

KNOWLEDGE MANAGEMENT AND COOPERATION TECHNOLOGY

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Summary

In this chapter knowledge management is considered from a process-oriented point of view, instead of a resource point of view. Managing knowledge is therefore something more than collecting, storing, ordering and disseminating information and documents: it regards all the processes through which human beings create new (tacit and/or explicit) knowledge transforming the existing (tacit and/or explicit) knowledge.

Adopting the cooperative process perspective, considering human work as a social practice happening within a community (of practice) participating in a common story, the knowledge transformation types characterized by Ikujiro Nonaka and Hirotaka Takeuchi can be mapped on the different cooperation types its members perform. Supporting cooperation and supporting knowledge creation (management) are therefore strictly coupled and knowledge management becomes an attribute of Computer Supported Cooperative Work (CSCW) systems and Groupware.

It is finally argued that this requires the information and communication technology to create an *open, manifold, continuous* space supporting the awareness of its users with respect to the changing context in which they are embedded.

1. Introduction

Despite its vast popularity or, perhaps, because of it, knowledge management does not yet have a unique universally accepted definition. This is due also to the intrinsic ambiguity of the term itself: managing knowledge, in fact, refers both to the management of “knowledge”, as if the latter were something to be created, stored, processed and disseminated with the greatest effectiveness, and to the management of

the process of “knowing”, as if knowledge had no value per se, but only when it is used by people while interacting within their activities and creating new knowledge. Not surprisingly, the contrast between knowledge as an entity and as a process appears also when we compare the definitions of knowledge management that have appeared in the literature.

The above distinction is not creating two mutually exclusive classes: most of the scholars who adopt the entity viewpoint are aware that knowledge is embedded within a process and underline that managing it means managing the processes of its acquisition, creation, access, dissemination, etc.; on the contrary, those who adopt a process-oriented approach pay also attention, for example, to the different types of knowledge. The distinction between the two viewpoints emerges with greater emphasis when we look at the computer based systems which are proposed as tools for knowledge management.

On the one side, there are those systems focusing on the best methods for storing, ordering and retrieving knowledge (their reference fields are: knowledge bases, document management, digital libraries, information retrieval, etc.); while, on the other, there are the systems that are mainly devoted to support the interactions through which its users become capable of creating new knowledge and sharing it: CSCW (Computer Supported Cooperative Work) systems and cooperation technologies, groupware platforms, shared workspaces, workflow management systems, etc..

Even the latter systems provide their users with tools supporting the management of information and documents, but their focus is on their integration within the systems supporting communication, coordination and collaboration, while the former pay the greatest attention to the development of sophisticated techniques for indexing, ordering and searching data and documents. This reflects in the interaction modes they provide to their users: in the first case, they are applications to be coupled with other applications (among which CSCW systems) so that the user can switch to them whenever she/he has to manage knowledge; in the second, they are part of the work place of their user, where she/he can search, access, create, modify, store and distribute the information and documents that are relevant with respect to what she/he is doing, while she/he is doing it. In the first case, the emphasis is on the semantic links structuring the knowledge base; in the second, on the pragmatic links coupling information and documents with user actions and interactions.

Like its title indicates, this chapter lies within the second perspective: its aim is to investigate the process of knowing happening while people work and to outline the main features of a system supporting it. In order to reach its objectives, it develops the theoretical framework proposed by Ikujiro Nonaka and Hirotaka Takeuchi integrating it within the cooperative process model developed at the University of Milano - Bicocca, so that knowledge creation is characterized at the level of the practice of human beings while cooperating to perform a process and the support they need can be analyzed and outlined.

Cooperative processes characterize human activities as relations between their customers (those who are in the position of requesting them and benefiting of their completion) and their performers (those who are in the position of doing the requested activity). Both performers and customers of a cooperative process constitute together a

community of practice. The practice of human beings within a cooperative process is therefore embedded within the relation defined by their mutual positions (their positional relation). Moving the four knowledge transformation types defined by Nonaka and Takeuchi down to the level of practice, the latter can be characterized in terms of the positional relations binding its actors.

Moreover, since each knowledge transformation type (each positional relation type) is based on a different way of integrating speaking and reading/writing (i.e., conversations and/or document processing), when people switch from a transformation process to another they move from conversing to document processing and back. Therefore, a smooth switching between different knowledge transformation types requires the information and communication technology to create an *open, manifold, continuous* space supporting the awareness of its users with respect to the turbulent context in which they are embedded.

The chapter is organized as follows: Section 2 introduces the main features of cooperative processes; Section 3 analyzes the complexity of cooperative processes and relates it to knowledge; Section 4 characterizes knowledge creation within cooperative processes; Section 5 extends the analysis to the whole organization. The final chapter deals with the requirements for a computer-based system supporting knowledge management that can be derived by the analysis presented in the previous sections.

2. Cooperative Processes

Two are the main aspects of work practices: they involve several cooperating persons, forming what the Californian school of work anthropology (Lave, Wenger, Brown, Duguid and many other) call communities of practice and they are embedded within (business, work) processes where they get their sense. They can be understood only within the history of cooperation, the cooperative process, to which they belong.

A cooperative process can be characterized by the communicative relations binding its participants to one another and with the actions they are performing. The basic communicative relations within a cooperative process are therefore the conversations giving rise to it, where the customers (i.e. those who have a condition to be satisfied) and the performers (i.e. those who can satisfy it) reach an agreement on the actions to be performed and share the evaluation of their execution. The actions performed within a cooperative process are, in fact, embedded into the conversations between its customers and its performers: they are performed through their *collaboration*. Not less interesting are the other conversations involving (some of) the actors (both customers and performers) of the cooperative process, through which they face the breakdowns occurring within it, re-defining its condition of satisfaction and/or opening a sub-process.

The latter are not only conversations involving both customers and performers: a cooperative process, if not a trivial one, has more than one customer and more than one performer and, therefore, the relations (conversations) among only customers and the relations among only performers play important roles within it shaping other forms of cooperation.

The terms *customer* and *performer* refer to the *positions* and not the *roles*. A customer is not a person who has the role of making requests to the performers; on the contrary, it is the fact of making a request for action that puts a person in a customer position. Making a request for action means assuming a customer position; agreeing to satisfy a request for action means assuming a performer position. Whenever within a conversation a person negotiates the satisfaction of a request or makes reference to it, then she/he is occupying a customer position; conversely, whenever she/he negotiates the action she/he has to perform to satisfy a request or makes reference to it, then she/he is occupying a performer position.

Cooperative processes are to some degree recursive: within a cooperative process, in fact, the actors can consider each action to be performed within it as a cooperative process in itself. Moreover, frequently in order to make a requested action possible, either the performers themselves or the customers too may change their positions: any breakdown occurring to a performer while she/he is performing an action, for example, induces her/him to make a request for help, shifting her/him from a performer to a customer position; in the same way, if a customer is requested to provide some information characterizing the context in which the performance she/he requires falls, then she/he becomes a performer, changing her/his position. These movements are so rapid and frequent that it can be said that there is a strong continuity between the different positions an actor of a cooperative process occupies, while time passes.

The recursive nature of a cooperative process generates also a problem of granularity affecting both the understanding and the behavior of its actors: if within a cooperative process a group of actors opens a sub-cooperative process in order to get an action done that is necessary for its successful completion, then while cooperating those actors can be in different positions with respect to the main process and its sub-process. This unavoidable situation can cause the fact that they do not interpret their mutual positions consistently, since some make reference to the main process and its condition of satisfaction and others to the sub-process. Inconsistencies between the interpretations of the same relation may be solved through the explicit negotiation of the level of granularity to take into account.

The actors of a cooperative process converse and interact, changing eventually their mutual positions, in order to meet a condition of satisfaction. They constitute a network of social relationships that cannot be reduced to any functional and/or hierarchical model; they constitute a community of practice. Despite any attempt to plan its evolution with respect to its expected outcome, what its course will be is unpredictable. Its participants, while performing, change their understanding, their image of the requested actions, their ways of performing them, their mutual agreements in a course of successes and failures, all in a common experience of action, communication and learning.

Within a cooperative process its actors consume resources (have a cost) and create a value. The value of a cooperative process cannot be reduced to the price its customers pay the performers. The latter compensates, often inadequately, the difference between their respective value/cost ratios, but it does not help understand the real nature of the value itself. In what sense is the value a 'value'? How can value and cost be compared? If, adopting a very general and abstract perspective, the value of a cooperative process is characterized by the increase of the potential for action it generates and its cost by the

potential for action it extinguishes, then the principal component of its value is the knowledge - the practical knowledge, the knowledge for action - generated within it. For both customers and performers, a successful cooperative process creates new knowledge: thanks to it, the former become able to overcome the problem for which they asked help, while the latter increase their experience, improving their effectiveness in future performances as well as their public reputation.

There is a direct link connecting knowledge creation and communication in a cooperative process. Through their conversations the participants in a cooperative process learn, both individually and together, and share an experience constituting them into a whole, into a community of practice. Even if they occupy different positions, they share a space, a set of artifacts (tools, resources, documents and/or information), a language, the knowledge of the world they live in and of the possibilities it opens, the memory of the past events in which they have participated and the value they create within it. Sharing an experience reflects itself in sharing the knowledge created and used in it as well as the knowledge of it: participating in a cooperative process, being member of a community, can only be obtained through a learning process, though knowledge sharing.

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Biographical Sketch

Prof. Giorgio De Michelis teaches Theoretical Computer Science and Information Systems at the University of Milano – Bicocca, where he leads the Cooperation Technologies Laboratory (CTL). CTL is carrying out research on models of concurrent systems (Petri Nets), on Computer Supported Cooperative Work, communityware and knowledge management, where it has developed and is developing prototypes of support systems for cooperative processes (CHAOS, UTUCS, MILANO, CAMPIELLO, KLEE&CO). Giorgio De Michelis is member of the editorial board of 'Computer Supported Cooperative Work: The Journal of Collaborative Computing', 'Studi Organizzativi', 'Pluriverso'. From 2000 he is writing a periodical column on the i3 Magazine.

Giorgio De Michelis has authored four books and more than hundred papers in the areas of his interest. Giorgio De Michelis is vice-presidente of IRISO, where he leads research in knowledge management, information systems, e-business and e-government.