

Knowledge Management in a Multinational Context: Aligning Nature of Knowledge and Technology

Cataldo Dino Ruta and Ubaldo Macchitella

Department of Management, Bocconi University
Via Roentgen 1, 20136 Milan, Italy

Abstract. Aim of this paper is to show the importance of understanding the nature of both the technology and knowledge when promoting knowledge sharing through knowledge management (KM) portals. This paper investigate knowledge sharing and the “fit” between the nature of knowledge to be shared and the nature of the technological tools that are used. Technology intended as technical instrument could result in an empty box, and knowledge management initiatives could not be effective and lead to a sustainable competitive advantage. By means of an in-depth case study of a major consulting firm, the study discusses and answer the research question. Results show that knowledge areas with high level of codifiability can be effectively shared by using low collaborativity and low multimodality tools. Knowledge areas with a high level of epistemic complexity can be effectively shared by using high collaborativity and high multimodality tools. Knowledge areas with a high level of task dependence can be effectively shared by using low collaborativity and intermediate multimodality tools.

1 Introduction

In the last decade knowledge management (KM) received much attention from both practitioners and theorists. Interest in knowledge management issues was significantly boosted by the rapid evolution of information systems [15]. The new features introduced by innovative technological tools, like the possibility to share information on real-time and get in touch with people around the world, has led many companies to imagine a new world of leveraged knowledge [12].

Knowledge management systems are very often embedded in more comprehensive technological infrastructures such as Human Resource (HR) portals [2] and represent an invaluable instrument to foster the intellectual capital of an organization. The goal of this paper is to investigate the relation between the nature of knowledge and technology in order to have an effective KM system.

2 Theory

2.1 The Relevance of Knowledge Management for Sustainable Competitive Advantage

Organizational knowledge, and therefore knowledge management, are key in sustaining competitive advantage over time. Grant [7] develops a knowledge-based theory of organizations. He affirms that knowledge is the most important strategic resource for a firm. It resides in specialized form among individual organizational members and the essence of organizations is its ability to integrate the specialized knowledge of individuals.

However, even if originating from different fields and perspectives, these contributions present some aspects in common. In first place, they underline the relevance of knowledge for competitive advantage. With more or less emphasis, they refer to knowledge management mechanisms as a key element in developing capabilities that allow a sustainable, high performance. A second common feature across these contributions is the strict link between knowledge and technologies. In some contributions technology is seen as a technical support for knowledge transfer that favours the construction of organizational capabilities [11], [5], [18], [14]. According to other authors [7], [13], [1] technology not only concurs to the process of developing capabilities but also embodies knowledge and capabilities in itself.

Summarizing, from the analysis of the literature emerges that: 1) knowledge and its management are issues relevant to the construction of organizational capabilities and that 2) the nature of both knowledge and technology should be taken into consideration. Therefore, in the next section we present a model linking knowledge and technology that can be applied to knowledge management projects.

2.2 The Effectiveness of HR Portals: The Match between Technology and Knowledge

HR portals are vehicles through which HR information and applications can be channelled effectively and efficiently [2]. HR portals have technical characteristics that support employees' contribution and participation in knowledge management systems: employees' personalization through information profiling, relevance of information and customized single user interface. HR portals present several tools that support knowledge sharing, from document repositories to more interactive tools like forums, chat or blogs, the so called KM portals. In order to unfold their beneficial effects on knowledge management, employees should adopt these instruments and use them in their everyday working life. The adoption and use of technologies from the users is an issue that has been extensively investigated within the Information System Management literature. An established theoretical framework is the one of task-technology Fit [4]. According to this model, a "fit" between the nature of technology and the task to be executed should exist in order to perform the task effectively. We apply the same idea to the knowledge management context. Considering knowledge sharing as the "task" that should be carried out, we propose a model of "knowledge-technology fit", linking the nature of knowledge to be shared to the characteristics of

technological tools used to share it. We investigate this “fit” according to some dimensions derived from the literature that we present in next sections. We’ll consider the case of a world-wide consulting group. By the analysis of this case study we can test our theoretical framework and formulate our research propositions.

Knowledge Dimensions. Knowledge has been already measured and described according to different dimension in previous studies. Zander and Kogut [17] define codifiability, teachability, system dependence and product observability as the four characteristics influencing the speed of transfer of organizational capabilities and, consequently, determining the capability to imitate internal managerial practices. In particular, these authors find out that the level of codifiability and the easiness of teachability have a significant influence on the transfer process speed. Grandori [6] points out three main characteristics: tacitness, computational complexity and epistemic complexity. These knowledge dimensions influence the choice of organization and inter-organization coordination mechanisms. Hansen [8] focuses on codifiability and system dependence as the two main characteristics that can help to explain difficulties in the transfer of a practice. Knowledge with a higher level of codifiability and a lower degree of dependence will be easy to transfer. In our study, the phenomenon of knowledge sharing, and particularly the decision process in the choice of KM tools, is presented from a contingency perspective. Referring to previous studies, we indicate four main dimensions of a knowledge area as influencing its degree of transferability: codifiability, epistemic complexity, task dependence and knowledge competitiveness.

Technologies for Knowledge Management. Drawing on the classifications of technology suggested by the theories referring to task-technology fit, we now propose a model for the analysis of technologies for knowledge management based on two main dimensions. The first dimension of our model is collaborativity. Technologies for KM enable people geographically dispersed to work jointly and to exchange knowledge by direct interaction. Typically, these tools make possible the collaboration among people working on the same task, or support experiences of distributed learning [16].

The concept of “collaborativity” is also at the heart of Fulk et al. [3] studies, that define the distinction between communality and connectivity. Tools oriented to collaboration are the ones that present a higher level of connectivity, intended as the ability of the tool to create connections between people.

The second characteristic by which we classify instruments for knowledge management is multimodality. We define multimedia as “the seamless integration of two or more media” by supporting two or more channels like text, graphic, sound and motion, expressed in an increasingly complex order [9].

The following table presents the synthesis of the most used KM applications (email, audio-conference, video-conference, groupware, online meeting spaces, online discussion spaces, personal directories, text databases, intelligent data operating layer, audio databases, video databases, multimedia simulations, multimedia encyclopaedia) with specific levels of collaborativity and multimodality.

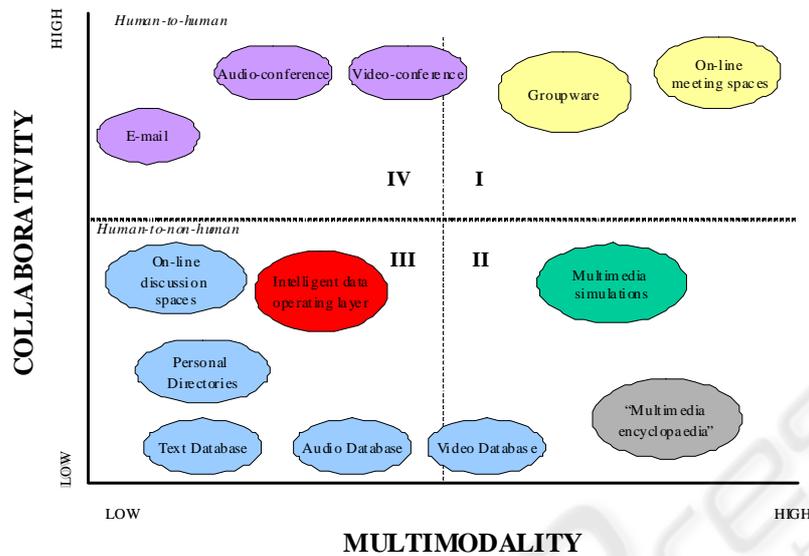


Fig. 1. A classification of instruments for Knowledge Management.

Therefore, based on these theories, we expect a relation between the nature of the knowledge that is shared within the company and the KM tools hosted by the HR portals.

We investigate this relation in Martinelli consulting (fantasy name). In the next section we present the methods we used to carry out our investigation. Further, we presents the results of our case study and discuss them in the light of the theoretical framework we used.

3 Methods

Data and information on the KM applications of experts and users were collected, selecting the most common applications and defining a script for each of them, in order to have clear data on functionalities and multiple possible usages. 5 KM experts and 5 users were asked to read these scripts and to grade the KM applications on collaborativity and multimodality based on their characteristics from 0 to 9. Questions about collaborativity were oriented to assess if the KM application is able to connect and involve a great number of people, human-to-human, from one-to-one to one-to-many. Compared to a low level of collaborativity when the KM application facilitates interaction between human and non-human actors (i.e. databases). Questions about multimodality were oriented to assess if the KM application offers two or more media (text, graphics, audio, animation, etc) in an integrated way for communicating among people. Finally, the 10 values for each application were averaged, asking them to decide the final value in cases of fragmented numbers (i.e. 6.5)

Knowledge dimensions could represent an important predictor in the choice of tools (in terms of collaborativity and multimodality) for knowledge sharing. The

model we defined has been examined by the analysis of a case study in order to further investigate the ideas suggested by the theory. The research method we used is the one of the case study as suggested by Yin [19]. This method has been selected as a consequence of the exploratory purpose of our paper. Our analysis has been conducted in the Italian office of Martinelli Consultants, one of the leading groups worldwide in organization and technology consulting.

We used three techniques for data collection, so respecting the principle of triangulation: participant-observation, qualitative interview and document analysis.

Participant-observation took place for a period of more than six months, during which one of the authors joined the Italy Knowledge Management team of Martinelli Consulting. In this period the researcher has been equiparated to the other members of the team, carrying out the same activities, having the same working instruments than his colleagues (desk, laptop, corporate e-mail, telephone), sharing the same working spaces, and participating to all the events of the team life (meetings, work-in-progress, training courses, presentations and so on). This helped to avoid the “observer paradox” described by Labov [10], making the behavior of the observed people not reactive.

A significant part of the data collection has been developed by carrying out qualitative semi-structured interviews we made to 52 consultants in Martinelli. The choice of the people and the groups to be interviewed was made following a systematic approach in order to have a good representation of the entire Martinelli. With the help of the Head of Knowledge Management Office we selected eight groups working on the typical Martinelli business, and we interviewed people covering all the organizational positions and different roles within the workgroups.

The contents of our interviews were related first of all to the composition of the workgroup, to better interpret the information we obtained. A second section of the interview protocol referred to the five or six macro tasks that the workgroup carried out. In the same section was asked to specify the knowledge areas used to execute the tasks that had been indicated. In the third section of the interview protocol we investigated the four characteristics of codifiability, epistemic complexity, task dependence and organizational competitiveness of the knowledge areas indicated by the respondents, using the following scale: 1-3 (low), 4-6 (intermediate), 7-9 (high).

The scales were taken from Zander and Kogut's [17] work on practices and their transfer, and were adapted to the concept of knowledge areas that were critical in this study. While the “codifiability” construct was quite well-defined and applicable to our context, some adaptations were necessary to measure “complexity.” We considered “teachability” and “output observability” as part of a more expanded knowledge complexity construct. Indeed, in this study the ease of defining cause-and-effect relationships, and the variety of problems and solutions, are also part of the complexity measure. Questions related to codifiability: Existing work manuals and operating procedures describe precisely what people working in this knowledge area actually do; most of the solutions to the problems related to this knowledge area are described in written manuals; the outputs related to this knowledge area are well documented. Questions related to epistemic complexity: a competitor can easily learn how we produce outputs related to this knowledge area by analysing carefully all the related resources used and produced for these outputs; the quality of the output depends more on the judgment of the experts than on well defined rules; within the practice of this knowledge area, a given action has a known outcome; the problems

related to this knowledge area are always different. It is not convenient to collect and store them.

Questions related to task dependence: indicate the degree to which each knowledge area is needed to complete each task (previously identified in the group project). Questions related to organizational competitiveness: this knowledge area is crucial for the success of the firm; we cannot allow that this knowledge is accessed by external people or competitors.

The last section of the protocol was about the use of technology tools for the working activities and the use of the corporate portal. In particular, we examined which kinds of knowledge area were retrieved and contributed from the portal and which ones, instead, had the project leader as an important link to external sources. We attempted to map the habits in the acquisition and contribution of information, in terms of “problems” and “solutions” related to a particular knowledge area.

The technique of document analysis has been adopted with the aim of investigating the use of KM tools that consultants have at their disposal. By classifying the documents that are on the Martinelli KM Portal it has been possible to understand how technology supports the sharing of the different knowledge areas in Martinelli. To operate this classification we performed a document analysis on a sample of the documents contained in Martinelli KM portal. We analyzed 2850 documents on a total of about 8000 documents referred to the Martinelli Italian Region. These documents have been extracted from the two most representative sections of Martinelli KM Portal: the Global Container (fantasy name) and the Management Section (fantasy name). The Global Container is the Martinelli general knowledge repository, while the Management Sections is a best practice database. Of these document we counted the frequency of appearance.

4 Findings

4.1 Knowledge Areas in use in Martinelli Consulting

From the analysis of the knowledge areas emerged by the interviews, it has been possible to define three macro-classes of knowledge areas (KA).

A first class of knowledge area is represented by managerial knowledge areas. This macro-class is made up of all the group management methodologies, the ability to organize one’s work in coordination with other team members, the rules for the interaction with other colleagues, the ability to use all the tools required by the workgroup activities and so on.

A second macro-category of knowledge areas is represented by technological knowledge. Seven out of the eight workgroups we examined heavily relied on this kind of knowledge. Technological knowledge typically consists of programming languages (ADA, C++,...), operating system source-codes, web design architectures, technological platforms and so on.

Finally, the third knowledge macro-class coming out from the interviews is the one of process/market knowledge. Process knowledge is intended as all the knowledge areas that must be managed in order to implement the service to the client. These knowledge areas can be related to the specific nature of the client or to the

particular kind of job delivered to it. For example, an ERP implementation will require different knowledge areas than an Application Maintenance service.

Market knowledge, instead, is simply the information related to the specific sector in which the client operates.

The level of organizational competitiveness for the three macro-classes was the same. All the respondents, in fact, considered equally important the different knowledge areas and said that not particular tensions generated when sharing any kind of knowledge.

Far less homogeneous is the situation for codifiability. Managerial knowledge areas, in fact, showed a high level of codifiability; technological knowledge, instead, showed a low level of codifiability. An intermediate level of codifiability was obtained by market/process knowledge. From the aspect of epistemic complexity, we noticed a low level for managerial knowledge areas, a high level for technological knowledge area and an intermediate level for market/process knowledge areas. Finally, task dependence resulted intermediate for managerial and technological knowledge areas, while it was very high for market/process knowledge. The results of this assessment are reported in table 2.

Table 1. Assessment of knowledge areas.

	Codifiability	Epistemic complexity	Task Dependence
Managerial K.A.	HIGH	LOW	INTERMEDIATE
Technological K.A.	LOW	HIGH	INTERMEDIATE
Market/process K.A.	INTERMEDIATE	INTERMEDIATE	HIGH

4.2 KM Tools in Martinelli and their Utilization

We analysed the main tools of the HR Portal available to the consultants for knowledge sharing. These tools can be conducted to the general type of instruments that we defined as repositories, that support knowledge sharing following a distributive logic.

The document analysis conducted on the Global Container and Management Section of Martinelli KM Portal shows the documents that more frequently appear are the ones related to market/process knowledge areas (64%), followed by the the ones related to managerial knowledge areas (35%). Document pertaining technological matters, are instead totally absent, even in the three technological Boxes.

A similar composition of documents has been found in the Management Section: also in this repository the mainly represented macro-class of knowledge is market/process (81%), followed by managerial knowledge (19%). Documents related to technological knowledge areas do not appear.

From the analysis of the Global Container and Management Section emerges the complete absence of technological knowledge. This could sound quite strange in a company that makes technology consulting its core business. This situation is confirmed by the words of the project leader of group number five: *“whenever I have a problem related to technology I’m sure I cannot rely on the portal! Probably, programming languages and other technological stuff are too specific to be usefully*

shared on the portal; problems are always different and it's not convenient to store them. So, I usually take the telephone and make a call to a colleague expert on that domain of knowledge".

5 Findings

From the analysis of the Martinelli case we obtain the following findings. In first place, we notice how the tools available on the Martinelli KM Portal can be reconducted to only one of the four categories of KM tools we defined in our model: the ones with low collaborativity and low multimodality. On the base of our study, besides, we also found that, of the three knowledge areas identified, only two are effectively shared by using the these tools. Technological knowledge, in fact, is not available at all on Martinelli KM Portal. This suggests the presence of a relation between knowledge dimensions and the characteristics of the technological tool used to transfer knowledge. As a consequence of the existence of this relation, some knowledge areas can be shared by a particular means, while others cannot. Drawing on this we can deepen the general model of task-technology fit. In particular, within the relation between knowledge and technology, we can observe the following relations.

5.1 The Relation between Codifiability and KM Tools

The presence on the Martinelli KM Portal of managerial and market/process knowledge areas reveals how a high level of codifiability requires the use of a low collaborativity and low multimodality tools, such as the Global Container and the Management Section.

Proposition 1: Knowledge areas with a high level of codifiability can be effectively shared by using low collaborativity and low multimodality tools.

5.2 The Relation between Epistemic Complexity and KM Tools

The complete absence of technological knowledge areas on Martinelli KM Portal shows how knowledge area, with a high level of epistemic complexity cannot be shared by using low collaborativity and low multimodality KM tools.

On the contrary, tools with a high level of collaborativity and high level of multimodality are indicated for this kind of knowledge.

Proposition 2: Knowledge areas with a high level of epistemic complexity can be effectively shared by using high collaborativity and high multimodality tools.

5.3 The Relation between Task Dependence and KM Tools

From the analysis developed in Martinelli Consulting we found out as knowledge areas with a high level of task dependence can effectively be shared by using tools with a low level of collaborativity and a low level of multimodality. Market/process knowledge area were widely present on Martinelli KM Portal. This shows that the “repository” logic is suitable when dealing with knowledge with a high level of task dependence.

Proposition 3: Knowledge areas with a high level of task dependence can be effectively shared by using low collaborativity and intermediate multimodality tools.

6 Conclusions

Our experience shows that knowledge management initiatives can fail if they are not included in the wider context of organizational capabilities. As Teece et al. [15] warn, the ability to integrate, build and reconfigure internal and external competencies to address rapidly changing environments is a matter of dynamic capabilities. Knowledge management tools and techniques are only a partial aspect of these mechanisms and cannot assure by themselves a sustained competitive advantage.

Our results indicate that the implementation of technologies for KM should be accompanied by a deep understanding of the nature of the knowledge that is going to be shared and of technology used to share it. Our paper, however, presents some points that need to be developed. Further research could be addressed to carefully define which is the “dominant” dimension within a knowledge area. In other words, the three characteristics of codifiability, epistemic complexity and task dependence could be present in the same knowledge area. It would be critical, therefore, to define which one, of this three knowledge dimensions, has the major influence in the decision process underlying the selection of the appropriate tool for knowledge sharing.

Another point to be addressed by further research, could be testing these propositions in other contexts, in order to reach a god level of statistical generalization. What we primarily aimed in this paper has been, instead, a sound level of theoretical generalization, consistently with the qualitative techniques we used.

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