

Evaluation Model of Enterprise Microblog Marketing Effectiveness on the Basis of Micromatrix

Chen Guang Wang, Tingjie Lu and Xia Chen

*School of Economics and Management, Beijing University of Posts and Telecommunications, Beijing 100876, China,
694033972@qq.com*

Abstract

Microblog matrix is an important strategy for socialized marketing. It builds various sub-Microblogs in accordance with the requirements of different orientations including products, brands, functions, etc., and covers various user groups through different IDs. Compared with traditional studies, the study concentrates on the micromatrix structure, and probes into the influence of synergetic effect between micromatrix members on enterprise Microblog information dissemination. From three angles including the deep, scale and speed of information diffusion, it puts forward the quantitative model and algorithm to evaluate enterprise Microblog matrix marketing effectiveness, and conducts empirical research through a large sample data of Sina Microblog. The empirical result shows that the model can effectively evaluate marketing effectiveness of micromatrix enterprise Microblog. The study finds out enterprises can change their internal structure by means of micromatrix, cover more people and enlarge the effect of information dissemination;

Keywords: *Microblog matrix, enterprise Microblog marketing, marketing evaluation model, social network dissemination, social media*

1. Introduction

In recent years, the development speed of Microblogs is astonishing. Sina Microblog is the largest Microblog social platform in China; till March 2013, registered users of Sina Microblog has exceeded 536 million [1]. Compared with traditional media, Microblogs provide equal and open platform for the participation of the masses, which gives it strong mass communicability, so more and more enterprises take Microblogs as their new marketing front. In the U.S., various famous enterprises have registered in Twitter, implemented Internet marketing and obtained good effects [2]. In China, up to June 2012, the number of verified enterprise IDs in Sina Microblog has exceeded 130,000 [3]. Though more and more enterprises begin to realize the importance of Microblog marketing, in fact, more official Microblogs of enterprises don't know how to conduct marketing with their Microblog. Therefore, to explore the information dissemination law and analyze the enterprise Microblog marketing effect is significant for improving enterprise Microblog operation.

2. Literature Review

2.1. Studies on Enterprise Microblog Marketing

The study results of Microblog marketing include two aspects: one discusses Microblog marketing patterns and strategies, value prospect, etc., in qualitative perspective (Shel Israel, 2009 [4]; Joel Colnl, 2011 [5]); the other studies the

theoretical model that Microblog marketing influences the consumer behavior (Cheung, Lee & Rabjohn, 2008).

In regard to quantitative study, scholars start with micro models including information dissemination model, *etc.*, and analyze how to realize the maximization of information diffusion effect: The study has verified that influence nodes and common nodes have differential functions in information diffusion, and the former can generate larger information cascades more frequently (Watts and Dodds, 2007 [6]). In the respect of information quality evaluation, scholars have put forward various information quality prediction and sort algorithms in view of text content, user characteristics [7], context information [8], non-textual characteristics [9], *etc.*

In short, besides improving their own information quality, the key difficulty of enterprise Microblog marketing is how to gather the investment in the most influential key point, form effect return and provide quantitative reference information for the formulation of marketing strategies. It involves the evaluation on the key nodes in the complex social network.

2.2. Evaluation on Key Nodes in Complex Social Networks

The essence of the study is evaluation of the contributed value of enterprise Microblog matrix members for Microblog dissemination. The study on evaluating the importance of network nodes mainly includes three methods of social network analysis, system science analysis and information search field analysis.

As to the social network analysis method, “importance is equivalent to significance”, and the method mainly involves judging the core degree of nodes through the structure centrality of nodes in the social network, including degree centrality [10], betweenness centrality (betweenness) [11] and distance centrality [12]. The system science analysis method stresses that “importance is equivalent to the destructive effect on network caused by removal of the nodes (set)”. It aims at finding out the key nodes to maintain the robustness of complex network, mainly including node removal method [13] and node contraction method [14]; in other words, the changes in network connectivity after the removal of some nodes in the network are explored so as to find the key nodes. Finally, in regard to the information search field analysis method, PageRank [15] and HITS [16] algorithms are mainly used for evaluating the value of web page links, and the core idea is that the influence of the neighboring nodes of one certain node is taken into account so as to judge the influence of the node. K-Shell algorithm [17] iteratively makes layers for the vertices in the network; the higher layer the vertex is in, the more important and influential it is.

In this article, because the network connectivity is not taken into consideration, system science analysis method is used for reference, and the value of a node is judged through building of the dissemination tree model of Microblog forwarding and measurement of the influence of node removal on the overall dissemination effect.

In a word, the existing Microblog marketing studies mainly concentrate on qualitative description, and quantitative analysis is not enough. Moreover, the studies on Microblog dissemination characteristics take enterprise Microblog as a single node to study, and never consider the special forms of its micromatrix and the possibility that the synergetic effect of micromatrix internal members may promote the dissemination capacity. Since the micromatrix concept is a fresh one, currently only a few people study its mechanism of action and value.

3. Value Evaluation Model for Microblog Matrix Members

3.1. Study Object: Micromatrix

Micromatrix (*i.e.*, Microblog matrix) refers to setting up the branches with different functions and purposes under an official Microblog account to realize the communication

with people at all levels and shape the image of the official Microblog in an all-round way. It is creating the Microblog branches to meet different demands ostensibly, but, in essence, it is intended to cover all groups of followers accurately and effectively. The dissemination process of enterprise Microblog can be divided into two parts through micromatrix. As shown below, internal nodes are the members of enterprise micromatrix and external ones are the users covered by enterprises' branches. The study focuses on the function of Microblog dissemination with micromatrix as entry point, which provides the practical application value for enterprises and a new perspective for theoretical study of social network communication.

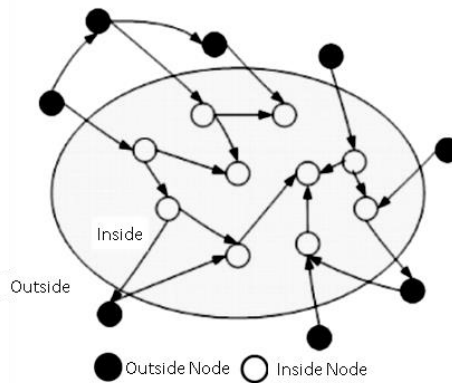


Figure 1. Diagram of Two Regions in the Process of Microblog Dissemination

3.2. Study Method: Tree Model for Microblog Information Dissemination

Every Microblog posting has its ID for identification in the database system, so if the original Microblog posting and its forwarding at all levels are acquired through layers, the path of its dissemination will be learned.

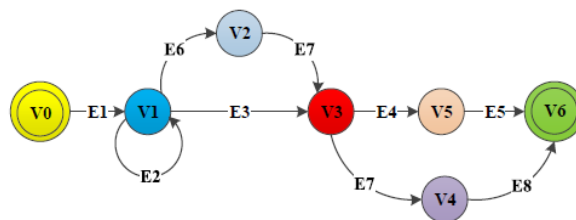


Figure 2. Tree Model of the Dissemination of a Microblog Posting

For a Microblog posting with hundreds of thousands of forwardings, the dissemination tree is very complex, but the nodes that bring a new round of upsurge in forwarding can be found easily from a macro view, which is called “information cascade”.

The study is to search for the enterprise micromatrix member that causes the “information cascade” of forwarding, and assess the value of every micromatrix member in terms of causing the “information cascade”.

3.3. Assessment of Microblog Dissemination Effect

Before the establishment of the model, the assessment method of Microblog marketing effect shall be determined. The key of enterprise Microblog marketing is to have an effective information impact on the consumers, so here the optimization of marketing effect can be quantified to the maximization of information dissemination effect.

The indicators of diffusion range (number of acceptors) and the time for reaching the specific range of diffusion are important for scholars at home and abroad to quantify the effect of social network information dissemination (jiang&Scott,2009 [18]). Will and

Stuart (2011) [19] add the measurement of dissemination depth based on this. In line with the viewpoints of former scholars, the direct elements of information diffusion – deep, scale and speed, are also adopted to assess the effect.

The Three Elements are defined as Follows

Deep refers to the level of the biggest forwarding layer in the tree of Microblog information dissemination.

Scale refers to the accumulated forwardings.

Speed refers to the time interval between Microblog posting and forwarding. To study the whole dynamic process of a information dissemination tree from emerging (root node release) to reaching the maximum dissemination range in an all-round way, the whole diffusion period is divided here and the time intervals from posting to reaching the 10% of the total forwarding, 20%, 30%, 40%, 50%, 60%, 70%, 80% and 90% are counted.

3.4. Establishment of Evaluation Model: Model of Dissemination Effect of Micromatrix

3.4.1. Evaluation Model for Dissemination Value of One-dimensional Micromatrix: Most of micromatrixes are hierarchical – that is taking the primary account as the core and branches as the ancillary tool to conduct the marketing activities, shown as below.

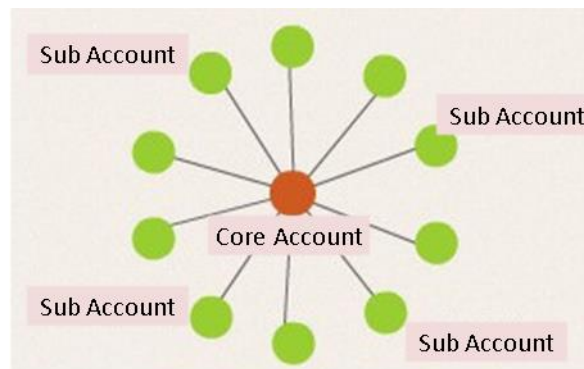


Figure 3. Structure Diagram of Hierarchical Enterprise Micromatrix

In the evaluation model for dissemination value of one-dimensional micromatrix, the supporting function of the members in the micromatrix for the primary account (core Microblog) shall be firstly considered, which is to assess the contributions of the branches to the primary account in information dissemination in terms of deep, scale and speed.

The Following Evaluating Algorithms are used (Only the Theory is Explained)

- (1). To collect the original Microblog postings of A enterprise in a year and calculate the deep, scale and speed of every forwarding;
- (2). To calculate the average of deep, scale and speed of all forwardings;
- (3) To establish the tree model of dissemination with the master-slave nodes according to the order and origin of every forwarding;
- (4). For $i = 1$ to n // n is the number of micromatrix members x ;
- (5). To take the i th member of A enterprise's micromatrix as M_i ;
- (6). To find all forwarding paths (branches) from M_i in the data sheet of forwarding and then delete them;
- (7). To measure the deep, scale and speed of every Microblog posting again after the deletion;
- (8). To calculate the changes in averages of deep, scale and speed of all Microblog postings;

- (9) To calculate the contribution rate of deep, scale and speed for every micromatrix member;
- (10). To evaluate the members in a circle with $i=i+1//$;
- (11). To collect the dissemination contributions of the members in the micromatrixes for subsequent analysis.

Finally, every member's average contribution to the dissemination of primary account in terms of deep, scale and speed can be obtained, and contribution rate of dissemination of every member can be measured by the three dimensions.

$$\begin{aligned} \text{Contribution rate of deep} &= \frac{\text{Change of deep before and after pruning}}{\text{Original deep}} \times 100\% \\ \text{Contribution rate of scale} &= \frac{\text{Change of scale before and after pruning}}{\text{Original scale}} \times 100\% \\ \text{Contribution rate of speed} &= \frac{\text{Change of speed before and after pruning}}{\text{Original speed}} \times 100\% \end{aligned}$$

3.4.2. Evaluation Model for Synergetic Dissemination Effect of N-dimensional Micromatrix: The one-dimensional model built in previous links is used to evaluate the unidirectional assistant contributions of various micromatrix members in the dissemination of main Microblog information.

However, the truth is that the Microblogs of micromatrix are disseminated through mutual help and promotion (as shown in the following Figure). Thus, a contribution evaluation matrix where micromatrix members jointly promote the dissemination can be obtained.

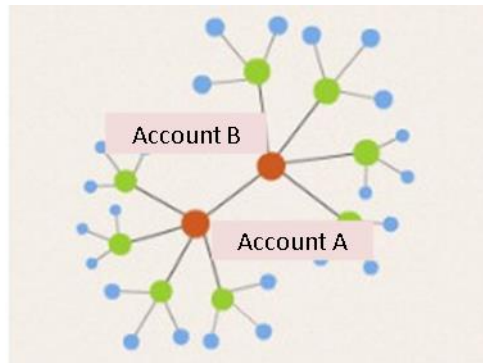


Figure 4. Structure Diagram of Synergetic Enterprise Micromatrix

Expand the evaluation model of one-dimensional dissemination effect in previous links without changing the basic structure of algorithm, choose one of the micromatrix members (such as account B), and delete all dissemination branches with B as the root node in various dissemination trees, then through the change of deep, scale, speed, we can know the contribution of B for other nodes. Finally, the mutual communication & contribution matrix of N-dimensional micromatrix is acquired and it is still measured through the three dimensionalities of deep, scale and speed. In result matrix, the diagonal symbolizes the self-forwarding diffusion coefficient of enterprise Microblog and the rest part is the diffusion influence coefficient between two members of micromatrix.

4. Empirical Research on Micromatrix Members' Value

4.1. Sample Selection & Collection

In January 2013, Sina Microblog issued the 2012 Annual Ranking List of Powerful Enterprise Microblogs on which one hundred most powerful enterprise Microblogs in 2012 were selected. The empirical research indicates that most famous enterprises Microblogs on the Ranking List adopt the micromatrix marketing strategy and have

typical characteristics. Thus, this article chooses “Xiaomi” and “360 Safe Guard” as well as the micromatrix members as the objects of contrastive research. On the one hand, the Microblog marketing performance of Xiaomi is extremely outstanding and its influence ranks the second place. On the other hand, the “360 Safe Guard” and “Xiaomi” are two famous enterprises in the same field and both adopt the micromatrix marketing strategy, thus possessing high research value.

4.1.1. Data Acquisition of Evaluation Model of One-dimensional Micromatrix Communication Value: Acquire the main Microblog accounts of Micromatrix: “@Xiaomi” and “@360 Safe Guard” and the micromatrix member list, and the micromatrix member list is as follows:

Xiaomi company Micromatrix member	Qihoo 360 company Micromatrix member
@XiaoMi Company	@ 360 Safe Guard
@Mi Phone	@ 360 Special Phones
@Mi Chat	@ 360 Secure WebBrowser
@Mi Box	@ 360 Phone Assistant
@MI ROM	@ 360 Antivirus
@Mi Bar	@ 360 Secure Desktop
@Mi Community	@ 360 Phone Antivirus
@Mi Market	@ 360 Search Engine
@Mi recruitingAnd Other 11 sub accounts.
Total: 9	Total: 20

Figure 9. Micromatrix Member List of Xiaomi and Qihoo 360

681 original Microblog postings of two main Microblogs in 2012 are acquired through software finder. And Microblog postings with over 5,000 forwarding times are selected to acquire the representative information. 42 Microblog postings are selected finally. It is found that the 42 Microblog postings are forwarded for 1,039,187 times, which can be used for follow-up data statistic analysis.

4.1.2. Data Collection of Evaluation Model of N-dimensional Micromatrix Dissemination Value: Four representative members are selected from the micromatrix of “@Xiaomi” and “@ 360 Safe Guard” (four accounts that ranks top in Sina Microblog Influence Ranking List of micromatrix) and the members are as follows:

Xiaomi company Micromatrix member	Qihoo 360 company Micromatrix member
@XiaoMi Company	@ 360 Safe Guard
@Mi Phone	@ 360 Phone Assistant
@Mi Chat	@ 360 Secure Desktop
@Mi Box	@ 360 Special Phones

Figure 10. Micromatrix Member List Extracted for Investigating Synergetic Effect

3,590 original Microblog postings posted by all members on the above list in 2012 are acquired and the forwarding times are 9,509,421. The original Microblog postings of micromatrix members with forwarding times ranking the top three are selected to acquire the representative information. 24 Microblog postings are selected finally. It is found that the 24 Microblog postings are forwarded for 2,531,346 times, which can be used for data analysis.

5. Result Analysis

By analyzing the result data, the result is as follows:

5.1. Result of One-dimensional Micromatrix Data Processing

Contribution rates of micromatrix members @ Xiaomi and @ 360 Safe Guard in deep scale and speed:

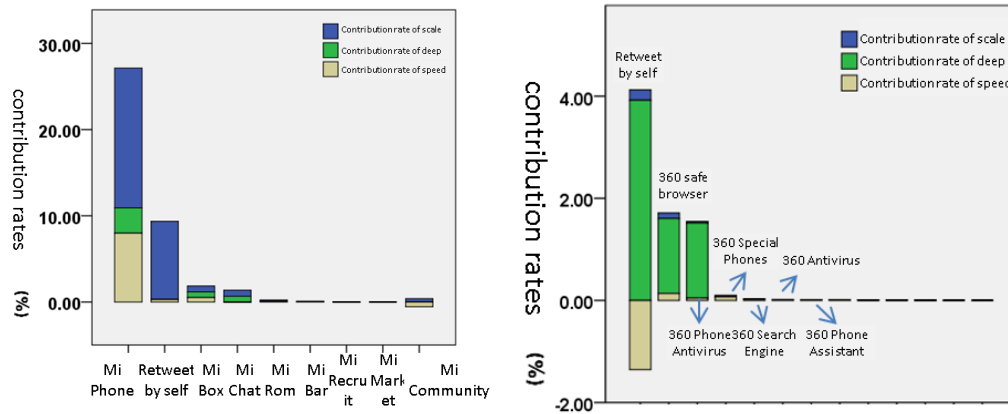


Figure 12. Contribution Rates of Various Micromatrix Members in Dissemination of Xiaomi &360 Safe Guard Microblog

5.1.1. Whole Statistical Result Shows: The micromatrix members @ Xiaomi efficiently promote the deep dissemination of their Microblog. Generally, besides the forwarding of Xiaomi, @ Xiaomi Phones, @ MiBox and @ MiTalk respectively rank top three in terms of contribution degree, and especially Xiaomi Phones makes the greatest contribution; their contribution rates in deep, scale and speed are: 2.93%, 16.22% and 7.99% respectively. In other words, 16 postings among every 100 @ original Xiaomi Microblog postings are forwarded by @ Xiaomi Phones. The micromatrix members @ 360 Safe Guard have some certain but not remarkable effects on the deep dissemination of Microblog. Meanwhile, it can be found that micromatrix members have hardly promoted the information dissemination of main Microblog.

It signifies that micromatrix members of both parts have made different contributions. Xiaomi Phones is of great importance to the Microblog dissemination of Xiaomi; while the Microblog of 360 Safe Guard is operated in a form of micromatrix, but synergetic effect is not generated. This is the part founded in the micromatrix value evaluation model and it can be promoted in enterprise Microblog operation.

5.1.2. From the Process of Microblog Dissemination: Further select the micromatrix members @ Xiaomi Phones: changes on contribution value of dissemination speed @ Xiaomi Phones, @ MiBox, @ MiTalk in terms of time dimension are shown in the following figure:

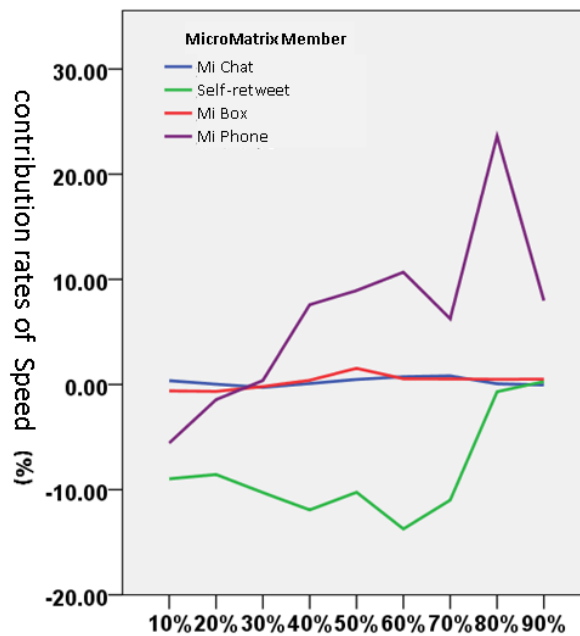


Figure 14. Contribution Rates of Micromatrix Members to Xiaomi in Dissemination Speed on Various Stages (Negative Value Indicates that the Dissemination Speed will be improved without the Member)

It can be seen from the Figure the specific contribution rate to speed @ Xiaomi Phones in the process of dissemination of information released by Xiaomi, especially on the middle stage of dissemination when the overall dissemination rate reaches up to 30%, @ Xiaomi Phones has greatly promoted the dissemination speed @Xiaomi Microblog. On the later stage with the overall dissemination rate of 70-80%, there is a new round of remarkable promotion. It can also be seen in the figure that another two micromatrix members do not show obvious promotion in dissemination speed.

Finally, it is noteworthy that in the statistical result, forwarding of enterprise Microblog by themselves is likely to increase the scale (Xiaomi: 9.07%) and deep (Qihoo 360: 3.92%) of dissemination, but it will not speed up dissemination according to the sample results.

5.2. N-dimensional Micromatrix Data Processing Results:

Through algorithm, it finally comes to the conclusion that the interaction matrix of various micromatrix members is as follows:

5.2.1. Contribution Rate in Deep: It can be seen from the data result, @Xiaomi provides the contribution rate in deep of 30.81% for @ MiBox Microblog dissemination, while @ Xiaomi Phones provides that of 11.11% for @ Xiaomi Microblog dissemination, very remarkable. the synergetic dissemination effect between micromatrix members of Qihoo 360 has no significant effect on the promotion of in-depth communication, and the largest contribution rate just occupies 23.61% after forwarding @ 360 Phone Assistant by themselves.

5.2.2. Contribution Rate in Scale: There is obvious synergy between Xiaomi micromatrix members in terms of scale, especially @ Xiaomi Phones to @ Xiaomi (26.27%) and @ Xiaomi to @ MiBox (16.41%). there is still slight synergy between Qihoo 360 micromatrix members in scale.

5.2.3. Contribution Rate in Speed: In terms of the dimension of average speed, there is no obvious synergetic effect of micromatrix, thus it is necessary to further analyze the influence of micromatrix members on Microblog dissemination speed at every stage of dissemination from the micro perspective.

To sum up, from the three dimensions of deep, scale and speed, it can be seen that there is obvious mutual promotion between Xiaomi micromatrix members, especially @ Xiaomi Phones to @Xiaomi and @ Xiaomi to @MiBox show remarkable promotion both in deep and scale of dissemination, while there is slight interaction between Qihoo 360 micromatrix members by contrast.

From the diagonal of the matrix, namely, the evaluation on contribution of their own forwarding dissemination of Microblog postings, it can be obviously seen that there is mutual promotion both in deep and scale of dissemination, but there is little effect on speed, which is consistent with the results of one-dimensional micromatrix evaluation model.

6. Summary and Outlook

Taking the special micromatrix structure of enterprise Microblog as the entry point, the paper makes an evaluation on the dissemination effect of enterprise Microblog from three levels of deep, scale and speed through building dissemination tree model.

Then through pruning algorithm and one-dimensional micromatrix evaluation model, it evaluates the promotion of enterprise micromatrix members for dissemination effect of its main Microblog information. Then it extends to evaluate the mutual promotion of micromatrix members through N-dimensional micromatrix evaluation model.

Finally, it uses Microblog Finder software written by JAVA language to visit API of Sina Microblog and then grabs enterprise Microblog and forwarding information. Through large-scale empirical data and with @ Xiaomi and @360 Safe Guard as the sample, it verifies the practical application of the model.

It can be seen from the verification results that the micromatrix members @ Xiaomi have obvious promotion for Microblog dissemination of primary account number, and also there is obvious mutual promotion between the micromatrix members; while for @ 360 Safe Guard, its micromatrix members have little connection, and also have slight promotion for the primary account number. There is a significant difference between the two enterprises in term of the role of micromatrix.

Besides, it is found in the study that the enterprise's secondary forwarding of the original Microblog is likely to promote the dissemination effect of original Microblog in deep and scale, but not to accelerate the dissemination. The result above shows that enterprises can change the inner structure in the form of micromatrix and cover more people, so as to enhance the effect of dissemination.

On the whole, the evaluation of model has achieved the desired result. However, only two companies @ Xiaomi and @ Qihoo 360 are selected in the verification sample, so more verification work is to be done. Furthermore, enterprise alliance is also a form of micromatrix in a broad sense, and its significance of co-marketing between enterprises needs further study.

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References

- [1]. http://blog.sina.com.cn/s/blog_566390f90101cpx.html.
- [2]. T. Xingtong, "The big trend of social media marketing: Strategies and methods", Beijing: Tsinghua University Press, (2011), pp. 217-220. (in Chinese).
- [3]. EB/OL].[2012-06-10.3.<http://news.xinhuanet.com/tech/2012-02,29/c-122769084.htm>.
- [4]. I. Shel, Twiterville, "How Businesses Can Thrive in the New Global Neighborhoods", Portfolio Hardcover, (2009).
- [5]. Joel Comm Twitter Power 2.0, "How to Dominate Your Market One Tweet at a Time", Wiley; Revised edition, (2011).
- [6]. Watts, D., Dodds, P. Influentials, "Networks, and Public Opinion Formation", Journal of Consumer Research, vol. 34, no. 4, (2007), pp. 441-457.
- [7]. E. Agichtein, C. Castillo and D. Donato, "Finding High-Quality Content in Social Media", WSDM'08, USA, (2008), pp. 183-193.
- [8]. C. Shah and J. Pomerantz, "Evaluating and Predicting Answer Quality in Community QA", SI- GIR'10, Geneva, Switzerland, (2010).
- [9]. J. Jeon, *et al.*, "A Framework to Predict the Quality of Answers with Non -Textual Features", SIGIR'06, Seattle, Washington, USA, (2006).
- [10].D. S. Calaway, M. E. Newman, H. S. Strogatz and D. J. Watts, "Network robustness and fragility: percolation on random graphs", Phys. Rev. Lett., vol. 85, no. 25, (2000), pp. 5468-5471.
- [11].L. C. Freeman, "A set of measures of centrality based upon betweenness", Sociometry, vol. 40, no. 1, (1977), pp. 3541.
- [12].Y. Li, Z. A. Bandar and D. McLean, " An approach for measuring semantic similarity between words using multiple information sources", IEEE Transactions on Knowledge and Data Engineering, vol. 15, no. 4, (2003).
- [13].Y. Chen, A. Hu, J. Hu and L. Chen, "A method for finding the most vital node in communication networks", Chinese High Technology Letters, vol. 1, (2004), pp. 573-575.
- [14].Y. J. Tan, J. Wu and H. Z. Deng, "Syst. Eng. Theory & Practice", vol. 26, no. 79, (2006) (in Chinese).
- [15].S. Brin and L. Page, "Anatomy of a Large - Scale Hypertextual Web Search Engine", Proc. 7th International World Wide Web Conference, (1998).
- [16].J. M. Kleinberg, "Authoritative Sources in a Hyperlinked Environment", Journal of the ACM, vol. 46 no. 5, (1999).
- [17].M. Kitsak, L. K. Gallos, S. Havlin, F. Liljeros, L. Muchnik, H. E. Stanley and H. A. Makse, "Identification of influential spreaders in complex networks", Nature Physics, vol. 6, no. 11, (2010), pp. 888-893.
- [18].J. Yang, S. Counts, "Predicting the Speed, Scale and Range of Information Diffusion in Twitter", Proc. of the 4th International AAAI Conference on Weblogs and Social Media, (2009), pp. 355-358.
- [19].W. Webberley, S. Allen and R. Whitaker, "Retweeting: A Study of Message-Forwarding in Twitter", Mobile and Online Social Networks Workshop, (2011), pp. 13-18.

Author



Wang Chenguang, (1988-) male. Born in Beijing, now studying at the School of Economics and Management, Beijing University of Posts commerce laboratories. Research direction: e-commerce, social networking, data mining, etc. E-mail : 694033972@qq.com.