ICIC Express Letters
Volume **10**, Number **7**, July **2016**

 ISSN 1881-803X
pp. 1711–1716

EMPIRICAL STUDY ON THE RELATIONSHIP BETWEEN KNOWLEDGE STOCK AND KNOWLEDGE DISSEMINATION EFFICIENCY IN NETWORK ORGANIZATION

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Received December 2015; accepted March 2016

Abstract. *Choose a network organization as study object, through the introduction about measures of reducing the node enterprises knowledge gap, using the empirical analysis method to verify the conclusion of negative correlations relationship between knowledge stock discrete degree and knowledge dissemination efficiency. The results showed: we reduced the knowledge stock gap among 3 nodes enterprises which focus on other nodes; organizational knowledge stocks discrete coefficient reduced, and knowledge dissemination efficiency improved. In 2013, knowledge stock discrete coefficient range of variation is small, but the knowledge dissemination efficiency has remarkable increase. According to these results, we can formulate the operational strategies of knowledge management in network organizations, then the benefits will be improved, and we can provide the reference mode for the similar enterprises.*
Keywords: Knowledge stock, Knowledge dissemination, Network organization

1. **Introduction.** In [1], as the basic organization form of society, economic environment which enterprises live in has clearly changed in the past half century. Macro-economic globalization and microscopic consumer-centered period have made the enterprises' organization form tend to network from hierarchy. From the 1990s, in [2], network organization gradually appeared. As the motivation of network organizations formation, regular rules about knowledge dissemination and dissemination efficiency are important points to clarify network organizations' nature. Readers can refer to [3-9]. Knowledge dissemination is a basic section of knowledge management, and it is an important work in the logical sequence of knowledge management. Academic discussions about knowledge dissemination are inclined to qualitative analysis, and concentrate on the traditional organization featured with vertical management.

Knowledge dissemination of network organization becomes a new research perspective. Knowledge dissemination taking traditional organization form as research object refers to activities communicating and shaping opinions, evaluations, experiences, skills through verbal and non-verbal means. Based on distinction of knowledge dialogues and common platform, in [10], knowledge dissemination proposed synchronous knowledge dissemination mode and asynchronous knowledge dissemination mode. As the boundary of network organization greatly changed, connotation and extension of knowledge dissemination also change. Dynamic and complexity of network organization make the traditional qualitative methods unable to undertake interaction analysis about dynamic characteristic of overall system behavior and local network node. Therefore, system simulation method based on complexity theory opened up a new train of thought in this field.

The logical steps are "construct concept model – define subject attribute – set interactive rules – system simulation experiment", according to numbers of experiments with

large samples. In [11], scholars draw the conclusion of "discrete coefficient of knowledge stock and knowledge dissemination efficiency are of negative correlation". This paper verified the conclusion with an empirical method. Empirical research can provide different perspectives to survey the nature of knowledge dissemination, because empirical research takes scientific research criteria.

2. **Data Sources and Empirical Analysis.** This paper takes a Chinese famous enterprise group as empirical object (The data involve enterprise core interests, and we use A to refer it), the main business of which is beverage packing R&D and manufacturing. A is composed of 7 regions companies or factories which are located in North, East, Central, Northeast, Northwest, Southwest and South of China. Each region has several subsidiaries or affiliated production lines. Considering about the difficulty in data acquisition, we selected 15 subsidiary enterprises as objects which are selected from the regions of northwest and southwest.

A adopted traditional management mode, and it is more and more difficult to satisfy their customers as the development of market economy and change of customer requirements. A tries to find better methods of management. The mode was supposed to help employees develop better work habits, minimize the cost, stabilize production, and improve efficiency, so that the enterprise can succeed in the fierce competition.

Based on analysis about above problems and necessity of introducing knowledge management, this paper takes analysis idea as follows: firstly, take 2010-2013 as a time series, adapt relevant index data as basis which were recorded by 15 nodes enterprises in 2010, and then calculate the discrete degree of knowledge stock and efficiency of knowledge dissemination; secondly, adapt the knowledge management methods which can reduce the discrete degree of knowledge stock; finally, calculate relevant index data from 2010 to 2013, compare these data and verify the conclusion of "discrete coefficient of knowledge stock and knowledge dissemination efficiency are of negative correlation".

3. **The Benchmark Index Data Calculation of A in 2010.** The benchmark index data of A group are divided into two parts: the first part is calculating knowledge stock of 15 nodes enterprises, which is based on weight of index and index data which come from survey; the second part is the average monthly production efficiency of two regions, that is northwest and southwest.

3.1. **Nodes enterprises knowledge stock and its discrete degree calculation.** According to [11] and the questionnaire survey data of 15 enterprises in A, we calculated the stock knowledge of the node enterprise.

$$KS_m = 0.1972 \times \sum_{i=1}^{3} w_i D_i + 0.5334 \times \sum_{j=4}^{8} w_j D_j + 0.2694 \times \sum_{k=9}^{11} w_k D_k \tag{1}$$

About the formula, KS_m is the knowledge stock of the first M node enterprise, it is 1-10 real number, but it has no unit. D refers to index survey value. Table 1 shows the knowledge stock of 15 nodes enterprises from A Group.

Based on the discrete coefficients calculation method, in 2010, calculation result about knowledge stock discrete coefficient from 15 nodes enterprises of A Group was **0.3218**, and it reflected that there were some differences. [11] provides a simulation result show that the dissemination efficiency of network organization falling slowly when knowledge stock discrete coefficient is 0.15. Therefore, the differences of A nodes enterprises knowledge stock were not ideal value in 2010.

Table 1. Nodes enterprises knowledge stock of A in 2010

number	1	2	3	4	5
K-S	3.3769	2.2157	4.1987	3.5690	5.0326
number	6	7	8	9	10
K-S	4.1564	3.9895	1.2569	2.5687	5.2659
number	11	12	13	14	15
K-S	6.3555	5.4569	5.5236	4.1590	4.7985

Table 2. Average monthly production efficiency of A in 2010

month	1	2	3	4
Average production efficiency	35.16%	34.32%	37.83%	39.46%
month	5	6	7	8
Average production efficiency	37.52%	39.69%	41.65%	41.79%
month	9	10	11	12
Average production efficiency	45.68%	42.12%	43.57%	45.19%

3.2. **The average failure rate of equipment in 2010.** The average monthly production efficiency data have been shown in Table 2.

Calculation result of average equipment production efficiency in 2010 was 40.33%, and the production efficiency shows a low degree.

4. **The Measures of Decreasing the Difference of Knowledge Stock.** The above data interpret the reality as the decreasing difference and inefficiency between node enterprises. After analyzing with the aid of knowledge management, we could know the key problem of the manufacturing process actually explains the experience dependence of these enterprises, which still has a huge gap from the so-called knowledge management. So the leaders of these enterprises start to use the knowledge management theory to their operation by forming one standard, in which the experience of manufacturing and managing knowledge could be shared and accumulated. Related measures include research and measure, confirming key node enterprises, and finding designed measures and supervised measures.

The above measures can be completed by arranging one certain staff to supervise in the first phase. After three months' trail period, the management of these three key node enterprises has been obviously improved. More and more people would realize the benefit and convenience by knowledge sharing platform. Behavior standard and behavior consciousness of these staff were improved largely. This trail work was transformed from external counseling to autonomous operations, and then the self-improvement was continued.

5. **Effect Comparisons.** For the change of knowledge stock in node enterprise, it can make comparison between the changed data from 2011 to 2013 and the baseline data in 2010. Tables 3-8 are cumulative statistics. And the calculation method will be the same as the context.

According to the discrete coefficients calculation method, we got the knowledge stock discrete coefficient of 15 nodes enterprises in A in 2011 was 0.24.

The average production efficiency in 2011 was 47.25%.

The knowledge stock discrete coefficient of 15 nodes enterprises in 2012 was 0.16.

Table 3. Knowledge stock of 15 nodes enterprises in A in 2011

number	1	2	3	4	5
K-S	4.4590	3.5689	5.4570	3.6590	6.0570
number	6	7	8	9	10
K-S	5.2690	4.8695	1.8570	3.9870	5.5990
number	11	12	13	14	15
K-S	6.3897	5.5690	5.6987	5.3570	5.8974

Table 4. Average monthly production efficiency of A in 2011

month	1	2	3	4
Average production efficiency	43.15%	44.86%	48.79%	47.92%
month	5	6	7	8
Average production efficiency	43.44%	48.69%	52.51%	48.77%
month	9	10	11	12
Average production efficiency	44.73%	47.52%	48.98%	47.63%

Table 5. Knowledge stock of 15 nodes enterprises in A in 2012

number	1	2	3	4	5
K-S	5.0655	3.8956	5.6237	4.4599	6.0570
number	6	7	8	9	10
K-S	5.5649	5.1257	3.4790	4.0570	5.6231
number	11	12	13	14	15
K-S	6.5125	5.7921	5.9652	5.6549	6.0159

Table 6. Average monthly production efficiency of A in 2012

month	1	2	3	4
Average production efficiency	49.30%	50.68%	55.09%	67.82%
month	5	6	7	8
Average production efficiency	80.06%	78.97%	69.70%	79.00%
month	9	10	11	12
Average production efficiency	80.96%	70.45%	88.99%	97.54%

The average production efficiency in 2012 was 72.38%.

The knowledge stock discrete coefficient of 15 nodes enterprises in 2013 was 0.14.

The average production efficiency in 2013 was 96.28%.

In order to clearly show the relationship between discrete degree of knowledge stock and average production efficiency (which means efficiency of knowledge dissemination), we draw Figure 1.

According to Figure 1, the discrete degree of knowledge stock in the 15 enterprises gradually reduced, and the production efficiency increased, which indirectly reflected that efficiency of knowledge dissemination increased. Meanwhile, the simulation results showed that when the discrete degree of knowledge stock is between 0.05 and 0.15, efficiency of

TABLE 7. Knowledge stock of 15 nodes enterprises in A in 2013

number	1	2	3	4	5
K-S	5.3180	4.2664	5.6489	4.6994	6.1120
number	6	7	8	9	10
K-S	5.6948	5.3104	3.9214	4.2921	5.7609
number	11	12	13	14	15
K-S	6.5437	6.1842	6.1402	5.9784	6.1328

TABLE 8. Average monthly production efficiency of A in 2013 (by the end of Oct. 2013)

month	1	2	3	4
Average production efficiency	92.91%	96.00%	92.49%	96.43%
month	5	6	7	8
Average production efficiency	95.38%	96.29%	98.11%	98.00%
month	9	10		
Average production efficiency	98.25%	98.91%		

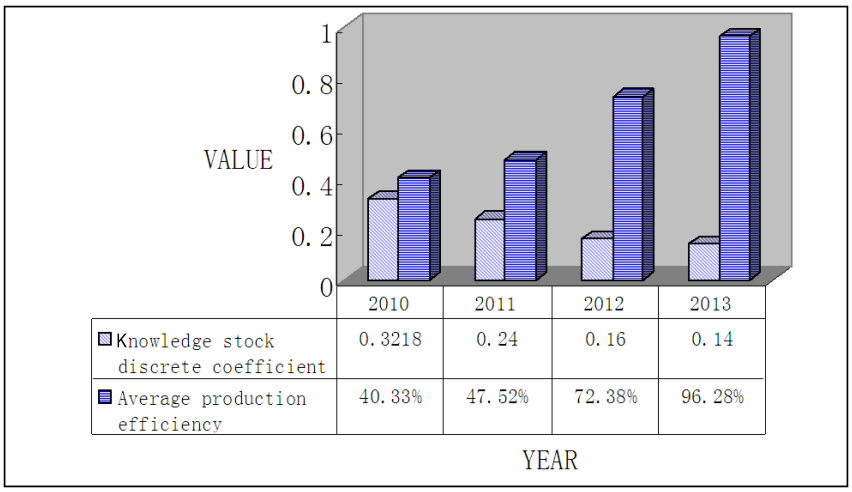

FIGURE 1. Effect comparison

knowledge dissemination changes at a high speed. The results also showed that efficiency of knowledge dissemination changes easily when the difference of knowledge stock is smart. When the discrete degree of knowledge stock exceeded 0.15, efficiency of knowledge dissemination tended to be stable. From empirical evidence data, dispersion coefficient of knowledge stock between 2010 and 2012 is bigger than 0.15, but this reflected the upward improving average production efficiency. This can be regarded as the evidence of the simulation result.

At the same time, compared with Guanghan, Kunming and Xi'an, after improving these key points, we got satisfied results and this reduces the gap with other node enterprises.

6. **Conclusion.** According to an empirical study on the characteristics of the organization, the theoretical conclusion could be described "construct concept model – define subject attribute – set interactive rules – system simulation experiment", which is acquired in simulation experiment and is attested. At the same time, we provided a management

model for same type enterprises, especially provided the measures for reducing the distinction of knowledge storage. However, we found most staffs of enterprises did not know the importance of knowledge management and connotation of knowledge management and accustom knowledge spreading, so we suggest managers of enterprises to consider for the perspective of long-term development of enterprises, make relative management measures and systems, strengthen the knowledge spreading wiliness of staffs and accustom them the operation, so that we can insure that enterprises improve the quality of development through knowledge management. Otherwise, the practice of knowledge management is improved constantly; the following research will take this as a turning point and provide more practical management patterns. We can predict the future research point as follows: firstly, the quantities of empirical sample should be enlarged; secondly, we might choose different scale enterprises not only large enterprises, which might take on different results; lastly, other characters of knowledge, like knowledge acquisition, and knowledge sharing, might adopt similar research method to promote the efficiency of knowledge management.

Acknowledgment. This work is partially supported by Social Science Planning Fund of Liaoning Province No. L12BRK002, Science Foundation of China No. 71372120 and Liaoning Province Natural Science Foundation of China No. 2013020006. The authors also gratefully acknowledge the helpful comments and suggestions of the reviewers, which have improved the presentation.

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