

Review for Identifying Online Opinion Leaders

Yu Wang

Abstract—Nowadays, Internet enables its users to share the information online and to interact with others. Facing with numerous information, these Internet users are confused and begin to rely on the opinion leaders' recommendations. The online opinion leaders are the individuals who have professional knowledge, who utilize the online channels to spread word-of-mouth information and who can affect the attitudes or even the behavior of their followers to some degree. Because utilizing the online opinion leaders is seen as an important approach to affect the potential consumers, how to identify them has become one of the hottest topics in the related field. Hence, in this article, the concepts and characteristics are introduced, and the researches related to identifying opinion leaders are collected and divided into three categories. Finally, the implications for future studies are provided.

Keywords—Online opinion leaders, user attributes analysis, text mining analysis, network structure analysis.

I. INTRODUCTION

WITH the quick development and popularity of Internet, the e-commerce develops at an unprecedented speed. Many online communities begin to appear and numerous Internet users begin to discuss the topics related to shopping inside these online communities. They are willing to share their shopping experiences and comments with others, to recommend new products and services, and to ask help for shopping.

In the traditional cases, when consumers need to make purchase decisions, they often ask for help from friends or other influential people [1]. Reference [2] argues that consumers' purchase decisions are made based on a large number of information on products and service, and that consumers are generally more likely to believe in others who are similar to themselves, rather than the advertisements in the mass media. Reference [3] points out that for consumers, compared to the advertisement, the verbal communication is generally more reliable. Reference [4] argues that the influence from the interpersonal relationships on the consumers is greater than that of the traditional media.

Now, because of these online communities, the potential consumers need to face with a plenty of online information before making a purchase decision. Hence, they begin to turn to online opinion leaders for help. The opinion leaders, who can collect and select information for affecting the attitudes or behaviors of the public [2], [5]-[10], begin to exert their influences online.

Obviously, how to identify the online opinion leaders becomes one of the hottest questions for researchers. Also for

companies, identifying opinion leaders will help them to make full use of the influence of opinion leaders for marketing. Hence, this article begins with the definitions of opinion leader, introduces the characteristics of them, and divides the researches related to identification of online opinion leaders into three categories. Finally, this article gives implications for future study.

II. DEFINITIONS OF OPINION LEADERS

The concept of opinion leader is from the theory of Two-step flow of communication by Lazarsfeld and Katz in 1940s. When they studied the presidential election, they found that the information did not flow directly to the public, but it was first known by the opinion leaders and was spread by them to the public. This famous theory resulted in the concept of opinion leader and it was defined as the individuals who can affect others directly [11]. The opinion leaders put forward new information, ideas and opinions, spread it to the public and become the influential individuals in the society. They are considered to be those individuals who can affect others' ideas, opinions, beliefs and motivation in an appropriate way [12]. Furthermore, other researchers also give out their definitions of opinion leaders.

Reference [5] defines opinion leaders as the individuals whom the public will ask for help and information and who will affect the decisions of others. Reference [13] defines opinion leaders as those individuals who are the fastest to receive the word-of-mouth information from mass media, and who interpret the information with or without their own subject ideas and spread the information to others. Reference [14] argues that opinion leaders are those who are trusted and well-informed in groups, that their opinions are representative and that they have an important influence on the surrounding relatives and acquaintances. Reference [15] defines opinion leaders as those who exert important influences on the public. Reference [16] defines the opinion leader as the individuals who take central places in a community and whose speeches will have a huge impact on others. Reference [17] defines opinion leaders as the individuals who utilize informal approach to affect others' attitudes or even behavior so as to achieve a desired result.

With the development of the Internet, the online interpersonal communication is development very quickly. Various online platform and social media begin to appear, and enable opinion leaders to exert their influence online.

Reference [18] found that the online and offline opinion leaders share similar characteristics and that the online ones are the individuals who have higher enduring involvement, are more innovative and more pioneer, and use more computers.

Yu Wang is with the Department of Economic and Management, Tohoku University, Chome-1-1 Katahira, Aoba Ward, Sendai City, Japan (corresponding author, e-mail: whc631211@vip.163.com).

III. CHARACTERISTICS OF OPINION LEADERS

In order to identify opinion leaders, it is necessary to understand the characteristics of opinion leaders. Previous researchers have concluded some common characteristics of opinion leaders, which enable them to be distinguished from other individuals.

Reference [19] points out that several hundred studies on opinion leadership have tried to figure out the characteristics of opinion leaders in the light of demographic and other variables, media exposure, social positions, and personality traits; while many studies focus on the education degree, gender, or social class of the opinion leaders, considering that these factors affect the opinion leadership. Moreover, some studies relate personality traits such as conformity, responsibility, motivation or others to the status of opinion leaders.

Overall, the characteristics of opinion leaders can be summarized as following:

- **Professional:** Professional knowledge related to the product is deemed as an important factor for identifying opinion leaders. With more interests and involvement in searching related information than the public, opinion leaders are more likely to be more professional [20], [21].
- **Innovativeness:** Innovativeness is also considered as a crucial feature of opinion leaders, who usually are more innovative and earlier to adopt new ideas or products than the public [17], [20], [22]-[24].
- **Involvement:** Opinion leadership is considered as “a manifestation of enduring involvement in a product class” [25] and the product involvement is also a crucial reason for explaining why opinion leader talk about products.
- **Socialized:** The social attribute is a consistent attribute of opinion leaders from the early studies and opinion leaders are more likely to interact with others [2], [26], [27]. Reference [28] also pointed out that opinion leaders are able to activate the diffusion networks in a social system.

Moreover, with the support of the developed technology of online communication, some researches also analyze some unique characteristics of online opinion leaders.

Reference [29] concludes that: 1) Because of the network anonymity, online opinion leaders have blurred social attributes. 2) They are now not limited by geographical reason, lifestyle and others, and thus have greater heterogeneity with their followers. 3) With the promptness of dissemination of online information, they can establish their position faster. 4) Because their ideas are able to be spread through text, images and other forms of text, they are less likely to be misunderstood. 5) They are now using new media and spending more time online. 6) With the Internet, they are more reactive to messages and can release information more frequently.

IV. CHARACTERISTICS OF OPINION LEADERS

According to existing researches, the approaches for identifying opinion leaders can be divided into three categories as follows.

A. User Attributes Analysis

Many researchers analyze the attributes of users for

identifying online opinion leaders.

Reference [30] proposed a model for identifying opinion leaders in the microblogging by utilizing the number of concerns, the number of fans, the number of texts and whether the certificated or not.

Reference [31] established an index system for the opinion leaders in the SNS. The indexes include the neutral level, the active level, the cohesive power and the infectious degrees. Furthermore, these four indexes are subdivide into twelve indicators, including being the administrators or not, the number of friends, the number of concerns, number of posts, the frequency of posts, the type of posts, the number of repliers and so on.

Reference [32] proposed an attribute matrix to identify opinion leaders by using the degree of recognition, the active level, the self-persistence degree and the debate ability as indicators.

Reference [33] built up a public opinion leader influence transmission model for BBS and the indicators include the degree of being active, the degree of being concerned and the degree of being acknowledged.

Reference [34] built up a X-means iterative clustering screening model and used it to cluster the attributes of opinion leaders so as to identify them.

Reference [35] utilized the Analytic hierarchy Process to analyze the attributes of users and to identify opinion leaders of microblogging based on indicators of the user influence and active level.

Reference [36] pointed out that opinion leaders can be identified and evaluated by three indicators, including the active level, the transmission level and coverage level. They use Analytic hierarchy Process to calculate the weights of users based on these attribute characteristics and rank the users with highest weight as opinion leaders.

Reference [37] utilized the social network attribute, content attribute and inherent attribute to identify opinion leaders based on Markov logic networks.

B. Text Mining Analysis

One typical example of this approach is the Influence Diffusion Model (IDM) [38]. It is a model for discovering influential comments, individuals and terms from online discussions, by analyzing the relations of comments showing the flow of influence, and by emphasizing that the individuals' ideas are expressed through texts. Reference [39] introduce the concepts of effective key words and the probability of word propagation under the same interest space to the original IDM and verified their new model which measures the influence of forums posts. Other researchers also use this approach to identify opinion leaders.

Reference [40] identified the influential bloggers in a community by using the indicators which include the evaluation of blog texts, the number of references, the blog contents, the length and the degree of novel and so on. Reference [41] utilized the number and quality of the contents to identify opinion leaders in the online social blogs. Reference [42] measured the similarity between comments for implicit

links so as to detect positive opinion leader in the Sina news community.

C. Network Structure Analysis

The researches related to the network structure analysis include two categories: The first one is to utilize the classical network topology analysis, such as PageRank to identify the opinion leaders.

PageRank is a computing technology of web page rank, based on the Random Surfer Model in search engine to calculate the number of hyperlinks among different web pages [43]. The value of a web page depends on the frequency of Internet users browsing. The higher the PageRank number of a certain web page is, the more convincing its recommendation of its related page is. Meanwhile, the less the hyperlinks which a web page provides, the more convincing its recommendation of its related page is.

The PageRank algorithm is used to identify the opinion leaders in BBS [44] and many new algorithms are proposed based on the PageRank algorithm to identify opinion leaders in eBay [45], in a network [46], in a blog [47], in BBS [48], [49], in twitter [50] and so forth.

According to the researches, more algorithms for identifying opinion leaders are pointed out. Reference [49] proposed the LeaderRank algorithm considering the emotion hidden in the replies. Reference [50] utilized the Microblog-Rank algorithm by analyzing the relationships among the comments of users. Reference [51] pointed out the TwitterRank algorithm which focuses on the concerns of individuals and the similarity of topics in the Twitter.

The second approach is to use social network analysis to identify opinion leaders.

Social network analysis (SNA) is to investigate social structures by using network and graph theories, and to be more specific, by using nodes (individuals or things within the network) and the ties or edges (interactions) that connect these nodes. The most common types of social network analysis include the survey method and the content analysis method [52].

The survey method is to ask members to fill in questionnaire with some questions so as to identify their relationships. For example, members may be asked about their closest friends or about the individuals whom they consider to be the most prestige. After gathering the results, researchers can calculate the data of each individuals with the number they are selected by others and thus obtain the attribute data.

The content analysis method is to use the information saved in the process of online communication directly, which include the number of posts, the number of replies and others, to calculate the attribute data of relationships among members, and use some index to identify the online opinion leaders.

The SNA is popular for being used to identify the opinion leaders in the social network out of two main reasons: The first reason is that using SNA has the advantages as follows [53]. SNA, analyzing the pattern of interpersonal communication, scrutinizes relationships with the directions and strength of the relationships [54].

- It generates various social network maps showing communicative relationships among members of a social system by terms of the computer software.
- It provides realistic results, because the data is gathered from all the members inside one group, rather than from a random sample.
- It can be used to create several virtual scenarios based on assumed changes in relationships. For example, it can be used to identify the situation after disconnecting one opinion leader with all other members.
- It is a strongly persuasive and attractive option for changing agents because it makes the social structure clearly.

This second reason is that opinion leaders, acting as influential nodes in the social network, play an important role on affecting other members' behavior and on the overall change of the network. Generally, opinion leaders have three main features: 1) They have some special personality traits, such as being persuasive. 2) They have some professional knowledge in the specific field. And 3) they have more network relationships with other members than the ordinary members [24]. Obviously, the third feature is more easily to be observed and calculated when identifying opinion leaders, and can be used as a criterion for many studies [24], [55]. Since the opinion leaders in the network are always prestigious and professional, it is reasonable to identify them by analyzing their network relationships. Furthermore, the influence from opinion leaders to the members is realized through the network relationship. Hence, the network relationship is not only an important criterion for identifying opinion leaders, but also the basis and essence of opinion leaders' influence [56].

Out of these two reasons, SNA is widely used to identify opinion leaders in BBS [57], in blogs [58], in Microblogs [59]-[61], in college student groups [62]; in social networks [63], in a virtual community of knowledge [64], [65]. In order to identify opinion leaders, it is necessary to understand the characteristics of opinion leaders. Previous researchers have concluded some common characteristics of opinion leaders, which enable them to be distinguished from other individuals.

V. DISCUSSION AND IMPLICATIONS

According to the study above, there are three main approaches for identifying online opinion leaders, including user attributes analysis, text mining analysis and network structure analysis. However, these approaches have their own shortages:

For the researchers who choose user attributes analysis, they mainly rely on using weight sorting and clustering algorithm, and only consider the attributes of opinion leaders. Obviously, they ignore the network interaction features of online opinion leaders and thus lead to the limitations of this method.

For the researchers who choose text mining analysis, they focus on considering the influence of the messages sent out by the users during the process of communication, in order to measure the influence of opinion leaders indirectly. However, the influence of opinion leaders is not only shown in the interaction between users, but also reflected in the attributes of

the users, such as their number of followers. Hence, this method has some flaws.

For the researchers who choose network structure analysis, they focus on using this approach, which based on the network structure analysis, to analyze the influence of online opinion leaders. Although the SNA is the current mainstream research approach, ignoring the attributes of the users themselves is its shortage.

In order to identifying the online opinion leaders, it will be better for the researchers to combine these three approaches in the future. For example, the advantage of SNA is that it emphasizes the relationships of every nodes, rather than the node itself and thus this approach is suitable to be used in the situation in which the online communities become more and more popular. Hence, when identifying opinion leaders in the virtual communities, the user attributes analysis and text mining analysis can be combine to the SNA. By doing so, the researchers and companies are able to identify the opinion leaders more accurately and thus can make full use of them for affect the potential consumers.

REFERENCES

- [1] Childers, T. L., "Memory for the visual and verbal components of print advertisements", *Psychology and Marketing*, 3(3), 2006, pp. 137-149.
- [2] Flynn, L. R., Goldsmith, R. E., and Eastman, J. K., "Opinion leaders and opinion seekers: two new measurement scales", *Journal of the Academy of Marketing Science*, 24(2), 1996, pp. 137-147.
- [3] Berkman, H. W., and Gilson, C., *Consumer Behavior: Concepts and Strategies*. Boston: Kent Pub. 1986.
- [4] Homans, G. C., *Social Behavior: its Elementary Forms*. Taylor and Francis. 1961.
- [5] Rogers, E. M., and Cartano, D. G., "Methods of measuring opinion leadership", *Public Opinion Quarterly*, 26(3), 1962, pp. 435-441.
- [6] Stern, B. B., and Gould, S. J., "The consumer as financial opinion leader", *Journal of Retail Banking*, 10(2), 1988, pp. 43-52.
- [7] Goldsmith, R.E., Flynn, L.R. and Goldsmith, E.B., "Innovative consumers and market mavens", *Journal of Marketing Theory and Practice*, 11(4), 2003, pp. 56-64.
- [8] Hazeldine, M F., "An exploratory role analysis of opinion leaders, adopters, and communicative adopters with a dynamically continuous innovation", *Journal of Applied Business Research*, 26(4), 2010, pp. 117-130.
- [9] Momtaz, N. J., Aghaie, A., and Alizadeh, S., "Identifying opinion leaders for marketing by analyzing online social networks, *International Journal of Virtual Communities and Social Networking*, 3(1), 2011, pp. 43-59.
- [10] Forbes, L. P., "Does social media influence consumer buying behavior? An investigation of recommendations and purchases", *Journal of Business and Economics Research*, 11(2), 2013, pp. 107-112.
- [11] Katz, E., and Lazarsfeld, P. E., *Personal Influence: the Part Played by People in the Flow of Mass Communication*. New York: Free Press. 1955.
- [12] Hellevik, O., and Bjorklund, T., "Opinion leadership and political extremism", *International Journal of Public Opinion Research*, 3(2), 1991, pp. 157-181.
- [13] Arndt, J., "Role of product-related conversations in the diffusion of a new product", *Journal of Marketing Research*, 4(1), 1967, pp. 291-295.
- [14] Corey, L. G., "People who claim to be opinion leaders: identifying their characteristics by self-report", *Journal of Marketing*, 35(4), 1971, pp. 48-53.
- [15] Engel, J.F., Blackwell, R.D., and Miniard, P.W., *Consumer Behaviour* (8th ed.), Fort Worth: Dryden Press. 1995.
- [16] Valente, T.W., and Davis, R.L., "Accelerating the diffusion of innovations using opinion leader", the *Annals of The American Academy of Political and Social Science*, 566(1), 1999, pp. 55-67.
- [17] Rogers, E. M., *Diffusion of Innovation* (5th ed.), New York: Free Press. 2003.
- [18] Lyons, B., and Henderson, K., "Opinion leadership in a computer-mediated environment", *Journal of Consumer Behaviour*, 4(5), 2005, pp. 319-329.
- [19] Weimann, G., "The influentials: Back to the concept of opinion leaders?", *Public Opinion Quarterly*, 55(2), 1991, pp. 267-279.
- [20] Myers, J. H., and Robertson, T. S., "Dimensions of Opinion Leadership", *Journal of Marketing Research*, 9(1), 1972, pp. 41-46.
- [21] Trepte, S., and Scherer, H., "What do they really know? Differentiating Opinion Leaders into Dazzlers and Experts", *Proceeding of Annual meeting of the International Communication Association*, 2004.
- [22] Baumgarten, S. A., "The innovative communicator in the diffusion process", *Journal of Marketing Research*, 12(1), 1975, pp. 12-18.
- [23] King, C. W., "Fashion adoption: a rebuttal to the 'trickle down' theory". In *Toward Scientific Marketing*. Ed. Stephen Greyser. Chicago, 1964, pp. 108-125.
- [24] Goldenberg, J., Han, S., and Lehmann, D. R., "The role of hubs in The adoption process", *Journal of Marketing*, 73(2), 2009, pp. 1-13.
- [25] Bloch, P. H., and Richins, M. L., "A Theoretical Model for the Study of Product Importance Perceptions", *Journal of Marketing*, 47(3), 1983, pp. 69-81.
- [26] Troidahl, V. C. and Dam, R. V., "Face-to-face Communication about Major Topics in the News", *Public Opinion Quarterly*, 29, 1965, pp. 626-634.
- [27] Weimann Gabriel., *The Influentials: People Who Influence People*. State University of New York Press. 1994.
- [28] Rogers, E. M., *Diffusion of Innovation* (4th ed.). New York: The Free Press. 1995.
- [29] He Ling., *The research on opinion leaders in the network communication*. Unpublished doctor thesis. Social Sciences Graduate University in Sichuan Province in China. 2010.
- [30] Wang Junze, Wang Yalie, Yu Hang et al., "Research on Opinion Leader Recognition Model in Micro-blog", *Journal of News and Communication Research*, 6, 2006, pp. 81-88.
- [31] Ding Hanqing, and Wang Yaping., "An analysis of characteristics of opinion leaders in SNS -- a case study of Douban website", *Journal of News and Communication Research*, 3, 2010, pp. 83-91.
- [32] Ding Xuefeng, Hu Yong, Zhao Wen et al., "A study on the characteristics of online opinion leaders", *Journal of Sichuan University*, 2, 2010, pp. 145-149.
- [33] Xu Ke, and Chen Xi., "A study on the Influential Propagation Model of the opinion leader in BBS -- a case study of the BBS in Shanghai Jiaotong University", *Journal of News University*, 2010, pp. 87-93.
- [34] Zhu Shuai, Zheng Xiaolin, and Chen Deren., "Research on the algorithm of automatic discovery of opinion leaders in forums", *Journal of System Engineering Theory and Practice*, 31(S2), 2011, pp. 7-12.
- [35] Liu Zhiming, and Liu Lu., "Identification and analysis of opinion leaders in Micro-blog", *Journal of Systems Engineering*, 29(6), 2011, pp. 8-16.
- [36] Li Yuzhen, Hu Yong, Xiong Xi, et al., "Evaluation model of opinion leaders in Micro-blog", *Journal of Information Security and Communication Confidentiality*, 2, 2013, pp. 79-81.
- [37] Zhang, W., Li, X., He, H., et al., "Identifying Network Public Opinion Leaders Based on Markov Logic Networks", *The Scientific World Journal*, 2014, pp. 1-8.
- [38] Matsumura, N., Ohsawa, Y., and Ishizuka, M., "Mining and Characterizing Opinion Leaders from Threaded Online Discussions", *Proceedings of the 6th International Conference on Knowledge-Based Intelligent Engineering Systems and Allied Technologies*, 2002, pp. 1267-1270.
- [39] Fan Xinghua, Zhao Jing, Fang Binxing, et al., "Influencing diffusion probability model and its application for opinion leader discovery", *Journal of Computer Science*, 36(2), 2013, pp. 360-367.
- [40] Agarwal, N., Liu, H., Tang, L., et al., "Identifying the influential bloggers in a community", *Proceedings of the International Conference on Web Search and Web Data Mining*, 2008, pp. 207-218.
- [41] Feng, L., and Du, T. C., "Who is talking? An ontology-based opinion leader identification framework for word-of-mouth marketing in online social blogs", *Decision Support Systems*, 51(1), 2011, pp. 190-197.
- [42] Song, K., Wang, D., Feng, S., Wang, D., and Yu, G., "Detecting positive opinion leader group from forum", *Web-Age Information Management*, 7418, 2012, pp. 95-101.
- [43] Page, L., Brin, S., Motwani, R., and Winograd, T., "The PageRank Citation Ranking: Bringing Order to the Web", *Technical Report of Stanford University*, 1998.
- [44] Ning Lianju, and Wan Zhichao., "Identifying opinion leaders Based on Group Review", *Information magazine*, (8), 2013, pp. 204-206.

- [45] Hon Wai Lam, and Chen Wu., "Finding influential eBay buyers for viral marketing—a conceptual model of buyerrank", Proceedings of IEEE conference on commerce and enterprise computing, 2009, pp. 778-785.
- [46] Zhou, H., Zeng, D., and Zhang, C., "Finding leaders from opinion networks", Proceedings of the 2009 IEEE International Conference on Intelligence and Security Informatics, 2009, pp. 266-268.
- [47] Song Xiaodan, Yun Chi, Koji Hino, et al., "Identifying opinion leaders in the blog-sphere", Proceedings of the sixteenth ACM conference on Conference on information and knowledge management, 2007, pp. 971-974.
- [48] Zhai Zhongwu, Xu Hua and Jia Peifa., "Identifying opinion leaders in BBS", Proceedings of the 2008 IEEE/WIC/ACM International Conference on Web Intelligence and Intelligent Agent Technology, 2008, pp. 398-401.
- [49] Yu, X., Wei, X., and Lin, X., "Algorithms of BBS opinion leader mining based on sentiment analysis", Web Information Systems and Mining, 6138, 2010, pp. 360-369.
- [50] Weng, J., Lim, E., Jiang, J., et al., "TwitterRank: finding topic-sensitive influential twitterers", Proceedings of the third ACM International Conference on Web Search and Data Mining, 2010, pp. 261-270.
- [51] Lin Yu, Li, H., Liu, X., et al., "Hot Topic Propagation Model and Opinion Leader Identifying Model in Microblog Network", Abstract and Applied Analysis, 36(2), 2013, pp. 360-367.
- [52] Chen Ran., "Identification methods and principles of opinion leaders in online forums", Journal of Media Age, 2012, pp. 33-36.
- [53] Kim, D., "Identifying opinion leaders by using social network analysis: a synthesis of opinion leadership data collection methods and instruments", Unpublished doctor thesis, the faculty of the Scripps College of Communication of Ohio University, 2007.
- [54] Valente, T. W., Network models of the diffusion of innovations, Creskill, N. J. Hampton Press. 1995.
- [55] Iyengar, R., Van den Bulte, C., and Valente, T. W., "Opinion leadership and social contagion in new product diffusion", Marketing Science, 30(2), 2011, pp. 195-212.
- [56] Ho, J. Y. C., and Dempsey, M., "Viral Marketing: Motivations to Forward Online Content", Journal of Business Research, 63(9), 2010, pp. 1000-1006.
- [57] Gao Junbo and Yang Jing., "Analysis on the opinion leaders in the online forums", Journal of University of Electronic Science and Technology of China, 36(6), 2007, pp. 1249-1252.
- [58] Chen Yuan, and Liu Xinyu., "Recognizing opinion leaders based on Social Network Analysis", Journal of Information Science, 33(4), 2015, pp. 13-20.
- [59] Wang Di, and He Yue., "Analyzing structure of opinion leaders based on Social Network Analysis", Journal of Statistics and information forum, 28(10), 2013, pp. 84-89.
- [60] Zhao Hanqing. "Research on the identification of opinion leaders in Micro-blog based on Social Network Analysis", Journal of E-commerce, 9, 2013, pp. 63-64.
- [61] Zhang Junli, Sun Houquan, and Wang Dongdong., "Analysis of opinion leaders of the government", Journal of Information magazine, 33(1), 2014, pp. 124-128.
- [62] Luo Xiaoguang and Xilulu., "Research on opinion Leaders of electronic word-of-mouth based on Social Network Analysis", Journal of E-commerce and Information Management, 24(1), 2012, 75-81.
- [63] Cho, Y., Hwang, J., and Lee, D., "Identification of effective opinion leaders in the diffusion of technological innovation: A social network approach", Technological Forecasting and Social Change, 79(1), 2012, pp. 97-106.
- [64] Wang Lu and Ma Ruxia., "The function of opinion leaders in the virtual communities of knowledge", China Academic Journal of Electronic Publishing House, 2009, pp. 54-58.
- [65] Liu Min, Hu Fangang, and Li Xingbao., "Social network location and roles analysis of opinion leaders in teacher virtual community", China Academic Journal of Electronic Publishing House, 325, 2014, pp. 46-53.