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Knowledge Nodes: the Reification of Organizational Communities. The Pizzarotti Case Study[1]

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Abstract: In our work a new approach, the Distributed Knowledge Management (DKM) approach, is used and organizations are seen as constellations of communities, which "own" local knowledge and exchange it through meaning negotiation coordination processes. In order to reify communities within a DKM system, the concept of Knowledge Node (KN) is used and then applied in a case study: a complex Italian national firm, the Impresa Pizzarotti & C. S.p.A. All communities of practices are unveiled and reified as KNs within a high level architecture of a DKM system. In this paper it is argued that, even if knowledge has to be organized and made useful to the whole organization, there are types of knowledge that must be managed in an autonomous way, and the DKM approach is a good system to deal with coordination/negotiation processes.

Key Words: Distributed Knowledge Management, Communities, Knowledge Nodes

Category: H.4.2, C.2.4

1 Introduction

Most KM systems aim at creating large, homogeneous knowledge repositories, in which corporate knowledge is made explicit, unified, represented and organized according to a unique – supposedly shared – conceptual schema (e.g. an ontology, a classification system) [Davenport et al., 1998], [Borghoff and Pareschi, 1998].

In this work it used the DKM approach [Bonifacio et al., 2002d] in which it is argued that traditional KM systems, and in particular the unique and objective conceptualization of corporate knowledge, are incompatible with the very nature of knowledge, and consequently are often deserted by users. The DKM approach is based on two main principles: the principle of autonomy, which grants organizational units a high degree of semantic autonomy in managing their local

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knowledge (perspective making [Boland and R.V.Tenkasi, 1995], or single loop learning [Argyris, 1999]), and the principle of coordination, which allows each organizational unit to exchange knowledge with other units through processes of perspective taking [Boland and R.V.Tenkasi, 1995] or double loop learning [Argyris, 1999]. Therefore, complex knowledge-based organizations can be seen as "constellations" of local "knowledges", that is to say organizational units either formal (e.g. divisions, market sectors) or informal (e.g. interest groups, teams) exhibiting some degree of semantic autonomy, namely the ability to manage knowledge locally and to develop a specialized perspective on the world through social interaction, participation and reification processes [Wenger, 1998].

A KM system, which supports both the principles of autonomy and coordination, and is based on the DKM approach, is called DKM system, which considers local heterogeneity, and negotiation/coordintation of different conceptual schemas [Bouquet et al., 2002], as potential sources of new insights/ideas and innovations which are the basis of organizational learning and adaptability.

2 Knowledge Nodes as organizational units

In order to develop a DKM system within a firm, the new concept of Knowledge Node [Bonifacio et al., 2002a] is adopted to reify organizational units.

As shown in figure 1, each KN represents a semantically autonomous unit composed, in other word a community of practice, by:

- *a knowledge owner:* an individual or a collective entity that has the capability of managing its own knowledge (e.g. worker, manager, team, community, office);
- *a system of artifacts:* the system of procedures, activities, documents, archives, technologies, languages, and so on, used by the knowledge owner to manage local knowledge in a way that best suits its environmental condition and its needs;
- *a context:* an explicit representation of a knowledge owner's perspective (or personal conceptual schema).

Therefore a DKM system is composed by a "constellation of KNs" (see figure 2), each one managing knowledge in an autonomous way, and exchanging knowledge through negotiation/coordination processes. One of the most suitable technological solutions for a DKM system is the creation of a peer to peer system, in which each peer has the characteristics of a KN [Bonifacio et al., 2002e][2].

[2] This architecture is under development as part of EDAMOK (http://edamok.itc.it/), a joint project carried out by the Institute for Scientific and Technological Research (IRST, Trento) and by the University of Trento (Italy).

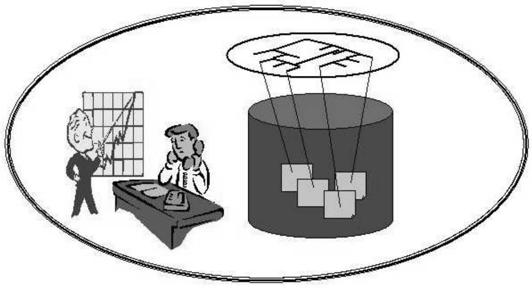

Figure 1: Knowledge Node

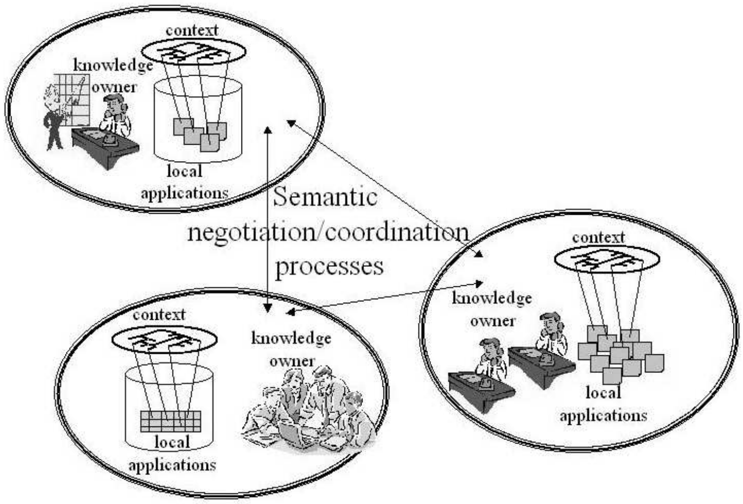

Figure 2: A DKM system composed by KNs

3 The case study: Impresa Pizzarotti & C. S.p.A.

In order to develop a DKM system within the firm, an effective methodology of analysis is needed. As described in [Cuel, 2003] and in [Cuel, 2003] this methodology has to focus the attention on two relevant aspects based on the two DKM's principles:

- identify the borders of existing KNs within the firm, namely organizational units which exhibit some degree of semantic autonomy (principle of autonomy);

– identify the way in which knowledge is exchanged across the whole organization through negotiation/coordination processes (principle of coordination).

This methodology has been applied to a complex Italian building industry, the Impresa Pizzarotti & C. S.p.A. The aims of the analysis were:

– to develop a high level architecture of KM systems based on the DKM approach, unveiling KNs and their relations;

– to figure out which kind of knowledge can be managed within an autonomous organizational unit and how it can be made available to others.

Pizzarotti & C. S.p.A. has a complex organizational model because of the nature of the product and the characteristics of the sector. Production processes need to be localized in the areas in which the product is created, therefore building yards are spread out over the country and in Europe. The central offices are organized as services which support the production (e.g. the security office, the quality office, the administration office), and since they are located in the same building, each service has its own organization and structure.

To unveil KNs we made ethnographic interviews with 36 workers selected in different offices and in 16 different roles, and we visited 3 different building yards. This analysis allowed us to unveil KNs looking at knowledge owners, the systems of artifacts, the contexts and, more importantly, the kind of knowledge that is exchanged within a community and the way in which people negotiate/coordinate knowledge across the whole organization. Each building yard must solve specific problems which are connected with the kind of production, and other environmental factors (e.g. the weather, local costumers and suppliers); and each service office has its own structure and its own way of working which expresses semantic autonomy. Each one of them is managed in an autonomous way, and a specialized system of artifacts are used in the way that best suits local needs. Moreover, in this analysis some other cross-organizational communities, which exhibit some degree of semantic autonomy, have been discovered: the group of project managers and the group of yard managers. These groups are not formally recognized by the firm, and are composed by workers (belonging to several other units) who need to manage knowledge according to a particular conceptual schema, and to use a personalized system of artifacts in order to work. For instance, the project managers communicate all together in an informal way (e.g. phone-calls, discussions over a cup of coffee) to develop common knowledge and a shared conceptualization schema that are used to develop new projects; they share systems of artifacts (such as specific timetables) and a specific language (such as technical words) which allow them to manage their work.

Within each organizational unit (e.g. offices in the central building, and building yards), people, through their work, exhibit some degree of semantic

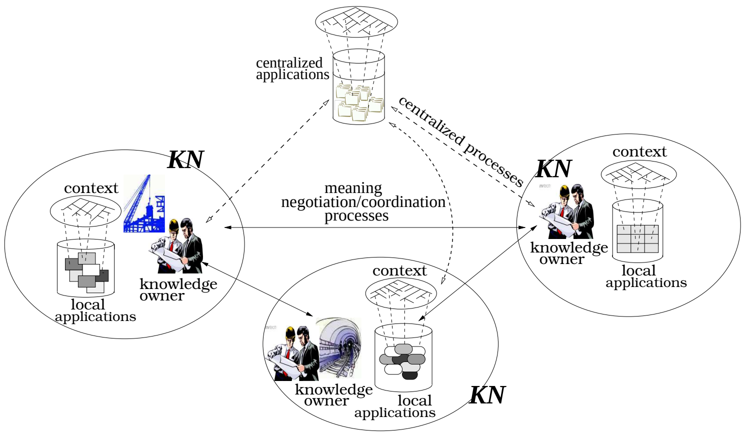

Figure 3: DKM system of Impresa Pizzarotti & C. S.p.A.

autonomy (e.g. by developing their system of artifacts, different working and problems solving practices, using specialized and personalized languages), thus the Impresa Pizzarotti & C. S.p.A. might be seen as a constellation of communities of practices (CoPs). Therefore, local building yards, centralized offices and cross-organizational communities have been unveiled and reified as KNs.

We observed that concepts as quality, security and so on, are perceived – and related processes are developed – in different ways. For example, on one hand, in the "Barilla" building yard, the quality control process is not a daily activity managed by dedicated resources and it has no specific schedules. On the other hand, in the "Fontanellato" building yard, the quality control is one of the most important processes. In particular, every days workers have to control the quality of products and activities and periodically they meet all together to discuss new quality procedures.

As shown above, in our analysis, we focused the attention on identifying the way in which knowledge is exchanged across the whole organization. These processes are often unveiled through negotiation/coordination processes such as workflows management systems, shared artifacts, and institutionalized practices within the firm (e.g. software procedures, modules for requests, periodic meetings). From a KM perspective, the Impresa Pizzarotti & C. S.p.A. has historically developed standardized and shared knowledge repositories (which are managed according to a set of common and supposedly shared conceptual schemas) with the aim to manage a unique version of data, and to coordinate all the organizational processes. These schemas include, for example, shared taxonomies to classify suppliers, and project documentation or quality procedures developed and managed by the Electronic Data Processes (EDP) office. Indeed, during an interview, the responsible of EDP office said that his work consists in controlling data and information workflows developed within the organization. Workers ask to develop personalized systems which support some specific processes, but the management and the EDP office are worried about the coherence and the transparency of information. Thus centralized procedure are developed and used across the whole organization but offices and building yards are still asking to use specialized procedures which suit local needs.

We discovered that the centralized KM system has been developed according to the need, expressed by the management, to coordinate each organizational unit creating a common and shared knowledge system, and developing standardized knowledge exchanging processes. Such approach, that was reified in the design of collaborative repositories and workflow applications, revealed some weaknesses which are basically rooted into the distributed nature of knowledge introduced above. As observed during an interview with a manager, if in a building yard a new type of stone-mason's hammer is needed, workers have to draw up a buying request form, then send it (through a document management system, which will store all the information into the enterprize knowledge repository) to the purchasing office which will provide the requested tool. The buying request process is a centralized workflow, developed to deal with the centralized repository and to coordinate all the buying processes of the whole organization. ¿From a KM point of view we can say that the buying request successfully reflected a unique conceptualization schema according to which knowledge is stored and organized within the enterprize knowledge repository.

In our analysis we discovered that quite often the buying request process, although technically correct, is not enough to obtain a good result. In particular, every time the tool requires specific characteristics, the requester and the company buyer need to exchange additional contextual information using informal communication channels which are not officially considered in the collaborative system. In the analysis it has been emerged that most of the time the buying request refers to a non standard forniture (such as a special hummer, a new mechanism, . . .), and in the most of the cases the purchasing office is not able to understand the real needs of requesters. Phone calls, meetings or emails are necessary to establish a coordination process based on meaning negotiation through which workers attempt to make clear "what they mean by what". These communication processes between company peers (who are part of different offices or CoPs) are not formalized by the buying work-flow, and are developed according to the personal perspectives of the actors. In other words, formalized processes of knowledge exchange are constantly supported by informal and personalized meaning negotiation/coordination processes which allow people to understand each other, and to effectively achieve their goals. As shown in this example, and as depicted in our analysis, most of the knowledge exchange processes, developed within the Impresa Pizzarotti & C. S.p.A., are not able to create a unique understanding on the meaning of what is communicated. Therefore the KM system has to take into account the need expressed by organizational entities to manage knowledge with some degree of autonomy while enabling coordination processes across different KNs.

As described in figure 3, we suggest a DKM system which is composed by an enterprize knowledge repository (centralized applications which are organized according to the firm's conceptual schema) and a constellation of KNs which autonomously manage local knowledge, and exchange it, through personalized meaning negotiation/coordination processes.

According to this view, the Impresa Pizzarotti & C. S.p.A. has recently accepted that current knowledge exchange practices and artifacts are, as a matter of fact, characterized by a strong need of autonomy that must be sustained and compensated focusing on coordination rather than standardization. For example, in terms of artifacts, groupware tools are being customized and used in a way that clearly mirrors how work and knowledge is actually organized within and across different KNs. In fact each yard, office and team is now able to instantiate and maintain its own local repository and work-flow processes. Organizational procedures are gradually being redesigned accordingly, allowing each yard, for example, to autonomously manage some core processes, such as purchase of specific materials, or the recruitment of specialized workers. For example in the Modena SCARL different views are used on a common DB, such as general notes, services, production, visits, security, quality, and so on. As a consequence, the EDP office and IT consultants will now focus their efforts in designing coordination/translation processes across heterogeneous nodes of content, document work-flows, categorization and taxonomies rather than developing shared and standardized procedures. The EDP office is now developing two different systems in which information about human resources, dedicated to administrative function, are managed in the central offices and in the building yards. These two applications refers to the same domain of data but manage them through different schemas.

4 Conclusions

Through our interviews, we focused the attention on different kind of knowledge which is needed and exchanged within the firm. In particular, we proved that even if some kind of knowledge has to be centralized, organized, and managed by EDP office according to a common and shared conceptual schema, there are other types of knowledge that must be managed in an autonomous way and have to be negotiated and coordinated every time. Finally the DKM system we proposed in figure 3, seems to be more effective than other traditional and centralized systems, because it allows people to manage knowledge according to personal views, and it seems to be more consistent with how knowledge is actually managed by people. In conclusion the Impresa Pizzarotti & C S.p.A. is developing both new personalized and local procedures which allow CoPs to manage knowledge in the way they prefer; and new centralized procedures, which enable workers to contribute to the common and shared organizational knowledge.

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