

# Collaborative strategies supporting knowledge management in organizations

## Estrategias colaborativas que apoyan la gestión del conocimiento en organizaciones

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**Abstract.** Significant work has addressed the role of knowledge and its impacts on business organizations. The construction of effective environments implies time and cost pressure, allowing staff to seek immediate solutions from knowledge management (KM). Some studies have shown that collaborative knowledge generation through storage, access, dissemination, and application could help organizations collaborate with partner firms to share supply chain knowledge and improve their work. However, it is not clear how to structure activities that convey real collaboration. In that way, this paper proposes a mechanism using collaborative strategies supporting effective transfer knowledge in different kinds of organizations.

**Keywords:** Knowledge management, Collaborative Knowledge Management, Collaborative activities.

**Resumen.** Un trabajo significativo ha abordado el papel del conocimiento y su impacto en las organizaciones empresariales. La construcción de ambientes efectivos implica presión de tiempo y costos, permitiendo al personal buscar soluciones inmediatas desde la gestión del conocimiento (KM). Algunos estudios han demostrado que la generación de conocimiento colaborativo a través del almacenamiento, el acceso, la difusión y la aplicación podría ayudar a las organizaciones a colaborar con empresas asociadas para compartir el conocimiento de la cadena de suministro y mejorar su trabajo. Sin embargo, no está claro cómo estructurar actividades que transmitan una colaboración real. De esa manera, este artículo propone un mecanismo que utiliza estrategias colaborativas que apoyan la transferencia efectiva de conocimiento en diferentes tipos de organizaciones.

**Palabras clave:** Gestión del conocimiento, Gestión colaborativa del conocimiento, Actividades colaborativas.

**Paper type:** Research paper

## 1 Introduction

Until recently, businesses have not been able to take full advantage of this wealth of knowledge. Most companies operate with a responsibility-and-task orientation, filling employees' days and to-do lists with constrained, prioritized duties that strictly delineate their jobs and work philosophies. In general, enterprises only use the knowledge and experience of employees who happen to have job descriptions that include variations on the words "come up with new ideas" or "solve problems."

The insertion of the organizations into the knowledge economy requires a reformulation that permits them to integrate this knowledge into their conventional operation to convert it into a valid strategic active. Under this perspective, a clear definition of methods, strategies, processes, and structures is essential to the knowledge and its management (Kluge et al., 2002).

Knowledge management involves capturing all the best practices and knowledge that people acquire and storing them in a computer system, hoping that one day it will be useful. Knowledge Management (KM) is concerned with finding ways to make tacit knowledge explicit by documenting best practices to enhance knowledge sharing through human to human collaboration (Wiig, 1997).

Identifying and sharing best practices in a domain means duplicating successes, which help people learn from each other and reuse proven techniques. Successful sharing of best practices can be accomplished by establishing a collaborative environment where users, experts, and communities can interact and cooperate.

This paper presents a model that pretends to serve as a reference guide for constructing knowledge-oriented organizations, supporting audit knowledge processes, defining the knowledge-oriented organization, displaying knowledge management solutions, and its evolution and evaluation to establish an improvement process. The next section describes some related works. Then the model is depicted. Section 4 presents the main results in the validation phase, and finally, some conclusions and further work are described.

## 2 Related works

Nonaka and Toyama (2015) describe knowledge as "a meaningful set of information." Organizations continuously create relational and context-specific knowledge and are grounded in values, experience, and purposeful action. More specifically, organizations create knowledge by synthesizing contradictions between the organization's internal resources and the environment. Lastly, knowledge can be tacit or explicit and is used to create knowledge assets.

Collaborative Knowledge Management (CKM) is a process of collective resolution of problems. It is useful to memorize the process of making collective decisions and structure the group interactions to facilitate problem-solving and sharing of ideas (Lewkowicz, 2000). Kim and Yang (2010) have defined the concept of intellectual bandwidth as the sum of collaborative information system and knowledge management system capabilities within the organization: "We define Intellectual bandwidth as a representation of all the relevant data, information, knowledge, and wisdom available from a given set of stakeholders to address a particular issue." The proposed Intellectual Bandwidth has three dimensions: the content, the collaboration level, and the group size. The content can be data, information, knowledge, or wisdom.

The collaboration level can be:

- Collective: Efforts toward organizational goals are individual and uncoordinated. Processes are individualized from start to finish.
- Coordinative: The efforts in the organization are coordinated, and processes are sequential.
- Concerted: Efforts and processes are concerted and either simultaneous or asynchronous.

CKM consists of a new community-based collaborative approach to create and share knowledge where two significant aspects have been considered (Kim & Yang, 2010):

1. The internal processes of collaborative knowledge creation and sharing.
2. The effective design of human-computer interfaces facilitating the internal processes, providing functionalities for the knowledge workers to comprehend, conceptualize, and cooperate in knowledge creation and sharing through e-collaboration processes.

Migdadi et al. (2018) have proposed a study to develop and empirically test a comprehensive framework analyzing the relationship of collaborative knowledge management practices (CKMP) with the overall organizational business performance through two mediating variables; supply chain integration and supply chain knowledge quality.

There are also many works about the impact of CKM in different kinds of organizations; however, there is not clear how to define collaborative activities to execute real collaboration. The next section describes the model we have proposed, considering some of the foundations of Collaborative Learning (CL) applied to knowledge management scenarios.

## 3 The proposed model

Collaborative Technologies provide an ideal environment for sharing information that is both dynamic and richly linked, can be used for asynchronous communication across different time zones (e.g., electronic discussion groups), and can enhance communication and collaboration (Cohen, 1998). An intranet is also valuable for use in teleworking and virtual team settings since it can allow knowledge from individuals to

be transferred into a central repository and thus facilitate the exchange of, for example, insights and experiences (Davenport et al., 1998). Essentially, as highlighted by Scott (1998, p. 3), "possibly the most far-reaching impact of Intranet use is on organizational knowledge creation." Scott uses Nonaka and Takeuchi's theory to describe how. As mentioned previously, this knowledge creation theory hinges on the distinction between tacit and explicit knowledge. It incorporates the four modes of knowledge conversion depicting a life cycle of organizational knowledge creation. However, these collaborative technologies need to be designed in a way people really can communicate and share information.

Computer-Supported Collaborative Learning (CSCL) is one of the most promising ideas to improve teaching and learning with the help of modern information and communication technology (Stahl, 2017). Several researchers in recent years have demonstrated a high degree of learning possible when students can collaborate in learning tasks (Ludvigsen et al., 2016). It is common to hear how CSCL can improve some teaching-learning processes in the classroom, helping to develop some skills like communication, learn to learn, memory retention, better problems solution. However, just putting a group of students around a task does not guarantee a real collaboration (Collazos et al., 2004), so it is necessary to define a process that conveys collaborative activities among participants (Delgado et al., 2017).

Many authors have proposed different techniques to structure collaboration. Kollar et al. (2006) have offered some mechanisms called collaboration scripts, considered as scaffolds that aim to improve collaboration through structuring the interactive processes between two or more learning partners (Kollar et al., 2006). Collaboration scripts are essential to design elements in computer-supported collaborative learning and aim to support learning activities by structuring otherwise deficient interactions. "A script describes the way students have to collaborate on task distribution or roles, turn-taking rules, work phases, deliverables, etc. This contract may be conveyed through initial instructions or encompassed in the learning environment." (Dillenbourg & Jermann, 2007). Computer-supported collaboration scripts are an approach to set up and facilitate effective collaborative learning. On a macro-level, CSCL scripts can structure and link lectures, individual and collaborative learning phases in face-to-face or computer-mediated environments (Weinberger et al., 2009). The dynamic mechanisms that govern CSCL scripts include task distribution among groups and roles, group formation, and sequencing of activities.

Kolfschoten et al. (2004) have proposed ThinkLets, which is one of the key concepts in Collaboration Engineering that corresponds to a codified facilitation technique that creates a predictable pattern of collaboration. Because ThinkLets produce a predictable pattern of interactions among people working together toward a goal, they can be used as snap-together building blocks for team process designs.

However, these initiatives are not defined as a whole process that can be implemented easily in a real scenario. In that way, we propose a method that involves a set of activities that need to be considered for helping to design collaborative environments. The proposed model, depicted in [Figure 1](#), involves three interrelated activities; each one provides feedback. The model attempts to assist collaboration in two ways: establishing the situation in which the collaboration takes place (set up initial conditions) and structuring the collaboration itself through coaching or self-regulation (maintaining the collaboration).

The cycle starts with the definition of the initial set of conditions that probably will be present during the collaboration process, which influences the elements that will be used in the process and the role of each one of them. These two elements put restrictions on the strategies that can be used for maintaining the collaboration among the participants. The strategy to support the collaboration will make a difference between a successful or unsuccessful activity.

As a result of applying this model, it is expected the collaborative activity carried out on the environment promotes collaboration among group members. The next section describes these three key elements.

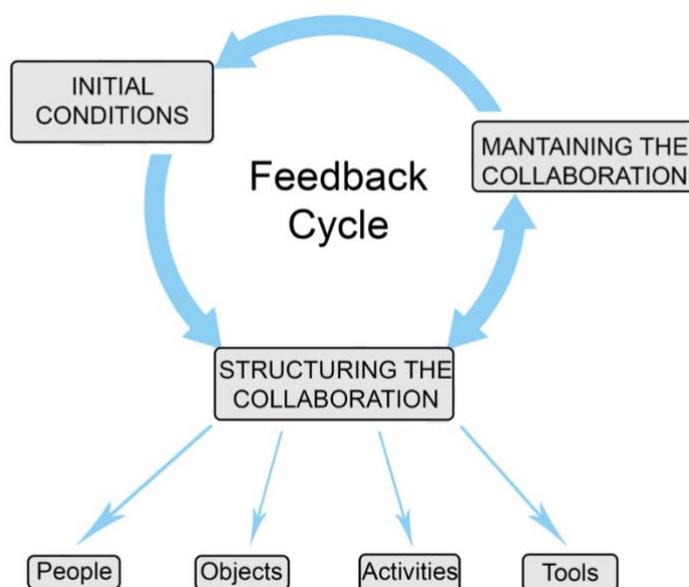


Figure 1. Proposed model for supporting collaboration

### 3.1 Establishing initial conditions

A first way to increase the probability that some types of interactions occur is to design a situation where the collaboration will take place carefully. Numerous independent variables have been studied to determine the conditions under which collaborative learning is efficient and effective. Based on Bannon's work (Bannon, 1995), the proposed model defines a set of elements to consider for specifying the initial characteristics of the groups. Next, we briefly explain these elements.

*Type of activity.* Specify the type of activity that will be performed by the members of the group to solve a problematic situation. It could, e.g., include tasks such as puzzle-solving, editing a newspaper, writing a letter, etc.

*Nature of collaborators.* Specify the types of interactions that occur. It could include three types of interactions: peer-to-peer interaction, boss-employee interaction, and employee-computer interaction.

*Group heterogeneity.* Covers independent variables such as the size of the group, gender, and differences within the group. Typically, the smaller the group, the more each member talks, and the less chance there is, someone will be left out. Also, smaller groups require less group management skills, and they can usually decide faster (Kagan, 1992). Gender specifies the male/female group composition.

*Positive interdependences.* Correspond to one of the key elements in successful groups. Based on many studies, psychologists working in education identified positive interdependence as a feature of good learning groups (Slavin, 1989). Collazos et al. (2003) have developed various ways of structuring positive interdependences in software tools based on the interface design to ensure students think "we" instead of "me."

*Setting of collaboration.* Corresponds to the place where the collaborative activity will be held. It could correspond to the classroom, workplace, home, or a virtual space.

*Conditions of collaboration.* Specifies the kind of mediation that could be physically co-present or computer-mediated.

*Period of collaboration.* Specifies the interval time in which the collaborative activity will occur. It could be specified in minutes, hours, days, weeks, or months.

### 3.2 Structuring Collaboration

The activity coordinator cannot simply ask people to start the projects and encourage peers to work together but should specify a collaboration process. Such a process could include several activities. At each activity,

the team has to produce something as a result, and team members have some role to play. The elements we propose to use to design the collaboration process are the following ones:

*Activities.* This element represents the tasks that must be performed by the group members during the collaboration process, which includes the workflow of individual and collaborative activities that composes the process. It also includes the goals and rules of each task. There are activities performed by the group associated with the main goal and other activities done by every member of the group related to the partial goals. On the other hand, the rules of group activity should be specified. These rules mediate the subject-community relationship and refer to the explicit and implicit regulations, norms, and conventions that constrain actions and interactions within the activity system (Engeström, 1987). These rules permit reviewing boundaries and guidelines for the activity. The activities included in the collaboration process must be designed so that every group member has a similar workload.

*People.* This element determines the roles that should be present in the collaboration process. Each group member has a role to play in each activity. The role assigns responsibilities and grants to the users. For example, in a pair reading exercise, a student can play the role of the reader. Therefore, such a student must read a section for the partner. After that, the reader's role must rotate.

*Tools.* This issue represents the tools through which people can perform collaborative activities. These tools must allow collaborators to communicate, coordinate, and participate in the process. Members of the group must communicate and coordinate to accomplish independent tasks that are not entirely described or require negotiation (Fussell et al., 1998). Regarding participation, the idea is to define scenarios where members of the group have the same chances to solve the situation.

*Objects.* The objects represent the knowledge that is shared by the group members during an activity. This knowledge can include several resources, such as digital objects, a portion of the user interface, coordination strategies, decisions, goals, and awareness mechanisms. For example, the discussion of the strategies to solve a problem helps group members to construct a shared view (shared object) of their goals and tasks required to be executed (Fussell et al., 1998). This shared view can improve the coordination during activity because each member knows how his/her task fits into the global team goals.

These four elements can structure the collaboration process by considering the constraints imposed by the setup initial conditions. This design's goal should be maximizing the knowledge acquired about a subject (learning goal) or the student's ability to assimilate and reproduce.

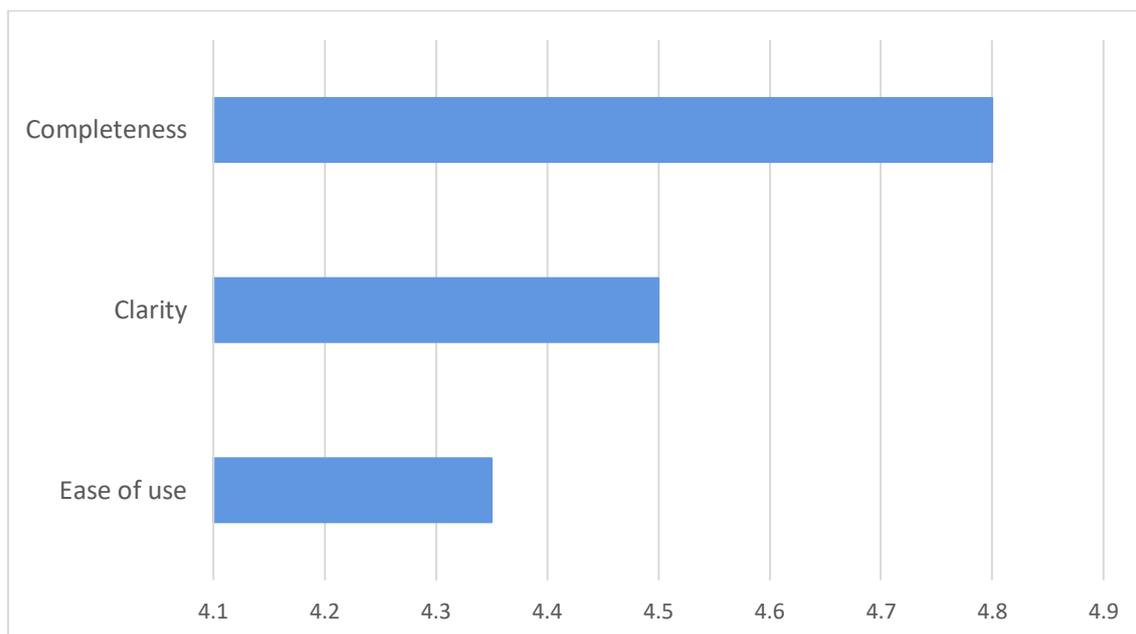
### 3.3 Maintaining the collaboration

The last aspect to consider is related to the strategy that can maintain the collaboration among members of the group. Such a strategy could be conducted by a cognitive mediator or by the team members. There is no guarantee that interactions among team members occur. Hence, some external regulation is needed to satisfy the occurrences of those kinds of interactions. One way to provide that kind of regulation is through cognitive mediators. The mediator's role will not be to intervene at the task level, but to guarantee all the group members participate and frequently ask questions such as: What happened? What does it mean? The cognitive mediator's role is to maintain the focus of the discussion, guiding students through the knowledge construction process. As the collaboration goes on, the state of interaction is evaluated (Kirsch-Pinheiro et al., 2003). Remedial actions may be proposed to reduce discrepancies between these states.

## 4 Validation

The model proposed has been validated and evaluates with expert people on knowledge management and collaborative aspects. The aspects we have considered to be analyzed are easy use of the model, clarity, and completeness.

There were 20 experts from different countries worldwide, 15 of them with an important knowledge level on collaboration and knowledge management, three experts only on knowledge management, and two experts only on collaboration. The aspects were given a value ranging from 1 to 5, 1 being the lowest and 5 the highest. [Figure 2](#) depicts some of the most relevant results.



**Figure 2.** Main results of the validation with experts.

As we can notice, almost all the aspects were evaluated satisfactorily. An aspect related to completeness was the better with 4,8, then clarity with 4,5 and finally ease of use with 4,35.

## 5 Conclusion and further work

To achieve goals in organizations, people working together must have effective and efficient collaboration processes, and they must be able to bring the intellectual capital of their organization to bear on their task. Subsequently, it should be useful for KM and Collaboration systems to integrate both kinds of capabilities into a single collaborative-and-knowledge system to support joint efforts towards a goal.

We have reported on a study of the relationship between collaboration and knowledge management. Successful knowledge management projects encourage and enhance collaboration between employees. It is essential to have collaborative services and design and define activities convey a good collaboration based on the design of activities, considering aspects related to roles, people, and task.

As future work, we will define guidelines to use the model easily. Also, we want to use the model and validate it in different scenarios to specify some collaboration patterns.

## Statement of conflict of interest

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

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