THE KNOWLEDGE-CREATION PROCESS: A CRITICAL EXAMINATION OF THE *SECI* MODEL

García Muiña, Fernando Enrique

Rey Juan Carlos University

P. Artilleros s/n, Campus de Vicálvaro, 28032, Madrid (Spain)

Tlf.: 91 301 99 05/06

E-mail: muina@poseidon.fcjs.urjc.es

Martín de Castro, Gregorio

Complutense de Madrid University

Campus de Somosaguas, Pozuelo de Alarcón, 28223, Madrid (Spain)

Tlf.: 91 394 25 05

E-mail: ecorgz1@sis.ucm.es

López Sáez, Pedro

Complutense de Madrid University

Campus de Somosaguas, Pozuelo de Alarcón, 28223, Madrid (Spain)

Tlf.: 91 394 25 05

E-mail: pedro.lopez@ccee.ucm.es

ABSTRACT

In this paper we develop a holistic model which successfully integrates not only the knowledge ontological dimension, but also the epistemological one. Putting together Epistemological SECI (Socialization, Externalization, Combination, and Internalization) processes and Ontological SECI processes provides a wider view about the knowledge creation process. This holistic model, that we have named EO-SECI (Epistemological and Ontological SECI), constitutes a complete theoretical framework to understand the key processes which can determine the true sources of competitive advantage in the present knowledge-based economy.

KEY WORDS

Knowledge Creation, Tacit Knowledge, Explicit Knowledge, Individual Knowledge, Social Knowledge.

A FRAMEWORK FOR THE KNOWLEDGE CREATION PROCESS

The Knowledge-Creating Company from Nonaka y Takeuchi (1995) and their following papers became a essential reference for practitioners and academics interested in understanding how knowledge is shaped and how can this knowledge be applied to the firm. Time has told us that the capability to create and apply new knowledge successfully constitutes the true source of competitive advantage of the firm.

In order to understand the criteria that rule this knowledge-based competition, the development of a theoretical framework is required. This framework must explain clearly the nature of knowledge, the place where it is created and applied, and the mechanisms which allow the transfer of knowledge developed in a certain place to different places, whether it be, persons, groups, firms or groups of firms. In our study about the knowledge creation process we must pursue three main issues: a) the nature and typology of knowledge, based on relevant and generally accepted criteria, b) the determination of the different entities, levels, systems or agents that are able to create knowledge, and c) how this entities can develop knowledge within them, and capture and transfer knowledge related to lower or higher levels.

Firstly, the issue of classifying knowledge by means of a relevant and generally accepted criterion must be addressed. We can consider this issue as already solved through the consideration of the named knowledge epistemological dimension. The extensive use of Polanyi's (1966) distinction between tacit or implicit knowledge and explicit knowledge has proved that knowledge tacitness can establish a two-extreme continuous typology for knowledge, by which one extreme shows characteristics quite different from the opposite.

Distinction between tacit knowledge and explicit knowledge can be considered generally accepted if we examine the knowledge creation and knowledge management literature. The number of authors that have utilized this distinction in their papers are countless. Even some of them are forming a novel theoretic course that dares to consider knowledge –in its tacit and explicit forms- as the phenomenon that allows to work on a new dynamic theory of the firm (Grant, 1996; Spender, 1996; Porter

Liebeskind, 1996; Nahapiet and Ghoshal, 1998). This course is quite appealing and gains support every day.

Unlike using the knowledge epistemological dimension as general convention, in order to determine what entities are able to develop knowledge there is no general agreement. Academics are not sure at all if only individuals are able to create knowledge in a strict sense, letting a simple paper as applicators for firms and other social collectives, or if, however, organizations own knowledge-creating and learning capabilities too. During this paper we will choose this conception. The reason to do so is that, if groups and teams are constituted by individuals, and these individuals own knowledge-creating and learning abilities, then, applying a systemic reasoning, it can be argued that every system (group) has the same properties than its elements (individuals). In a similar way, it can be argued that organizations, as a system of different groups, teams or departments, and in turn the environment within organizations are embedded, as the highest level system, composed by different organizations and agents, are knowledge-creating and learning entities too. Summarizing, from our point of view, there are four basic levels for the knowledge creation process to happen: the individual level, the group level, the organizational level, and the inter-organizational environmental level. Individual level is the basic unit or element for knowledge creation, and the group, organizational and inter-organization environmental level are higher level knowledge-creating systems.

In their 1998 work, Nonaka and Konno seem to suggest that the shift from one level to another takes place through each of the four basic SECI processes, although they do not show a resolute proposal. Based on that paper, we can think about socialization as an activity with intra-level effects, externalization as a way to develop group knowledge from individual knowledge, combination as a process that allows organizations constitute a knowledge body from the knowledge owned by its different groups, and internalization as the way by which organizational knowledge can be converted into individual knowledge, setting the base to reinitiate a new SECI loop through the different levels.

Preceding suggestions are useful, though evidently insufficient to explain the knowledge creation process across the different levels that make up the called

knowledge ontological dimension. This dimension must be incorporated to a complete framework for knowledge creation to be formulated.

To develop a successful theoretical framework it would be necessary to take into account four essential components: a) a SECI cycle within each ontological level, b) the shift from one level to another not only through a sole process, but also through the four different modes of knowledge conversion, c) the possibility of knowledge transfer from one level to another without crossing intermediate levels, and d) to confer the different processes linking the ontological levels a two-way nature, allowing feedback processes for the whole system regeneration or renewal.

We have suggested that knowledge creation can take place within four different levels. Now, focusing on each of them, we will try to explain how the knowledge creation process can happen.

INTRA-LEVEL KNOWLEDGE CREATION PROCESSES: THE EPISTEMOLOGICAL SECI

Lastly, the issue concerning which are the means by which the above cited levels can create knowledge within them, and by which they can capture and transfer it between them, stills being an open question, that awaits solid theoretical response. The primary target of this paper is providing a useful approach to contribute to the efforts to address the solving of this challenging question.

Individual knowledge creation has been explained by the SECI model, developed by Nonaka and Takeuchi in 1995, and later improved through the addition of new and interesting suggestions like the concept of *ba* (Nonaka and Konno, 1998) and the notion of knowledge assets (Nonaka, Toyama and Konno, 2000). The SECI model describes the knowledge transformation processes, according to the knowledge epistemological dimension, setting the four basic feasible combinations and naming them Socialization, Externalization, Combination and Internalization (SECI).

We consider that SECI model constitutes a strong framework about the knowledge creation and conversion inside a certain level or entity, based on the knowledge epistemological dimension. Nevertheless we believe this model contributions are not enough to explain how knowledge can be created between different levels, incorporating the knowledge ontological dimension.

The Individual Knowledge Creation Process

Individual knowledge is shaped by personal experiences, through space and time, caused by relations with other individuals or, generally, with the nature of the environment, and that are processed by the human brain. These brain interpretations can be done in a rational and objective way, by means of causal relationships or clear and formally structured reasoning, originating explicit knowledge; or by means of emotional, personal and subjective reasoning, originating tacit knowledge, deeply related to context and conditions of its acquisition. This way, individuals are unfolding in their minds, an endless knowledge creation cycle based on the four basic processes of knowledge conversion, triggered by each moment and place stimulus, generated by the environmental universe.

The Group Knowledge Creation Process

Now, let's take a look at the development of the body of knowledge of a group of individuals. The group, as we have argued before, can be considered an open system whose elements are different individuals able to create knowledge through the time, using the SECI processes. In a similar way to the individual, group level captures knowledge from higher level systems, which constitute its institutional (organizational level) and general (inter-organizational level) environment. Besides, the group captures knowledge from its members through time and space. In each specific time and space combination, the group captures the knowledge contribution of its members. Observation, imitation, and practice shared between team members through the time shape, by means of socialization, a body of shared tacit knowledge, nor owned by any of the individuals nor owned by a shared property mode. This body of shared tacit

knowledge is group specific. In a similar way, when the group reaches to express a piece of its tacit knowledge, using metaphors, analogies or models, an externalisation process takes place at group level, developing a body of shared explicit knowledge owned by the group. The combination of explicit knowledge through formal reasoning, logic and dialogue confers to the group the capability of combining in the SECI model sense. Lastly, when knowledge is close-related to practice and experience, becoming deeply specific, personal and subjective for the group, internalization takes place at the group level too. However, groups not only enable its own SECI through individual or element contributions, but also through contributions captured from the continuous historical relationships with higher ontological levels, that trigger off the different knowledge conversion processes of the SECI model.

The Organizational Knowledge Creation Process

Moving to organization or firm consideration we will find a set of phenomena very similar to those previously described. The organization, as a system, is composed by several subsystems, groups or teams, which in turn are composed by several elements or individuals. An organization is continuously related to its environment, and this fact allows this level to capture knowledge from the highest level system, the inter-organizational level. Moreover, from an internal point of view, groups and individuals that compose the firm (members, teams, departments and the like) continuously provide contributions from their own bodies of knowledge, which enrich the organizational one and trigger off the socialization, externalization, combination and internalization processes.

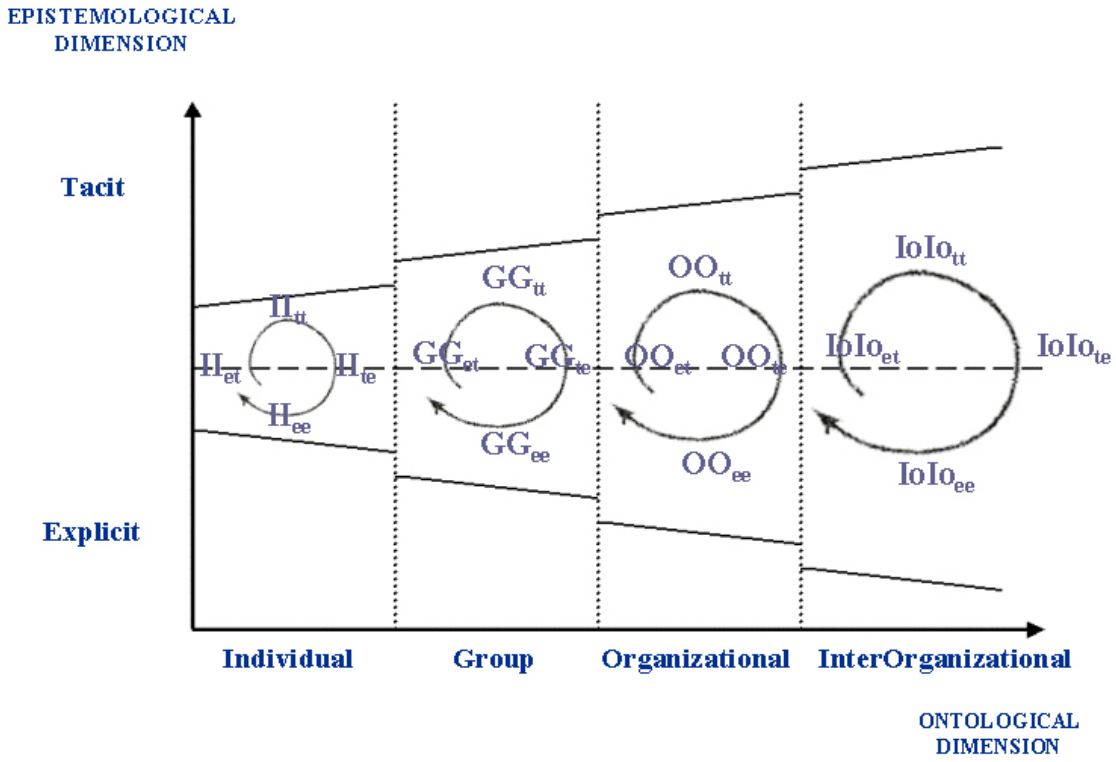
The Inter-Organizational Knowledge Creation Process

The inter-organizational level is deeply related to the object of study of the Industrial Organization Economics. This environment shows the presence of several agents as costumers, suppliers, government and public actors, allied, mass-media, etc. The relationships between the organization and its environment through time and space provide stimulus and knowledge that trigger off the processes of an own SECI model.

As we can see, wide and general environment develops an own SECI too, based on the knowledge accumulated by its components or subsystems through history and subsequent contributions of these components. Knowledge creation at the highest ontological level only takes place according to past events and lower level contributions. There is no contact with higher entities, because, by definition, environment holds everything, but is not held by anything. Environmental level would be a macrocosmus, an entity so large as we wish, that changes over time, but only from itself. Individuals create knowledge based on their time-space experience, connecting with external entities, and environment creates knowledge based on its time-space experience, connecting with internal entities. Instead, groups and organizations create knowledge from its relationship with higher level entities and with its own components.

Figure 1 shows the intra-level knowledge creation processes through the Epistemological SECI.

Figure 1: Epistemological - SECI processes



THE HOLISTIC KNOWLEDGE CREATION PROCESSES: THE EPISTEMOLOGICAL AND ONTOLOGICAL SECI

Once we have analysed intra-level knowledge creation processes, we address the issue of describing the named Ontological SECI processes, using the knowledge ontological dimension as main argument.

To understand the dynamics of these processes, making a distinction between feed-forward knowledge creation processes and feedback knowledge creation processes is required, following Crossan, Lane and White (1999) reasoning.

Individuals nurture their SECI processes through feedback coming from higher levels as they maintain relations within them as space and time go by.

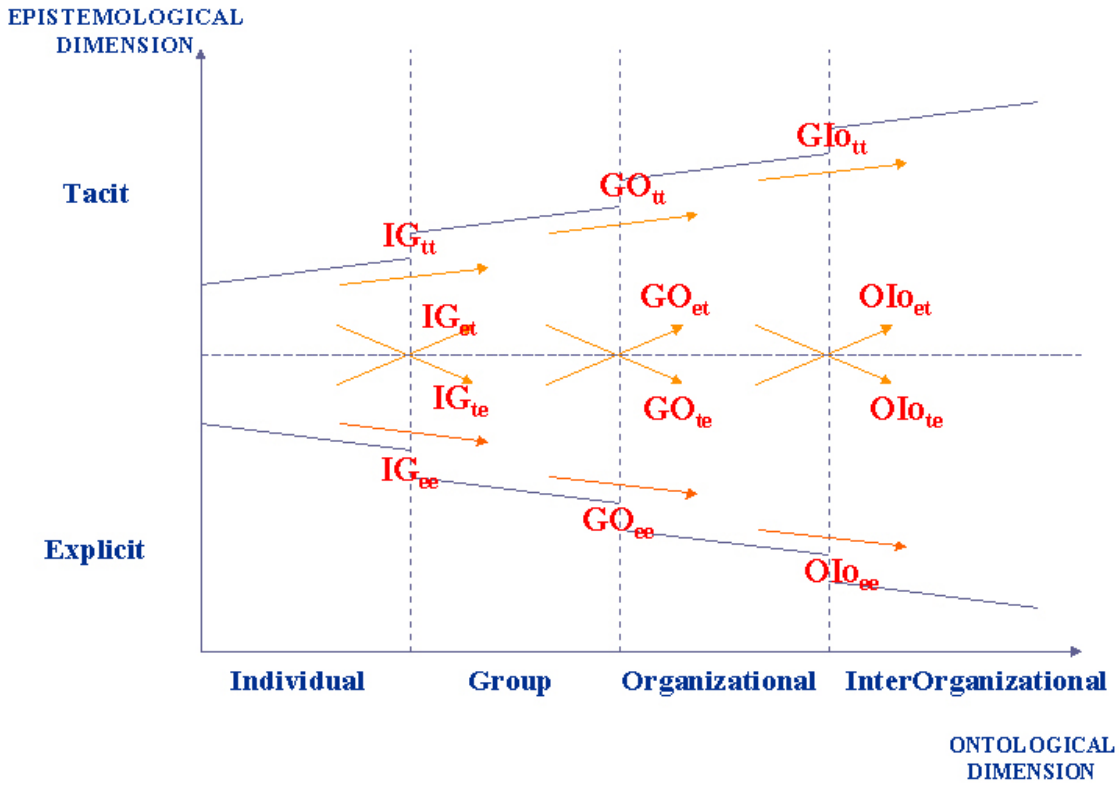
This reasoning of feed-forward processes for the assimilation of new knowledge and feedback processes for the exploitation of already developed knowledge was employed by the 4 I's organizational learning model (Crossan et al., 1999).

Feedback and feed-forward processes between ontological levels can assume the form of each of the four basic modes of knowledge conversion established by the SECI model following the knowledge epistemological dimension criterion. This way, in addition to each level own socialization, externalization, combination, and internalization (Epistemological SECI or E-SECI), we notice a SECI between that ontological level and the rest of the levels (Ontological SECIs or O-SECIs) in a feed-forward way, and another one in a feedback way.

Respect to feed-forward processes we can notice three basic processes: the one which happens from individual to group level (IG), that shows how individual knowledge nurtures group knowledge; the one which happens from group to organizational level (GO), that represents how group knowledge nurtures organizational knowledge; and the one which happens from organizational to inter-organizational level (OIo), that express how organizational knowledge nurtures knowledge created through relations sustained between the organization and several environmental agents.

Nevertheless, this inter-level knowledge creation feed-forward will be incomplete without an analysis of the knowledge epistemological dimension. This way, the three previously described processes must by multiplied by four, as Figure 2 shows.

Figure 2: Inter-level and feed-forward knowledge creation processes



Following the SECI cycle (from tacit knowledge to tacit knowledge, from tacit to explicit, from explicit to explicit, and from explicit to tacit) we can gather this processes this way:

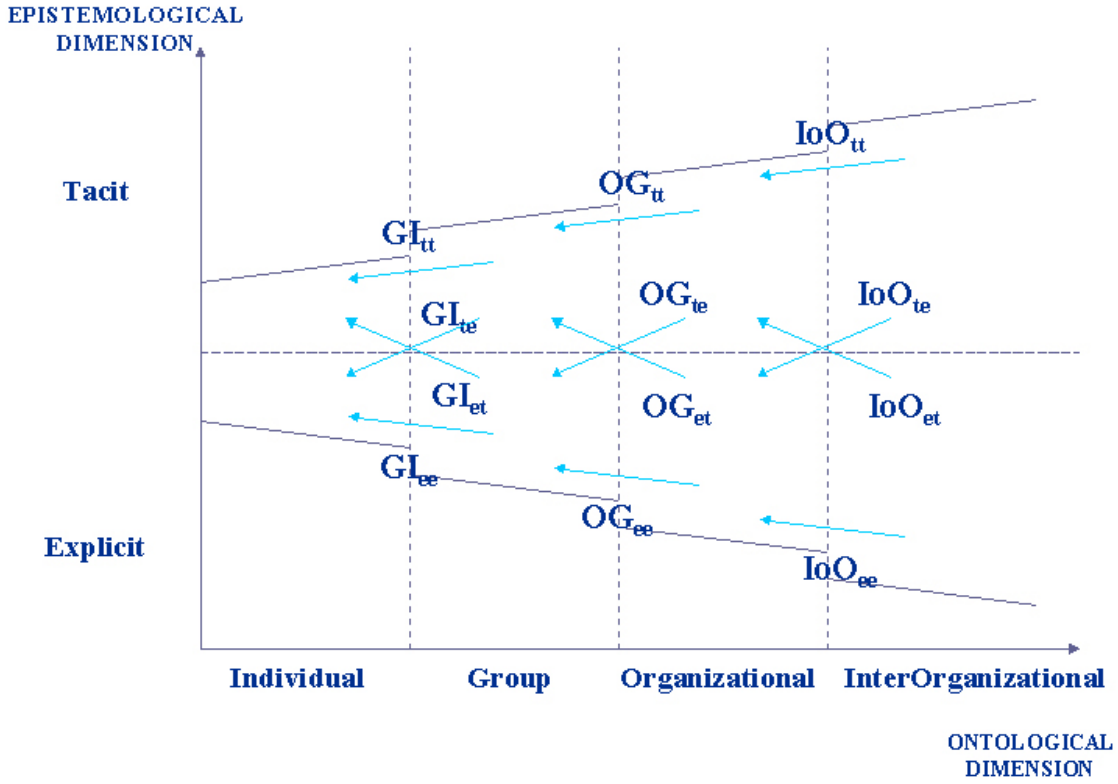
- Inter-level feed-forward and individual-group processes. This category holds the following processes: individual-group tacit-tacit (IG_{tt}), individual-group tacit-explicit (IG_{te}), individual-group explicit-explicit (IG_{ee}), and individual-group explicit-tacit (IG_{et}).

- Inter-level feed-forward and group-organization processes. Holds: group-organization tacit-tacit (GO_{tt}), group-organization tacit-explicit (GO_{te}),group-organization explicit-explicit (GO_{ee}), and group-organization explicit-tacit (GO_{et}).
- Inter-level feed-forward and organization-interorganization processes. Holds: organization-interorganization tacit-tacit (OIo_{tt}), organization-interorganization tacit-explicit (OIo_{te}), organization-interorganization explicit-explicit (OIo_{ee}), and organization-interorganization explicit-tacit (OIo_{et}).

Lastly, about the feedback processes, we can identify again three basic processes: one from group to individual level (GI), that shows how individuals capture knowledge from the group, one from organizational to group level (OG), that represent how groups capture knowledge from the organization, and one from the inter-organizational to organizational (IoO), related to how organizations capture knowledge from the relations sustained with several environmental agents.

Nevertheless, these feedback knowledge creation processes would be incomplete without an analysis of the knowledge epistemological dimension. So, the three basic processes mentioned above must be multiplied by four again, becoming twelve processes, presented in Figure 3.

Figure 3: Inter-level feedback knowledge creation processes



According to the SECI scheme, we can gather these ontological processes as it follows:

- Inter-level feedback and group-individual processes. This category holds: group-individual tacit-tacit (GI_{tt}), group-individual tacit-explicit (GI_{te}), group-individual explicit-explicit (GI_{ee}), and group-individual explicit-tacit (GI_{et}).
- Inter-level feedback and organizational-group processes. Holds: organization-group tacit-tacit (OG_{tt}), organization-group tacit-explicit (OG_{te}), organization-group explicit-explicit (OG_{ee}), and organization-group explicit-tacit (OG_{et}).
- Inter-level feedback and interorganizational-organizational processes. Holds: interorganization-organization tacit-tacit (IoO_{tt}), interorganization-organization tacit-explicit (IoO_{te}), interorganization-organization explicit-explicit (IoO_{ee}), and interorganization-organization explicit-tacit (IoO_{et}).

We have described all the inter-level processes that shift form one level to the immediately higher or lower level. However, we must notice that there are several knowledge creation processes, feeding-forward and feeding-back, that shift from one

level to lower or higher levels without passing through intermediate levels. This allows us to propose the holistic model displayed in Figure 4.

In summary, we can develop a holistic model which successfully integrates not only the knowledge ontological dimension, but also the epistemological one, putting together E-SECI and O-SECI to reach a wider view about the knowledge creation process. This holistic model, that we have named EO-SECI (Epistemological and Ontological SECI), provides a theoretical framework to understand the key processes which can determine the true sources of competitive advantage in the present knowledge-based economy.

Figure 4: A holistic knowledge creation model