Knowledge Sharing and the Dynamic Evolution of Organizational Culture: Impact of Incentives and Information Technology

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Abstract

We present a dynamic model of knowledge management in which knowledge sharing influences organizational culture. Employees’ fit with the organizational culture improves with the sharing and learning of common organizational practices. We analyze the impact of providing incentives for knowledge sharing as well as the investment of information technology in shaping knowledge sharing. Using analytical models, we study the evolution of organizational culture in a multi-period setting under appropriately designed incentives and optimal IT investment.

Key words: incentives; information technology; knowledge management; knowledge sharing; organizational culture.
Introduction

In the information era, knowledge management (KM) has been enhanced by the latest developments of information technology. For instance, the recent explosion in social software technologies has created a new paradigm that allows knowledge workers to collaborate and share knowledge with relative ease. The continuous downward trend in the price of data storage and other information technologies enables organizations to capture and store valuable information and knowledge with lower costs. XML-based data structures and services facilitate the codification and extraction of knowledge and streamline the flow of information and knowledge within organizations.

Nevertheless, technology is only one of the many factors impacting knowledge management. Other factors affecting knowledge sharing and learning include learning capacity (Simonin 1999), perceivable organizational support (Wayne, Shore, and Liden 1997), innovative work behavior (Janssen 2000), social status (Thomas-Hunt, Ogden, and Neale 2003), value of knowledge (Cummings 2004), and participation inequality and conversational interactivity (Kuk 2006). Prior studies (Davenport and Prusak 1998, Jarvenpaa and Staples 2000) have noted that most knowledge workers are reluctant to share their knowledge in organizations that lack the appropriate culture. Put differently, Knowledge sharing and learning will not happen automatically if a firm does not have a culture favoring these activities.

Organizational culture can be regarded as “a system of shared values and norms that define appropriate attitudes and behaviors for its members”, which should be managed effectively for firms to remain innovative and gain competitive advantage (Tushman and O’Reilly 2002). In particular, the organizational culture may encourage or deter sharing knowledge and learning. For instance, symptoms such as knowledge hoarding, apprehension about failures, and the “Not-invented-here” syndrome are hostile to knowledge sharing (Michailova and Husted 2001). As incentives related to knowledge-management efforts are essential in creating a knowledge-sharing culture (Szulanski 1996), organizations need to offer incentives to motivate workers to share knowledge so as to promote the organizational culture for knowledge sharing.

Although prior research has identified the critical role of organizational culture, incentives, and information technology in knowledge management, few studies have investigated their combined effect on knowledge sharing and learning. Our study addresses this gap by exploring the inter-dependencies of organizational culture, incentives, and information technology for knowledge management in organizations.

Specifically, we study the following questions in this research. First, how can incentives be designed to motivate knowledge sharing so that organizational culture can be improved and organizational benefits maximized? Second, what is the appropriate level of information technology that facilitates optimal knowledge sharing and learning? Third, what is the inter-relationship among organizational culture, incentives, and information technology in enabling knowledge sharing and learning and achieving best organizational benefit? Fourth, under appropriately designed incentives and optimal IT investment, how does organizational culture evolve in a multi-period setting?
The rest of the paper proceeds as follows. Next section reviews related literature. The third section presents our model of knowledge management and organization culture and outlines our analysis. The last section concludes the paper.

Related Literature

In this section, we first review prior literature by focusing on three streams of research in knowledge management: (1) knowledge management and organizational culture, (2) incentives for knowledge sharing, and (2) the role of information technology in knowledge management, and then highlight the contribution of our research.

Many studies have examined the implications and effects of organizational culture on knowledge management. For instance, Park, Ribiere, and Schulte-Jr (2004) identify the critical organizational attributes facilitate knowledge sharing and help implement knowledge management technologies. Lemken, Kahler, and Rittenbruch (2000) argue that developing an organizational culture that promotes knowledge sharing enables organizations to adapt to changing environments. Donate and Guadamillas (2010) find that organizational culture has different moderating effects when firms adopt different knowledge management initiatives on storing and transferring organizational knowledge. Leidner, Alavi, and Kayworth (2006) investigate the influence of organizational culture on two KM approaches (organizing communities and knowledge management processes) and show that knowledge initiatives can result in either an information repository or electronic communities. While prior studies have focused on the impact of organizational culture on knowledge management, we want to also examine how knowledge sharing in turn influences organizational culture.

Incentive is an important element in facilitating knowledge sharing and learning via knowledge management systems (Argote, McEvily, and Reagans 2003, Ba, Stallaert, and Whinston 2001). Researchers have studied the incentives for knowledge sharing in organizations. For instance, Lee and Ahn (2007) analyze how to design a reward system for knowledge sharing and compare an individual-based reward system with that of a group-based system. Sundaresan and Zhang (2010) explore the joint role of incentives and information systems in knowledge sharing and learning in organizations, and extend their model to a setting of knowledge in two independent dimensions with individual rewards. However, none of these papers considers the effect of organizational culture on knowledge sharing and learning.

Information technology plays a crucial role in growing and managing organizational knowledge (Borghoff and Pareschi 1997). For instance, information technology provides extremely important support to the community of practice (Baird and Henderson 2001) and can help develop effective knowledge markets within organizations (Davenport and Prusak 1998). In addition, information technology creates a friendly environment for knowledge management and help achieve knowledge management goals. For example, Stenmark (2002) finds that IT can support the interaction between information and knowledge, leading to a useful and people-centric KM environment (Stenmark 2002). Markus, Majchrzak, and Gasser (2002) argue that IT can be appropriately utilized to support emerging knowledge processes (EKPs). Neverthe-
Figure 1: Model

less, prior research in this stream does not consider the joint impact of other factors such as incentives and organizational culture.

In summary, none of the prior research has explicitly studied the design of incentives and the role of information technology against the backdrop of organizational culture. We investigate these important issues in our research by extending the concept of organizational culture fit (Carrillo and Gromb 1999). In particular, we model incentives and information technology to facilitate knowledge sharing and learning, thus improving a firm’s cultural fit. Hence, the firm seeks the best design of incentives and support of information technology to leverage knowledge assets within organizations to increase organizational cultural fit, maximizing organizational benefit.

Outline of Model and Analysis

In this section, we present a preliminary model of knowledge management and organizational culture. We discuss the mutual relationships among the three components (incentives, information technology, organizational culture) in our model, the business setting, and the organizational decision problem.

We consider a model in which a firm seeks the best design of incentives and the level of information technology of its knowledge management system (KMS) to facilitate knowledge sharing and learning within organizations to promote organizational cultural fit, maximizing organizational profit. The major component of the KMS is a centralized knowledge base that stores organizational information and knowledge. Figure 1 captures the mutual interactions among incentives, information technology, and organizational culture fit.

We next describe the business setting of the model, in which a firm operates for \( n \) number of
periods. In each period, the firm employs knowledge workers from a labor market, where only \( \kappa_0 \) proportion of the recruited workers are congruent (“fit”) with the firm’s current organization culture. During each period, workers generate an output \( X_H \) when they fit the culture and \( X_L = X_H - D \) otherwise. All the workers (both fit and misfit) will get a fixed wage payment \( w \) in each period. We assume that the output produced by each worker is always greater than the wage payment (i.e., \( X_L > w \)). We model the dynamic changes in the worker pool by considering that each worker may voluntarily leave the firm with the probability \( 1 - q \). In addition, the firm evaluates workers at the end of each period; with the probability \( \phi \), those who are misfit will be replaced with new hires from the labor market.

The firm announces a knowledge-sharing incentive \( s(k_s) \) to motivate knowledge sharing from culturally fit workers (Line 1 in Figure 1). The incentive rewards knowledge sharing based on the amount of knowledge \( k_s \) shared by a worker and is applicable throughout all periods. The knowledge shared by a worker will be captured and stored in the centralized knowledge base. Hence, the volume of the knowledge base at the time period \( t \) is

\[
V_t = V_{t-1} + k_s \cdot p(\kappa_{t-1}, T)
\]

where \( p \) is the probability of a worker being willing to share knowledge parameterized by \( \kappa_{t-1} \) and \( T \). We denote \( \kappa_{t-1} \) as the organizational culture fit at the beginning of the time period \( t \) and \( T \) the level of information technology supporting knowledge sharing and learning. \( p \) is a concavely increasing function in both \( \kappa_{t-1} \) and \( T \), which implies that when the firm’s culture fit is higher, more workers will be willing to share knowledge and contribute to the knowledge base (Line 5 in Figure 1), and when the firm’s IT infrastructure for knowledge sharing is more advanced, workers will find it easier to share knowledge (Line 2 in Figure 1).

The central knowledge base stores the valuable knowledge that can potentially improve the culturally fit of workers. We use \( \rho_t(v_{t-1}, T) \) to represent the proportion of culturally misfit workers who learn and align themselves to the firm’s current culture, in which \( \rho_t(v_{t-1}, T) \) concavely increases in both \( v_{t-1} \) and \( T \), implying that (1) when the volume of the knowledge base increases, it will contain more useful knowledge that facilitates workers’ learning; therefore, more workers may become culturally fit (Line 4 in Figure 1), and (2) when the IT level \( T \) is higher, workers will find it easier to search the knowledge base and obtain their desired knowledge (Line 3 in Figure 1).

During the process of knowledge sharing and learning, the total payoff that a culturally fit knowledge worker can obtain from knowledge sharing in each period will be

\[
\pi_i = s(k_s) - c(k_s, T).
\]

We assume that only culturally fit workers have the useful knowledge to share that improves organizational culture. Knowledge shared by culturally misfit workers will not be rewarded as it does not help improve the organizational culture fit.

Consequently, the firm’s decision problem \([P]\) is to determine the best design of incentive
Table 1: Summary of Notation

| β   | discount rate                      |
| c(T) | cost of IT infrastructure at level T |
| D    | difference of revenues between culturally fit and misfit workers |
| κ₀   | probability of a worker being fit with the firm’s culture on the labor market |
| κₜ   | organizational cultural fit in time period t |
| p    | probability of a worker sharing knowledge |
| φ    | probability of a worker being identified as misfit in each period |
| q    | probability of a worker staying in the firm in each period |
| ρₜ   | probability of a culturally misfit workers being transformed into fit in time period t |
| t    | index for time periods |
| Vₜ   | volume of knowledge base in time period t |
| w    | fixed wage payment for workers in each period |
| Xₐ   | output from culturally misfit workers |
| Xₜ   | output from culturally fit workers |

$s(\cdot)$ and the IT level $T$ to maximize its total payoff at the end of time period $n$, which is

$$
\max_{s(\cdot), T} \pi_n = \sum_{t=1}^{n} \beta^{t-1} \left\{ (X_L - w) + \kappa_t \cdot D - s(k_s) - c(T) \right\},
$$

subject to

$$
k_s^* \in \arg\max_{k_s} \pi_i, \quad \pi_i \geq 0,
$$

where $\beta$ is the discount rate and $c(T)$ is the firm’s cost of maintaining an IT level $T$ in (3). We assume that $c(T)$ convexly increase in the level $T$, which indicates that the firm needs more investment in maintaining a more sophisticated IT infrastructure. In addition, constraint (4) denotes workers’ incentive-compatibility constraints that ensure workers will choose the sharing amount to maximize their totaly payoff. Constraint (5) represents workers’ individual rationality constraints that guarantee a non-negative total payoff for workers.

Conclusion

There is a plethora of research investigating the important role of IT, incentives, and organization culture in KM. However, prior studies have not considered the joint interactions among these three elements in facilitating knowledge sharing and learning in organizations. We address these issues in our model and investigate their inter-relationship as well as the dynamic evolution of organizational culture. Specifically, we solve the organizational decision problem and then examine the critical factors affecting the firm’s optimal decision—the design of in-
centive for knowledge sharing and the level of IT infrastructure. Importantly, we explore the mutual relationship among IT, incentives and organizational culture for supporting knowledge sharing and learning. We investigate the effects of organizational culture on the firm’s decision on incentive and the IT level. In addition, we study how the incentive and IT level indirectly impact the organizational culture fit through facilitating knowledge sharing and learning. We map the evolution of organizational culture in a multi-period setting under appropriately designed incentives and optimal IT investment. In summary, our research presents a formal model of knowledge management by capturing the interactions between IT, incentives, and organizational culture, and develops valuable insights for practitioners to effectively manage knowledge assets.

References


