DISPERSED WORKERS PROFILES AND KNOWLEDGE MANAGEMENT CONFIGURATIONS: THREE EXPLORATIVE CASE STUDIES

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Abstract

Knowledge Management (KM) has become a central theme in today's business environment and a commonly cited source of competitive advantage. This paper argues that one of the main drivers of knowledge-related organizational problems is the dispersed nature of organizational knowledge. In today's global economy, much of economic activity in and between firms is based on dispersed knowledge workers (DW). Therefore, developing tools to support KM in distributed environments is becoming a major challenge. On the basis of literary reviews and on field research consisting of 6 explorative case studies (Corso et al, 2003 a; Corso et al, 2003 b) and a survey on 82 Italian firms (with a response rate of 43%), a research investigation framework has been developed and refined. It analyses four groups of variables and their relationships: Dispersed Workers Profiles, KM Systems (KMS), and Performances. On the basis of the work DWs do, it is possible to group Dispersed Workers into three main classes: sales force (47%), maintenance people (35%) and consultants (18%). Building on this survey preliminary results, we will develop three explicative case studies in order to deeply understand the cause-effect links between DW Profiles and KMS.

Keywords: dispersed workers, knowledge management, case studies.

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Abstract

Knowledge Management (KM) has become a central theme in today's business environment and a commonly cited source of competitive advantage. This paper argues that one of the main drivers of knowledge-related organizational problems is the dispersed nature of organizational knowledge. In today's global economy, much of economic activity in and between firms is based on dispersed knowledge workers (DW). Therefore, developing tools to support KM in distributed environments is becoming a major challenge. On the basis of literary reviews and on field

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Keywords: dispersed workers, knowledge management, case studies

1 Introduction

This paper argues that one of the main drivers of knowledge-related organizational problems is the dispersed nature of organizational knowledge (Becker, 2001; Goodman, 1998).

Globalization and virtualization have emphasized dispersion even more (Malhotra, 2000; Joshi et al.2002; Hayman et al. 2000; Larsen et al. 2002; Murthy et al. 2002). In today's globalized economy, much of economic activity in and between firms is based on dispersed teams (Cramton, 1997, 1999; Furst, 1999).

The paper presents some field results of the national research program "Technological, Managerial and Organizational Tools for Knowledge Management (TOM)", funded by MIUR (Ministry of Technology and Research), which started in 2002, involving the Universities of Pisa and Genoa, and the Polytechnics of Turin and Milan.

The focus of this paper is on (1) dispersed workers profiles; (2) organizational, managerial and technological levers supporting KM process in dispersed environments.

The paper is organized as follows: section 2 presents the theoretical and research background; section 3 introduces the methodological issues of the field analysis and describes the cases; section 4 presents the results of the case studies; section 5 describes the comparative analysis. Finally, section 6 reports the conclusions .

2 Theoretical and Research Background

In order to be successful, Knowledge Management (KM) efforts have to be oriented towards the complex of management systems, organizational mechanisms and information and communication technologies (Zack 1999, Hansen et al. 1999, Holtzner, 1979, Pentland, 1995, Corso et al. 2002) and must be sensitive to the features of the context in which knowledge is generated, located, and applied.

A KM process is, in general, described as a sequence of three or more sub-processes or phases (Martensson 2000; Alavi and Leidner, 2001; Shin et al., 2001), not necessarily sequentially or hierarchically ordered:

- Knowledge assimilation and generation (Knowledge Creation);

- Knowledge transferring and sharing (Knowledge Transfer);

- Knowledge capitalisation and reuse (Knowledge Capitalisation).

As regards the impact of KM on performances, a big stream is recently emerging in literature (Haanes and Lowendhal 1997; Petrash, 1996; Roos et al., 1997; Schiuma and Marr, 2001; Sveiby, 1997). The impact on performances is strongly related to the approach adopted in the KM configuration (Davenport and Prusak, 1998; Wiig, 1997) and to the direct impacts on organizational behaviors in terms of knowledge creation, transfer and capitalization.
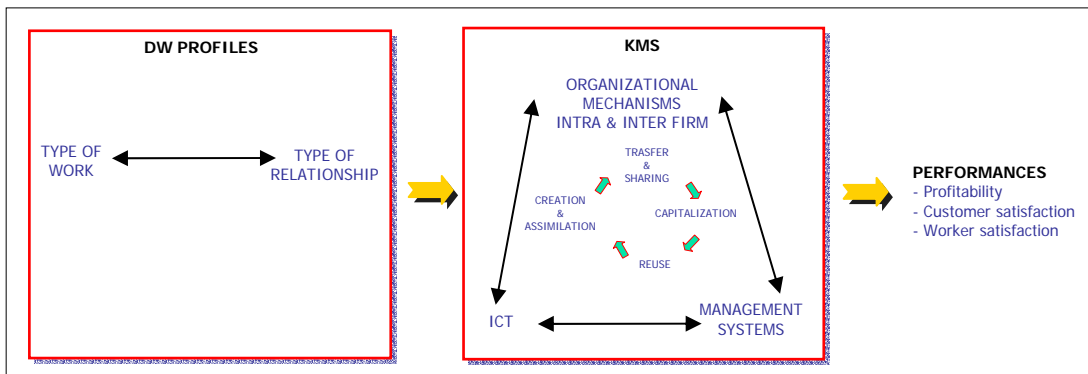

Fig. 1. The Research Framework

On the basis of literature reviews (Cainarca et al, 2002) and of field research consisting of 6 explorative case studies (Corso et al, 2003 a; Corso et al, 2003 b) and a survey on

82 Italian firms (with a response rate of 43%), the research investigation framework has been developed and refined (Figure 1).

The research investigation framework analyses three groups of variables and their relationships: Dispersed Workers Profiles, KM System and Performances.

In the framework, the choice of the KM System, made accordingly to DW Profiles, produces effects in terms of Performances.

Within this framework, the paper focuses on the first two blocks, aiming at answering the following research question:

- *What are the most appropriated KM Systems for dispersed workers?*

The DWs are described in terms of: 1) the Work they do, that is the tasks the DWs perform; 2) the relationship which links the DWs to the firm. Such a relationship emerges as the result of two groups of variables – Space and Contractual Characteristics, each encompassing two dimensions, as shown in Figure 2.
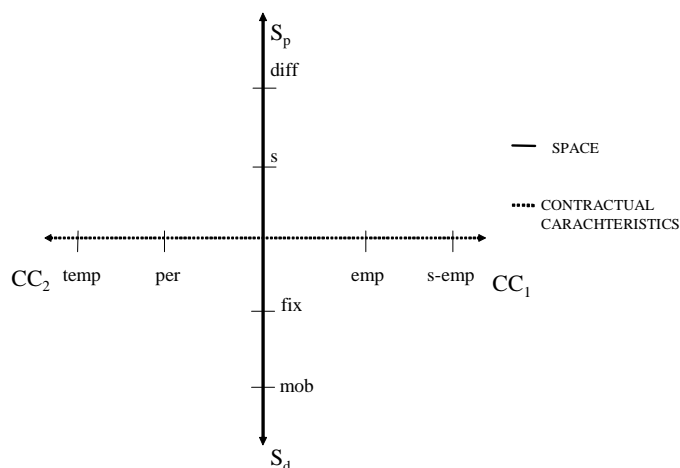

Figure 2. Relationship of DW to the firm

The Space group refers to both the physical and the dynamic dimensions. The first one – Sp – identifies the place where the DW usually works: it can be the same location of the company (s) or different from that (diff). The second one – Sd – refers to the dynamic aspect of space, that is, to the frequency in working in a certain place (s or

diff): if a DW never changes its working place, then his/her space is fix (fix), while, on the contrary, it is mobile (mob).

The Contractual Characteristics group refers to both the contractual relationship – CC1 - between the worker and the firm – employee (emp) or self-employee (s-emp) - and the duration time of that relation (permanent or temporary).

According to the survey, as regards the work DWs do, it is possible to group them into three main classes: sales force (47%), maintenance people (35%) and consultants (18%). As regards the relationships with the firm, the greatest part of the DWs are permanent (CC1 = per) employees (CC2 = emp), whose location is different from that of the firm (Sp = diff) and mobile (Sd = mob).

As the type of work they do seems to be the only variable differentiating DWs, the paper focuses on such a dimension. In order to explore the influence of task characteristics on the effectiveness of KMS, the paper draws on Perrow's model of technology and structure (Perrow (1967). Perrow's model highlighted two key dimensions of routine: the existence (or otherwise) of well-established techniques for performing tasks (task analyzability), and the degree of variety in the tasks encountered (number of exceptions). The two dimensions are commonly, and collectively, referred to as task uncertainty. Where established techniques for handling tasks do not exist (low analyzability), or where there exists substantial variety or novelty in the tasks encountered (high number of exceptions), Perrow describes the task setting as "non-routine". Conversely, when tasks are analyzable with few exceptions, the task setting is "routine". Perrow proceeds to describe the structural arrangements necessary to achieve effective control and coordination for the different task environments faced by an organization. Figure 1 presents a diagrammatic representation of Perrow's framework. Tasks in Cell 1 of Fig. 3 are repetitive and familiar (few exceptions), with known routines for handling them (high analyzability). Perrow also argued that organizations facing such tasks would be able to rely on procedure guides, operating manuals, job codification and rigid lines of reporting and accountability for controlling employee behaviour.

In contrast, Cell 3 represents the "non-routine" situation and it is here that Perrow expects that formal, bureaucratic controls will not be effective for controlling performance. Tasks cannot be "programmed" and thus behaviour cannot be controlled by implementing procedures which pre-specify desired actions or by monitoring individual actions through the use of supervisors. The remaining two situations depicted in Fig. 3 (Cells 2 and 4) involve task settings where it is more difficult to predict which forms of control will prove most effective. Tasks may have little variety, yet exhibit uncertainty in the transformation process (Cell 2); others may have little uncertainty but a great deal of variety (Cell 4). They are in the middle of the routine/non-routine continuum, but they are not the same; they differ from one another. Considering Cell 2, tasks here are low in variety suggesting the potential suitability of behaviour controls. However, notwithstanding the lack of variety of tasks, little has been learned about the process by which inputs are transformed into outputs; programs for performing these tasks have not been established (i.e., analyzability is low). It is, therefore, not possible to develop a set of manuals, guides or procedures which can be drawn upon during task execution.

In Cell 4, much variety is encountered in tasks, but notwithstanding this variation, input-output relations can be readily specified. This enables the development and implementation of programmed controls, such as procedure guides and operating manuals, and/or the use of superior authority to ensure that behaviour is in accordance with what is known to achieve desired results.

In order to explore deeply the relationship between DW Profiles and KMS, three cases have been selected, according to the three kinds of work that emerged from the survey (sales force, maintenance people and consultants).

Task Analyzability

	High	Low
Low	Routine	
	1	2
	4	3
High		Non Routine

Number of Exceptions

Figure 3. The Perrow's model of technology and structure

3 Case settings

The dataset refers to three firms: *A* is the Italian leading system integrator company; *B* is the leading European operator in terms of GSM lines on a single network and leader in the domestic market; and *C* is the Italian subsidiary of the leading European provider of energy services to local authorities and businesses.

In *A* the consulting process was selected and analyzed, in *B* it was the sales process whereas in *C* the maintenance process. Such processes are critical for the business and involve dispersed workers.

3.1.   Characteristics of the analysed firms and dispersed workers

A is the Italian leading system integrator company. It specializes in end-to-end financial solutions, e-security, intranet applications and web integration; everything from feasibility studies and the drawing up of an e-Business strategy, through the identification of business processes and the design of rich content, right up to the development and integration of software solutions.

A started its internal KM solution in 1998 and now it has become a standard model for its customers. The solution includes, in addition to the standard intranet functionalities, specific tools to support communities online.

A employs 300 consultants operating out of multiple locations and frequently on customer sites. The primary unit of work is a project that is carried out for a particular customer. Customers include private companies (mainly banks and insurance companies), public service and local governments in Italy. Typical projects include the design and development of Intranet/Extranet/Internet portal, content and knowledge management solutions, e-business integration, e-security, e-ERM/PRM/CRM (electronic employee/partnership/customer relationship management), e-learning and e-marketing applications. In order to completely satisfy the clients and to guarantee the full integration of the new solutions into existing systems, the company has to work closely with its clients. An important part of its business strategy is developing long-lasting customer relationships. In terms of task complexity, consultants in *A* have to face a high variety of situations and exceptions that need customized and flexible solutions. Many clients need to be provided with a large portfolio of technologies and solutions, in a wide range of areas: from manufacturing to services, from the public to the private sector. The consulting process is characterized by low repetitive activities, absence of standardized procedures and practices and unavailability of a clear body of knowledge which can guide the work. According to Perrow's model the consultancy task represents the "non-routine" situation (Cell 3).

B is the leading European operator in terms of GSM lines on a single network and leader in the domestic market with about 24.6 million lines at 30 September 2002. Due to its old monopolistic position, *B* played a trail-blazing role in the mobile telecommunication industry, both opening a mass market for the mobile business in Italy as well as making Italy itself one of the most advanced European markets in terms of penetration and supply of advanced services.

In order to keep the leadership in a market in which the penetration level of the mobile voice services is already very high and competitors are more and more numerous, *B* competes on innovation both at the technological and the service level, consolidating

its own leadership in the traditional voice business and concurrently becoming one of the fundamental players in the development of the whole telecommunication industry.

In the last years, *B* tried to enlarge its presence also outside Italy, particularly in Europe and in South America.

In Italy, B's sales force is divided into three groups. Large firms are directly followed by dedicated account managers while final customers are contacted by means of shops and e-commerce. For small and medium enterprises (SMEs), *B* adopts an indirect sales force, composed of approximately 150 agencies (Business Promoters), employing almost 1000 agents. This paper focuses on *B* indirect sales force. These agents supply SMEs with a large portfolio of pre-determined solutions, facing a high variety of situations due to its broad range of customers. According to Perrow's model the sales task is characterized by little uncertainty but a great deal of variety (Cell 4).

C is the Italian subsidiary of the leading European provider of energy services to local authorities and businesses. Its service portfolio includes the management of heating and air conditioning facilities, the operation of district heating systems, facilities management for state and private clients, and industrial energy services. *C* has locations throughout Italy (Rome, Naples, Turin etc) and the head office is located in Milan. The employees are 700 of whom 450 are involved in the maintenance process. This paper focuses on *C* maintenance staff, who are mainly mobile, except for a small group permanently located in big plants that require daily control and maintenance. There are about 5.500 sites managed by *C* staff but, despite the high number of customers, task execution does not involve high variety as *C* is focused only on a specific type of facilities (heating and air conditioning).

According to Perrow's model, this task represents the "routine" situation, characterized by little task variety and a clear view of input-output relations in task execution (Cell 1).

	A	**B**	**C**
Sector	Consultancy	Telecommunication	Energy services
Core product	E- solutions	GSM communication system	Heating systems management
Number of DW	300	1000	450

Investigated process	Consulting	Sales	Maintenance

Table 1. Description of firms

Table 1 summarizes the case settings.

3.2 Data collection

Data were collected through semi-structured interviews with individual respondents and observations.

Case studies were conducted in 2003. During the site visit, impressions and informal observations were recorded too.

An interview guide and open-ended questions were used to conduct two-hour semi-structured interviews

The interview guide had two sections. The first part referred to the general information about the firm; the second was focused on DW typology according to the dimensions proposed in the model.

As known, the utilization of triangulation or multi-method approaches, designed to compensate for any single-method's weaknesses, are effective ways of increasing both reliability and validity in qualitative research. Thus, data collection in this study relied on interviews, observations and archival documents. The study respected Kanter's (1977) suggestion that different sources of data be used to validate one another. Multiple informants were interviewed thereby providing further opportunity for triangulation. These informants come from all hierarchical levels and have both the role of simple KMS users as well as that of decision makers.

Wherever possible, documents were consulted in order to gather information about the KMS development to discover any additional important elements that may have been missed. This is also a way to further confirm or refute data obtained through other means and to guard against bias in informants' accounts (Leonard Barton 1990).

3.3   Data analysis

Data were analysed by first building individual case studies and then comparing cross-cases to investigate the relationship between DW Profiles and KM configurations. A

case study for each site has been written using the interviews and the record of impressions.

4 Results

4.1 Case 'A'

Since 1998, "A" started to design and develop a new organizational model in order to pursue the continuous improvement of internal processes and performances, directly involving the whole staff. Such a model, supported by the intranet, is based on the creation of improvement groups, the "cubes", aiming at suggesting and implementing plans of improvement and growth, in the company strategic areas, according to EFQM (European Foundation for Quality Management) that "A" joined in 1999. Each cube includes a limited number of employees, selected by the top management, among whom a chairman and a secretary are nominated. The chairman, directly chosen by the CEO, the latter who sponsored the project from the beginning, is responsible for the success of the cube: coordinates its activities, controls the newsgroup, approves the documentation and supervises the contents. The group interacts through both face-to-face and computer-mediated meetings. Each cube publishes the results of its activity (white papers, FAQ) on the intranet and interacts with all the employees through discussion newsgroups. Periodically the performances of each cube are evaluated (participation degree of the employees, work in progress, achieved results …) and, in case they are not satisfactory, the cube may be closed.

The newsgroup management requires high investments both in terms of people (about one third of the consultants is directly involved in the cubes) and of money (the system is constantly improved by a new release every 2 months). The company top management has been very satisfied with the results obtained till now by the cube model. Besides promoting the ongoing improvement, it also changed progressively the organizational relationships, intensifying horizontal communication and making easier the vertical one.

User satisfaction concerning the cube model was assessed through a survey at the end of 2003. On a five-point Likert scale, the users expressed a satisfaction degree of

3.35 about the content management in the corporate portal; of 3.41 about the graphical interface and of 2.95 about the speed in content retrieval.

The cube model is now well consolidated and *A* recently launched it on the market.

4.2   Case 'B'

Faced with the necessity to improve the poor knowledge and weak relationship *B* had with its agents (at the end of 2000) – put in evidence by their high turnover rate (greater than 50%), their unsatisfactory degree of qualification and their commitment to the firm – *B* introduced a web-based platform (B_plat) for developing and creating a virtual community between the agents. The challenge was to make B_plat an environment where the agents could train, exchange experiences and acquire information regarding the company and its products. In other words, with B_plat the aim was to give agents the social dimension that the dispersed work risks to lose and to build direct communication with the agents therefore avoiding the interface of the agency owners.

The platform is composed of five sections:

- News, where the most important information is classified and published;
- Training, where courses (with asynchronous fruition) are provided;
- Offer, containing information regarding *B* offer and the benchmark with that of competitors;
- Community, containing moderated forums, where agents can meet each other, discuss, ask questions and exchange experiences, as well as information;
- Desktop with a schedule of interesting events and a selection of useful tools such as presentations, ideas for customers and a service offered by experts providing agents with supports on commercial, fiscal and technological matters.

The use of the B_plat was encouraged by means of a game rewarding those users who show to be more active in information sharing a prize. The possibility of having a prize but, most importantly, the satisfaction the agents got in reaching the highest rank and boosting colleague esteem were revealed as the most stimulating factors to game participation.

Since its introduction, the platform received even more success than expected, as the rapid growth in the user number as well as usage during after work hours demonstrated. The forum, where the agents have the opportunity to ask questions/help

and tell their own experience, immediately became the heart of the system. Soon the agents became proactive in proposing and asking for changes to the platform. Among the most important changes, that make today B_plat a KM system, the following should be remembered: i) the introduction of an offer channel with up-to-date information on *B* products and services; ii) the setting up of a 'direct line' where *B* marketing people answer to agents questions (such a 'direct line' was soon revealed as an important source of information and impressions regarding the market); iii) the introduction of a news channel for the publication of both information regarding industry and papers for stimulating dialogues with customers or colleagues; iv) the enrichment of the training channel with programmes for the development of sales skills.

4.3   Case 'C'

In order to improve efficiency and effectiveness of its operations, *C* started a fully in-house developed Intranet project, sponsored by the Information System Department, in 2001. Soon after, opportunities towards information and knowledge management emerged, even though a clear involvement of Top management in improving the first applications is far to come. Till now, the project involved low investments and it is rather static.

There are two main activities supported by the Intranet: Quality Management and Facilities Remote Control & Management. In the present paper, only the latter will be described.

The Facilities Remote Control & Management allows C:

a) To collect customer calls through a Call Centre in Milan and make them available to all the peripheral offices. A scheduler assigns the call to a regional office and thus, after the validation of the responsible of local scheduling, to a maintenance technician or team.

b) To collect real time information from customer facilities in order to

    b1) better perform heating and air conditioning control data collection and

    b2) better monitor both ordinary and extraordinary maintenance interventions.

As regards b1, control data are collected by means of a WAP (wireless application protocol) technology and thus directly transmitted to a database, avoiding a second data entry, previously made by a headquarter staff. The new ICT-enabled procedure

avoids maintenance staff to collect data on paper, to go to the regional office in order to fax them and avoids the re-entering of data with high error risk and time wasting. Furthermore an automatic formal error checking can control the data entry online. It is worth noting that the control frequency is very high: some facilities require a control on a weekly basis and some other on a monthly basis. Statistical analysis on these data were usually performed once a month (in order to send information to the gas suppliers) but the new system could allow to make it to be done more frequently thus enhancing the information management process of *C* and of its suppliers.

As regards b2, ordinary interventions are driven by a technical hand-book and a predefined form to fill in, while for extraordinary interventions technical guidelines are not provided. The ordinary maintenance plan (in an ante and post two weeks time window) is also available to every technician, together with the list of all the interventions already done.

The application is essentially perceived as a customer service improvement. During the maintenance intervention, in fact, data about technical aspects are collected thus permitting the customer to control them in real time through an internet service. Previously, information about work in progress and work closure were communicated to customers by means of telephone call, fax and file transmissions. The real time customer involvement avoids misunderstandings and complaints.

The above described applications, while strongly satisfying Top Management, were at the beginning not agreeable to maintenance staff that were detecting the intention an increasing level of control on their daily activities.

After a sponsoring phase among maintenance team leaders, the reluctance was overcome by imposing the adoption. Anyway, after one year, the maintenance staff recognized the usefulness of the system in their recurrent practices. In order to make the adoption easier and less traumatic, as an IS interviewee said, very simple technical equipment was required: a mobile phone equipped with WAP technology.

At the moment a formal performance measurement system has not been developed but the positive effects on efficiency and effectiveness have been widely recognized by all the interviewees.

	A **CONSULTING**	**B** **SALES**	**C** **MAINTENANCE**
MAIN EXPECTED RESULT	Improve efficiency and effectiveness	Enhance DW social dimension	Improve efficiency and effectiveness
ICT SOLUTION	Intranet (Plumtree, Webcube™, Documentum, Cruisenet™, Digital Think, Applix, Eyenet™)	Internet (UNITIM, SimToolkit, WAP, GPRS)	Intranet (also via WAP)
ADOPTION	All the DW were forced to adopt the system	Adoption on voluntary basis, fostered by managerial levers (awards)	All the DW were forced to adopt the system
DEVELOPMENT	- In-house - Top-down - High investment - Dynamic (a new release every 2 months)	- Outsourced - Bottom-up - High investment - Dynamic (emergent)	- In-house - Top-down - Low investment - Static
CONTROL SYSTEM	On frequency of use and contents	No	On frequency of use
COMMUNICATION STYLE	Formal	Informal	Formal
INTEGRATION WITH OTHER IS	No	Marketing IS	No
MAIN SPONSOR	CEO	Sales executive	IS executive
USER SATISFACTION	High	High	High
FORMAL PERFORMANCE MEASUREMENT	Yes	Yes	No
INFORMATION	Network	Network	One-direction

FLOW			(periphery to headquarter)
ORGANIZATIONAL IMPACT	Impact on internal communication	Impact on power map	Impact on workload distribution

Table 2. KM Configurations

Table 2 summarizes the main features of KM configurations in the three cases.

5   Discussion

The findings of this study suggest that there is a connection between the DW Profiles, expressed in terms of the characteristics of the tasks performed, and the choice of the KMS. The task type, analysed by means of Perrow's model, seems to suggest some guidelines for the KMS. The study of the cases shows that the perceived performances of the KMS, evaluated in terms of usefulness, appropriateness to the business and frequency of use, seem to match the guidelines which emerged from the analysis of the task type. In particular, user satisfaction is low with the aspects of KMS that disagree with the organizational suggestions derived from Perrow.

As regards case A, user satisfaction seems to be quite high. The KMS has a network structure that allows horizontal/vertical communication among participants well-suiting the employee communication needs. As an interviewee underlines: "The newsgroups are open to everyone and there are no barriers to communication: you can share knowledge/thoughts even people you have never met and coming from all hierarchical levels".

According to the non-routine task type, the KMS in *A* does not provide a centralized knowledge storage-retrieval system. In fact a company that sells customized services that is, most of its work goes toward meeting particular customers' unique needs, takes limited advantage of codified knowledge.

Anyway, some criticisms emerge about specific aspects of the KMS, such as:

- Top-down development strategy (the evolution of the system is planned centrally by the Chief Knowledge Officer and the CEO that decide the requirements of the new releases). In fact, according to the user satisfaction survey, the 40% of the respondents complains about the usability of the KMS

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that does not care about the user needs, the 29% about interactivity features, the 19% about the content structure and the 10% about graphics.

- rigid hierarchical structures and task definition inside the cubes and formal performance measurement (a chairman and a secretary are nominated that coordinates a team of 8/9 people; the chairman is responsible for the success of the cube; formal document management; performance about the level of participation of the employees, works in progress, achieved results …; in case performances are not satisfactory, the cube may be closed). As an interviewee says, "The formal control causes distortion in the use of cubes that tend to become *auto referential*. The people that participate in the newsgroups are the same people that manage them".

- High specialization of cubes. As regards this issue, an interviewee notes that: "Some cubes are too specialized, for example the IT one, and so scarcely useful to me". According to the user satisfaction survey, the 54% of participants identify the contents as the most urgent issue to be improved and the 27% asks for knowledge about processes and daily activities, overcoming organizational function boundaries. This point is connected to the knowledge needs of consultants in A. In order to manage the consulting process in a system integrator company a broad range of knowledge is required and when specialized knowledge is needed, experts are contacted on-demand.

The criticisms expressed by the users give some indications that can be related to the appropriateness of the system to the task type. In fact in case A, criticisms regard the aspects of the system that seem not to follow Perrow's suggestions. Regarding non-routine situations, Perrow expects that formal bureaucratic systems will not be effective. Perrow argues that "collegial" structural arrangements are required in these settings. As regards contents, frequently cubes are perceived as too specialized and consequently not useful. This content structure seems to follow the bureaucratic model that establishes the high specialization of tasks inside the organization. Such a model seems to have been adopted by *A* also in the navigation path within the corporate intranet.

Thus, guidelines in case *A* could be summarized in shifting the architecture to a more informal one, avoiding a too strict and top-down control in favour of a self and peer group control process. Furthermore the company, by means of the KMS, should promote socialization processes that could lead to the emergence of spontaneous knowledge communities overcoming the boundaries between organizational functions.

As regards case B, user satisfaction is very high. The KMS has a network structure that allows horizontal/vertical communication among participants well-suiting the agents communication needs. According to the interviewees, the system improved the feeling of belonging to a community as underlined in the words of the CEO: "Since the introduction of the tool, in a six month time period, the agents' turnover rate reduced from over 50% to 29%" The connection between the introduction of the tool and the turnover reduction is also proved by the enthusiastic feedback from agents. The turnover reduction together with knowledge sharing and professional training opportunities (e-learning) provided by the system, positively impacted on the agents professional quality, as emerged from some interviews. The improvement of professional quality of the agents, enabling them to cope with a high number of exceptions, is coherent with implications of Perrow's model. In fact, if task variety is very high (number of exceptions) the number of procedures required to handle all the exceptions would be prohibitively costly to document. The organization, in order to achieve the coordination needed for task execution may need to resort to "personnel" controls (Perrow, 1970).

In accordance with Perrow's model, where tasks are highly analyzable (with known routines for handling them), the organization can justify the development and use of formal procedures guides. In case *B* the agents can have access, by means of the tool, to a large portfolio of pre-determined solutions for the client. Another aspect that well-suit the implications of Perrow's model, is the emergent character of the KM solution. During the development of the system and successively, for the following releases, the feedback and suggestions from the field, were taken into high consideration. The involvement in the continuous improvement of the system was appreciated by the agents. As one of them reports: "Our contributions proved to be determinant for the success of the tool. Now services and functionalities really fit our needs". In fact,

where tasks are highly analyzable and exceptions are many, "it is more difficult to predict which configuration will prove most effective". The system is dynamic, and thus new evolutions are going to be implemented. For example, one the main concerns is decreasing the control of newsgroups and forums. At the moment, forums are supervised by a chairman that guarantees the reliability and privacy of published items. In the near future this may not be necessary any more. According to Perrow, moving towards a less bureaucratic model fits with the characteristics of the task that is in the middle of a routine-non routine continuum.

As regards case C, user satisfaction is high. The KMS has a structure that allows vertical one-way communication between DWs and their headquarter, well-meeting the maintenance staff communication needs. According to the interviewees, the system improved the feedback process from the client site, making it easier and reducing data entry errors. In fact the system operates in "real-time" during task execution, rather than "ex post" as in the old way. As an interviewee underlines: "In my area, Sardinia, there is only one peripheral office of my firm, which serves a large region. I immediately appreciated the tool as it helped me in performing my daily tasks". Although the tool provides limited and simple functionalities (one-way communication, fixed forms to be filled), it well meets the user information needs. In fact, where the task is highly analyzable and with few exceptions (routine), Perrow argues that organization would be able to rely on procedure guides, operating manuals, job codification and rigid lines of reporting. The investments in the system have been low, till now, but satisfying the limited needs of the DWs. The integration with the accounting system could be the next step in order to improve the system.

6 Conclusion

In conclusion, the paper aimed at answering the following research question:

- *What are the most appropriated KM Levers for dispersed workers?*

The DWs were described in terms of the work they do, using Perrow's model of technology and structure and user satisfaction was considered a proxy of the system's appropriateness.

The main contribution of the study is the finding which shows that where KM levers fit Perrow's model, user satisfaction is high, thus confirming their appropriateness. Otherwise, where criticisms are stronger, conflicts with Perrow's model emerge.

While multiple informants from different hierarchical levels, triangulation using different types of data sources and a systematic data analysis serve to attenuate many of the problems with reliability, generalizability remains more of an issue. It remains to be seen, through further research, whether its finding can be replicated in similar firms. But, although they must be treated with caution the findings of this exploratory study are nonetheless suggestive.

References

Alavi, M. and D. Leidner (2001). Knowledge management and knowledge management systems: conceptual foundations and research issues. *MIS Quarterly*, 25, 107-136.

Becker, M.C. (2001). Managing dispersed knowledge: organizational problems, managerial strategies, and their effectiveness. *Journal of Management Studies*, 38, 7, 1037-1051.

Cainarca. G., M. Corso, G. De Cantis, A. Martini, S. Massa, P. Neirotti, E. Paolucci, S. Pavesi, L. Pellegrini and S. Testa (2002). Technological, organizational and managerial tools for knowledge management supporting dispersed workers. *Proceedings of AiIG Conference "Impresa e Competizione Knowledge Based"*, Lecce, November 7-8, 349- 373.

Corso, M., A. Martini and L. Pellegrini (2002). Knowledge management configurations in network-based product innovation: a case study based approach. *CINet Conference 2002 – Continuous Innovation in Business Processes and Networks*, September 15-18, 2002, Dipoli Congress Centre, Espoo, Finland, 185-196.

Corso M., De Cantis G., Martini A., Massa S., Paolucci E., Pellegrini L., Testa S. (2003) (a)Technological, Organizational and Managerial Tools for Knowledge Management Supporting Dispersed Workers, *Organizational Knowledge, Learning and Capabilities (OKLC),* IESE Business School, University of Navarra, Barcelona, 13-14 April

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Corso M., De Cantis G., Martini A., Massa S., Paolucci E., Pellegrini L., Testa S. (2003) (b), Knowledge Management for Dispersed Workers in Utilities Firms, *Joint International Conference - One World? One View of OM? - The Challenges of Integrating Research & Practice, EUROMA-POMS (European Operations Management Association - Production and Operations Management Society)*, Cernobbio, Como, 16-18 June; Vol. 3, pp. 747 -756

Cramton, C.D. (1997). Information problems in dispersed teams. *Academy of Management Best Paper Proceedings.*

Cramton, C.D., (1999). *The mutual knowledge problem and its consequences in geographically dispersed teams*, Mimeo, George Mason University.

Davenport, T. and L. Prusak, (1998). *Working knowledge: how organizations manage what they know*. HBS Press, Boston.

Fletcher, K. and G. Wright (1995). Organisational, strategic and technical barriers to successful implementation of database marketing. *International Journal of Information Management*, 15, 2, 115–126.

Furst, S. R. Blackburn and B. Rosen (1999). Virtual teams: a proposed research agenda. *Proceedings of the Organizational Communications and Information Systems Division of the Academy of Management*, August.

Goodman, P.S. and E.D. Darr (1998). Computer-aided systems and communities: mechanisms for organizational learning in distributed environments. *MIS Quarterly*, December.

Haanes, K. and B. Lowendhal, (1997). *The unit of activity: towards an alternative to the theories of the firm. Strategy, culture and style*. J Wiley and Sons, London.

Hayman A., Elliman T. (2000) Human elements in information system design for Knowledge Workers. *International Journal of Information Management* 20 pp. 297-309

Hansen, M.T., T. Nohria and T. Tierney (1999). What's your strategy for managing knowledge?. *Harvard Business Review*, 106-116.

Holzner, B. and J. Marx, (1979). *The knowledge application: the knowledge system in society*, Allyn-Bacon, Boston.

Kanter (1977)

Larsen K.R.T., McInerney C.R. (2002) Preparing to work in the virtual organizations *Information & Management* 39 pp. 445-456

Leonard-Barton D. (1990) A dual methodology for case studies: synergistic use of a longitudinal single site with replicated multiple sites. *Organization Science*, 1 (3), 248-266

Malhotra Y. (2000). *Knowledge management and virtual organisations*. Idea Group Publishing, Hershey PA, 390 pp. ISBN 10878289-73-X

Martensson, M. (2000). "A critical review of knowledge management as a management tool". *Journal of Knowledge Management*, 4, 204-216.

Murthy U.S., Kerr D.S. (2003) Decision making performance of interacting groups: an experimental investigation of the effects of task type and communication mode, *Information & Management,* 40, 5, 351-360

Pentland, B.T. (1995). Information systems and organizational learning: the social epistemology of organizational knowledge systems. *Accounting Management and Information Technologies*, 5, 1, 1-21.

Perrow, C. (1967) A framework for the comparative analysis of organizations, *American Sociological Review* N.2, Vol. 72

Perrow, C. (1970) Departmental power and perspectives in industrial firms in M.N. Zald (EDS) *Power in Organizations* pp 59-89 Vanderbilt University Press

Petrash, G. (1996). Dow's journey to a knowledge value management culture. *European Management Journal*, 14, 365-373.

Roos, J. G. Roos, N. Dragonetti and Edvinsson, (1997) *Intellectual Capital: navigating in the new business landscape*. Macmillan, London.

Schiuma, G. and B. Marr, (2001) Measuring and managing intellectual capital and knowledge assets in new economy organizations, in Bourne M., *Performance Measurement Handbook*, GEE Publishing Ltd.

Shin, M., T. Holden and R. Schmidt (2001). From knowledge theory to management practice: towards an integrated approach. *Information Processing and Management*, 37, 335-355.

Sveiby, K., (1997) *The new organizational wealth: managing and measuring knowledge based assets.* Barret-Kohler Publishers, San Francisco.

Wiig, K. (1997). Integrating intellectual capital and knowledge management. *Long Range Planning*, 30, 399-405.

Zack, M.H. (1999). Managing codified knowledge. *Sloan Management Review*, 40, 4, 45-59.

Joshi A., Labianca G., Caligiuri P.M. (2002) Getting along long distance: understanding conflict in a multinational team. *Journal of World Business*, 37, 4, 277-284