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A Note on Systems Intelligence in Knowledge Management

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Abstract

Purpose:

This paper aims to show that systems intelligence (SI) can be a useful perspective in knowledge management, particularly in the context of the SECI (socialization, externalization, combination, and internalization) model. SI is a recently developed systemic concept, a certain kind of human intelligence based on a systems thinking perspective.

Design/methodology/approach:

This paper first provides an overview of the related literature, and then conceptually discusses the role of SI in organizational knowledge creations.

Findings:

SI can work as a powerful momentum in each stage as well as the whole process of SECI.

Originality/value:

This paper is the first application of SI to the field of knowledge management. It provides us with a new perspective to touch human factors in knowledge management processes, which are considered to be essential in the SECI model.

Keywords: systems intelligence, systems thinking, knowledge management, SECI model
Article Classification: Conceptual paper

Introduction

Since the 1990s, management thinkers have argued that knowledge is the most important resource for an organization's sustainable success (e.g., Toffler, 1990; Drucker, 1993), and the importance of knowledge management (KM) has been widely recognized. The SECI

(socialization, externalization, combination, and internalization) model proposed by Nonaka and Takeuchi (1995) is one of the best-known models of organizational knowledge creation.

Several firms have acknowledged its importance and have tried to incorporate the idea in their management processes. However, it has been reported that a number of firms failed to manage the process properly, and the cause of the failure in most cases derived from seeing knowledge and information as synonymous (Nonaka and Konno, 1999; Malhotra, 2004). A typical example is that "knowledge management" only introduces IT systems (e.g., groupware and knowledge databases) that accumulate and share best practices, document information, and other things. This "engineering paradigm" deals only with existing knowledge (Malhotra, 2004). According to Nonaka and his colleagues, knowledge is primarily created by individuals in social interactions by combining tacit and explicit knowledge (Nonaka *et al*., 2008). Since KM is about interconnections between people, when it focuses only on technological aspects, it very often fails because it neglects attributes in human resources (Ruggles, 1998). Moreover, the effectiveness of such IT systems also may depend highly on human aspects. They are often not used as effectively as the managers expected because of the lack of user motivation (Hendricks, 1999; Tsai *et al*., 2010). Prior to their introductions, it is important to design how to involve knowledge workers in the systems and to motivate them (Nonaka and Konno, 1999).

Some researchers have shown that human-oriented factors, such as members' commitment (van den Hooff and de Ridder, 2004), cooperation and trust (Casimir *et al*., 2012) and attitudes (Yang, 2008) can positively influence the KM process. It has also been pointed out that the applicability of the SECI model depends on the cultural context of the organization (Glisby and Holden, 2003; Andreeva and Ikhilchik, 2011). Thus, although the importance of human factors in organizational knowledge creation has been emphasized both conceptually and empirically in the literature of KM, practical discussion is lacking about how we can touch the minds of organizational members and can change their micro-behaviors so that the SECI process works more effectively.

This paper conceptually discusses the possibility that discourse about systems intelligence (SI) (Saarinen and Hämäläinen, 2004) can provide a useful perspective to fill this gap. SI is a certain kind of intelligence combined with a systems thinking perspective, and it aims to influence the minds and micro-behaviors of individuals. This paper illustrates how SI can promote each stage and the entire process of SECI. Although most discussions are hypothetical and lack evidence, this paper aims to provide a new perspective about KM from the viewpoint of systems thinking and SI.

The discipline of KM and the notion of learning organization are inextricably linked and can always be analyzed and discussed together (Loermans, 2002). In the literature of learning organization, little attention has been paid to how the members perceive the organization as a system despite Senge's (1990/2006) emphasis on the systemic abilities of individuals (Törmänen *et al*., 2016). Typically, it takes a top-down managerial perspective (Dymock and McCarthy, 2006) and views individuals as objects rather than as active agents who create the organization (Chiva and Habib, 2015). However, as Törmänen *et al*. (2016) argued, it is clear that subjective features of individuals can play an essential role in a learning organization. On the basis of this observation, they discuss SI's benefit in the context of learning organization. This paper elaborates on this idea more in terms of KM, particularly from the viewpoint of the SECI model.

The theoretical contribution of this paper is to combine the two initiatives: the SECI model that has been widely acknowledged in KM literature and the concept of SI, which has been recently developed in the field of systems science and systems thinking. SI has been studied in a wide range of applications, such as organizations and leadership (Hämäläinen and Saarinen, 2008; Luoma *et al*., 2008; Saarinen, 2008), emergency management (Seppänen *et al*., 2013), and psychotherapy (Martela and Saarinen, 2013), but this paper is the first to discuss it in the context of KM.

In the rest of this paper, we first provide an overview of the concept of SI and the SECI model, followed by a discussion on how SI can work in the SECI process. Finally, we add our conclusions.

Overview of the Two Initiatives: Systems Intelligence and the SECI Model

Systems Intelligence

SI was originally defined as "intelligent behavior in the context of complex systems involving interaction and feedback," and an intelligent agent in this sense "perceives herself as part of a whole, the influence of the whole upon herself as well as her own influence upon the whole" (Saarinen and Hämäläinen, 2004, p.9). It is a certain kind of human intelligence (e.g., Goleman, 1995, 2006) combined with a systems thinking perspective (e.g., Jackson, 2003).

Hämäläinen and Saarinen (2007) have argued that, in the context of organizational learning, systems thinking has been proven to be a powerful tool for understanding a specific

complex problem; however, its link to sustainable learning and the success of an organization is missing. (Recently, Scott *et al*. (2013) discussed this link.) Indeed Senge's updated edition of *The Fifth Discipline* (1990/2006) acknowledges that building a learning organization has turned out to be significantly more difficult than what he first envisioned in 1990. Saarinen and Hämäläinen (2004) proposed to move from "thinking" with tools of systems thinking to "actions" backed by a certain kind of intelligence – intelligence with a systems perspective, i.e. the fact that people inside the system are interconnected, they act according to a mental model about the system, and the system can have feedback loops.

Unlike systems thinking, SI does not require one to identify what the system is. The key question of SI studies is what an intelligent choice means when one cannot step outside the system and sort out the options and their systemic impacts. It presupposes that the system may have "systemic leverage," where even a micro-behavioral change can generate a huge system-wide improvement. SI aims to alter one's mode of thinking and obtain such a micro-behavioral change.

The starting point to be "systems intelligent" is to accept a view that one acts based on a mental model of the system, i.e., what he or she believes the system to be. The mental model, by definition, may not capture the system fully and accurately. The "true" system may have hidden feedback loops. Even when it is difficult or impossible to identify them exactly, he or she can expect that his or her behavioral change can influence the system's output through feedback. This perceptual change encourages him or her to take some new action, which is not business as usual. Then, if another person observes the behavioral change, it may lead to change in the person's mental model and hence his or her behavior as well. When a chain of such changes happens, they may be able to achieve an improvement of the system – an improvement triggered by the micro-behavioral change of the person with SI. Saarinen and Hämäläinen (2004) describe the process as four dimensions: mental change, perceptual change, individual behavioral change, and change in the system. The mechanism has also been characterized in terms of decision theory (Sasaki *et al*., 2015).

Another important characteristic of SI is that it is considered to be something that human beings possess inherently. Therefore, what is needed to be systems intelligent is awareness rather than learning some new tool or methodology. In fact, Hämäläinen and Saarinen (2007), in their lectures and seminars, say that many non-academic people can easily understand the essence of SI and feel encouraged to act intelligently. In this sense, SI is a practical perspective.

The SECI Model: The Process of Organizational Knowledge Creation

The SECI model is a widely-acknowledged organizational knowledge creation process proposed by Nonaka and Takeuchi (1995). Moreover, the universality of the model has been discussed in Örtenblad (2014).

SECI deals with interactions and conversions of tacit knowledge and explicit knowledge, and consists of four stages: socialization, externalization, combination, and internalization. First, *socialization* is a transfer of tacit knowledge, that is, an acquisition of tacit knowledge by a person who does not have it from another person who does. This usually happens during face-to-face interactions among individuals. Second, *externalization* is the conversion of tacit knowledge into explicit knowledge. Typically this is done by documentation or verbalization. The converted knowledge can be shared with members of a group. Third, *combination* is the generation of new explicit knowledge, attained by connecting existing explicit knowledge. This happens through sharing, transfer or integration of explicit knowledge among groups. Lastly, *internalization* means embodying explicit knowledge into tacit knowledge. This is close to "learning by doing." It is a process of obtaining new tacit knowledge based on the combined explicit knowledge shared in a group or an organization.

The SECI process is spiral rather than circle: that is, it is expected to be a never-ending dynamic process. Internalized tacit knowledge can be then socialized, and the knowledge interaction process continues. After several rounds of the spiral, an individual as well as the organization can obtain significant new knowledge. Thus, SECI is also referred to as a self-transcendental process (Nonaka and Konno, 1998).

As mentioned above, IT systems such as groupware and a knowledge database are often introduced in KM. This is typically utilized in the combination phase, since such systems basically deal with explicit knowledge such as documents, graphics, and numerical data, and also can, to some extent, support the externalization process. Firms that fail to implement KM in a proper way often neglect the other stages of the SECI model (Nonaka and Konno, 1999).

Systems Intelligence in Knowledge Management Implementation

Organization as a Knowledge Creation System via the SECI Model

The SECI model can be translated into the systemic terms as shown in Figure 1. It perceives an organization as a knowledge-creating system through the SECI process, consisting of four

subsystems: socialization, externalization, combination and internalization. Each subsystem is an input-output system for a certain type of knowledge, interconnected so that a subsystem's output will be used as the next subsystem's input. Note that it is an open system that interacts with the external environment, including outside stakeholders. Furthermore, given that SECI is a self-transcendental process, it necessarily possesses the fundamental nature of a system: a system is more than the sum of its parts (Ackoff, 1973).

In the SECI system, each subsystem should be regarded as a human interactive system rather than as an engineering or mechanical system. Let's see the importance of human factors in each subsystem, based on the discussions of Nonaka and Takeuchi (1995). First, since the basic form of the socialization subsystem is that individuals interact with each other spontaneously, it is clear that subjective views, or mental models, can have critical roles. If a member of the system is closed psychologically, is reserved, or fears sharing experiences, the subsystem does not function well. Second, in the externalization subsystem as well, the key is interactions between individuals or between an individual and a group. Thus, it is important to stimulate a member in a positive way, so that he or she feels like expressing his or her tacit knowledge, information, and feelings, which will become the output of the subsystem. Third, in the combination subsystem, IT systems can play a big role. However, the way it can be used by members depends very much on the organization's cultural context. It is important not only to improve the technological aspects but also to share the context behind them. Finally, in the internalization subsystem, the main process is an individual's practice, trial, simulation, or experimentation of combined explicit knowledge. One's will to do this is the key driver here. Through these individual processes, explicit knowledge is supposed to be converted to new tacit knowledge.

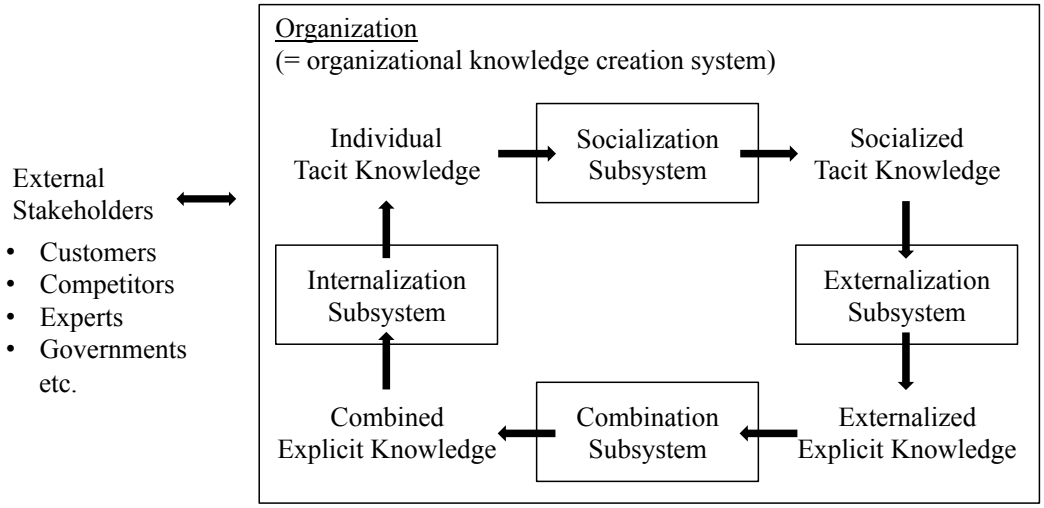

Figure 1: System description of an organization with the SECI model

The Role of Systems Intelligence in the Organizational Knowledge Creation System

All subsystems are human interactive systems, which are the main targets of SI. According to the underlying assumptions, people in each subsystem make decisions and act according to their views about other people, the organization, and their influence in the organization. Changes in organizational knowledge creation systems induced by SI are described by the five dimensions of Table 1, a variant of the original four dimensions of Saarinen and Hämäläinen (2004). The fourth element in their original definition, "change in the system," has been modified into two dimensions, "change in the subsystem" and "change in the whole system," to emphasize that the first four steps can happen in each subsystem (1 to 4) and that these changes in the subsystems can bring about a change in the whole system, e.g. the organization (5).

Let us see how SI can work in each SECI subsystem. First, regarding the socialization process, Nonaka and Takeuchi (1995) give examples, such as face-to-face communications with external stakeholders, a manager walking around in the workplace, and sharing experiences among workers. These can be promoted by SI. For example, a systems intelligent manager not only walks around and observes the office but also tries to open new doors of conversation with subordinates and attempts to access their feelings, so that they share their tacit knowledge openly. A systems intelligent worker can try to find new opportunities in his or her interactions with customers and colleagues to obtain knowledge from or to give his or her own knowledge to them.

Further, in the externalization subsystem, interactions between individuals or between an individual and a group are also a key. A systems intelligent worker is willing to externalize his or her own tacit knowledge to stimulate his or her colleagues, or other stakeholders, so that they feel like expressing their tacit knowledge, information, feelings and so on. Next, although IT systems can play an important role in the combination subsystem, they may often not be used effectively, as mentioned above. For example, it can often happen that many people in a company understand the importance of a knowledge database system but do not use it because others do not. (This is a typical example of a "system of holding back," which will be discussed below.) A systems intelligent worker may be able to overcome this situation by taking some new action such as beginning to use the system (even if other members still do not use it) and motivating others to use it. Finally, in the internalization subsystem, the primary driver is a member's will to do "learning-by-doing" such as practice, trial, simulation, or experimentation of combined explicit knowledge. SI can accelerate the process because a systems intelligent person now believes that his or her new individual tacit knowledge may at least potentially work as an effective input of the socialization subsystem, and the entire knowledge creation system. As a whole, through the interconnectivity of each subsystem, the organizational knowledge creation will be expected to be enhanced more than before by SI.

Table 1: The five dimensions of changes in organizational knowledge creation systems

1. Mental change	One accepts the SI perspective.
2. Perceptual change	One sees him or herself as a part of the whole system, and admits the possibility that his or her original mental model might not have captured the true structure of the system.
3. Individual behavioral change	One changes the mode of thinking relevant to his or her every day micro-behavior, and tries new actions that have not taken previously.
4. Change in the subsystem	Triggered by someone's micro-behavioral change, through the feedback loops possessed by the system, the subsystem can produce more valuable outputs than before.
5. Change in the whole system	The whole system can create organizational knowledge more effectively than before.

Avoiding Systems of Holding Back

If the current KM process fails due to human factors, it falls into what Hämäläinen and Saarinen (2007) call a "system of holding back." This is a system wherein people have a common desire but somehow it never appears and instead a less desirable outcome is obtained. Ackoff (2006, pp.706-707) describes a typical example in firms. When he gave lectures on systems thinking to workers in a company, after the lectures, they said, "This stuff is great, I would love to use it, but I can't introduce it without the approval of my boss." Then he gave a lecture to the CEO of the company, and the CEO said, "This stuff is great, I would love to use it, but I can't do it without the approval and support of my subordinates." As a result, the company did not adopt systems thinking. Both the CEO and the workers held back from using this beneficial tool, despite the fact that both of them wanted to use it. (See also Hämäläinen and Saarinen (2008).)

This situation is replicated with many failed KM processes. Even if everyone admits the importance of KM, if they hold back their contributions simply because others do not contribute to them, an organizational knowledge creation system can fall into a system of holding back. Usage of IT systems in the combination subsystem mentioned above is a typical example. In general, a system of holding back is the main target of SI, and its primary goal is to surmount this trap and make systems produce better outcomes. (Hämäläinen and Saarinen (2007) give various examples of systems of holding back.)

The complex problem of a system of holding back is that it is hard, or impossible, for people inside the system to notice the current situation is a system of holding back. Ackoff (2006) noted that there are two types of mistakes: "errors of commission" and "errors of omission." The former refers to a situation when an individual, or an organization, does something that should not have been done. In contrast, the latter refers to a situation when someone fails to do something that should have been done. Of the two types of errors, Ackoff says that errors of omission are usually more important. When we commit an error of commission, we can notice it and learn a lesson from the mistake. But this is very difficult or even impossible when we commit an error of omission because we cannot notice the fact that we made a mistake. If a KM process becomes stagnant due to holding back, it can be seen as an error of omission, because although the organizational members can potentially improve the situation, each member of the organization would be unaware that he did something wrong. Here is a room for improvement of the system driven by SI.

SI is considered to be an inherent intelligence. Therefore, the discussion above can provide a simple and practical perspective for the sustainable improvement of an organizational knowledge creation system. “Sustainability” is the key here. If a manager tries to use systems thinking to tackle a failure of KM, according to Saarinen and Hämäläinen (2004), it may be possible to solve the specific problem but difficult to find sustainable improvement. Conversely, the SI approach touches daily micro-behaviors of people and looks for a possibility of change in the system triggered by them.

Conclusion

This paper has discussed the role of SI in promoting the process of SECI in KM implementation. Since the applicability of the SECI model highly depends on human and cultural contexts as Nonaka and other researchers emphasized, SI can work as a momentum of the SECI process and be useful to avoid the knowledge creation system becoming stagnant as a system of holding back.

As mentioned above, SI is considered an inherent intelligence, and people can easily learn its essence. Thus, for example, a manager can encourage his or her colleagues and subordinates to become systems intelligent. Also, every organizational member can make an effort to be systems intelligent by him or herself. These efforts can be supported by, for example, using some books of SI written for practitioners by the SI advocates. (For example, Hämäläinen *et al*. (2014, back cover) claims that their book “encourages the reader to see how we all live in a world of systems, and steps through how we can sense, think and act differently on that basis.”) It is the message of this note that all such efforts can potentially improve the effectiveness of the SECI process.

This paper’s contribution to previous studies can be summarized as follows. From the viewpoint of SI studies, this is its first application to the field of KM. Conversely, from the viewpoint of KM studies, SI provides a new perspective to touch minds and micro-behaviors of organizational members, which are key factors for success of the SECI model, as discussed above.

Overall, this paper provides conceptual and hypothetical discussions. Recently Törmänen *et al*. (2016) have developed an inventory to measure the level of SI. We plan to survey the relationship between the degrees of SI of organizational members and their contribution to the SECI process.

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