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Effective knowledge sharing mechanism in knowledge communities

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Abstract:

Knowledge sharing is an important issue of management of knowledge communities. In the recent years, a variety of knowledge communities have emerged, and effective knowledge sharing mechanism can be very helpful to improve the knowledge communities' performance. This paper analyses the features of modern knowledge communities and proposes knowledge sharing mechanism and management strategies. Knowledge sharing processes in knowledge communities are studied quantitatively, considering how different factors can affect knowledge sharing results and how to improve knowledge community performance. Some interesting results are inferred from the quantitative model of knowledge sharing and mathematical simulation: 1) Improving the acceptance ability of individuals can increase the productivity interest; 2) With a fixed learning ability, there exists an optimal team size for the working group so the number of working individual should be controlled to get a maximum productivity interest. Finally, this paper discusses the necessity, effectiveness and possible improvement of knowledge sharing in knowledge communities.

Keywords: Knowledge management, knowledge sharing, knowledge communities, modelling, performance

1 INTRODUCTION

In today's world consisted of a variety of knowledge communities, knowledge management is considered to be one of the most effective tools for organizations to survive and develop in this environment filled with all kinds of competitions [1][2]. Different from traditional enterprise management which mainly concerns about purchasing, production, sales, human resources, financial issues, etc., knowledge management mainly focus on knowledge lifecycle activities such as knowledge discovery, knowledge retrieval, knowledge sharing, knowledge creation, knowledge application, etc. Knowledge management is widely applied

to all kinds of real and virtual organizations, including government, enterprises, institutes, social networks, especially knowledge communities.

In a knowledge community, knowledge usually shows its value when shared. By knowledge sharing, different resources of members in the knowledge community can be integrated to realize global optimization. Effective knowledge management in knowledge communities can enhance organizations' capabilities to respond the drastic and dynamic changes of environment, ameliorate inner collaboration, so as to increase their efficiencies.

2 KNOWLEDGE SRTUCTURE IN KNOWLEDGE COMMUNITY

Compared to traditional communities, knowledge communities usually relax constraints on their members, including spatial and time. Such relaxed constraints can enhance communications and knowledge sharing among the members and increase community's vitality. In order to increase an organization's competition ability, creation ability and management efficiency, an effective knowledge sharing mechanism is usually required. Different knowledge structures lead to difference knowledge sharing mechanism, so we firstly analyse the main features of knowledge community and the corresponding knowledge structure.

Uncertainty is one of the most apparent features of today's world. Shortened product lifecycle, technical innovation acceleration, fast appearance of competitors, these uncertain situations are unavoidable to all organizations. In order to respond effectively, more and more knowledge communities appear or transform from existed traditional organizations. Knowledge communities can rapidly collect core competence and resources from different agents in order to confront an opportunity in common. As virtual organization is an open organization without inner hierarchy, it can easily meet environment requirements dynamically. McWilliam points out that the primary thing of a virtual organization is the sense of belonging of team members [3]. Mole *et al.* have proposed a community hexagon including precisely tailored content, identification with the brand, awareness of other like-minded users, ability to interact with others on website, opportunity to shape the development of website, mutual benefits of participation [4]. Furthermore, in order to enhance the sense of belonging, organizations should have a lifecycle that is long enough, because communications among team members, which enhance trust, need time.

One of the main advantages of knowledge communities is knowledge sharing enhancement. In knowledge communities, knowledge sharing process is usually regarded as knowledge transfer, knowledge processing and knowledge delivery among a network system. In fact, knowledge itself has very limited value, only when it is combined with other knowledge, people and resources can reveal its value. In this paper, we introduce two types of knowledge, individual knowledge and organizational knowledge. Individual knowledge is possessed by each team member and stored in personal mind, such as idea, experience, etc. Sometimes, knowledge of a group when is considered in whole is also regarded as individual knowledge, such as product design ability. Another type is organizational knowledge which exists in the organization. It is a kind of macro-intelligence. Figure 1 shows illustration of organizational knowledge.

Organizational knowledge is not simply the addition of individual knowledge, e.g. $OK \neq \sum IK_i$, it also includes the evolution results during the addition process. Based on this, individual knowledge in a specific knowledge community should not have much difference, in other words, knowledge distance should be controlled [5]. Hu and Pan suggested that overlap knowledge is the adjustor in knowledge communities to balance knowledge sharing and enhance knowledge creation [6].

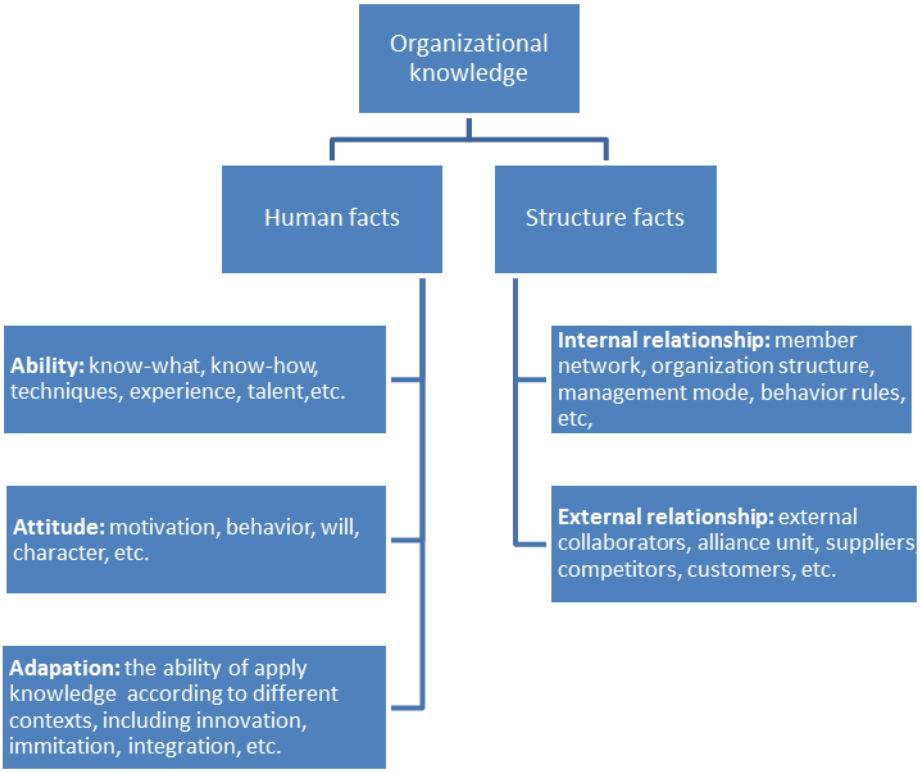

Figure.1. Organizational knowledge structure

3 KNOWLEDGE SHARING MECHANISM

In this section, we will analyse quantitatively in knowledge sharing process in knowledge communities, how different factors can affect knowledge sharing results and how to improve knowledge community performance.

3.1 Assumptions and parameters

We are introducing the following parameters for the model.

1. Team size. The team size refers to the number of members in a team and is noted by n.
2. Working time allocation. One unit of the member's working time is divided into three parts.
    a. Part 1: Choosing the received knowledge. This part mainly makes the judgments about the suitability of the knowledge received. The time spent for each unit of knowledge received is α.
    b. Part 2: Production. This part is used for production and to yield outputs, i.e. the knowledge is integrated into production, including processing the accepted knowledge tagged by the first part. The time allocated to this part is β.
    c. Part 3: Pre-treatment of the created knowledge to be sent. Modern production systems are structured with units linked by knowledge flows rather than discrete units, so it is supposed that there is always knowledge to be sent out after processing. The time allocated to this part is γ. This part also includes the action of sending the knowledge generated, but sending knowledge is regarded as an instantaneous action in this paper.
3. Each unit of output is accompanied with one unit of knowledge generated. In fact, the knowledge is the link between different working units and the basis of teamwork.

4. α and the expressing ability of knowledge are inversely proportional. Generally, if a piece of knowledge has a higher expressing ability, the time used to choose the received knowledge, namely α is less.
5. γ and the expressing ability of knowledge are directly proportional. Generally, if a working unit spends more time in the pre-treatment of the knowledge created, the knowledge will have a higher expressing ability. The allocation of γ is important to the cooperation effect, because in cooperation knowledge unit sent is expected to get feedbacks. As a result, each unit should use a part of its working time to improve the expressing ability of the knowledge generated in order to facilitate the partners.
6. As the team members are mutually dependent on one another, each individual has to choose and process all knowledge received from the other team members in order to coordinate a commonly approved team task. No manager is assigned this model.
7. One unit of production time yields one unit of output. Suppose that the coefficient of productivity value and the output unit is p, as this coefficient is beyond the topic of this paper, a constant value is assigned to p.
8. One unit of production time needs one unit of cost. Suppose that the coefficient of productivity cost and working individual for one unit of working time is k. Similarly, as this coefficient is beyond the topic of this paper, a constant value is assigned to k.

3.2 Modelling

The modelling process is based on the eight assumptions of the section above and is deployed as follows.

1. Inferred from assumption 2, we get:

$$0 < \alpha, \beta, \gamma < 1 \quad (1)$$

2. Inferred from assumption 4 and 5, α and γ are inversely proportional and we get:

$$\alpha + g = \frac{m}{\gamma + g} \quad (2)$$

where m represents the receiver's choosing ability.

3. As (α, γ) passes the two points $(0,1)$ and $(1,0)$, we get:

$$g^2 + g - m = 0 \quad (3)$$

As Formula (2) is the translation result in quadrant I, we get $g > 0$, so:

$$g = \frac{\sqrt{1+4m} - 1}{2} \quad (4)$$

4. Inferred from Formula (3) and (4), we get:

$$\gamma = \frac{m}{\alpha + \frac{\sqrt{1+4m} - 1}{2}} - \frac{\sqrt{1+4m} - 1}{2} \quad (5)$$

5. Inferred from assumption 1, 3 and 6, the knowledge quantity received by each individual of the team is:

$$(n-1)\beta \quad (6)$$

6. Inferred from assumption 2 and 6 and Formula (6), for each individual of the team, the time spent to choose the knowledge is:

$$\alpha\beta(n-1) \quad (7)$$

7. Inferred from assumption 2 and Formula (7), the time used for production for each individual is:

$$1 - \alpha\beta(n-1) - \gamma \quad (8)$$

8. Inferred from assumption 2 and Formula (8), we get:

$$\beta = 1 - \alpha\beta(n-1) - \gamma$$

$$\beta = \frac{1-\gamma}{\alpha(n-1)+1} \quad (9)$$

9. Consequentially, considering Formula (5), the total output unit of the team for one unit of working time is:

$$P(n) = \beta * n = \frac{1-\gamma}{\alpha(n-1)+1} * n$$

$$P(n) = \frac{\frac{\sqrt{1+4m}+1}{2} - \frac{m}{\alpha + \frac{\sqrt{1+4m}-1}{2}}}{\alpha(n-1)+1} * n \quad (10)$$

10. Inferred from assumption 1 and 8, the total cost of the team for one unit of working time is:

$$C(n) = k * n \quad (11)$$

11. Inferred from assumption 7 and formulae (10) and (11), the productivity interest is:

$$I(n) = P(n) * p - C(n) = \frac{\frac{\sqrt{1+4m}+1}{2} - \frac{m}{\alpha + \frac{\sqrt{1+4m}-1}{2}}}{\alpha(n-1)+1} * n * p - k * n = I(n, \alpha, m) \quad (12)$$

Formula (12) is the final result of the modelling process and the productivity interest is determined by three parameters - n, α and m. By studying the relationship among I, n, α and m, we can obtain some interesting conclusions, which can make knowledge sharing and teamwork cooperation more efficient in practice.

3.3 Results from mathematical simulation

From mathematical simulation we may infer some interesting results from it:

- In the same team size, $I(m,n)$ increases when m decreases. In other words, improving the acceptance ability of individuals can increase the productivity interest, especially when m is small, the effect of improving choosing ability is remarkable.
- With a fixed m, there exists an optimal team size for the working group so the number of working individual should be controlled to get a maximum productivity interest.

4 FURTHER DISCUSSIONS

According to the principles of knowledge management, knowledge communities should define their own pattern of organization, including essential regulations, specific standards and measures, evaluation methods, organization climate and behaviour, management model, decision-making and execution procedures, organization structure, communication system between members, etc.

The main target is to improve the innovation ability, efficiency and productivity of the organization, to develop the communication channels of sharing knowledge, to enhance the recognition and confidence between members, to strengthen the capability of overcoming difficulties and problem-solving, to provide a mechanism of encouraging knowledge sharing,

to maintain a high-standard knowledge base and to coordinate the resource integration and team cooperation.

The following suggestions can be referred in order to improve knowledge sharing performance in knowledge communities.

- Knowledge access. Internet and database are both effective tools for knowledge access. In the process of knowledge sharing, knowledge providers and potential customers should be linked. Since the providers may not reveal their knowledge explicitly and completely, especially the given contexts.
- Knowledge distribution. It is actually the preparation step for knowledge access, including both electronic and printed publications. In knowledge sharing management, we should not expect all members to seek for knowledge actively.
- Knowledge exposure. It is the visualization process for knowledge distribution. For example, when visiting academic laboratories, we may notice that many teams use posters to introduce their projects, which is more interesting, and attract more attentions from colleagues.
- Archival management of knowledge. Renzl points out that the archival process help the members to relieve the fear of losing their unique value and increase the confidence in knowledge sharing [7].
- Learning and education. They are important ways for knowledge sharing in communities. Using some traditional ways such as lectures, forums, speeches, etc. are quite useful. They are not fashion but with irreplaceable benefits and effects.

5 CONCLUSIONS

This paper mainly discusses knowledge sharing issues in knowledge communities. By analysing quantitatively knowledge sharing mechanism, some useful suggestions are proposed. Further research opportunities may include practical case study and more quantification on knowledge sharing effects.

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