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How To Motivate People To Share Knowledge Through KMS: The Mix Of Game Theoretical Approaches Coupled With Empirical Studies

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ABSTRACT

There are many problems in people using Knowledge Management System (KMS) to share knowledge. We can classify these problems into 3 types: 1) Free-riding situation, 2) Non-use situation, 3) Dormant situation. Organizations applied many strategies (e.g. rewards) to encourage people to share knowledge, but there has been no conclusive evidence of the role of them. This paper describes a research-in-progress that aims to 1) explain why and how the different knowledge sharing problems occur in KMS, 2) promote a better understanding of the effect of rewards. By applying game-theoretical models to analyze interactions between participants and doing case studies in KM projects of real organization, this research is expected to contribute with new insights into managing knowledge sharing activities successfully.

Keywords

Knowledge sharing, knowledge management system, game theory, social exchange theory, Kingdee case

INTRODUCTION

Knowledge sharing (KS) activities can enable organizations to leverage their most valuable asset (Wasko and Faraj, 2000). More and more organizations are using KMS to encourage people to share knowledge (Lawton, 2001). However, the availability of ICT is no guarantee that KS will actually take place (Alavi and Leidner, 1999). Why people are reluctant to share knowledge through KMS, and how to motivate them are still central problems in KS issues. This question has not yet been fully answered is partly because many prior studies investigated the factors affecting KMS usage from a single participant perspective (Kankanhalli, et al., 2005; Kollock, 1999; Markus, 2001; Wasko and Faraj, 2000). Few studies focused on the interaction of participants in KS through KMS. In practice, however, people make KS decision based on other's activities.

This current study focuses on the interaction of participants in KMS. The paper is organized as follows: Section 2 describes three types of knowledge sharing dilemmas. Section 3 summarizes studies about the role of rewards as motivation. Section 4 describes relevant theory we adopted. Section 5 designs research models of knowledge sharing and develops some propositions. In the end, we present the plan of case study in Kingdee International Software Group Company, Ltd. for providing the evidence to propositions of theoretical model.

THREE TYPES OF KNOWLEDGE SHARING DILEMMAS

We consider the asynchronous model of knowledge sharing. There are 2 behaviors in knowledge sharing of KMS, contributing knowledge and using knowledge (Goodman and Darr, 1998). Participants should make 2 decisions, 1) contributing knowledge or not, 2) using others' contribution or not. The process of knowledge sharing is described in figure 1:

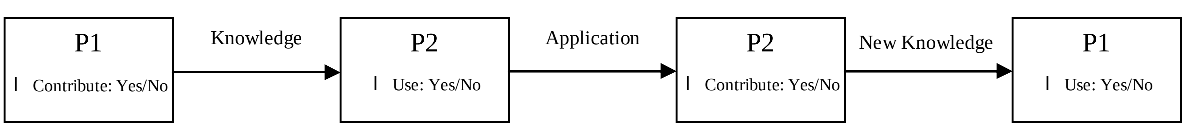

Figure 1. The knowledge sharing process

In this process, if participants choose "No" in some phases, several "knowledge sharing dilemmas" may occur (Cabrera and Cabrera, 2002). We designed a 2 by 2 matrix, where the two decisions are the axes (Contribute - yes or no and adopt - yes or no). Quadrant I is the perfect situation, where all participants contribute knowledge and use it. The other 3 quadrants can be described as 3 dominant types of knowledge sharing dilemmas.

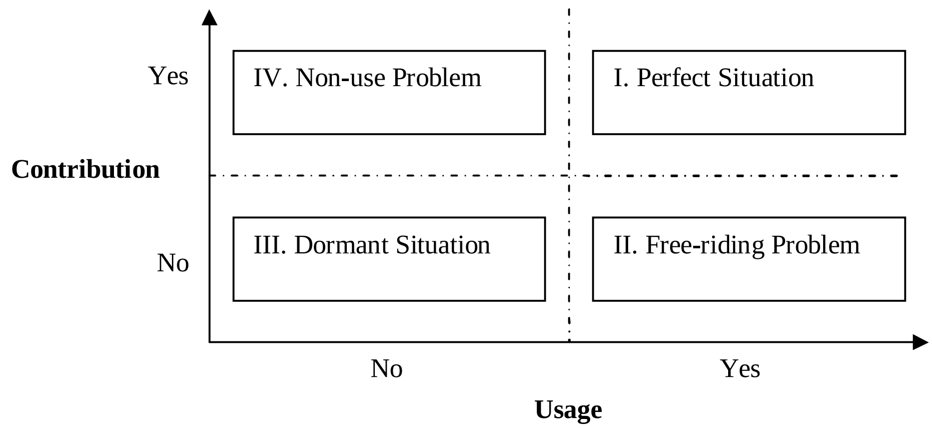

Figure 2. Knowledge sharing dilemmas in KMS

1. Free-riding problem (Quadrant II): Free-riding is one of the most serious problems in knowledge sharing (Kwok and Gao, 2004). Some participants use the knowledge in systems but are reluctant to share new knowledge. These problems even occur in some famous systems such as Gnutella. Free-riding can make service unattractive and diminish system performance (Adar and Huberman, 2000). It is not the perfect situation.

2. Dormant situation (Quadrant III): No visitors contribute their knowledge and no one will use it. There are some reasons for dormant situation: a) People cannot see a personal benefit from contribution; b) participants perceive insufficient support from top management of organizations; c) KMS requires too much time and effort to contribute knowledge (Cabrera and Cabrera, 2002). In this situation, people are reluctant to contribute and use knowledge, and thus systems are not being used.

3. Non-use problem (Quadrant IV): Although knowledge is contributed into the KMS, most participants will "reinvent the wheel" rather than reuse organizational knowledge. In this way, participants do not improve their performance by benefiting from the knowledge of others, while contributors have no motivation to upload their knowledge in the future (Garud and Kumaraswamy, 2005). Non-use problems may not stay in KMS for a long time. In our paper, however, these problems will be misleading reward Nash-equilibriums.

REWARD AS INCENTIVE

Many researchers have explored economic and social incentives to motivate participants to share knowledge in the context of KMS (Ba, et al., 2001). Reward is a direct incentive strategy. Many studies focus on the role of systems for motivating knowledge sharing behavior. However, there has been no conclusive evidence of the role of reward in the literature:

1. Some studies claim that reward systems are useful and important for most mechanisms of knowledge sharing (Bartol and Srivastava, 2002; Orlikowski, 1993), and that it is a good investment for organizations (Bartol and Srivastava, 2002). Kankanhalli and Tan (2005) found that rewards can motivate individuals to seek knowledge from EKR, especially in low tacit knowledge tasks.

2. Other studies, however, have found that using rewards is not as universally effective as expected. Moon and Park (2002) investigated the reward systems at Samsung. They found that reward systems could indeed motivate people to contribute knowledge, but there were also many problems such as the lack of quality assurance of knowledge.

3. There are even studies that claim that reward systems have a negative effect. Bock and Kim (2002) found the expected rewards discouraged the positive attitude toward knowledge sharing. Bock et al. (2005) also found that extrinsic rewards sometimes negatively influenced attitudes toward knowledge sharing.

These studies have focused on the effect of incentives on the single decision-maker's interaction with knowledge sharing systems. There is, however, no discussion about how one user's behavior impacts on another's, or how one user can "cheat" the system with misleading strategies. In the latter section of this paper, we describe our game-theoretical model and investigate the role of rewards in motivating people to contribute knowledge.

RELEVANT THEORY

Social Exchange Theory

SET posits that when people share knowledge, they will maximize their benefits and minimize their costs (Molm, 1997). Knowledge sharing in the context of KMS can be seen as the process of social exchange (Kankanhalli, et al., 2005). The costs of contributing knowledge include: 1) time cost, 2) loss of power (Goodman and Darr, 1998). The benefits include: 1) Reciprocal benefits, and 2) enjoyment in helping others (Kankanhalli, et al., 2005), 3) self-efficacy (Cabrera and Cabrera, 2002). The cost of using knowledge from EKR involves the time cost on seeking and matching knowledge (Goodman and Darr, 1998); the benefits relate to users gaining new knowledge from it. Some factors (e.g. Knowledge reciprocity) are affected by the interaction of people.

Game Theory

Game theory is the study of the interactions among rational players to produce outcomes with respect to the utilities of those players (Fudenberg and Tirole, 1991). Based on game theory, payoff function of each participant is determined by others' behavior. We construct payoff function by cost and benefit factors of knowledge sharing, so the payoff function is also determined by the interaction of people's behavior. For example, P1 contribute knowledge at the beginning; if P1 know P2 will use it, P1 will obtain the enjoyment of helping, P2 will gain the knowledge; if P2 do not use the knowledge, P2 will save the using cost, however, motivation of P1 may be reduced. Participants will choose the behavior by which they can maximize their utility. We can use the backward induction to analyze these complex balancing processes, and then have the condition of possible Nash equilibrium.

GAME THEORECTICAL MODELS

In this section, we simply introduce two knowledge sharing models based on game theory. Considering the limitation of length, we just describe the extensive form and major propositions, additional detail will be provided upon request.

Simple Model: Contribution Or No Contribution

We first consider a situation in which the quality of knowledge can be easily identified. Participants can only make the choice of contribution or no contribution. This situation is not very common in knowledge sharing; however, knowledge sharing in low tacit tasks (e.g. data sharing and secondary materials sharing) can be explained as examples. Simple model is a 4 phase game-theoretical framework. The extensive-form is:

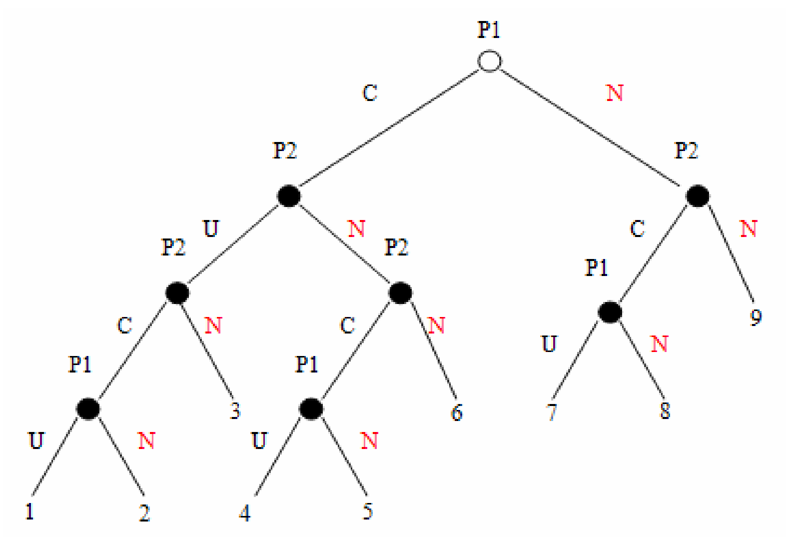

Figure 3. The extensive-form of simple model

Proposition 1: (Possible Nash-equilibriums)

There are 4 possible Nash-equilibriums at the end of the game: Perfect situation (S1), Free-riding problem (S3), Non-use problem (S6) and Dormant situation (S9). *(Proof can be provided upon request)*

We use reward as the motivator of people's contribution. We assume that reward is associated with one's added knowledge contribution, and $r = r(k) \geq 0$.

Proposition 2: (Adding Reward)

If the reward is sufficiently high, it can effectively motivate people to share knowledge in the EKR. There are 2 possible equilibriums, S1 and S5. *(Proof can be provided upon request)*

Corollary 2.1: If the timing cost of using knowledge from EKR is low enough, the Perfect situation (S1) is the unique Nash equilibrium. *(Proof can be provided upon request)*

Complex Model: Contribution Of High Or Low Quality Knowledge

Let us consider more complex and "real" situation where the quality of knowledge cannot be easily identified. Participants can choose to contribute high or low quality knowledge, or not to contribute. The total energy and time of each participant are limited; every contributor should balance the quantity and quality of knowledge. The complex model is also 4-phase game. P1 can make one choice from "CH, CL or N (No contribution)" and choose the quantity of contribution. In the second phase, P2 chooses whether to use or not to use knowledge from the system. In the third phase, he chooses the strategy from "CH, CL or N" and the quantity of contribution. P1 ends the game with choosing whether to use or not to use this new knowledge. The extensive form is:

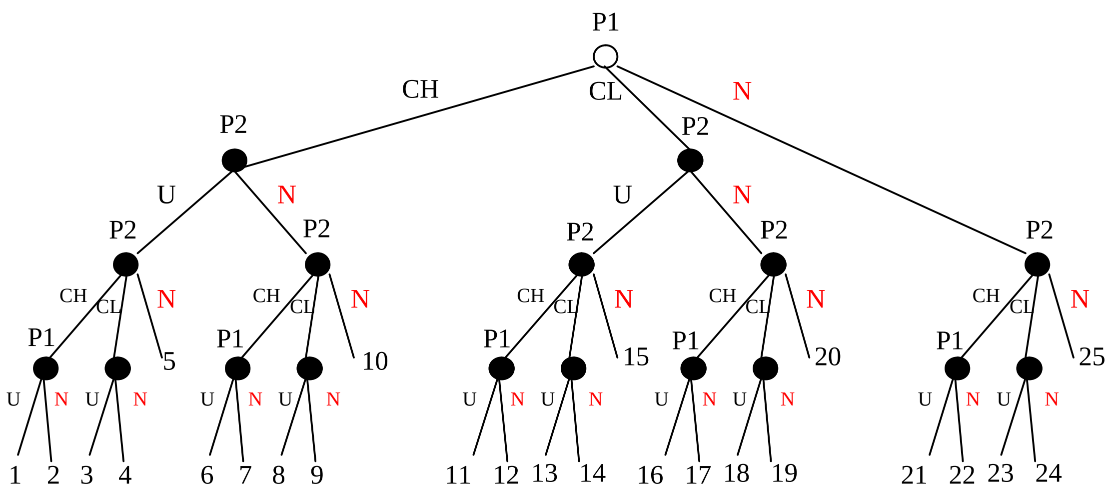

Figure 4. The extensive-form game in complex model

Proposition 3: (Possible Nash-equilibriums)

There are more complex situations and more possible Nash-equilibriums than the simple model. They involve the Perfect situation (S1), the Free-riding problem (S5, S15, S21, S23), the Non-use problem (S10, S20), and the Dormant situation (S25). *(Proof can be provided upon request)*

If an organization can not distinguish between different qualities of knowledge contributions, it can only give reward assuming that high quality knowledge has been contributed. When the participants contribute one report of their knowledge, the reward is $r = r(k_h)$, the total reward of participant a is $R_a = Nr(k_h)$. N is the number of reports.

Proposition 4: (Add Reward)

When the reward is sufficiently high, it misleads participants to an ineffective situation-S19, which is unique Nash-equilibrium and the participants contribute a considerable quantity of low quality knowledge but do not use knowledge from EKR. *(Proof can be provided upon request)*

Proposition 4 can be explained as the "misleading reward", reward is so attractive that participants find they can gain more without needing to work hard. Thus, they will "reinvent low quality wheels." This is an interesting result where active contributors may cheat the system with low quality knowledge. If there had been no misleading reward, they might have contributed their new idea. In this situation, the reward will motivate people to maximize their private utility, but the outcome is ineffective. Some studies can provide the evidence of this proposition. Garud and Kumaraswamy (2005) investigated the KM projects of Infosys (one of biggest software companies in India), and described the vicious circle of reward.

STRATEGIES TO SUPPORT THE EFFECTIVENESS OF KNOWLEDGE SHARING

In knowledge sharing, not only the quantity but also quality of knowledge is important. We can apply some strategies to protect the quality of knowledge in contribution:

1. We consider adding a review process. If we can identify the quality of knowledge, we will give different levels of reward to contributors based on quality, $r_h = r(k_h)$, $r_l = r(k_l)$. It is easily proved by game theory that contributing low quality knowledge is not the Nash-equilibrium. In practice, there are two major review strategies: 1) employing "knowledge steward" to manage KMS, 2) "voting", knowledge users can vote on the knowledge which is useful to them. Based on theory, these strategies can solve the problems of quality. However, there are some potential problems in applying them (e.g. users may not be motivated to vote).
2. Creating a knowledge sharing culture. Many studies investigate the culture influence on knowledge sharing, and the importance of creating knowledge sharing culture in facilitating high quality sharing(Goodman and Darr, 1998; Muller, et al., 2005) .

INVESTIGATATION IN REAL ORGANIZATION: CASE STUDY IN KINGDEE

Background of Kingdee Software Company

Kingdee International Software Group Company, Ltd. (www.kingdee.com) was founded in 1993, headquartered in Shenzhen, P.R.China. It is a leading ERP software supplier and application solution provider in the Asia-Pacific region and the undisputed leader in the Chinese software market. It is also one of the fastest-growing independent software vendors in the global market, and listed on the Main Board of the Stock Exchange of Hong Kong Limited (HKSE) in 2005. Kingdee set up 3 R&D centers in Shenzhen and Shanghai, and has 39 branches that are primarily responsible for selling and servicing customers. At present, Kingdee has 3200 employees and over 400,000 customers in whole Asian-Pacific region, including Mainland China, Hong Kong, Taiwan, Singapore, etc.

Kingdee has its unique organizational culture. Its management mode is "Passionate Management". The company inputs a passion for the knowledge workers and provides them with sufficient capacity and platform. Kingdee have applied KM projects to help knowledge workers for several years and have set up series of KMS. KM projects include department of KM (Kcentral), OA and a big KM portal-Mykingdee (www.mykingdee.com). Only employees of Kingdee can access "Mykingdee" to share knowledge and search useful documents. "Kcentral" manages KM initiatives and also has an incentive plan for facilitating knowledge sharing through "Mykingdee".

Research Approaches

Case study is most suitable for research issues at early stage of formulation (Sherif and Vinze, 2003). We propose to do some semi-structure interviews in Kingdee. Through the case study of KM projects in Kingdee, we can: 1) providing the real evidence of propositions, analyzing the implication and limitation of research model; 2) considering more complex factors, such as culture and IT, to find the effective ways to facilitate knowledge sharing.

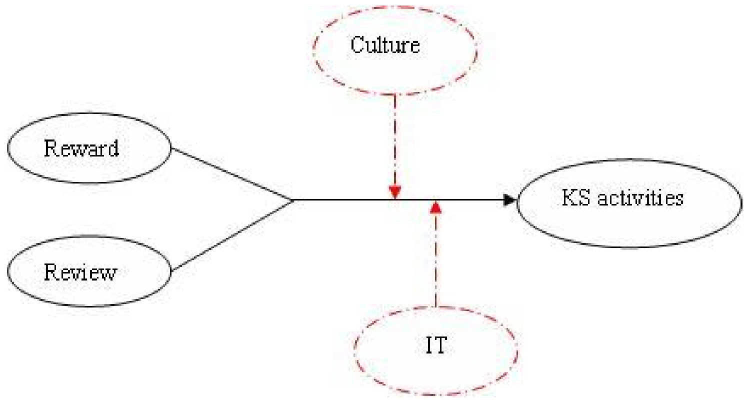

Figure 5. Proposed research framework

EXPECTED CONTRIBUTION

The mix of game theoretic approaches coupled with empirical studies may promise a higher level of understanding of KS issues with implications for both research and practice. This study is expected to find some strategies which can motivate people to sharing knowledge effectively.

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