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The use of community to organize knowledge: the case of an energy company

Abstract: This research conducted within an energy sector company brings together both information systems and knowledge organization (KO). Our proposal, based on a case study, analyzes the 'interface' question in a firm through the building of an information system dedicated to the organization of knowledge within a community of practice. Through this case, we will develop an approach related to KO/technologies and by considering the discipline as a way of having a common understanding in a community of practice. Moreover, by sharing the same knowledge, it is also a way to render communication efficient between the member of this community.

Introduction

In this political and economic understanding of the society that is the 'Information Society' or the 'Knowledge Society' (first used by Drucker (1969) then by the UNESCO), the question of how to organize the knowledge is essential. From decades knowledge organization systems (KOS)[1] such as classifications, and documentary languages, topic maps, ontologies (more recently through the use of information technology), were developed in order to optimize the way we use knowledge.

The organization of knowledge can be thought of through the prism of digital technology because the theoretical framework of knowledge organization (KO) allows us to 'develop methods to guide effective practices to exploit our knowledge in a digital environment which is now crucial' (Beau, 2012, p. 1). The knowledge organization system in this way, 'constitutes a common language, either for the design of an information system, or, more generally, for sharing knowledge concerned by different carriers. It can be used as a framework to express knowledge shaping in the field in as comprehensive and complete manner as possible' (Mahé *and al.*, 2010, p. 66). The objective of these KOSs is therefore to 'define principles for describing a domain to facilitate the classification and search for more or less abstract items: documents, persons, places, products, opinions or activities' (Zacklad and Giboin, 2010, p. 8) and thus facilitate knowledge dissemination. Moreover, in organizations where dematerialized knowledge, or even produced natively in digital formats, has become prevalent (Martínez-Ávila, 2015; Fujita and Ribeiro Pinheiro, 2016).

The concept of interface can be viewed as a user interface in order to access to knowledge. In KO publications, authors are using generally the term 'interface' in this meaning. However, an interface can also be seen as a pathway between groups of people or inside a community (here for instance between science and society (Puente-

[1] https://www.isko.org/cyclo/kos

Rodríguez, Bos and Groot Koerkamp, 2019)). In this article, we will explore the interface aspect, not only as a computer interface but to show how a KOS can serve as an interface between a community and the rest of the organization.

In this paper, we will focus on the interface aspect of knowledge organization as follows: we first, develop our literature review in order to define more precisely the research questions and scope. Then we define our methodology, show results and our findings that are going to be discussed. Finally, we show our search shortcomings, conclusion and limits**.**

Literature Review

According to Broughton *and al.* (2005, p.133), the concept of KO is mostly about the use of knowledge organization system (e.g., classification, thesauri, semantic networks) and the process of organizing this knowledge. If KO is mainly related to 'memory institutions', many organizations are working now over the way they organize their knowledge. In this article, we will focus over this KO dimension in a private organization to highlight an aspect related to KO: the interface dimension.

The professional context in which the members of an organization operate is then a specific context in terms of knowledge organization. This forces the organization to create its own organizational model and technical systems to best meet its objectives by empowering its employees to act.

Knowledge produced within an organization can be considered as organizational knowledge (Bibikas *and al.*, 2008; Coakes, Coakes and Rosenberg, 2008; Yang, Fang and Lin, 2010) as an entity is able to produce new knowledge regarding its needs and then disseminate it throughout the organization (including in services, products or systems (Nonaka and Takeuchi, 1995). This production of organizational knowledge is related to the actions of members who are part of the whole (the organization) and create in the context of their mission, this knowledge 'to some end' (Nonaka and Takeuchi, 1995, p. 58) for this whole. Before becoming organizational knowledge, knowledge is already individual or even communal within a group (Merali, 2000; Allard, 2004;

Kaschig, Maier and Sandow, 2016). In his research Brix (2017) illustrate those three level and type of knowledge:

Unit of analysis	Types of Knowledge	Comment(s)	References
Individual	Personal knowledge *(Created as a process of intuiting and interpreting)*	Knowledge is created by the individual using his/her educational, vocational and avocational backgrounds and experiences. Learning is cumulative building on existing knowledge and hence more difficult in novel domains. "How can *I* know what *I* mean until *I* see what *I* say"	Cohen and Levinthal (1990) Crossan et al. (1999) Nonaka (1994) Weick (2012) Brix (2014)
Group/team	Collective knowledge *(Created as a process of interpreting and integrating)*	Knowledge is created and converged as a 'negotiation of meaning' as well as collective sensemaking and sensegiving processes between individuals. "How can *we* know what *we* mean until *we* see what we say"	Crossan et al. (1999) Gioia and Chittipeddi (1991) Weick (2012) Nonaka and von Krogh (2009)
Organizational	Organizational knowledge (*Created as a process of integrating and institutionalizing)*	Knowledge must be documented and/or used as part of the organization's intellectual capital, e.g. in work processes, routines and in IPR-related documents. Knowledge is embedded in the organization's culture and it is collective (or available e.g. via transactive memory systems). People know *how* to act and react to certain situations, and most often also *why* their response to the situation is appropriate.	Weick (1995a) Crossan et al. (1999) Rozenblit and Keil (2002) Argote (2011) Brix (2015)

Figure 1: the three type and level of knowledge according to Brix (2017, 116)

The willingness to share knowledge among employees remains fairly recent (in relation with the development of knowledge management (Bell DeTienne *and al.*, 2004)): 'organizations have only recently begun to expect their employees to consistently share and exchange knowledge; in the past, organizations typically urged workers to pursue individual goals and rewarded them on the basis of individual performance and knowhow' (Biron and Hanuka, 2015, p. 655) and this with the aim of being competitive (Chen and Fong, 2015; Martinez-Gil, 2015).

The community has an essential role in the production and management of organizational knowledge by considering that 'real knowledge management is not possible without true community' (Hassel, 2007, 193), in fact 'in a strict sense, knowledge is created only by individuals. An organization cannot create knowledge without individuals' (Nonaka and Takeuchi, 1995, p. 58); from individuals, knowledge can become organizational by being shared in communities of practice and more broadly in the organization. These statements resonate with Hachour's (2011) who thinks that by allowing, in the communicating organization, to co-construct meaning that 'emerges within communities and that its analysis should not be dissociated from the social, historical, cultural and political dimensions' (Lemke, 1995, p. 9 cited by Hachour, 2011, p. 202).

Thus, individual knowledge can become 'organizational' by being shared in the communities of practice and more widely in the organization. The professional situation in which the members of the organization operate is in fact a specific context in terms of knowledge organization. For instance, an action carried out by a member of the organization involves a 'situated action' (Guyot, 2000) and therefore to a situation where the actor is confronted with a need for established knowledge, or even the production of a new knowledge if the technical situation is a new one. The knowledge produced

therefore comes from the professional context in which the need to solve concrete problems appears.

This idea is in line with the fact that 'the collective competence of actors is based on the existence of networks that ensure knowledge sharing' (Alter, 2000, p. 267). This situation can be illustrated by Castro Goncalves (2011) who highlights the fact that learning in an organization is supported by interactions between individuals confronted in their tasks. If those researches illustrated the role of community to create knowledge, however, it remains the question of how this community can organize knowledge the way they need it. In many cases, KOS are controlled at the organizational level by experts that are in a 'for use' approach (Folcher, 2015). These systems are set up, developed and mediated by experts who are sometimes quite far from the operational situation. They, then design these systems in a logic 'for use' before being set out for the actors. Instead of developing them in a 'in use' (*ibid.*) approach, in which end-users' usage patterns are registering in the developed software. This approach is then a source of legitimization for the system and a way of sharing the view of the community regarding the way they organize knowledge toward the rest of the organization.

Context of the research and methodology

In order to investigate this question, we choose a case study approach in an organization. The data collected allowed us to design this progressive development of a new KOS. It is a result of a one-year participating observation (Bastien, 2007). Other data were collected during workshops aimed at identifying more precisely the expectations of future users.

The company 'Alpha' is an important company in the energy sector, according to the INSEE nomenclature, which operates throughout France. The population of our study (also called 'Territorials' and represents around 45 individuals) is located in the Île-de-France region (IDF) and works in public relations positions. We can describe those 'Territorials' as community of practice (Wenger, 1998) since they share codes and routines that are part of the collective's social practices (Coulon, 2002); they have then internalized the values conveyed by this community and its system of representation. Quarterly meetings, gatherings and seminars organized during the year are opportunities for them to meet, exchange and at depth to strengthen their capacity to produce practices. The use of systems is then limited to devices such as e-mail, calls or 'business' software, but without any specific space for organizing the knowledge of this community or facilitating its sharing. As part of their job, in relation with local actors, the knowledge they produce is kept individually by employees or sometimes recorded in textual documents or even in Excel spreadsheets.

Results

'Territorials' are in a logic of 'actionable knowledge', i.e. knowledge intended to produce an action and effects (Argyris, 2003), that the business software (call @T) they used before does not allow. In the case of @T, its use has never been approved by the 'Territorials' but was imposed by the national management as a case tracking tool. Since

its implementation in 2012, the ‘Territorials’ have been constantly developing other systems that better meet their needs for information and project monitoring.

The request expressed by the ‘Territorials’ was the construction of an information system allowing to create links between their data, actors, projects and territories in order to have actionable knowledge. Progressively, the participants in the workshops noted that the observations regarding the system could not be carried out independently of those concerning their practices. They even had an official mission letter from a member of their steering committee to pursue this aim. In conjunction with the technical part, the associated approach has been reviewed to identify current practices. Far from simplifying an approach of technical determinism or innovation determinism, the technical system is built through practice and use and goes beyond technical aspects in order to bring about through its mediation action a set of translations that build a sociotechnical ecosystem that has not yet stabilized (Hoareau, 2014).

It is on the basis of this observation that the ‘Territorials’ have developed an entity-association or entity-relationship scheme proposed by Chen (1976). This is how the KO dimension emerged in the project. This work on the system is essential, an information system is above all a symbolic system of representation (Bélisle, 2002) which is mobilized here and which we had to present/model through the entity-relationship scheme and the vision on their profession so that this view can be implemented in the final product. This is then composed by representations designed and interpreted by the ‘Territorials’ (business classifications, integration of their processes, etc.) and links collective and/or individual actions by a technological base. Regarding their needs and the solution that was developed to answer practically to them, the KOS is then a hybrid one that aggregate: terminology (in order to have a common vocabulary between them), a knowledge base (in which they can preserve their knowledge) and also a semantic network (this semantic network is inspired by linked data, yet it’s simplified by using the graph database NEO4J. This database allows storing data and create semantic relations between them). The result of the semantic network looks like a topic map in the user interface in order to allow them to ‘navigate’ through their knowledge and their concepts/entities figure N° 2:

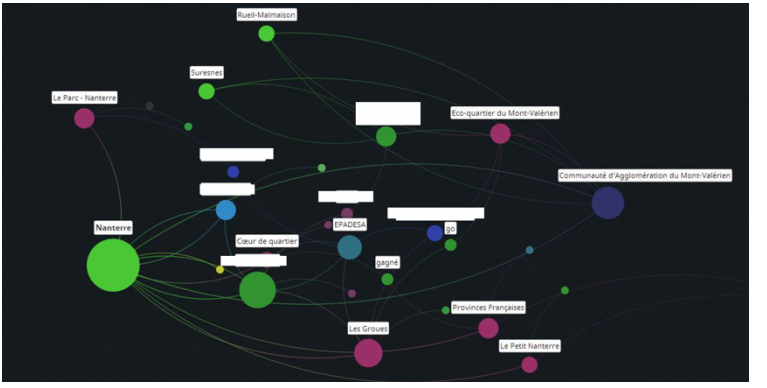

Figure 2: illustration of the use of the semantic relation between data (first prototype of the information system)

All those elements aggregated in the final hybrid KOS are interoperable in order to facilitate the communication between the components and the other information system in the organization.

Regarding the individual, community and organizational level, we can summarize the results at those levels through the Table N° 1 bellow:

Table 1: Comparison between individual, community and organizational level using the information system with hybrid KOS

Individual level	Community level	Organizational level
Save time with faster identification of the right interlocutors for a project.	Harmonization of practices and vocabularies between IDF 'Territorials'.	Implementation of knowledge continuity.
Simplification for tracking information and fewer various information flows.	Construction of a socio-technical system so as to become a virtual community of practice.	Use of a new technology within the organization: graph-oriented databases.
Consideration of their requests and recognition of the specificities of their activities.	Work of reflection on their job and the way it is done.	Enhancement of the organization's information assets in order to make it more efficient.
Deduce new information or knowledge through graphic modeling which becomes a support to the analysis of 'Territorial' data.	Possibility to do more collaborative work. By adding data and information via the online tool, they enrich their collective knowledge heritage which can then be consulted and used by all.	Valuing the members of the organization by showing consideration for their needs or expectations.
Capturing weak signals and setting up inductive logic from the visualization.	Production of values, practices, benchmarks for community members.	

It's obvious the system plays an interface role at various levels and results of its actions would depend on this level.

Discussion

By designing the information system 'in their uses' and practices, and by questioning their profession, this seems to be an approach that limits the risk of rejection and makes it closer to operational reality. From an organizational point of view, the development of a specific information system shared by the 'Territorials' raises questions about their extremely individualistic culture (for instance address book is a tool for their work and at the service of their careers) to a more collaborative culture. In this case, the creation of a sharing vocabulary in the hybrid KOS is an opportunity to reinforce the common culture.

By building their KOS, 'Territorials' also make an important analytical work related to their knowledge and their needs of knowledge. To illustrate that, during one workshop arise the question of how to preserve and use of knowledge when someone is leaving the organization? As we know, when a member of the community leaves, the loss of its knowledge for the organization can be detrimental. The implementation of a mechanism to ensure continuity and allow the community to fulfill its mission is then to be considered in a 'knowledge continuity' (KC) strategy (Ermine, 2010; Biron and Hanuka, 2015). It is to alleviate this situation but also to harmonize the practices of the members and strengthen the sense of belonging to this group (Ellison, Steinfield and Lampe, 2007) that an information system was developed on their initiative and with them to transform this community of practice into a fully-fledged virtual community of practice (Tessier, Bourdon and Kimble, 2014).

In this case, we can estimate that this hybrid KOS is then an interface at various levels:

- It is an interface between the members of the community of practice that enhance (first of all) the possibility of sharing knowledge. The development of a common controlled terminology or of a semantic network is then useful to reinforce the community of practice and harmonize practices. Moreover, it's also an information system that allows them to have a clearly cut idea about their work, their needs of knowledge related to their uses.
- It's an interface between the community and the organization (and therefore other employees). In this specific case, as the community develop its own KOS, they do formalize the way they organize knowledge and how they consider the environment in which they evolve. Furthermore, by using a technological system, it's an opportunity to reinforce interoperability between their system and the rest of the organization's information system through the use of API (application programmation interface) for instance or the sharing of the used terminology.
- It can at least, be considered as an interface between the community and future members (or new members) in order to facilitate the integration inside the community by facilitating the access to a shared language and to share knowledge. Then, the KOS enhances knowledge continuity during the time that the community is existing.

This situation underscores the importance of a dualistic evolution of the system and the user, in fact, the user must adapt within the framework of co-evolution where adjustments are made both by the user and to the technical system for optimal operation (Bourguin and Derycke, 2005). By authorizing employees to develop their information system, the organization's hierarchy delegates its ability to control and organize their knowledge. Thus, this KOS will have an important dimension as an interface between various communities in the organization.

With the new system, the 'Territorials' found themselves facing a situation where they had to produce new explicit knowledge, and, furthermore, must have a thinking

over the way they organize it in order to use it in an efficient way. The system develop was designed by the future users for collective use, in particular with regard to the knowledge related to the realization of their profession. The appropriation of the information system by the users is then facilitated ('in use' approach) contrary to the devices made by providers but benefiting from institutional legitimacy ('for use' approach).

Conclusion

This article focused over the study of the building of an information system that is a hybrid KOS (including shared vocabulary, knowledge base and semantic network) by its future users. 'Territorials' did an analytical work over knowledge, their knowledge needs and the way they can organize it in order to realize their missions. At that time, this KOS is then an interface between all the 'Territorials' that are going to use it and even with the future members of this community.

By building themselves, the aim is to ensure that the KOS is related to their uses. In this configuration, the organization allowed them to create in fact an interface between this community of practice and the rest of the employees.

Throughout this article, we highlight the interface dimension of KO regarding the effect that the development of an information system as a hybrid KOS has over a community of practice and by extension, to an organization.

Limits

At this stage of experimentation, the project is operational on the scale of a single region, but its extension to all regions is envisaged by the national management, which supervise the activity of the 'Territorials' if the results on the IDF are convincing. However, as we shall see in the second practical example, regional specificities are sometimes such that there is a strong disparity closely linked to the local context.

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