feasible investment, basically infeasible investment and prohibited investment.

3.2. Fuzzy function block

①Calculate the weight for the influence factor of network model. The required weight shall be determined on a basis of hierarchical method to establish the judgment matrix $C = (c_{ij})_{n \times n}$, $c_{ij} > 0$ where $c_{ij} = c_{ji}$, $c_{i=j} = 1$, so calculation result of weight W_i is:

$$W_i = \frac{\sum_{j=1}^n c_{ij}}{\sum_{j=1}^n \sum_{i=1}^n c_{ij}} \tag{1}$$

Based on the hierarchical calculation method, the weights of the first-level modules of the fuzzy neural network model for influence of opinion leaders on consumers'

behavior intentions are respectively expressed as W_1, W_2, W_3, W_4 and W_5 , and there is $\sum W_i = 1, i = 1, 2, \dots, 5$. Therefore, the weights set can be expressed as $W = (W_1, W_2, W_3, W_4, W_5)$. For the weights of the second-level modules of the fuzzy neural network model for influence of opinion leaders on consumers' behavior intentions: sub-weights set of technical factor is $W_1 = (W_{11}, W_{12}, W_{13}, W_{14}, W_{15})$, sub-weights set of capital factor is $W_2 = (W_{21}, W_{22}, W_{23})$, sub-weights set of management factor is $W_3 = (W_{31}, W_{32}, W_{33}, W_{34})$ and sub-weights set of environmental factor is $W_4 = (W_{41}, W_{42}, W_{43})$.

② Construct the judgment matrix. According to status quo of the influence of opinion leaders on consumer's behavioral intentions, this paper constructs the evaluation data set $U = \{\text{high, relatively high, medium, relatively low, low}\}$ for influence of opinion leaders on consumer's behavioral intentions.

③ Calculate the membership function. Currently, there is no specific way for calculation of membership function index, and the classic way is to use empirical methods to determine it and correct the data according to the real situation until it meets the intended target. The membership function (triangle) is used hereof for calculation, with details as shown in Fig. 2.

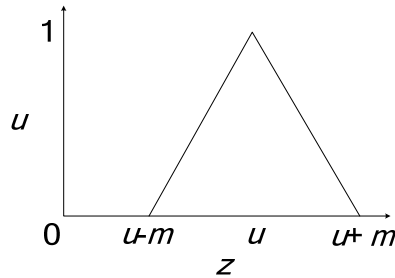


Fig. 2. Membership function (Triangle)

The membership function can be used for calculating the mean value of evaluation results for influence of opinion leaders on consumer's behavioral intentions:

$$u_{ij}(x) = \begin{cases} 1 - \frac{z_{ijk} - u_{ij}}{m_{ij}}, & |z_{ijk} - u_{ij}| < m_{ij} \\ 0, & |z_{ijk} - u_{ij}| \geq m_{ij} \end{cases} \quad (2)$$

In formula (2), z_{ijk} is the data evaluation value of Item j in Category i of influence of opinion leaders on consumer's behavioral intentions; u_{ij} represents the data evaluation mean value of Item j in Category i of influence of opinion leaders on consumer's behavioral intentions; m_{ij} refers to the fuzzy boundary of the evaluation subset for influence of opinion leaders on consumer's behavioral intentions, of which role is to determine the necessity of subordination conditions for influence of opinion leaders on consumer's behavioral intentions. $m_{ij} = 2\sigma_{ij}$ can be selected; in which σ_{ij} means the variance of the evaluation value for influence of opinion leaders on

consumer's behavioral intentions, with calculation as follows:

$$\sigma_{ij} = \sqrt{\frac{(z_{ij1} - u_{ij})^2 + (z_{ij2} - u_{ij})^2 + \cdots + (z_{ijk} - u_{ij})^2}{k}}. \quad (3)$$

Based on the above calculation method, the following fuzzy judgment matrix can be constructed:

$$R_i = \begin{bmatrix} u_{11} & u_{12} & \cdots & u_{1n} \\ u_{21} & u_{22} & \cdots & u_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ u_{m1} & u_{m2} & \cdots & u_{mn} \end{bmatrix}. \quad (4)$$

In formula (4), u_{ij} ($0 \leq i \leq m; 0 \leq j \leq n$) represents the index evaluation value of different experts on the influence of opinion leaders on consumer's behavioral intentions.

④ Construct the factor decision matrix. Based on the calculation method shown in formula (1), construct the factor evaluation data matrix:

$$B_i = W_{ij} \cdot R_i, 0 \leq j \leq m. \quad (5)$$

Then, the data shall be normalized to improve the accuracy of the data prediction.

⑤ Construct target decision matrix. The following target decision matrix is constructed based on formula (2):

$$B = (B_1^T, B_2^T, \cdots, B_i^T). \quad (6)$$

⑥ Comprehensive evaluation on the influence of opinion leaders on consumers' behavioral intentions. We can obtain the fuzzy comprehensive evaluation set of influence of opinion leaders on consumers' behavioral intentions, and the fuzzy subset contains fuzzy matrix B and weight vector W , with calculation as follows:

$$S = W \cdot B. \quad (7)$$

We can obtain the different factor evaluation levels for influence of opinion leaders on consumers' behavioral intentions according to $S = W \cdot B$.

⑦ Evaluation results of influence of opinion leaders on consumers' behavioral intentions. The following final fuzzy evaluation results can be obtained for process of influence of opinion leaders on consumers' behavioral intentions:

$$f = S \cdot X^T. \quad (8)$$

In formula (8), X denotes the quantitative value of evaluation set for influence of opinion leaders on consumers' behavioral intentions.

3.3. Neural network module

The input part of the neural network is mainly responsible for receiving the external input data and then simply processing the data or directly transmitting it to the neurons of the middle layer module. The neurons of this layer can process the data internally and exchange data, and then sends it to the neurons of output layer for result output. This is a forward data learning and processing procedure [14]. If the output of the neural network module does not satisfy the expected output, the back communication of the algorithm model shall be performed. In this way, the weight coefficient of the neuron can be corrected according to the real data so as to optimize the network model. The modeling procedure is as follows:

① Determine the threshold θ_j for weight ω'_{ji} of network model and the neurons j in the hidden layer and the output layer in the model for influence of opinion leaders on consumers' behavioral intentions;

② Fuzzification shall be performed to data sample $\{x_{pl}\}$ of influence of opinion leaders on consumers' behavioral intentions and the expected output $\{y_{pl}\}$ shall be taken as input to be transferred into the network model, in which l is the input of the network model and p refers to the sample size of influence of opinion leaders on consumers' behavioral intentions.

③ Model output of influence of opinion leaders on consumers' behavioral intentions. If the input layer of the network model is not processed, the input data will be consistent with the output data, that is $O_{pi} = x_{pi}$, where x_{pi} represents the i th calculated value of the sample p . For the hidden layer and the output layer of the network module, the output result is $O_{pi} = f(\sum \omega_{pi} - \theta_i)$, in which O_{pi} can be taken as the input of the neuron j and the output of the neuron i . The node threshold function in the hidden layer is sigmoid function in the following form:

$$f(x) = 1 / (1 + e^{-x}). \tag{9}$$

④ Calculate the error in various layers of model for influence of opinion leaders on consumers' behavioral intentions. We can obtain the output layer deviation is $\delta_{pj} = (y_{pj} - O_{pj}) O_{pj} (1 - O_{pj})$ from the calculation; hidden layer deviation form is $\delta_{pj} = O_{pj} (1 - O_{pj}) \sum \delta_{pj} \omega'_{pj}$.

⑤ Calculate the back communication of model error. Learn and correct the weight form $\omega'_{ji}(t + 1) = \omega'_{ji}(t) + \alpha \delta_{pj} O_{pj}$, in which α is the learning speed of the model.

⑥ Calculate the error $E_r = 12 \sum p \sum k (O_{pk} - y_{pk})^2$. If the calculated value of error E is less than the expected error, then the model for influence of opinion leaders on consumers' behavioral intentions shall be terminated, otherwise the calculated value shall be fed back to procedure ③, with continuing to perform the model calculation process as mentioned above until the set termination conditions are met.

4. Experimental analysis

4.1. Path analysis and hypothesis testing

In this paper, the users who often use e-commerce platform are the main survey samples, and survey channels are divided into online and offline categories. In order to ensure the validity of the questionnaire survey, the survey team will explain the concept of the marketing information of the celebrity and celebrity e-commerce platform to the respondents before the questionnaire is issued.

In this survey, a total of 310 questionnaires are issued, and 288 valid questionnaires are returned after removing the lack of key data and perfunctory invalid data, with the response rate of 93%. In terms of sample characteristics, the male and female ratio is 46.24% and 53.76% respectively. The ages mainly ranged from 22 to 25 years, accounting for 79.21% of the total samples. Most of the valid samples belong to younger groups who are willing to accept new things, easily accept the e-commerce platform, and are concerned about the celebrity e-commerce platform, in line with expectation for researched sample.

In this research, the built mode and proposed hypotheses are tested with the aid of AMOS 21.0. First, calculate the model fitting index, and the results are shown in Table 3. Table 3 shows that all the other fitting indexes meet the ideal standard proposed for of relevant research except for GFI and NFI slightly less than the proposed standard, which indicates the model researched in this paper has higher overall fitting degree. Next, the hypothesis corresponding to the theoretical model is tested. The path analysis and hypothesis testing results for model are shown in Table 1.

Table 1. Path analysis and hypothesis test results

Variable path relationship	Standardized path coefficients	<i>t</i> value	Testing result
H1: trust in celebrities - cognitive attitude	0.24**	3.426	Support
H2: trust in celebrities - emotional attitude	0.20*	2.932	Support
H3: activity of celebrity e-commerce platform - cognitive attitude	0.38***	5.411	Support
H4: activity of celebrity e-commerce platform - emotional attitude	0.54**	6.816	Support
HS: trust in celebrities. Trust in marketing information of e-commerce platform	0.36**	4.622	Support
H6: Trust in marketing information of e-commerce platform. Cognitive attitude	0.48**	6.015	Support
H7: Trust in marketing information of e-commerce platform - emotional attitude	0.38**	5.171	Support
H8: cognitive attitude, intentional attitude	0.16	2.359	Support
H9: emotional attitude - intentional attitude	0.73**	8.246	Support

4.2. Results analysis

In the experimental analysis stage, the standard support vector machine algorithm is chosen as a contrast.

Evaluation indexes shall be compared and optimization time and the final convergence value shall be selected. To reduce the impact of experimental volatility, each group of experiments runs independently for 30 times to obtain the mean of the compared indexes, and the selection period of the optimal individual index is 100. Fig. 3 shows the comparison of experimental data distribution. At the same time, the calculation time for the standard support vector machine algorithm and the proposed algorithm shall be designed in a similar way, and the specific results are shown in Fig. 4. The results (partial) of teaching resource allocation are shown in system screenshot of Fig. 4.

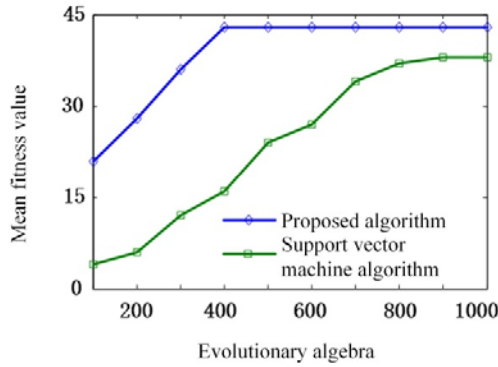


Fig. 3. Comparison of optimal target convergence

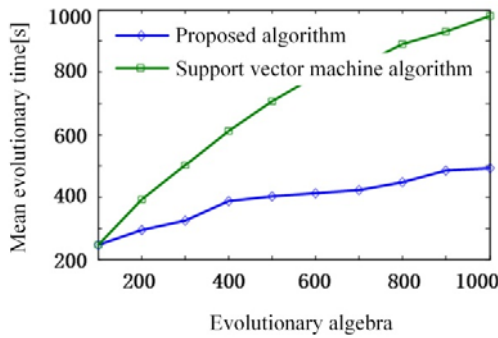


Fig. 4. Comparison of calculation time convergence

5. Conclusion

5.1. *Research conclusions*

In this paper, a multi-layer fuzzy neural network model is used to establish an effective analysis method for influence of opinion leaders on consumers' behavioral intentions in social commerce platform. Experimental analysis on field survey data shows that the proposed method is superior in convergence speed and accuracy. For the next research, we will mainly analyze the following three items with the multi-layer fuzzy neural network model.

1. The quality evaluated by the opinion leaders is positively related to consumer's purchasing intention. The higher the quality of evaluated content is, the greater the influence on consumers' purchasing decisions will be. By analyzing, we found if the content commented by opinion leaders is closely related to the products, the commented contents are true and reliable, and the comments are relatively neutral, the such comments will have greater influence on consumers' purchasing decisions.

2. The more evaluation of opinion leaders is, the greater the influence on consumers' purchasing decisions will be. Analysis on the relevant literature shows that more comments published on the products (especially many opinion leaders have comments on the products, including the positive and negative ones) will be conducive to deep and comprehensive understanding of consumers to the products and have greater influence on their purchasing decisions.

3. The higher the professionalism of opinion leaders is, the greater the influence on consumers' purchasing decisions will be. The professionalism of the opinion leaders is mainly manifested in whether they have the professional knowledge of the product and whether they are knowledgeable, trained and experienced. This professional comment will affect consumers' trust in purchasing the product and directly affect consumers' subsequent purchasing decisions.

5.2. *Inspiration to management*

E-commerce platform is an emerging media, its huge popularity cohesion has become the focus of enterprises and merchants, and celebrities, as a special group on e-commerce platform, are widely concerned by the public, furthermore, the communication effect of e-commerce platform is much better than ordinary users. Based on the above conclusions, this paper puts forward some related management suggestions: (1) Help users build trust and enhance consumer's cognitive trust. According to the results of this research, consumers' trust in the marketing information of celebrity e-commerce platform is an important dimension that affects their attitude. Celebrities may publish the real comments on product quality performance, brand appearance and operation and maintenance to build the trust. In addition, celebrities may release some valuable information in the marketing of e-commerce platform, such as experience posts in relevant fields, dry cargo sharing, to attract consumer to get attention. (2) Form brand aggregation effect and enhance the user's stickiness by combining the characteristics of social networks and opinion leaders. The

participation of opinion leaders promotes active public participation. Therefore, it is suggested that enterprises should choose celebrities with good public image and select celebrities who fit well with brands, products and services to shape the image of their professional opinion leaders so as to improve consumers' attitudes. (3) Pay attention to the community interaction of e-commerce platform and improve the activity of celebrity e-commerce platform. Among the three factors of celebrity e-commerce platform marketing, the activity of celebrity e-commerce platform has the most obvious positive impact on consumers' attitudes. Celebrity e-commerce platform marketing may enhance the activity in the following ways: ensure the marketing information frequency of the e-commerce platform since the low frequency will lead to loss of fans; enhance the exchange and interaction with fans. Respond to the very interesting and creative fan comments to attract the attention of consumers, and exchange and interact with fans by drawing a lottery or raffle, award-winning forwarding and in other forms. The prize contents can be designed as marketing products or services of celebrity e-commerce platform to increase audience coverage. In short, their own influence can be improved and audience's attitudes can be changed through interaction.

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