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## Micro Blogging Opinion Leaders of Quality Circle Based on Social Network Analysis and Mining

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**Abstract:** In order to identify and analyze the micro blogging opinion leaders of quality circle, the researchers select 100 micro bloggers, with label of "quality" and high follower number on Sina micro blog, as an object to study current situation of micro blogging circle by social network analysis methods. According to the matrix constructed by micro blogger, the opinion leaders can be found by community diagram, indegree of centrality, cohesive subgroup activity. Quality micro blogging circle have formed micro blogging knowledge network centered on opinion leaders which can be divided into celebrity and experts. For the opinion leaders, the quality of micro article significantly affects the number of followers.

**Key words:** Micro blogging, opinion leader, quality, social network analysis

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### STATUS QUO ON MICRO BLOGGING RESEARCH

Sina Micro-blog is namely miniature blog, China's Twitter, a new type social network platform of broadcast system on which is used to share short real time message by follow mechanism. After July 2009, Sina micro blogging rapid development in China is surely beyond many people expectation. From the micro blogging transmission perspective, micro blogging has the 4A elements (Anytime, Anywhere, Anyone, Anything), became an instant network platform (Holotescu and Grosseck, 2011). Chinese micro blogging allows users to update information within 140 Chinese characters. Chinese micro blogging relatively large amount of information, because 140 Chinese characters have 4-5 times more than 140 English characters in the amount of information. Micro blogging extensively arise various academic interests and the current research on the micro blogging can be come down to the following three aspects.

**Micro blogging characteristics and trend analysis:** Micro blogging network is a typical scale-free network, showing the small-world phenomenon. Micro blogging is a new brief broadcasting social networking platform about real-time information by follow mechanism. Around specific topics and events, the majority of micro-blog users and their mutual relations (including attention, forwarding, comments, replies, private letters and other micro-group relationships) together constitute a vast social network circle. Micro blogging has been come down to 6

characters: "short, equalization, fissile, fragmentary, real-time and open-ended". Popularly saying, it is the short record, equalization communication, fissile broadcast, fragmentary presentation, real-time network and open-ended platform. The related studies on Twitter involves some content analysis of individual events, while others focus on monitoring and identifying trends in Twitter, Twitter trends reveal underlying patterns and Regularity, to understand how these trends are generated and how evolution (Cheong and Lee, 2009). These researches are closely related to public opinion analysis and text mining.

**Micro blogging user research:** The number of followees, who are defined as other users followed by one Micro blogger, comply with long tail phenomenon distribution (Broder *et al.*, 2000). The follower number obeys a power law distribution and the micro blog article number approximately power-law distribution. The research on micro blogging users mainly includes the user's motivation, character classification, behavior, etc., (Nardi *et al.*, 2004). Some scholars divided micro blogging according to the user's motivation and role. Some scholars classify different types micro blogger by the number of followee, follower, article. Some scholars mine potential friends on Twitter relationships, then found that Twitter network is composed of high density network of mutual concern with sparse network composed of true friends. The interpersonal characteristics, the questions and strategies in micro blogging has also become the focus and hotspot of micro blogging study (Efron and Winget, 2010).

**Application of micro blogging:** With the popularity of micro blogging, it's role have gradually extended from the initial exchange of information dissemination tools to the aspects of people's daily lives as well as all society. Micro blogging role gradually had been realized by peoples as an electronic word of mouth. Scholars began to study the Twitter article including brands comments, feelings and opinions and to further investigate how to use Twitter to brand a more effective customer relationship management, by which enterprise can use micro blogging as part of their overall marketing strategy (Jansen *et al.*, 2009). Micro blogging has become a new kind of remarkable scientific communication tool which has injected fresh vitality in the exchange of digital scientific research and development, particularly prominent in nearly two years (Han, 2010). Some scholars explore the characteristics and impact of the micro blogging platform Twitter for specific professional and theoretical aspects (Xifra and Grau, 2010). Many scholars launched a more focused research at academic conferences micro blogging communication applications and the role of (Priem and Costello, 2010) and whether the micro blogging phenomenon and references in scholars how to carry out such issues.

**RESEARCH PERSPECTIVE AND DATA ACQUISITION**

For analysis core users of Sina micro blogging circle, the researcher attempts to make use of methods of social network analysis and tools UCINET6.0 to study Sina "Quality" micro blogging circle, from the aspects such as the community charts, network centrality, community factions, the user usage behavior.

**Personal knowledge portal based on micro blog:** Micro blog will be the entrance of personal knowledge management substituting for search engineer at the web3.0 era. Users firstly look at their own micro blogs to find out information or clues on internet every day and surf the Internet from other network software such as Blog, SNS, Wiki, Tag, VoIP, IM and Smart Search engineer from hyperlink or clues of micro blog.

Interactions between Micro Blog users of each other are a kind of asymmetric follow mechanism. Both Audience-segmentation and cluster of Micro-blog can become a circle, centering on hot topic, to enable interested individuals to form a network social circle based on Micro-blog. Extended Micro-blog users and relations between them of each other (attention, forwarding, comments, reply, private letter, Web log Class) had constituted an enormous social network structure and knowledge network.

**Research perspective and problem:**

- Quality micro blogging circle has its unique network characters. According to users and content in micro blogging, the researcher building a "follow Matrix", then further analysis its characteristics by social
- The core users with specific label have its unique characters. Previous study mostly adopted snowballs or random sampling pattern to confirm sample which had revealed is mainly network structure features on generalized Micro-blog. This article had selected the core users of Sina micro blogging with the label of "quality", aiming at exploring features on Micro-blog users with specific label

Table 1: Comparative analysis of traits

Trait	Web 1.0	Web 2.0	Web 3.0
Core	Web portal	Interaction	Humanization, Smart
User Participatory	Read only, Passive	Read+write, interactive, only PC	Read-write, interactive, portable
Information Direction	One-way, like B2C	Two way, mix of B2C+C2C	Reticular network, subscription, mix of C2C+C2B
Technology	Static and dynamic HTML	Social software Application Such as Blog, Tag, SNS, RSS, Wiki	Semantic web
Environment	Cable Internet, slow	High speed network	wireless Internet
Representative products	Sina, Sohu, Yahoo etc.	SINA Blog, Renren Platform,	SINA weibo, QQ weixin, Twitter

Table 2: Top 10 follower number of micro blogging

No.	Micro blogger	Followee	Follower	Article	Rank	Online days	A/d
c1	健康红绿灯	443	3515905	4068	8	397	10.25
2	海外美食作家冰洁	659	1751313	7786	11	391	5.89
3	营养师顾中一	885	1325452	4691	11	1323	4.87
4	曝光平台	60	1038382	1572	8	964	2.03
5	健康时报孟宪励	600	866086	9241	10	1399	10.45
6	陈君石院士	333	501652	316	6	775	0.43
7	王旭峰营养师	2006	470648	4494	9	647	4.20
8	王自如	195	451392	3203	10	884	15.04
9	环保董良杰	2227	296011	7985	10	734	9.96
10	范志红_原创营养信息	55	270276	4872	10	1071	4.55

**Data sources and processing:** On the platform of Sina Micro-blog in China, there are Micro blogging circles tagged with "quality" which involve a large number of experts, scholars, employees and other persons in the field of quality. The study choose randomly selected 120 micro blogger, with follower number more than 500 as a sample group, with the tag "quality" on Sina micro blogging platform. The 120 sample cover 25 province, especially including Beijing, Shanghai and Guangzhou (Sampling time: June 27, 2013).

- The relationship about the following and the followed among above-mentioned 120 micro blogger build into the " matrix"
- The number of followees, followers, articles, reference, cited among above-mentioned 120 micro blogger build into indicator table

**Introductions to matrix construction:** Follow matrix is structured according to (1). After the confirming of 120 Micro-blog users' samples, firstly, numbering 120 Micro-blog users consecutively; Then recollect the status of following and being followed among 100 Micro-blog users of each other which will matrix data into a dichotomized matrix. In this matrix, the row and column indicate the relationship among users, 1 indicates column users followed a line users, 0 indicates no follow; the value of the main diagonal positioning is 0; account relationship among all Follows, thus forming a Follow matrix.

**ANALYZE "QUALITY" MICRO-BLOG CIRCLE  
BASED ON SOCIAL NETWORK  
METHODS**

Social network method can be used to analyze social network from many angles, including analysis of centrality, coagulation subgroup, core-marginal texture

and structural parity and so on. Here, the researchers mainly use community diagram, centrality and subgroup methods to analysis "quality" micro blogging circle.

**The community diagram of quality micro blogging circle:** In the community diagram of citation matrix, the opinion leaders can be discovered. The community diagram is a way to describe social network, mainly composed by points (mean actors) and lines (mean relations between actors of each other). According to the direct of relations (lines), it can be divided into directed and undirected graph. By the tool NetDraw in Ucinet, draw community diagram which is the relations of following and being followed in "quality" Micro-blog circle about. The conclusion is shown in Fig. 1.

The community diagram is shown in Fig. 2, directing arrow means relations of following and being followed, A directing to B means A had followed B. The central node on the community diagram (round node) owns enormous fans group, square node means no enormous fans group. 12 users are isolated nodes on the community diagram, isolated from the circle which is "Mall inspection report", "Housing quality consultant" and so on.

Density means tightness degree among each node on the community diagram (Huberman *et al.*, 2009), the more contact of nodes on fixed scale have, the larger density on the community diagram will be. The Micro-blog social network density is low with 4.05% density. This density value accounts for that the intimate of network nodes communication between each other.

**Centrality analysis:** Opinion leaders can be found by the indegree. Centrality degree are used to measure who should be on central position, thus to explore this core user. There are many ways in distinguishing the critical and non-critical roles of social networks. Here select the point degree centrality in centrality degree. Matrix and references are concerned with the direction of the matrix,

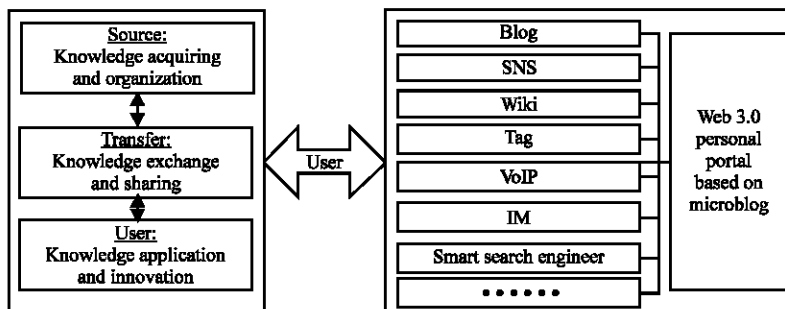


Fig. 1: Personal knowledge management system based on micro blog

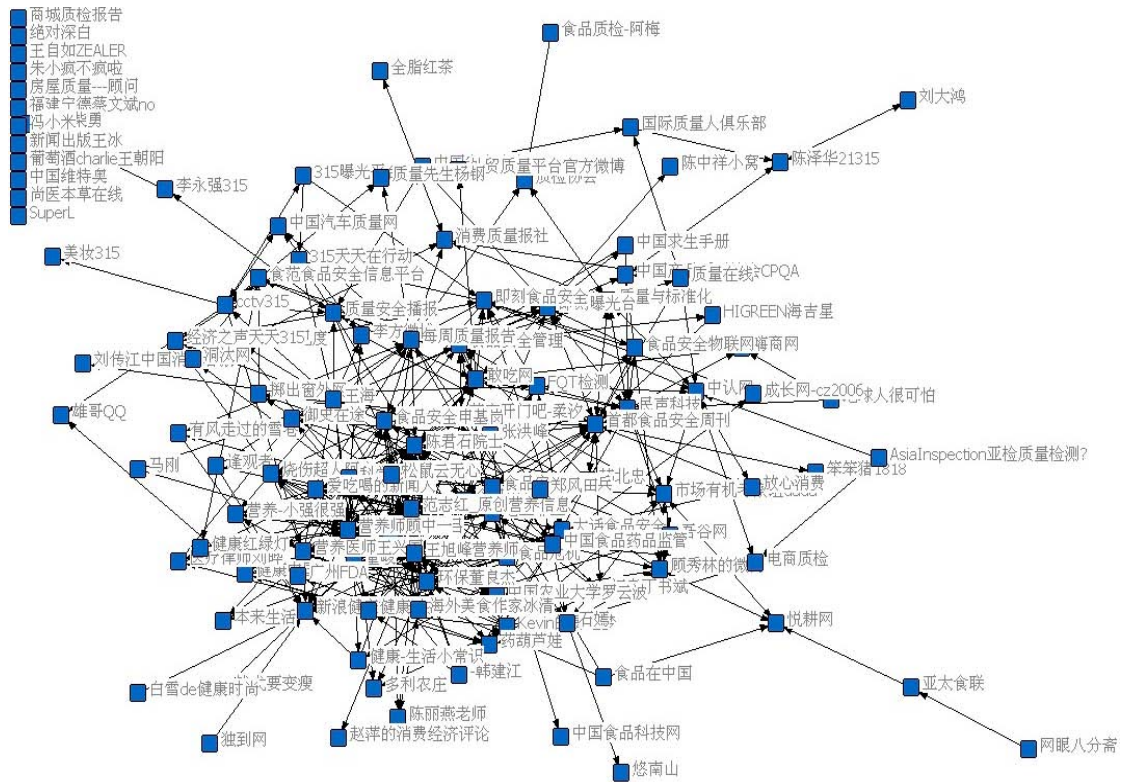


Fig. 2: The community diagram of matrix of quality Micro blog

Table 3: TOP 10 users indegree and outdegree

Indegree		Outdegree	
范志红_原创营养信息	25	科学松鼠会	27
营养师顾中一	23	王旭峰营养师	20
陈石磊院士	19	营养师顾中一	18
松鼠云无心	18	干海	17
王旭峰营养师	15	食品安全刘红兵	17
首都食品安全周刊	15	营养师小吕	16
民声科技	14	都食品安全周刊	15
新浪健康	14	老十非十	15
每周质量报告	13	松鼠云无心	13
环保董良杰	11	海外美食作家冰清	11
食品安全标准	11		

Table 4: Freeman's degree centrality measures

No.		Outdegree	Indegree	NrmOutDe (g)	NrmInDe (g)
1	Mean	4.817	4.817	4.048	4.048
2	Std Dev	4.873	5.065	4.095	4.256
3	Sum	578.000	578.000	485.714	485.714
4	Variance	23.750	25.650	16.771	18.113
5	SSQ	5634.000	5862.000	3978.532	4139.538
6	MCSSQ	2849.967	3077.967	2012.546	2173.552
7	Euc Norm	75.060	76.564	63.076	64.339
8	Minimum	0.000	0.000	0.000	0.000
9	Maximum	27.000	25.000	22.689	21.008

Network centralization (outdegree) = 18.798%, Network centralization (indegree) = 17.103%

thus point degree centrality includes the "out degree" and "in degree" in the point (Table 3 and 4).

Table 5: Spearman correlation coefficient of indicator variables

Variables	Followees	Followers	Article
<b>Followee</b>			
Coefficient	1.000	0.008	0.480**
Sig. (2-tailed)	0.000	0.935	0.000
N	120	120	120
<b>Follower</b>			
Coefficient	0.008	1.000	0.226*
Sig. (2-tailed)	0.935	0.000	0.013
N	120	120	120
<b>Articledaily</b>			
Coefficient	0.480**	0.226*	1.000
Sig. (2-tailed)	0.000	0.013	0.000
N	120	120	120

\*Correlation is significant at the 0.05 level (2-tailed), \*\*Correlation is significant at the 0.01 level (2-tailed), In the case of  $p_i \leq 0.01$ , the correlation coefficient between the followers number and the article number every day reached 0.480, which is a moderate correlation

$$\text{Network Centralization (Outdegree)} = 18.798\%$$

$$\text{Network Centralization (Indegree)} = 17.103\%$$

The outdegree means the degree which some user "follow" other users, indegree means the degree which some user is "followed" by other users. In the matrix, maximal indegree is "Quality Network in China", the next is "范志红\_原创营养信息", "营养师顾中一"; maximal outdegree is "科学松鼠会", "王旭峰营养师". 21 users' out

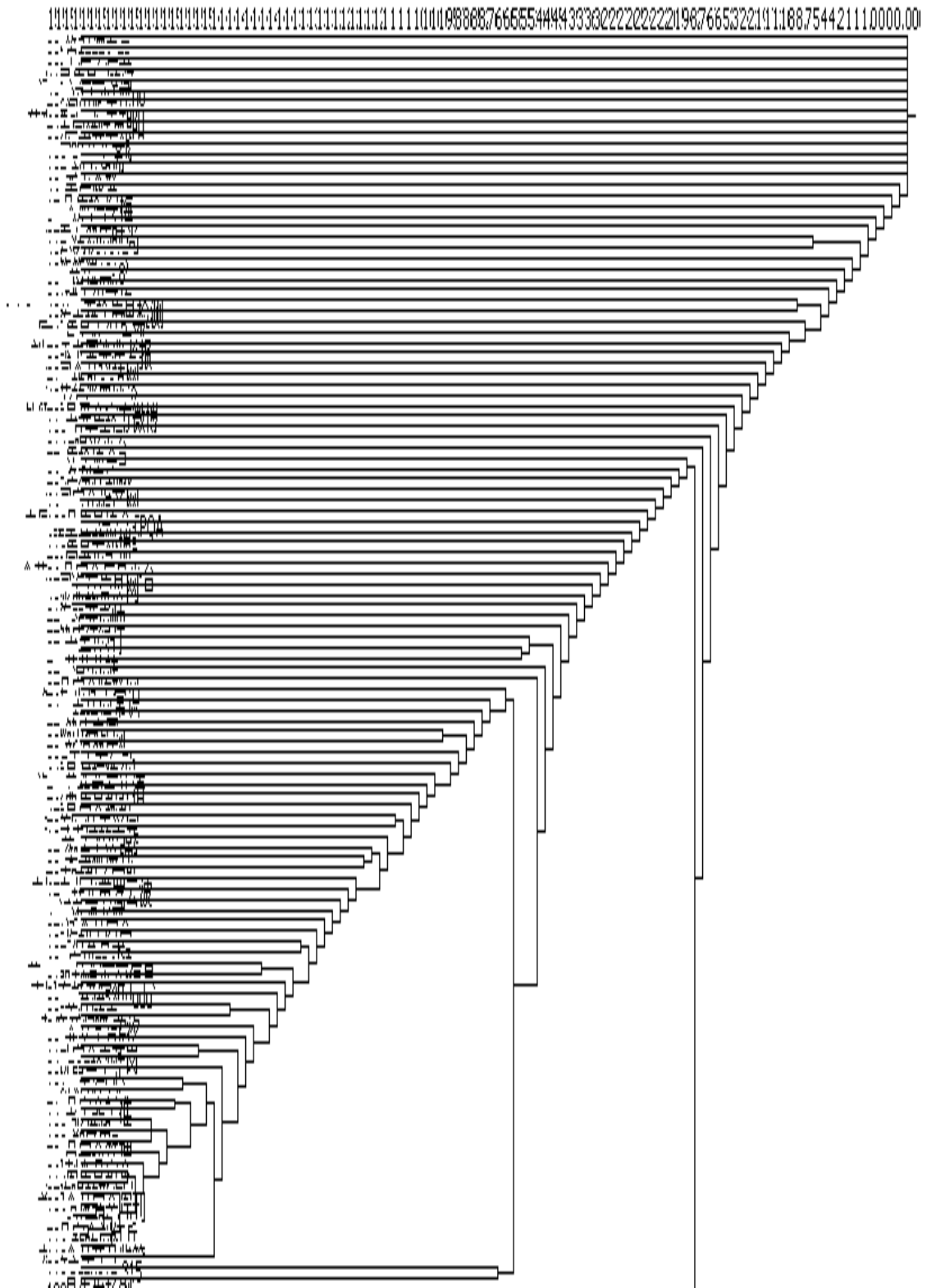


Fig. 3: When  $k = 3$ ,  $n = 16$  the follow matrix cohesion subgroup figure

degree is 0; 20 users' in degree is 0; 12 users' in degree and out degree is 0 which means neither follow nor being followed. Both network centralization of out degree and in degree of matrix is 18.798 and 17.103%, respectively.

**The analysis of cohesive subgroup:** From the micro blogger's activity in deferent cohesive subgroup, (Fig. 3) the opinion leader can be found. In order to reveal actual existing or potential relations between social actors, cohesive subgroup utilizes arithmetic to find relative stronger, direct, close or positive relationship individuals who are among actors collection, aiming at confirming both frequency information sharing and close relation of internal members of small groups who composed whole network. This article used 2 dimensions, one is reciprocity of users relationships in "quality" in Micro-blog circle, the other is relational density between users both inside and outside in subgroup, to analyze cohesive subgroup. According to what the value of K is and network scale restriction rule, if we take 2 of the value of K, then the scale of the subgroup is 4.

Take 2 as the value of K: Thus, if  $k = 2$ ,  $n = 4$  which will get 62 subgroups; if  $k = 2$ ,  $n = 5$  which will get 25 subgroups... if  $k = 3$ ,  $n = 15$ , which will get 36 subgroups. Analyses showed that "Huang gang quality and supply chain" appeared in almost all factions.

Member interactions within factions are more frequent by synthesizing above analysis, a blog is far from a member of some faction, but a member of different faction and also internal structure of factions are close. Lack of interaction is current situation of communications of Micro-blog circles about "quality", communication status of Micro-blog circle about "quality" from 2 user lay of famous people and common people.

**The analysis of microblogging user behavior:** The researcher also collect information, including the number of article, the following, fans, citations and the cited, about this 120 micro blog users. Then, analysis carried out correlation.

In the case of  $p \leq 0.01$ , the correlation coefficient between the followers number and the article number everyday reached 0.480 which is a moderate correlation (Table 5).

## CONCLUSION

**Micro blogging opinion leaders can be divided into celebrities and experts:** Through comparative analysis, a specific label "quality" micro blogging has unique opinion leaders by follow matrix network which reflects the social

networks characteristics constructed. In quality micro bloggers, opinion leaders can be divided the celebrities and experts. Because their power and identity in reality, celebrity's follower number are much more and celebrity has less influential power in quality micro blogging circle, for an example "Academician Chen Jun Shi"; Experts, whose followers number and activity are high, exchanges more frequently in the quality circle, such as "Scientific squirrel". For opinion leaders, the quality of micro blogging article significantly affects the number of followers.

**It has formed microblogging knowledge network centered on opinion leaders:** Micro blogging is social network centered on people. As a kind of potential informal social organization, there are enormous knowledge communications and sharing actions in quality micro blogging circle, thus had formed micro blogging knowledge network. In quality micro-blog circle, knowledge network is centered on human and micro-blog users and their articles had constituted micro-blog knowledge nodes with constantly dynamic contact and update. When getting key information, people will look for relative credible ones in some field to consult. Through attention mechanism, especially attention to opinion leaders and hot topic, thus micro-blog will constitute micro blogging knowledge network to help humans to get key information. In much time, knowing the owner and the position of knowledge will be more important than knowing knowledge itself.

**Study limitations and outlook:** The selected samples only have 100 users, with smaller networks and limited artificial statistics. Follow-up studies are needed to further expand the number of samples, the use of intelligent technology, from larger scale to explore micro blogging network structure and the core user characteristics. This paper chooses Sina micro blogging "quality" label network, for different industries and fields micro blogging circle, characterized and how, but also need to expand the new study. The researchers chose Sina micro blogging with "quality" label, but how to recognize the opinion leaders needs new research, for different industries and fields micro blogging network.

## REFERENCES

Broder, A., R. Kumar, F. Maghoul, P. Raghavan and S. Rajagopalan *et al.*, 2000. Graph structure in the web. *Comput. Networks: Int. J. Comput. Telecommun. Network.*, 33: 309-320.

- Cheong, M. and V. Lee, 2009. Integrating web-based intelligence retrieval and decision-making from the twitter trends knowledge base. Proceeding of the 2nd ACM workshop on Social web search and mining, November 2, 2009, Hong Kong, China, pp:1-8.
- Efron, M. and M. Winget, 2010. Questions are content: A taxonomy of questions in a microblogging environment. Proc. Amer. Soci. Inform. Sci. Technol., 47: 1-10.
- Han, R., 2010. The influence of microblogging on personal public participation. Proceedings of the IEEE 2nd Symposium on Web Society, August 16-17, 2010, Beijing, China, pp: 615-618.
- Holotescu, C. and G. Grosseck, 2011. Mobile learning through microblogging. Proc. Soci. Behav. Sci., 15: 4-8.
- Huberman, B.A., D.M. Romero and F. Wu, 2009. Crowdsourcing, attention and productivity. J. Inform. Sci., 35: 758-765.
- Jansen, B.J., M. Zhang, K. Sobel and A. Chowdury, 2009. Twitter power: Tweets as electronic word of mouth. J. Amer. Soci. Inform. Sci. Technol., 60: 2169-2188.
- Nardi, B.A., D.J. Schiano, M. Gumbrecht and L. Swartz, 2004. Why we blog. Commun. ACM., 47: 41-46.
- Priem, J. and K.L. Costello, 2010. How and why scholars cite on Twitter. Proc. Amer. Soci. Inform. Sci. Technol., 47: 1-4.
- Xifra, J. and F. Grau, 2010. Nanoblogging PR: The discourse on public relations in Twitter. Public Relations Rev., 36: 171-174.