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MOBILE KNOWLEDGE WORKER.

Theme: The Social Processes of OL and KM

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Abstract

The work presented in this paper is based on the MILK project. MILK (IST Project 2001-33165) is the acronym of Multimedia Interaction for Learning and Knowing. Partners of the MILK project are Irso (coordinator), Butera e Partners, Orbiteam, University of Milan Bicocca, Domus Academy, Fraunhofer Institute, PictureSafe, Xerox Research Centre Europe, Xerox Global Services. This paper is focused on the dynamic idea of knowledge management as a way to enable learning, communication and networking processes between and within communities of practice made up by knowledge workers. As knowledge workers become more and more mobile, often changing working environments between being in the office and being out e.g. by a client or working from home a knowledge system based on the "the right knowledge at the right time" is introduced and related to different working situations in which mobile knowledge workers need different information and knowledge and different communication channels.

Introduction

Nearly 80% of leading companies worldwide have some knowledge management efforts under way. Some of them have already established a clear pattern of knowledge management responsibilities within their organisational chart by including chief knowledge officers, knowledge managers and knowledge champions.

A knowledge management programme is often related to organisational development, change management and human resources management issues, such as training and continuous learning. This is due to the fact that knowledge management and organisational learning represent two sides of the same coin. A knowledge-based innovative organisation takes care of individual learning and knowledge sharing processes and is a 'community of communities', where people are used to, and encouraged to launch, new ideas to innovate processes, practices and products.

This paper starts from the assumption that knowledge management can increase the overall organisational value, in terms of performance and company market value. Business processes are made of different workflows: material flows, financial flows, information flows and communication flows. Communication flows as they are often intangible in nature are often hidden for the organisation.

A knowledge management system should support communication processes with the objectives of: 1) transforming tacit knowledge into explicit forms, and 2) to facilitate "inspiration"/knowledge creation/idea generation. Following this approach, an effective knowledge management solution improves and supports operative processes and provides a growing set of learning opportunities by improving access to the pool of information and knowledge that belongs to people and communities, allowing also the retrieval of expert knowledge through people experiences tracking.

In this regard traditional knowledge management solutions, which are PC-centric/office-centric, are not adequate because more and more knowledge workers are mobile during a significant part of their daily working. While being out of the office mobile knowledge workers are in need of:

- Constant access to existing organisational knowledge
- Tools to manage explicit knowledge both on servers and on laptops
- Make expert knowledge ("who knows what") visible and accessible
- Produce new documents and information
- Share tacit knowledge with colleagues (in a work environment where people have little opportunities for face to face meetings)
- Take part of, and integrate the knowledge of communities working in different physical locations.

Starting from the theoretical background, this article describes the work done in the MILK project in order to identify user needs with a focus on mobile knowledge workers. Methodology and theoretical tools are explained.

Theoretical background

Tacit and explicit knowledge

We have argued that a knowledge management system should support communication processes with the objectives of: 1) transforming tacit knowledge into explicit forms, and 2) to facilitate "inspiration"/knowledge creation/idea generation. It implies that a knowledge management system has to manage two different kinds of knowledge: tacit knowledge ("kept in people minds") and explicit knowledge (memorised through Information and Communication Technology and paper supports). The analysis of knowledge creation and transfer is based on a model developed by Nonaka and Takeuchi (reference).

The most important objective of knowledge management related to organisational performance is, according to Nonaka and Takeuchi, to support knowledge creation, to ensure that such knowledge becomes collectively shared by organisational members, and effectively used in business processes. Knowledge creation is explained as interactions between tacit and/or explicit knowledge resulting in the creation of new knowledge. This process takes place in a shared context among people, referred to as "ba", which can be physical (e.g., office, dispersed business space), or virtual (e.g., e-mail, teleconference), or mental (e.g., shared experiences, ideas, ideals).

Communities of practice

The community of practice is as "an informal aggregation of people who share work practices and common experiences" (Wenger E., 1998). A Community is a strategic tool for the production of knowledge innovation processes. It is characterised by some key elements:

1. Spontaneous participation: participation in the community is a personal, self motivated choice.
2. Common goal (shared needs and problems). Relationships between community members are based on a common objective; people share needs, activities and problems.
3. Social network relationships and strong interaction between people promote the social construction for knowledge and information diffusion.
4. Common repertoire (experiences, actions and technology) people create a common sense making of the world, a common language and a common model for actions.

Furthermore, a community is also characterised by a lack of formal structures even if community members share common standards and rules. Communities cannot be designed nor managed through top down processes: they grow up spontaneously and should be recognised and cultivated to make them additional arms of the organisation.

The 4C organisation

A knowledge-based organisation, where learning processes are enacted promoting innovative and change processes, is characterised by some key elements (Butera, 1999). Professional Communities represent the first one, where people share needs and interests, values and scope, language and practices. Business processes and work practices are supported by extended Communication and tight Co-operation so that Cognition, information and knowledge flows are externalised and become more accessible for users. Through this network, people at all levels (inside or outside the company, independently from the business process or the working team they are involved in) are actors in the main knowledge processes and in the construction of common spaces of culture, sense, goals and activities – important promoters of different "ba" within the organisation.

The "Seductive Design Approach"

The approach chosen to design the Klee&Co and the MILK solution is strongly focused on integration between users, technology developers and designers (Agostini et al, 2000). This approach has been chosen based on the experience of involved partners that in order to support an effective implementation and use of knowledge management systems in organisations these first and foremost have to be understood, used and useful for Users, which means that users should be involved already in the early stages of system development.

In Klee&Co and MILK, users are company employees and managers accessing the knowledge management system during their working processes, as knowledge providers and/or knowledge users, depending on their role and on the activity they are carrying on. In this way system design is based on an understanding of working needs and culture of users, according to their common practices. Users practices and culture can be identified using ethnographic analysis methods, starting from the observation of daily working situations.

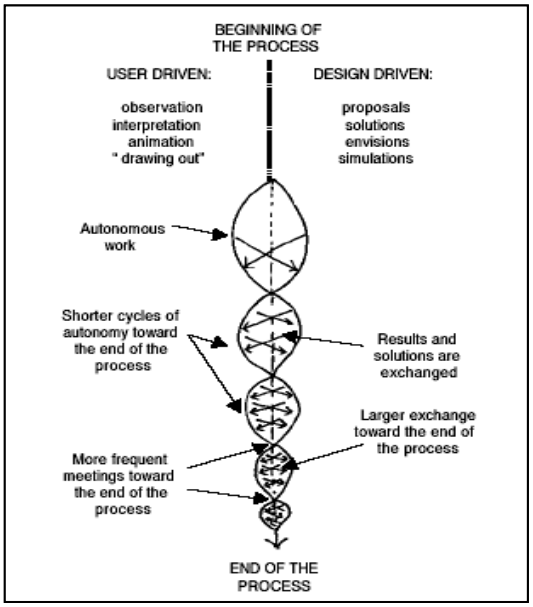

Figure 1. The seductive design approach

Technology developers should be involved in the programming and system integration activities in order to translate users needs into system functionalities.
Designers' involvement in the system development is an innovative method to enlarge system capabilities from the beginning: it means to include usability aspects and interface issues according to users needs and attitudes. An effective knowledge management system, in order to be used, has to be "appealing": "process oriented interfaces" should be replaced by "user centred interfaces.

The organizational context

In the MILK project we have analyzed two different organizations: a consultancy firm and software house, both belonging to the new economy context and based on knowledge intensive activities. Even if they have very different business focuses they seem to be very similar concerning social practices and knowledge management issues.

They are both project based which means that their workers are expected to work on different projects, with different customers located in different sites. Knowledge workers of these two organizations are used to work also while they are moving from one site to another: they usually do telephone calls from the taxi or the train to fix appointments with their clients and to discuss project content and management with their colleagues. Even if when they stop they still are mobile: they are always connected with the whole world through internet and emails, even during meeting at the customer site they may leave their mobiles switched on to recive SMS and to quickly reply to urgent messages.

Thus, all the business activities– Thus the major part of working activities are in these companies characterized by high mobility. In the following section a short description of the two organizations is introduced.

An Italian Consultancy Firm

The company is a leading Italian management consultancy firm in the fields of change management, organisation, HR, Knowledge Management and Customer Relationship Management. The company provides high-level professional services to major enterprises and government agencies and has, during the last 30 years, built up a solid reputation in the Italian market. The firm was founded, with an international imprint, in 1997 as a spin off of a research institute (with an experience of 25 years in research and consultancy).

The company has be fast growing over the last three years, with a steady growth of 25%, and employs currently about 50 professionals and 9 staff members located in Milan and Rome. It is passing from a smaller group of experienced professionals to a more structured company, with a formalization of both core and support processes and a wider management team. The firm has had 50% newcomers in the last two years, mainly newly graduated from University. All the professionals spend most of their time (80%) in front of their customers fast moving from one place to the other and switching from one activity to another.

Clients include the major Italian companies (such as FIAT, Telecom Italia, Tim, Monte dei Paschi di Siena, Alitalia, Il Sole 24 Ore), Italian branches of international companies (such as GlaxoSmithKline, Johnson & Johnson, Vodafone-Omnitel, Microsoft, Coca-Cola, etc) and public agencies (Ministries of Education, of Finance, of Treasury, the National Social Security, Regione Lombardia, Regione Emilia Romagna, etc).

The firm's approach to consultancy aims at entering into partnerships with the client in order to build a “tailor made” solution that lasts over time: each project gives rise to a specific, in-depth understanding of the clients' organization and needs, aimed at devising tailored solutions to maximize effectiveness and quality of working life.

The firm’s core competence is the ”socio-technical” design, i.e. integrated design of information and communication technology, organization and human resources development. Its services include: service strategy and design, change management, organization design and development, management control systems, process design and redesign, design of ICT architectures, human resource development, management and knowledge workers training.
Prevailing projects are oriented at jointly optimizing technology, organization, and people management in the world of e-business and e-government development.

The software house

The company is a leading German firm founded in 1992 and experiences currently a significant growth and development phase. The firm employs 60 people, located in 3 offices within two sites: Hannover and Hamburg in the beginning of the 1990s. The company’ core business is providing a complete digital asset management (DAM) solution under a single roof: software development, MSP – Managed Service Provider, Hotline and support and consulting services.

Three are the main products offered by the company: one is focused in leveraging multimedia databases to provide a professional platform for managing the day-today task of media

production and marketing communication; one represents a solution to the challenge of effectively marketing and production in a media-house (a complete range of text, image, audio and video assets – including content, workflow and copyrights – via internet); one product is a portal-based solution for the syndication of digitally distributed media.

Customers are among national and global Top Ten companies, mostly in the automotive and publishing industry. The core competence of the firm relates to the provision of portal-based solutions for the Intra-, Extra- and Internet through product families specially designed to meet the individual needs of clearly defined user groups and to cover the entire spectrum of Digital Asset Management. At the heart of these software solutions there is a basic technology, which all the products are built on.

The software house is, compared with the consultancy company, characterized by a more heterogeneous population of workers. Because of the technological nature of its business there is a big group of developers (who develop systems functionalities) and supporting staff (people who are in charge of maintaining the system and of assisting clients in its usage) then there are project managers and sales people who are expected to work in direct contact with the clients in order to provide and implement the required solutions and to develop new business. Both project managers and sellers work in high mobility.

Typical working practices and knowledge needs and requirements

The analysis has been realized through the identification of typical working scenarios taking into consideration knowledge networks, working processes and physical spaces in which community of mobile knowledge workers usually works. In the following section some typical scenarios and the related problems in knowledge sharing are presented.

Typical working scenarios

As mentioned before, people, above all project managers and consultants, are used to work at the customer site, where they have formal and informal meetings to discuss content and process for project deployment (see first box in figure 1). These meetings look like traditional meetings where people arrive, have a seat and take decisions about next steps to do, but, indeed, it is not like that. Everything is mobile here; in the sense that professionals involved in the meeting use remote sources to get input for the discussion, they exchange information and knowledge with their colleagues in the office through emails and sms.

Thus, meeting input is not confined to people in the room. Furthermore, it can happen that, while in a meeting, people (decision makers) have to take a stand on processes or events taking place outside the context of the meeting, but which, due to emergency need to be managed and taken care of instantly. It implies that meeting participants act and make decisions while in the meeting.

After the meeting, it happens that professionals have conference call with their colleagues who are in the office (see second box in figure 2). Here information about the meeting is given to the other project members, as they can simultaneously exchange files and other

Figure 2 - Example of a working scenario representation

critical documentation through e-mails. Thus the project team has the information needed and can work very effectively on that. But the problem is that this knowledge is personally exchanged so there is no track of it in the organizational system, neither of the people who acquired it. This means that even if knowledge exchange is very fast and effective among the people in a project, it stays there and it is very hard for other people working on the same client (or similar projects) to benefit from it (reuse).

Moving from one customer to the other or from home to the office, mobile knowledge workers have conversations with other team members to receive information about what happened at client site, they also spend time to fix new appointments, update the agenda, call customers and to look at documents on the laptop (see box 3 in figure 2).

Colleagues can also meet while out of the office, in the airport for example. Here they can hold work meetings in VIP rooms or the like, to exchange information about projects but also about company activities. Both the shared taxi and a VIP room in the airport can in this optic become real offices (so as can a bar or a restaurant).

These mobile knowledge workers work very little in front of their office PCs which is the reason for arguing that traditional KM technology tools, which are PC-centric/office-centric, are not adequate to their typical working practices. Instead they need to enhance their communication tools (mobile telephone, laptop, palmar) functionalities to support their strong mobility.

They also exchange a lot of knowledge in an informal way, while they casually meet in the office, making photocopy e.g., or while having a cup of coffee. These informal discussions represent a key cross fertilization manner for knowledge sharing, which is good, but considering that is almost the only way these organizations have to exchange knowledge this means that knowledge practices and related innovation processes are not properly managed at the organizational level.

Analysis of knowledge needs related to typical working practices

The analysis of typical working scenarios identifies some of the main barriers for effective knowledge sharing and learning processes that mobile knowledge workers usually experience during their working activities.

Knowledge sharing and innovation processes

The organizations are project based and strongly customer oriented, and people work on knowledge intensive processes. According to the fast growing business, workers spend more time by the client and less in the office; therefore there are fewer occasions for informal meetings and knowledge exchange. The analysis underlines two levels of knowledge circulation: inside each project and area of business and among different organizational areas. Knowledge sharing inside project teams is based on personal exchanges by emails or telephone calls, this flow is fast and effective. Knowledge circulation within a business area and with the rest of the organization is mostly based on informal, mainly occasional, meetings among people. So, usually knowledge stays in the projects where it is generated. As, professionals are used to exchange information and knowledge related to their business activities mostly through emails, the number of working emails in people personal inbox is dramatically increasing and the communication flow becomes very hard to manage. In addition, people use emails also to exchange working documents (presentations, new offers, final reports,) and organizational knowledge (what the company is doing, who is doing what, where the firm is going, etc.). This knowledge is partly present in the corporate intranet but it is not linked to daily activities and working practices, so it is not clearly visible to people who need it.
Infact, working activities lack an effective support by, i.e., a document management system. Concerning the consultancy company, the current support consists of a file system implemented on two local servers (one in each office) where documents are organized in a tree by client or by project. Each project team is responsible for the storage, organization and management of its working files and folders within the server. Nevertheless, there is not a well-established procedure for the management of the file system. Thus, the access to new documents and knowledge becomes difficult for people that do not participate in a project team.
Concerning the software company it currently uses different systems to support working activities: management system as a central repository, a "grass-root" intranet, several task related systems, bug-tracking system, and internal newsgroups, MS Exchange Server. What they really need is something more than a document management system or an Intranet: they need something able to connect the different communities, to moderate between different working habits, to adapt to different "thinking" structures.

Relationship among different organizational levels to manage knowledge processes

According to the project-based activities and to the different physical locations, there are different clusters - based on smaller teams - of people who produce excellence and innovation. These clusters include few people and are focused on specific topics. They can change every time a new project starts or a customer is acquired, or when there is a new service to develop. These networks meet rarely, they mostly communicate through telephone/e-mail to solve a problem or discuss a service development. Cross-fertilization among different business areas and clusters happens mostly when people move from one project to another or, as mentioned before, through informal occasional discussions. Furthermore, there is no track, in the organizational system, of new knowledge produced within different projects and clusters.
So we can argue that knowledge is managed at different organization levels: the project level, the level of innovative clusters of experts, and the formal organizational structure level. Each of them produces valuable knowledge, which is not exchanged neither managed at the higher

organizational levels. So these different levels coexist but they do not produce synergy and value for the business.

Knowledge management requirements identified by existing community

Mobile knowledge workers have expressed some specific expectations concerning the future of knowledge management in their organization.
Concerning consultants, they need a solution that: help people to reuse knowledge and stop "reinventing the wheel"; manage explicit knowledge both on servers and on laptops; make expert knowledge ("who knows what") visible and accessible at a detailed and updated level; support the development of new knowledge and the exchange of tacit knowledge in a less casual, informal way and in a work environment where people have little opportunities for meeting face to face; integrate the communities working in different physical locations, both on formal working processes and on informal knowledge sharing processes, through multimedia connections.
Concerning the software company, the organization is composed of different professional communities (developers, project managers, sale people and support staff), with different social backgrounds and with different communication structures. Users form this organization believe that a new solution could support to build up a new perception of their company's opportunities; encourage people to participate actively; make knowledge available in environments not connected yet (mobile plus social); enhance the quality of their products; facilitate knowledge sharing and learning among different communities. Thus, they expected returns from MILK in terms of reduced cost and stronger market position leveraging on efficiency and product's quality.

Methodology of study

The analysis of users requirements aimed at describing:

- Organizational processes and social practices
- Critical and strategic knowledge in work context (social space)
- Knowledge circulation processes and communication flows
- Network between experts

These elements are useful input to define organizational requirements of the MILK technical and conceptual solution.

The analysis of communities and their main knowledge management requirements have been conducted through an ethnographic investigation. The research has been based on an interactive approach that aims to activate a participative interaction and a mutual understanding among observers and workers. It is a combination of ethnographic methods and action learning approach. This framework has been adopted in all the different techniques used for the analysis on the field:
The knowledge network analysis (focused on people knowledge exchanges),
The social space analysis (focused on relationship between knowledge exchanges and people physical distribution)
And the scenario-based design analysis (focused on the representation of typical working scenarios).

The basic idea is that knowledge management and learning processes are not only managed at formal organisational level but they are social facts that happen spontaneously around daily work activities. The actors of these processes are people who work in teams and communities. So the assumption is that only by studying this micro organisational level, it is possible to design socio-technical solutions able to support and empower knowledge management and learning processes.
We have used different tools according to the different steps of the investigation:

- *Focused interviews*: the main goal was to identify a strategic organisational area on which to focus the analysis. People involved were top management.
- *Focus group*: the main goal was to identify strategic knowledge areas inside the selected organisational unit. People involved were organisational area members. There has been different focus group sessions supported by the use of a specific tool (the knowledge portfolio analysis).
- *Cyclic Observations*: the main goal was to identify social practices related to working processes. People involved were organisational area members. There have been different sessions of observation (for daily individual and social activities) supported by the use of an observation grid.
- *Survey for the assessment of KM needs*: the main goal was to identify current knowledge management needs. People involved were organisational area members. Individual interviews have been conducted with the support of a specific set of questions.

Conclusion

Looking back at the work done, there are several considerations to keep in mind:

- An effective knowledge management solution should start with a thorough understanding of users' needs and behaviour
- An effective knowledge management solution is not only a "set of software tools", it is the combination of processes, organisation, culture and technology
- Providing knowledge in context is the only way to effectively support knowledge sharing and knowledge creation processes
- Users can work in different situations, so the system should be able to present the same knowledge in
- Different ways.

All these points confirm that a knowledge management solution is a combination of top-down and bottom-up perspectives and implies a cultural change to the way people use and exchange knowledge among them.
In terms of future perspectives, adding mobile and 'social working' features to a knowledge management system will assist greatly with the development of knowledge processes within organisations. This is also opening a door towards new ways of working. The MILK social environment is completely changing the space/content perception of an organisation, affecting logistics, people management, content management and visualisation; giving to individuals and groups emerging capabilities that right now we cannot even imagine.
Similarly the MILK mobile environment is increasing the mobile communication of the organisation, in terms of services, protocols, devices and related components, reflecting a need for people to communicate all day (whether it is a working day or not). Giving

employees the possibility to combine communication with knowledge management creates a strong value opportunity for the company and, at the same time, for the society.
Through the MILK project we are not only developing an integrated knowledge management solution but also challenging the way people work by creating new work spaces (which extended over space and time), and by questioning the professional identity of the knowledge worker in the current management culture. Complexity is growing, change is ever present. If we want to influence the future we need to design new concepts and ideas for the knowledge society as well as develop the technology to managing knowledge. The challenge is to design technology which fits with entire work practice and which is not, as is often the case, simply developed around isolated or fragmented units of work.

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