The success of the Expert management systems : the role of knowledge community

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Thèse
Tesi

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Discipline : Sciences de Gestion

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présentée et soutenue publiquement par
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JURY/COMMISSIONE

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To a convivial degrowth

I thank everyone who participates somehow to my thesis effort: my family and my friends, the

colleagues of the two research centers, CETIC and CREGO, the members of the dissertation

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I also express gratitude to the people who have motivated me to prosecute with persistency in

this educational and professional progression.

Finally, I show appreciation to you, reader, because you have given to me the energy to

complete this document.

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1 Research framing

In the diversity of the Information Systems research (Vessey, Ramesh et al. 2002), this thesis is mainly backed up by the reference disciplines of **Information Systems** and Management. The research topic is Knowledge Management, which is studied at the level of the individuals, who are considered members of some Knowledge Communities. The author adopted a positivist research approach to this topic and applied the case study and the survey methodologies as main research methods.

The observation of the limited success of the type of Information Systems, hereafter called Expert Recommending Information Systems, has motivated the author to research the reasons of this limited success. The major objective of this thesis has been therefore the identification of the dimensions of success of the Expert Recommending Information Systems and determination of the influence of the Knowledge Communities in this success. As it will be described in the following chapters, the author has found and measured the influence of the Knowledge Communities to the success of the Expert Recommending Information Systems.

Before the description of the two preliminary studies, the author proposes the explanation of the research context, the research object, the study propositions and assumptions, the research questions, the research objectives, the research framework, and the research relevance.
This first section ends with the presentation of two preliminary studies and the description of the organization of the research.

1.1 Research introduction

The knowledge transfer

In our society (Nonaka 1991; McDermott 1999b; McDermott and O'Dell 2001; Viginier, Paillard et al. 2002), knowledge is considered, by individuals and by organizations, an economic resource and it surges as the only long-term sustainable competitive advantage (Nonaka 1991; Abecker and Decker 1999; Viginier, Paillard et al. 2002; Liu 2003). In the organizations, the management of knowledge is an ever-green issue and it exploits the existing technology to improve its processes (Guida and Berini 2000). Nowadays, Information and Communication Technology (ICT) are giving chances to enhance the management of knowledge in the organizations containing its costs (Sveiby 1997).

In this attempt to contain costs, organizations are trying to train their members basing on the existing knowledge, because transferring existing knowledge is cheaper than creating new knowledge (Nonaka 1994; Smith and McKeen 2003). Within this document, "**knowledge transfer**" refers to this communication of knowledge from an individual or an organization and its reception and application by another individual or organization (Ko, Kirsch et al. 2005; Lin, Geng et al. 2005; Maier, Hadrich et al. 2005; Lichtenstein and Hunter 2006).

The importance of the knowledge transfers is largely debated (Swap, Leonard et al. 2001; Bhagat, Kedia et al. 2002; Nadler, Thompson et al. 2003; Song, Almeida et al. 2003; Lin, Geng et al. 2005). Empirical results demonstrate that the ability to transfer knowledge positively contributes to the organizational performance of firms in both the manufacturing (Galbraith 1990; Epple, Argote et al. 1996) and service sectors (Darr, Argote et al. 1995; Baum and Ingram 1998). Although the benefits of the knowledge transfer have been documented in many settings, the effectiveness of this transfer varies considerably among the organizations (Szulanski 1996; Argote 1999).

Knowledge transfer is the only way to train people basing on the existing knowledge and it is accomplished in multiple ways, from the training courses, to a conversation during a coffee break (Brown and Duguid 1991; Nonaka 1994; Davenport 1997; Sussman and Siegal 2003). Even though knowledge transfer could assume different forms, some intrinsic limits exist in this transfer and they depend on the characteristics of the knowledge. The particularity of knowledge transfer, in comparison with the transfer of other resources, is due to a peculiar property of knowledge: knowledge does not exhaust itself through its use. On the contrary, its

use brings to its extension and development, through a virtual growing circle (Guida and Berini 2000).

Moreover, knowledge involves cognitive structures and processes and it cannot be embodied in texts or other explicit representations (Brown and Duguid 1991; Nonaka 1994; Davenport 1997; Becerra-Fernandez 2000; Sussman and Siegal 2003). Even though knowledge transfer requires always human action, ICT can play an important role in the knowledge transfer, by the very beginning.

The first step to transfer knowledge regards the recognition of the heterogeneous distribution of knowledge among individuals (O'Dell and Grayson 1998b). ICT supports this activity, but some significant steps could be done toward much more efficient solutions.

Knowledge redundancy refers to the existence between the parties of common information, in addition to the specific information of each individual (Nonaka 1994). Whether there is knowledge redundancy among the sender and the potential recipient of knowledge, the recognition of the heterogeneous distribution of the knowledge among the individuals makes the knowledge transfer possible.

Nonaka (Nonaka 1994) affirms that this knowledge redundancy is caused by the overlapping of company information, business activities, and management responsibilities. This knowledge redundancy is assured by the participation to the same **Knowledge Community**, which is a group of individuals that share a common practice, work, or interest as common knowledge, for the integration and transfer of specialized knowledge among the group's members.

The participation to the same Knowledge Community reduces the cognitive distance between the parties (Markus 2001; Marti 2005) and assures the existence of same common knowledge, which will be used as basis for the knowledge transfer. The Knowledge Community has therefore a crucial role in knowledge transfer. In this situation, individuals can enter each others' area of operations and they can provide advice. A Knowledge Community allows people to provide new information from different perspectives, what Nonaka (Nonaka 1994) calls learning by intrusion. In summary, redundant knowledge enables the members of the organization to recognize the specialized knowledge of the colleagues and to facilitate the transfer of knowledge (Nonaka 1994).

Knowledge Communities are gaining relevance as an organizational resource that can enhance the knowledge transfers among their members, for the benefit of the individuals and the hosting organizations (Wenger, Mc Dermott et al. 2002). However scholars and

practitioners debate on the degree of intervention the organizations should practice on the Knowledge Communities involving their personnel.

Various examples of firms that support Knowledge Communities, through computer-based systems, storing and retrieving documents, exist and some of these systems are very successful (Bonifacio and Merigliano 2002). On the other hand, computer-based systems supporting the transfer of knowledge are less diffused and successful.

Since previous research reports the central role of knowledge for competitive advantage, it is imperative for organizations to explore more effective solutions for levering this knowledge. This research study is proposed in an attempt to contribute in solving this lag, starting from the hypothesis that Knowledge Communities and computer-based systems can facilitate the transfer of knowledge.

In the research area where Knowledge Communities, computer-based systems and Knowledge Management overlap, this study focuses on the computer-based systems that counsel the individuals who could be potential source of specialized knowledge, within a Knowledge Community. The author calls this type of computer-based systems "Expert Recommending" information systems because they counsel the individuals supposed to be experts and in the position to help the users to solve problems of business process breakdowns. The author hypothesizes that these counseled individuals can be potential sources of knowledge for the users who are facing these problems of business process breakdowns.

In this research, the author studies the Expert Recommending information systems as a service. Instead of focusing on the computer-based system in it-self, the author is interested in the service it delivers, the Expert Recommending Service. Consistently with this service perspective, the research object would include also the information systems in which this ERS is delivered without any computer-based support, thus by a specific department or by the members of the Knowledge Community by them-selves.

Research object

The described research context suggests various research streams. This study has defined the Knowledge Management, the Knowledge Communities, the Knowledge Management Systems and specifically the Expert Recommending Services, as its research objects. These four objects will be introduced in the following, while the second chapter will offer their extensive presentation.

Knowledge Management

Knowledge Management is the field that aims at the enhancement of the management of knowledge in the organizations and it derives from the integration of some organizational approaches to the Management discipline. This integration opens the possibility and opportunity to intervene in the organizations to lever existing knowledge and to enhance the creation of new knowledge for the organizational benefit (Maier, Hadrich et al. 2005).

This attention toward knowledge originates from the recognition of knowledge as a potential source of sustainable competitive advantage (Spender and Grant 1996). On one hand, the organization has to optimally employ the existing knowledge. On the other hand, the organization has to continuously develop new knowledge (Grant 1996b; Sambamurthy, Bharadwaj et al. 2003). The attainment of these two objectives determines the **sustainable competitive advantage** and therefore some superior performances.

These objectives can be achieved through very different efforts. The field of Knowledge Management has been, from the very beginning, a multidisciplinary field, which caused the existence of multiple perspectives on Knowledge Management, in theory and in practice. These multiple perspectives open the possibility to this great variety of efforts concerning Knowledge Management.

Knowledge Communities

Different mechanisms are proposed in the literature for the **integration and transfer of knowledge** (Thompson 1967; Van de Ven, Delbecq et al. 1976; Levitt and March 1988; Brown and Duguid 1991; Nonaka 1994; Grant 1996b): the rules and directives, the sequencing of the work activities, the routines, the groups of problem solving and decision making, the conversion of knowledge, the communities. The suitability of the mechanisms depends on the properties of the knowledge and on the context where this knowledge has to be integrated or transferred.

While the first mechanisms are very suitable in the stable ad simple environments, the later ones are adapted for more dynamic and uncertain contexts (Grant 1996b). As already stated, a Knowledge Community is a group of individuals that share a common practice, work, or interest as common knowledge, for the integration and transfer of specialized knowledge among the group's members.

Part of the literature names "community of practice"this ensemble of individuals, volitionally interacting and coordinating each others basing on common practices,. However the utilization of the term "community of practice" in different contexts, with very different

senses, and the vagueness of the term "practice" bleach the meaning of "community of practice" (Ross 2003). Therefore, within this research, the term "Knowledge Community" will be used, with the previously stated meaning.

The contexts, where tasks are complex (Perrow 1967) and uncertain (Galbraith 1973), demand to rely upon the continuous volitional interactions among the individuals and the creation of spontaneous, non-standardized coordination mechanisms (Boland and Tenkasi 1995; Grant 1996b; Hasan and Gould 2001).

In these dynamic, complex and uncertain contexts, the Knowledge Communities seem effectively enhancing the knowledge transfer. In these cases, the knowledge redundancy, which is necessary for the integration and transfer of specialized knowledge, is based on this common practice, work or interest of the members (Brown and Duguid 1991).

On the contrary, the mechanisms, like formal groups and teams, result having a limited ability to create spontaneous, non-standardized coordination, knowledge transfer, and knowledge integration (Favier, Coat et al. 1998; Griffith, Sawyer et al. 2003; Koeglreiter, Smith et al. 2006).

Knowledge Communities can be exploited for the organizational management of knowledge. The organizations can practically intervene in the Knowledge Communities, also providing resources and infrastructures. These interventions can reduce the obstacles to knowledge transfer and knowledge integration making the Knowledge Communities more effective and more respondent to the organizational aims (O'Dell and Grayson 1998a; Cross, Parker et al. 2001; Millen, Fontaine et al. 2002; Wenger, Mc Dermott et al. 2002; Lesser and Strock 2004).

Knowledge Management Systems

Among the possible resources, Knowledge Management Systems (KMS) have been indicated as an effective solution **to support knowledge transfer** and knowledge integration in Knowledge Communities by vast portions of the research community (Wenger 2001; Bieber, Engelbart et al. 2002; Agresti 2003; Pan and Leidner 2003; Markestijn 2004; Taylor 2004; Boughzala and Kaouane 2005).

KMS are the computer-based systems supporting the organizational management of knowledge (Alavi and Leidner 2001). Various computer-based systems could be effectively applied such as:

- Email, groupware, intranets, collaboration platforms to support the transfer of knowledge between individuals (Boland, Tenkasi et al. 1994; Nonaka 1994; Henderson and Sussman 1997; Alavi and Leidner 2001; Kim, Chaudhurry et al. 2002).

- Knowledge maps, corporate directories, personnel profiling systems to assist the retrieval of the information on the knowledge domains of the individuals (O'Dell and Grayson 1998b; Huber 2001).

The major advantage of the computer-based systems is the possibility to break the geographical barriers and to reach distant individuals (Robertson, Swan et al. 1996; Hansen, Nohria et al. 1999). In fact, research demonstrates that the retrieval of information and the communication tend to be usually limited to the neighboring individuals, who each individual is in regular contact with. This behavior limits the diversity of knowledge domains that a single individual can access, because it is probable that the nearby individuals have similar knowledge domains (Robertson, Swan et al. 1996). This tendency is aggravated by the ascertainment that individuals are unaware of the knowledge domains of the other organization's members (Kogut and Zander 1996).

The computer-based systems that are able to expand the amplitude and the richness of the contacts expose the individuals to new knowledge (Granovetter 1973; Granovetter 1983; Constant, Sproull et al. 1996; Robertson, Swan et al. 1996). The retrieval, through a computer-based system, of the individuals with a specific knowledge domain, extends the potential access to remote knowledge (Andreu and Ciborra 1996; Offsey 1997). The access to these individuals and the following communication with these individuals with the researched knowledge domain, improves the mobility of knowledge (Hinds and Kiesler 1995).

Expert Recommending Services

Among the variety of Knowledge Management Systems, one kind of KMS, called "Expert Recommending Service" (ERS), addresses the knowledge transfer between individuals. Its specificity reposes on its functionality of **supporting the individual awareness** on the knowledge domains of the other individuals.

This awareness regards the acknowledgement of the domains of knowledge of the other members. Several studies were concerned about the awareness barrier to knowledge transfer and the dimensions of this awareness (Libby, Trotman et al. 1987; Beaudouin-Lafon and Karsenty 1992; Dourish and Bellotti 1992; Littlepage and Silbiger 1992; Tollmar and Sundblad 1994; Littlepage, Robison et al. 1997; Davenport, De long et al. 1998; Cross, Parker et al. 2001; Ruta and Turati 2002 page 151; Borgatti and Cross 2003; Kondratova and Goldfarb 2003; Baumann and Bonner 2004; Daassi, Favier et al. 2004; Denrell, Arvidsson et al. 2004; Qureshi and Keen 2004). Being aware of the individuals who could be source of

specialized knowledge, i.e. knowing what the other members know, is a precursor to search a specific individual out, when some specialized knowledge is required.

This knowledge awareness improves the retrieval of the individuals with specialized knowledge. The lack of knowledge awareness or its incompleteness is the first barrier to knowledge transfer. The Information Systems can enhance the knowledge awareness, by counseling the individuals, who could likely have the specialized knowledge, required by the potential recipient. This support can also be reversely realized, by counseling the individuals, who could likely require the specialized knowledge that a person has.

Starting point of the information processing of the ERS is the capturing of information on the individuals, concerning their knowledge domains. Several kinds of information on the individuals can suggest their knowledge domains, such as: their competences, their project participations, their task attributions, their responsibilities, their training programs, their education. The process ends with:

- the display of the information on the knowledge domains of the individuals, and
- the counseling of the individuals who could likely have specialized knowledge, or
- the counseling of the individual who could likely required specialized knowledge.

In order to avoid information overflow, this Information System supporting knowledge awareness should provide information only on a precisely selected subset of all the individuals.

The Information Systems that propose a subset of all the stored entities that should most likely satisfy the users' requests are classifiable under the label "Recommender Information Systems". The recommendation could concern different entities such as; books, restaurants, routes. In case the recommendations are about individuals, who could likely have the required knowledge, the Recommender Information Systems have been declined as Expert Recommender Information Systems (Yimam-Seid and Kobsa 2000a).

As already affirmed, this study prefers to explicitly state the service nature, instead of the product nature, of the Expert Recommender. Moreover, the use of the term "service" seems appropriate in regard also to the writing of Allison and Jonquet (Allison, Cerri et al. 2005; Jonquet and Cerri 2005). These authors state that the term "**service**" refers explicitly to the condition of the only partial expression, in advance, of the required knowledge, and its completion only as result of the interactions. The Expert Recommending Service (ERS) is, therefore, the Information System service of counseling to the potential recipient those

individuals, who could likely have the specialized knowledge that the potential recipient requires.

Research propositions and assumptions

This study approaches these research objects with some preliminary propositions and assumptions. They are the starting point for the development of the research questions and of the research framework. The author, from his empirical experience and the literature review, proposes that:

1. The Knowledge Communities differ one to another on the values of their properties.
2. The Expert Recommending Services vary for their specific technical characteristics, their integrations in an organizational context and their usage by the members of the Knowledge Communities.
3. The characteristics of the Knowledge Community influence the success of the Expert Recommending Service.
4. The Expert Recommending Services influence the knowledge transfers among the members of the Knowledge Communities.
5. The provision of the Expert Recommending Services and the knowledge transfers influence the values of some properties of the Knowledge Communities, creating a feedback loop.

These propositions and assumptions give a preliminary perspective of observation on the research objects and inform the definition of the research questions.

Research questions

These research propositions and assumptions give the basics to try to answer the following three research questions. They concern the Expert Recommending Service and the Knowledge Community.

This study assumes that an increase in the success of the ERS has a positive effect on the amount of the knowledge transfer in the Knowledge Community. Nevertheless, the author considers the analysis of the knowledge transfer out of the research scope, limiting the scope at the enhancement of the awareness in the knowledge distribution among the members.

First research question

The first research question concerns the success of the Expert Recommending Services. In the organizations, Expert Recommending Services are realized in different ways: from the

informal ERS provided by the colleagues, to the formal computer-based ERS provided by software applications. The different forms of the ERS and the organizational contexts could influence the success of the ERS.

The major aim of the ERS is the improvement of the awareness of the individuals on the knowledge domains of the other members. Therefore, the success of the ERS could be measured on the degree of knowledge awareness obtained. This knowledge awareness, at last, could determine an increase in the knowledge transfers.

This study proposes to understand and to measure the dimensions of the success of the ERS, hence the first research question is:

What are the dimensions of the success of the Expert Recommending Services?

Second research question

The second research question is about the determinants of the success of the Expert Recommending Services.

As already mentioned, the Expert Recommending Service is an Information System aiming at enhancing the awareness on the knowledge distribution among the members of a Knowledge Community.

Many variables could influence the success of an Information System and the ERS could equally have several factors that could influence its success. The specificities of the ERS put in evidence the crucial influence of the Knowledge Community in the success of the ERS. This study proposes to understand the properties of the Knowledge Community, because they are supposed to influence, as external variables, the success of the ERS. Therefore the second research question is:

What are the properties of the Knowledge Community that influence the success of the Expert Recommending Services?

Third research question

The third research question is about the degree of influence of the properties of the Knowledge Community on the success of the Expert Recommending Service.

This study supposes that the Knowledge Community has an influence on the success of the ERS, and consequently the properties of the Knowledge Community affect the degree of the ERS success. The Knowledge Community could impact on the ERS success to different extent depending on the strength of the relationship between the properties of the Knowledge Community and the success of the ERS.

So the strength of this relationship is the third point under study and the third research question is:

To what degree the success of the Expert Recommending Services is influenced by the properties of the Knowledge Community?

Other research questions around these approached subjects have great potential. The feedback from the provision of the ERS, to the values of some properties of the Knowledge Communities, affirmed in the fifth research proposition, seems particularly interesting.

It is evident that a feedback exists. The individuals, who received a recommendation of an expert, extend their degree of Knowledge of the Others, and specifically of the proposed expert. This extension increases the awareness on the knowledge distribution among the members and the cohesion in the Knowledge Community.

Nevertheless, for resource constraints, this thesis will focus only on the three mentioned research questions, excluding the feedback loop from this study.

Research objectives

The answer to these three research questions will allow the achievement of the following set of three research objectives:

To describe **the success of the Expert Recommending Services within Knowledge Communities. The major aim of the ERS is the development of the awareness of the individuals on the knowledge domains of the other members of the Knowledge Community. Therefore, the description of its success is largely based on the degree of awareness obtained in the Knowledge Community and the measurement of the degree of improvement of the knowledge transfers (**

1. Figure 1).
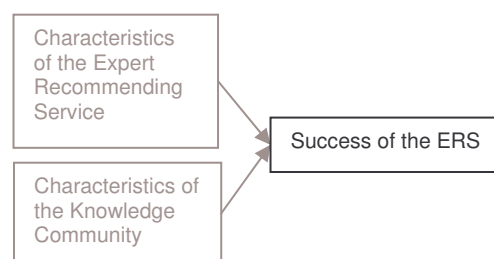
Figure 1 The description of the success of the ERS

2. To **predict** the degree of the success of the ERS within the KC, depending on the characteristics of the ERS and of the KC. The success of the ERS partially reflects the

factors influencing the Information Systems success. However the specificity of the ERS in comparison with the other classes of IS imposes to pay attention also to the characteristics of the Knowledge Community. The KC has a crucial role on the awareness of the knowledge domains of the others, on the knowledge transfers, and, therefore, on the ERS success. So, the degree of success of the ERS can be predicted taking into consideration the ERS and the KC where the ERS operates (Figure 2).
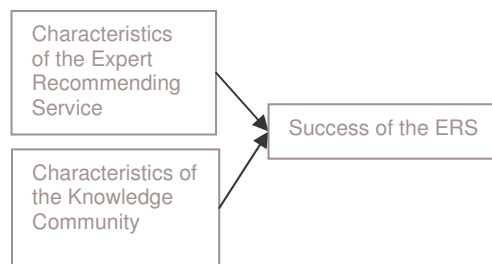
Figure 2 The prediction of the success of the ERS

3. To **identify** recommendable interventions to enhance the success of the Expert Recommending Services within Knowledge Communities. The definition of the causal links that relate the factors influencing the success of the ERS to the ERS and the KC is the first step to determine eventual interventions to improve the success of the ERS. The understanding of the factors affecting the success allows the indication of the initiatives to modify the ERS and the KC, in order to raise the knowledge awareness and the knowledge transfer in the KC (Figure 3).
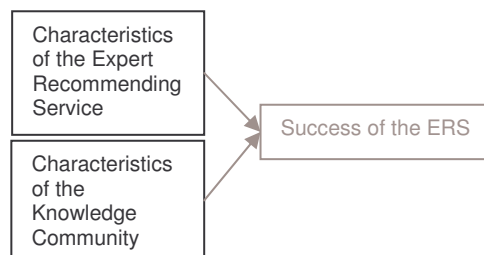
Figure 3 The prescriptions for the success of the ERS

Research framework

Epistemologically, this research is positivist, and realism is its ontological position. Nevertheless the post-positivist methodological pluralism is accepted because the author believes that there is not one correct method of science. As Hirshheim states (Hirshheim),

many methods could be correct and the most correct one is contingent on the facing problem, the kind of desired knowledge, and many other factors.

The positivist perspective is adopted for several reasons. The novelty of the subject induced the author to base the research on well-affirmed and widely diffused methodologies. So the adoption of a positivist perspective seemed the best solution to find wide support and well-affirmed methodologies in the literature of the IS disciple. Moreover, this choice has been in line with the research programs of the research center CETIC, where I started my research activity.

The presentation of this research follows the proposal of Cameron and Whetten (Cameron and Whetten 1983 pages 270-274) concerning the framing of the studies on organizational effectiveness that has been adapted to IS research for the studies concerning the IS success (Seddon, Staples et al. 1999). In the opinion of Cameron and Whetten, the studies that are concerned with measuring organizational effectiveness, should **answer to seven questions**.

In the adaptation to the IS research by Seddon (Seddon, Staples et al. 1999), the first question (From whose perspective is effectiveness being judged?) and third question (What is the level of analysis?) are conveniently combined in one dimension, which has been called "stakeholder". The stakeholder is "the person or group in whose interest the evaluation of IS success is being performed" (Seddon, Staples et al. 1999).

The resulting six questions are:

4. What is the stakeholder of analysis?
5. What is the domain of activity?
6. What is the purpose of evaluation?
7. What time frame is employed?
8. What types of data are to be used?
9. Against which referent is effectiveness to be judged?

Stakeholder of analysis

The research questions will be answered starting from the analysis of the individuals, who are members of the same Knowledge Communities and who have access to the Expert Recommending Services. It is from the perspective of this group of stakeholders that the success of the Expert Recommending Service will be judged and this judgment will be about the perception of these individuals wishing to be better off.

The stakeholders of analysis will be therefore the **individuals** who have access to the Expert Recommending Service and who are members of a Knowledge Community. Their analysis

will concern their perception on the Expert Recommending Service and on the Knowledge Community.

Domain of activity

For the evaluation of the success of the Expert Recommending Service, this study takes into consideration the domain of **activities performed by the individuals** through the Expert Recommending Service. These individuals use this Information System to receive counsels of those individuals, who could likely have the specialized knowledge they require. The success depends therefore on the success of these counsels. The enhancement of the awareness of the knowledge distribution among the members of the Knowledge Community should favor, at the end, the knowledge transfer.

Purpose of evaluation

The answers to the three research questions give the opportunity:

1. To explore the research theme of the Expert Recommending Services and its connection with the Knowledge Communities, as a preliminary step for the transfer of knowledge.
2. To describe the relationships between the success of the Expert Recommending Services and the characteristics of the Knowledge Communities.
3. To predict the success of the Expert Recommending Services basing on their characteristics and on the properties of the Knowledge Communities.
4. To recommend some interventions for increasing the success of the Expert Recommending Services.

The general aim of this research is the **improvement of the knowledge transfer** in the organizations. To attain it, the author identifies in the diffusion of the results of this research the principal mean to explain to the organizations the levers that the organizations have to improve the knowledge transfer.

More specifically within this general aim, the improvement of the knowledge transfer can be pursued by the enhancement of the success of the ERS. To achieve this objective, the organizations could follow the suggestions proposed in the final part of the document, where some levers to affect ERS success are delineated.

Time frame

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The author completes this research in a **short period of time**, making it a transversal study rather than a longitudinal study. Different Expert Recommending Services will be observed in different organizations in the same period of time of around 6 months.

Data types

Data will concern the Expert Recommending Service and the Knowledge Community. Specifically, data will be gathered on the characteristics of the Expert Recommending Services, the characteristics of the Knowledge Communities, and the characteristics of the organizations where the ERS exists and it is accessible to the members of the Knowledge Community.

Different types of data will be collected through the direct observation and the information reporting. Primary data will take mainly the form of annotations of the direct observations, interview transcripts, and questionnaire's answers, while the secondary data will take mainly the form of documents.

Judgment referent

The referent of the judgment on the success of the ERS will be the **individuals using the ERS**. The most part of the data collected will be perceptions of the individuals on the Expert Recommending Service, their Knowledge Community. These judgments are the individual feelings on the reality of the ERS and are controlled through the direct observation of the objects under study.

The comparison of the results will be made only within the different cases under study, and not with some other organizations, some ideal levels of performance, some stated goals, or some past performances, as proposed by Seddon (Seddon, Staples et al. 1999).

Research relevance

Sambamurthy and Subramani (Sambamurthy and Subramani 2005; Sambamurthy and Subramani 2005), in their foreword to the special issue on Information Technologies and Knowledge Management in the MIS Quarterly journal, have highlighted the research relevance in Information System jointly with Knowledge Management. The author justifies the research relevance of this study using their foreword as starting point.

Theoretical relevance

Different studies give the basis for the appreciation of the theoretical relevance of this research.

Sambamurthy and Subramani underline the centrality of knowledge as organizational asset, which is reflected in the emergence of the theory of the knowledge-based view of the firm (Nonaka and Takeuchi 1995; Conner and Prahalad 1996; Spender 1996b; Spender and Grant 1996).

This perspective builds upon and extends the theory of the resource-based view of the firm described by Barney (Barney 1991). This theory states that the product offer of the organizations is function of the firm's knowledge that is difficult to imitate, and so it could favor a long-term competitive advantage. As Alavi and Leidner (Alavi and Leidner 2001) underline, the basis of the competitive advantage is not the knowledge in it-self, but its employment in the business processes. Information Systems reveal their strategic relevance in the knowledge-based view because they can favor the employment of knowledge in the business processes.

Moreover, knowledge is heterogeneously distributed among individuals, as demonstrated by Takeishi, Teece, Pisano et al. (Teece, Pisano et al. 1997; Takeishi 2002). Therefore the capability to transfer and integrate knowledge where and when it is useful is crucial for the organizations.

In addition, Ghoshal and Moran (Ghoshal and Moran 1996), as well as Subramani and Venkatraman (Subramani and Venkatraman 2003) indicated that the cooperative social contexts are advantageous for the organizations' competitiveness. These cooperative social contexts promote the knowledge transfer and integration among their members and partners, through the creation of some effective intra-organizational and inter-organizational relationships.

These relationships between individuals, based on common practice, interest, or work, develop the Knowledge Communities (Brown and Duguid 1991), which are theoretically considered a prerequisite for an effective knowledge transfer and integration. Each Knowledge Community has its own unique and context-specific common knowledge that facilitates the knowledge transfer within the Knowledge Community and restraints the knowledge transfers with other Knowledge Communities.

Given this theoretical context, Sambamurthy and Subramani (Sambamurthy and Subramani 2005; Sambamurthy and Subramani 2005) deduce that the choice of the Information Systems

to support the transfer and integration of knowledge is very important, but unfortunately under-explored.

Information Systems could play a critical role in Knowledge Management, because the IS functionalities could provide important services for improving the knowledge transfer and integration.

Knowledge Management Systems, the IS supporting KM, gather computer-based solutions for storing documents and best-practices, mapping the distribution of the knowledge among the individuals, and linking non-collocated individuals (Alavi and Leidner 2001).

Sambamurthy and Subramani (Sambamurthy and Subramani 2005; Sambamurthy and Subramani 2005) account the existence of different frameworks in IS discipline concerning the themes around the management of knowledge and the role of the Information Systems. However these authors point out the persistence of some unresolved questions among the wide range of issues that the IS could cover in the organizational KM.

The management of knowledge in the organization is an issue that concerns all the business processes and also the IS could be largely employed across all the organization to support Knowledge Management. However, the identification of which **IS functionalities** could improve the KM, in each phase of the business processes, is not fully solved.

Sambamurthy and Subramani (Sambamurthy and Subramani 2005; Sambamurthy and Subramani 2005) call to clear up the matter of the role of the IS into the KM (Markus and Majchrzak 2002), because many unresolved issues, challenges and opportunities exist. This effort should not be restrained to the technical aspect of the Information Systems. Social processes have demonstrated their relevance in the success of the Knowledge Management efforts, so they need a balanced attention and exploration.

Theoretical relevance of a study on Expert Recommending Services

Sambamurthy and Subramani (Sambamurthy and Subramani 2005; Sambamurthy and Subramani 2005) highlight specifically the importance of the Expert Recommending Service. They describe that, under certain conditions, individuals have problems in identifying the colleagues with the specialized knowledge required to solve the problems or to make the appropriate decisions. These problems exist as long as an effective description of the knowledge distribution among the members of the organization is unavailable. The individuals cannot identify the correct expert who could contribute to the accomplishment of

the task at hand. Therefore, the wished knowledge transfer and integration would be aided by the understanding of the knowledge distribution among the individuals.

Research suggests that social relations, such as the membership to the same Knowledge Community, facilitate the **awareness on the knowledge distribution**. Similarly, Information Systems can contribute to the enhancement of the awareness on the knowledge distribution. IS can enhance it indirectly, backing the development of Knowledge Communities, but also directly, creating some KMS that map the distribution of the knowledge, and display this map to the individuals on demand.

This way of levering knowledge could avoid the cost and the risk of putting all the corporate knowledge into one central repository of the Information System, which is considered an attempt doomed to fail (Stewart 1997b).The real value of Information Systems on Knowledge Management would not be in the creation of this information repository, but rather in connecting people to people, so they can transfer knowledge one to each other (Stewart 1997b).

The verified limits of the information repository approach should stimulate a new approach that should pay much more attention to the individuals and to the individual knowledge (O'leary 1998; Hendricks and Vriens 1999; Nabeth, Angehrn et al. 2002; Maier 2004; Nabeth 2004).

Sambamurthy and Subramani (Sambamurthy and Subramani 2005; Sambamurthy and Subramani 2005) conclude affirming that "research is still needed to understand the social, cognitive, institutional, and technological processes, through which the seekers of knowledge locate" experts.

Of the same opinion are Wasko and Faraj (Wasko and Faraj 2005) who recall what Lin, Monge et al. (Lin 2001; Monge et al. 1998) have already affirmed about the existence of little empirical research into the communication and organization processes of knowledge transfer.

Also Borgatti and Cross (Borgatti and Cross 2003) are in line with this assertion, when they notice the considerably scarce attention paid to understand the characteristics of the factors that affect the decision to seek knowledge from other people.

The lack of academic research on Information Systems, contributing to the comprehension of the process, through which the seekers of knowledge locate the experts, justifies the following research.

Methodological relevance

The methodological relevance of this research is described starting from two studies aiming at understanding the diversity in IS research (Vessey, Ramesh et al. 2002), and in KM research in the IS discipline (Schultze and Leidner 2002).

Vessey, Ramesh et al. (Vessey, Ramesh et al. 2002) developed a taxonomy that classifies the Information Systems research basing on 5 different dimensions: reference discipline, level of analysis, topic, research approach, and research method. Their data collection and analysis of 488 IS articles, through the 5 top-tanked Information Systems journals, from 1995 to 1999, reveals considerable diversity in each of the five considered dimensions:

1. Reference discipline: the major reference discipline is Information System discipline.
2. Level of analysis: the most diffuse levels of analysis are organizational and individual levels.
3. Topic: the most frequently addressed topic is IT usage.
4. Research approach: the most used research approach is the evaluative-deductive approach.
5. Research method: the most practiced research method is field study.

From this broad perspective, this study is well positioned in the main Information System research for all the five dimensions:

1. The reference discipline is Information Systems.
2. The level of analysis is the individual, as member of some Knowledge Community.
3. The topic concerns the usage of a Knowledge Management service, called Expert Recommending Service.
4. The research has an evaluative-deductive approach.
5. The research method is field study.

The only differences in respect to the main stream of IS research concern the level of analysis and the topic.

Firstly, the individual level, instead of the organizational level is practiced. As Vessey, Ramesh and Glass (Vessey, Ramesh et al. 2002) affirm, individual level remains the second most diffused level of analysis, so there is also a large tradition at the individual level

Secondly, the research topic is the combination of Knowledge Management topic and IT usage topic. While IT usage is the most diffuse, the combination of the IT usage and Knowledge Management, through the analysis of the **Knowledge Management Systems usage** does not seem diffused. The reason of this lack of research in KM topic is traced back

to the growth of attention to Knowledge Management only at the end of the surveyed period, as registered by Sarmento (Sarmento, Ramos et al. 2005).

Methodological relevance of a study on Expert Recommending Service

More specific to the topic of this study, Schulze and Leidner (Schultze and Leidner 2002) have accomplished a similar effort analyzing IS literature from 1990 to 2000, but only on Knowledge Management topic. They classified the research only on two dimensions: local/emergent versus elite/a priori dimension, and consensus versus dissensus dimension (Deetz 1996). The combination of the two dimensions brings the categorization of the KM research in four scientific discourses: normative, interpretative, critical, and dialogic discourses (Deetz 1996).

Schulze and Leidner (Schultze and Leidner 2002) categorized each analyzed article in one of the four discourses. For each category, they presented its research focus, its metaphors of knowledge, its theoretical foundations, and its implications.

The discourse of this study is clearly normative, because this study aims at enlightening the issue of the success of the Expert Recommending Service. This normative discourse is characterized by the tentative to favor the management and the control in the organizations of the ERS, and "the search for law-like relationships" (Schultze and Leidner 2002). These objectives will be achieved through a formulative-deductive research approach (Vessey, Ramesh et al. 2002) and the nomothetic research method of field study.

The unifying themes, in terms of research focus, have been identified, by Schulze and Leidner (Schultze and Leidner 2002), in the problem-solving and decision making tasks. This study is completely included in this knowledge focus because this research considers the Expert Recommending Service like a tool facilitating the identification of the experts, who could contribute to make decisions, or to solve problems.

The normative discourses represent knowledge mainly with the metaphor of knowledge as an object that can exist outside an individual and that can be stored and manipulated without the human intervention. This study does not assume this perspective, it considers knowledge always associated with the individual knowing it, and it assumes that knowledge cannot exist outside an individual. This perspective is not the most popular one in the study of Schulze and Leidner (Schultze and Leidner 2002), but it is nevertheless significantly used within the normative discourse.

The theoretical foundations of the normative discourses, instead, are very heterogeneous. There is not a clear identification of a major theory, used as reference for several studies. This study frames the context of the research, using the theory of the knowledge-based view of the firm (Grant 1996b) and the theories on Knowledge Communities. They are complemented with a model of Expert Recommending Service success, which is a reinterpretation in the IS field of the theory on the success of the communications, proposed by Shannon and Weaver (Shannon and Warren 1949) and its adaptation to IS by Mason (Mason 1978).Finally, this study reinterprets traditional theories and contextualizes them in Knowledge Management.

In terms of implications, the normative discourses present the recommendations for the improvement of the research on the Knowledge Management initiatives. Technological solutions are one of the most typical kind of recommendation, consistently with the reference IS discipline tradition (Schultze and Leidner 2002). This study does not wander from this structure, as this study will provide a set of recommendations to improve the success of the Expert Recommending Services.

In conclusion, the study of Schulze and Leidner (Schultze and Leidner 2002) offers the basis to assess that the methodology adopted in this study is well affirmed and widely diffused in the IS research and in KM topic. The originality of the research could be traced in the theoretical foundations and in the applied knowledge metaphor. Concerning the theoretical foundations, in KM research there is not a predominant theory, so this study follows what has been done only by a little portion of the KM academic community in IS discipline. Regarding the knowledge metaphor, this study takes the perspective of knowledge as inseparable from the individuals.

The original theoretical foundations and the knowledge metaphor choice motivate the application of **well affirmed research methodologies** in order to contribute to the cumulative development of IS and KM tradition.

Managerial relevance

Sambamurthy and Subramani (Sambamurthy and Subramani 2005; Sambamurthy and Subramani 2005) notice a lack of clear insight into the issue of the support of IS in the Knowledge Management.

Alavi and Leidner (Alavi and Leidner 2001) refer that the attention by the organizations toward knowledge is not a new issue as revealed by the long standing practices of training, employee development programs, manuals, organizational policies, routines, procedures (Alavi and Leidner 1999). However Alavi and Leidner (Alavi and Leidner 2001) evaluate an

increase in the strategic relevance of the issue and the development of new practices, such as: benchmarking, knowledge audits, best practice transfer.

This recent increase in interest in knowledge does not have always the planned results. Alavi and Leidner (Alavi and Leidner 2001) report about a survey (Cranfield University 1998) that evaluated that "the majority of organizations believed that much of the knowledge, they needed, existed inside the organization, but that identifying that it exists, finding it, and leveraging it remained problematic."

Another complementary survey (Gazeau 1998), cited by Alavi and Leidner (Alavi and Leidner 2001), mentions that "74% of respondents believed that their organization's best knowledge was inaccessible and 68% thought that mistakes were reproduced several times".

Moreover, the portion of knowledge that is accessed is transferred mainly through personal experience, as revealed by Delphi Group (Delphi Group 1998) in its survey of 400 executives on knowledge, where the percentage of the use of the personal experiences as a mean to transfer knowledge tops the 52%. Formal training reached the 24 % and on the job training the 17%, while only 2 % passes through some formal Knowledge Management System.

The personal experiences allow the transfer of the knowledge that is considered difficult to communicate, but highly valuable (Wellins, Byham et al. 1993; Bannon and Kuuti 1996; Gibson 1996; Bennis and Biederman 1997; Stewart 1997a; Ackerman and Halverson 1998; Bishop 2000; Cross and Baird 2000; Koskinen 2001; Yimam-Seid and Kobsa 2003). This knowledge is variously estimated at the, 42% (Delphi Group 1998; Hickins 1999), 80% (Holloway 2000), or 85% (Paul 2003) of the total knowledge.

The significant value and the high amount of the knowledge that is difficult to communicate should stimulate new organizational **solutions to tap this knowledge**.

In the direction of finding new organizational forms, Costa (Costa 2002) expresses how the personnel should be always more apt to solve business problems, without charging the hierarchical superiors in the open issues. The personnel should assume the characteristics of the professionals (Butera and Failla 1992) and should be able to solve complex situations, without waiting for the intervention of the superiors, but linking one another horizontally to gather the competencies required for the problem at hand. In fact, in the organizations, Costa (Costa 2002) registers that roles and positions are diminishing their relative value in favor to competencies and skills, as well as the competence approach to management of the human resources is diffusing in the firms (Camuffo 1995).

Managerial relevance of a study on Expert Recommending Service

The integration of the competence approach to human resource management and the need to have personnel able to flexibly solve problems by gathering competencies induce the development of new solutions. The personnel has to autonomously find the right human resources to solve the current business problem, reducing, at maximum, time and energy (Nonaka 1994). In the opinion of Nonaka (Nonaka 1991), this reform should be push by the top management, clearing away any obstacle, and preparing the ground for self-organizing groups.

The accessibility to the necessary information in the shortest possible time by everyone is a practical requirement (Nonaka 1994). For this purpose, organizations' members should know the knowledge domains of the colleagues, nevertheless preventing information overload (Nonaka 1994).

In the opinion of Nonaka (Nonaka 1994), this awareness on the knowledge of the other organization's members could inspire also deep, mutual trust. This trust is an important factor affecting knowledge transfer as both potential sender and potential recipient of knowledge should feel secure to complete the knowledge transfer. The lack of security in transferring knowledge could be determined, as already said, by a lack of knowledge of the other, but also by a cultural heritage that affirms that knowledge means power and that the transfer of knowledge could reduce the power of the knowledge owner inside the organizations (Compeau and Higgins 1995; Padova 2003).

The KMS in the organizations do not always encourage knowledge transfers among the individuals. KMS have functionalities mainly for the management of documents, instead of stimulating the Knowledge of the Others members and promoting the knowledge transfer between individuals (Nabeth, Angehrn et al. 2002; Yimam-Seid and Kobsa 2003).

So, it seems that organizations could obtain important **benefits from Information Systems** that contribute to the knowledge transfer, though the enhancement in the awareness of the knowledge distribution among their members.

The combination of theoretical, methodological and managerial relevance brings clear evidences of the appropriateness of this study in the IS field.

1.2 Preliminary studies

Preliminary studies were accomplished in order to deeply understand the research context and the most relevant open issues. This preliminary research involved two explorative qualitative studies.

The first one aimed at comprehending the importance of the Expert Recommending Service and of the Knowledge Communities in the organizational Knowledge Management.

The second one aimed at assessing the support that the Human Resource Management Systems can give to the provision of the Expert Recommending Services.

A summary of the two studies is reported, hereafter.

Expert Recommending Service and Knowledge Communities in the organizational knowledge management

This study aimed at exploring the relevance for the Chief Information Officers of the issues concerning Knowledge Communities and Expert Recommending Services, within their Knowledge Management programs.

A qualitative exploratory research has been accomplished to explore the problems around organizational Knowledge Management and Knowledge Management Systems. In this preliminary study, there was no a priori definition of Knowledge Management System, by the researcher, but the term "Knowledge Management System" refers to the Information System solution considered by the organization as a support to the management of knowledge at the organizational level.

The advantage of the qualitative approach concerns its inductive capacity to enable the exploration and the enrichment of the research model.

About the data production method, the author decided to conduct a semi-directive survey, by individual interviews with KMS officers. The author preferred this instrument because it is highly flexible and can generate a wealth of information (Miles and Huberman). The author tried not to be overly directive in the **face-to-face interviews** with the KMS officers. The interviews lasted from 30 minutes to 2 1/2 hours and were held in the officers' place of work. The interview guide listed the main themes and sub-themes to discuss in the interview and was drafted beforehand to find out the views of the KMS officers. This guide was designed to learn what the individual views were on the characteristics of: the interviewee, the

organization's KMS, the perceived objectives and results of the KMS program, the KMS use, and the perceived obstacles and facilitators of its use.

The guide did not concern directly Knowledge Communities and Expert Recommending Services. The researcher was interest to see whether and to what extent the issues of Knowledge Communities and Expert Recommending Services come out spontaneously from the interviewees.

The sample of companies contacted was selected by analyzing the professional press, popularization literature and the reports and programs of knowledge management trade fairs. Five interviews of KMS officers were held in five French companies (the names of the organizations are not the original ones).

- FDE is among the key players in the field of electricity generation, distribution and supply in Europe. It has the headquarters in France and a network of affiliates around the world.

- Tluaner operates in the automotive industry. It has a French origin but nowadays it has a worldwide diffusion both for the manufacture and for the sales of its series of vehicles.

- Regrebmulhcs is a leading oilfield service provider with research and engineering facilities worldwide.

- Selaht is a company in the electronic industry, serving aerospace, defense, security and service markets worldwide, with operations in more than 30 countries and with 60.000 employees.

- Ronisu is a leading producer in Europe in the steel industry and it is focused, in its product range, on the top end of the market (flat carbon steels and stainless steels).

The interviews were recorded in full and their content analyzed. The qualitative data produced by the interview survey was reprocessed and analyzed to obtain significant results for the development of the overall conceptual framework of this research. For the data analysis and interpretation, the author chose the thematic content analysis method (Berelson 1952; Grawitz 1996), which is based on a system of themes and sub-themes. The premise of content analysis is that repetition in speech of some units of analysis (such as words, phrases, sentences or paragraphs) points out the centers of interest and the opinions of the speakers. The author defined the analysis units as sentences, parts of sentences or groups of sentences and then grouped them based on the relation to Knowledge Communities and Expert Recommending Services.

For each of the two main themes of research, Knowledge Communities and Expert Recommending Services, the presentation of the results follows (in the Annexes the analytical results for each organization are distinctively presented).

Results on Knowledge Communities

The studied organizations created and supported the Knowledge Communities. These Knowledge Communities gathered employees, located worldwide, each one around a specific professional domain. These Knowledge Communities started-up through a top-down approach, or bottom-up approach. In a bottom-up approach, single employees proposed to the company the creation of a Knowledge Community for gathering people on a specific business domain and the management took in charge the organization of the initiative. In a top-down approach, the management developed autonomously the initiative of creating Knowledge Communities around specific knowledge domains.

The participation to the official Knowledge Communities was **regulated by the management**. The admission in the official Knowledge Communities was regulated usually by the responsible of the Knowledge Community or the responsible of the professional domain, around which the members of the Knowledge Community worked.

Individual employees had nevertheless the possibility to ask for inclusion in or exclusion to a specific Knowledge Community by justifying the reasons of the request. While the request for inclusion was a quite common event, the request for exclusion did not happen because the compulsory activities for the members of the Knowledge Community were null or minimal.

The official membership to an official Knowledge Community authorized to exploit the organizational resource dedicated to the Knowledge Community, such as IT tools, information resources, meeting budgets.

These organizations invested in the official Knowledge Communities since they recognized that the Knowledge Communities improved the effectiveness, the efficiency, or the innovativeness of the organizations hosting the Knowledge Communities.

Moreover the organizations felt that structuring the Knowledge Community, and that stimulating specific behaviors of its members would have increased the benefits for the organizations. At the same time, the organizations assured to the official Knowledge Communities a certain degree of autonomy to favor the quality of the exchanges. The voluntariness of the exchanges was perceived as a way to exclude low quality interventions.

Since the organizations did not impose the interactions with the others members and the contributions to a central repository, the management stimulated an organizational culture, favoring the knowledge sharing. This knowledge sharing culture was perceived as a critical factor influencing the success of the investments in the Knowledge Communities. However, a knowledge sharing culture was not completely achieved. Some inconsistencies in the organizational structures and in the behaviors by the individuals appointed to promote the Knowledge Community were in contrast with this knowledge sharing culture, and they limited the activity of the Knowledge Communities.

Other organizational interventions toward the Knowledge Communities concerned the development and the maintenance of some computer-based solutions supporting telecommunication and information sharing among the members of the same Knowledge Community. These communication tools complemented the interactions of the in-presence events, proposed by the organizations. The official meetings were especially held in the period immediately after the official constitution of the Knowledge Community, in order to create commonality, cohesion, and trust among the members.

The vitality of the Knowledge Communities seemed also influenced by the professional homogeneity of its members. A high homogeneity favored the quality and the number of the exchanges among the members, while high heterogeneity reduced the quality and the number of these exchanges. Therefore the membership to the official Knowledge Community was defined granting the most similar professional domain among its members. This choice determined Knowledge Communities constituted of members with an important common background and common professional language, but with members coming from different culture and nationalities.

Some organizations tried to relate Knowledge Communities on different knowledge domains and tried to channel the heterogeneity between these Knowledge Communities. The organizations defined some super-communities, with a lower degree of professional homogeneity, but functioning like collectors of the different Knowledge Communities, and appointed to favor the interactions between the members of different Knowledge Communities.

Ulterior organizational support to favor participation in the Knowledge Communities was rare. So, it was quite common that some members of the Knowledge Communities interacted only very rarely or not at all. On the opposite, other members were overwhelmed with requests, because they were perceived as experts by the rest of the Knowledge Community.

Beyond the Knowledge Communities created or supported by these organizations, some other Knowledge Communities were existing, even if only partially observable by the Chief Knowledge Officers. Since the organizations did not officially recognize these Knowledge Communities, these organizations did not pay attention to them. These **unofficial Knowledge Communities** seemed living around the official ones, and including the official one in a wider unofficial Knowledge Community. In this way, the unofficial Knowledge Community gathered the members of the official Knowledge Community and the individuals excluded by the official Knowledge Community, but, nevertheless, in regular contact with each others. So, the individuals excluded by the official Knowledge Community developed their relationships in the form of unofficial Knowledge Communities.

The membership to the unofficial Knowledge Communities was evidently volitional and the members of these Knowledge Communities exploited the services freely available within the organization, in order to keep in contact with the other members.

These unofficial Knowledge Communities were circumscribed within the organizational boundaries (intra-organization Knowledge Communities), or went across the boundaries of the organization, linking people of different organizations (inter-organizational Knowledge Communities).

Results on Expert Recommending Service

The management was directly involved in the support of the Expert Recommending Service for the Knowledge Community members.

Some of the companies had developed a formal computer-based Expert Recommending Service. In general, it operated through the collection of information directly from the employees, when they submitted their personal CV in the software application. The information on the knowledge domains of the individuals, directly declared by the employees in their CV, was the main source of information for the retrieval of the experts.

The retrieval was possible using user-defined keywords, which were syntactically researched in the CV of the employees. The retrieval functionality was accessible to the employees, but sometime also to some external partners and clients. The retrieval interface was customizable and based on the membership to an official Knowledge Community. The result of the retrieval was a list of experts and, for each expert, the CV and the contact information.

When the formal Expert Recommending Service did not include a computer-based system, the retrieval function was in charge to a unit of specialized individuals who acted like

information brokers, in order to facilitate the matching among the knowledge seekers and the knowledge owners.

The computer-based ERS seemed successful since the majority of the users published their **CV** and the CKO perceived that users had easier access to their colleagues for the transfer of knowledge.

Final comments

The principal aim of the interviews was the understanding of the KMS with volitional contribution and the main results are readable in a series of article of Bourdon and Vitari (Bourdon, Vitari et al. 2003; Bourdon, Vitari et al. 2004).

Even if the main point was different from the one of this thesis, the importance of the ERS emerged from these interviews. The **role of the Knowledge Community** appeared determinant for the knowledge transfer. The membership to a Knowledge Community, official or unofficial one, stimulated the exchanges of information, even if the direct net benefits were not assessed by these organizations.

The stimulus to exchange information facilitated the contributions to the KMS, and the direct communications among the members. This stimulus was beneficial also for the ERS because the users edited their online CV.

Therefore the author found empirical evidences that the existence of a Knowledge Community and the membership to that Knowledge Community had an influence on the success of the ERS. These preliminary results stimulated the prosecution of the investigation.

Expert Recommending Service in the Human Resources Management Systems

This preliminary study had the objective to understand to what extent the Human Resource Management Systems (HRMS) are capable to provide Expert Recommending Services. The HRMS are modules of the ERP systems, specialized to satisfy the requirements to manage the personnel of an organization.

As, this research conceives knowledge as inseparable from the individual, the management of the personnel could also mean the management of the knowledge of the personnel. This perspective on the management of the knowledge of the personnel stimulated the author's attention toward the Information Systems for the human resource management.

Therefore the author expected the discovery of some type of Expert Recommending Service in these Information Systems.

A qualitative exploratory study was carried out to check the existence and the kind of Expert Recommending Service in these HRMS. The data were collected by two different means: secondary data sources, and primary data sources.

The secondary data came mainly from: Bassetti (Bassetti 2000), Amigoni and Beretta (Amigoni and Beretta 1998), Armstrong (Armstrong 2003), Busnelli (Busnelli 2004), IPD (IPD 1997; IPD 1999), NWI (NWI 2005), Technology Evaluation (Technology Evaluation 2005). The primary data was principally the web sites of the vendors of the HRMS (Counsnet 2005; Ebc Consulting 2005; Oracle 2005; PeopleSoft 2005; Spectrum HR 2005) , and some demo versions of the software.

The collected data was processed in order to functionally describe the HRMS and to verify the **existence of functionalities** of Expert Recommending Service. Before the description of functionalities of the ERS, a general description of the HRMS is reported to improve the comprehension of their architecture, and the supported business processes.

Architecture

The HRMS vendors can be distinguished on their offer specialization. To an extreme, there are some HRMS vendors that propose ERP supporting all the major organizational processes, like SAP or Oracle. To the other extreme, there are the HRMS vendors that propose an offer specialized on the single process of human resource management, like Counsnet. Between the two extremes, there are the HRMS vendors principally offering the HRMS, but completing the offer with applications on other business processes.

All the vendors have recently enhanced the accessibility of their HRMS, making them web-based client/server solutions. All the HRMS have a modular architecture, which means they are composed of modules. So each module is dedicated to a set of activities that satisfy a specific business process within the principal human resource management process. The modules of the HRMS are a software tool designed to accomplish an autonomous set of functionalities gathered around a process.

The HRMS have a set of **modules** that covers the basic functionalities of human resource management, and another set of modules that proposes additional functionalities. These supplementary modules can be added to the first set, depending on the needs of the organization. In addition, each module can be customized, even though expensively. The customization is the selling proposition that distinguish, the most, the HRMS vendors.

In fact, across the different HMRS, the subdivision of the process of human resource management in modules is similar, because the management of the personnel has a long

standing tradition and therefore the process is mostly standard. The main differences, across HRMS, depend on the formalization of the single process within the module.

Functionalities

The functionalities are the actions that the HRMS performs. They can be described in terms of their design to support a specific process. Armstrong (Armstrong 2003) lists, as basic functionalities of the HRMS, the following ones:

- To store personal information on the employees: the carrier progression, the skills, the qualifications, the presences, etc.
- To store working information on the job performed by the employees: the role, the position, the salary, the benefits, the working hours, the office location, etc.
- To publish reports, which show analytically and synthetically the stored data on the personal information and working information of the employees.

The additional functionalities include the following ones (Armstrong 2003; Ebc Consulting 2005; Technology Evaluation 2005):

- To store and analyze data on the presences, the absences and the turnover of the personnel, within and between the job positions.
- To manage the research and selection of the personnel and their training.
- To evaluate the job positions.
- To plan the carrier and the remuneration of the personnel in the short and long run.
- To share information with other organizations outside the company, like the personnel selection agencies.
- To design the organization chart.
- To manage the internal turnover of the personnel.
- To evaluate the personnel, in terms of competencies and attainment of the professional objectives.

Preliminarily, it is evident that a functionality specifically dedicated to the **Expert Recommending Service does not exist**.

Modules

The list of modules is quite homogeneous across the different HMRS and includes:

- Personal data module. It stores for each employee the information on: the personal and family data, the job position, the remuneration schema, the performance evaluations,

the competences, the training, the professional deadlines, the working timetable, the holiday plan, the presences, the absences, and the overtimes.

- Search engine module. It allows the retrieval of the data of the employees in accordance with the specified search criteria.

- Human resource planning module. It gives the tools to plan, qualitatively and quantitatively, the personnel demand, following the strategic business plans. These tools can design models showing the effects on the personnel of the potential organizational changes, in order to identify the most appropriate one. This module offers also the possibility to estimate the number and the type of human resources required, starting from the description of the business operations, the market trends, and the strategic choices.

- Organization chart module. It makes graphically visible the organizational structure of the organization and it gives access to the information concerning each graphic element, down to the single employees and their related information stored in the Personal data module.

- Competence management and personnel evaluation module. It supports the analysis of the competencies, their relative importance and their required mastering level, for each job position. The module allows also the structuring of the evaluation of the competencies of each employee, through the assignment of the mastering level for each competence to each employee, by the appraisers. The comparison between the required mastering level for each competency and the assessed mastering level determines the list of competencies to develop, to achieve a certain job position. This information gives the possibility to identify the employees who could cover the open positions and to plan the development objectives of the employees. In addition the information on the competencies of the personnel favors the research and the recruitment of the individuals with the required set of competences, the establishment of the training needs and the remuneration, based on the effective competencies of the personnel.

- Compensation management module. It offers querying and reporting tools on the remuneration and on the benefits of the employees. In addition it allows identifying the gaps between the expected salary and the actual salary of the employees for a defined job position. This comparison can also be done benchmarking the internal salary levels with the salary levels of the competitors. Finally, it is possible to model

the impact on the overall cost of the human resources of the salary increase of one employee or of one group of employees.

- Training module. It supports the training activities and training planning in the organization. It tracks the training history of each employee and it proposes to the employees the possibility of new training, when there is evidence of some competence gaps from the actual and the expected competence level of the employees. Moreover, the training module can be connected to some external training agencies that the organization partners to extent its training offer. Finally, this module stores information on the participation of the employees to the training and the results of the training courses.

- Recruiting, selection and hiring module. Starting from the analysis of the open positions and the requested profile for filling these positions, this module grants the accessibility at the databases of the recruiting and selection agencies. Complementary, the module allows the structuring of the job offer advertisements. It also gives the tools to create a publishable form for gathering applications from private individuals and to store this information. Once a job application is received, the module compares the job application with the expected one, and it verifies the eventual gaps. For the satisfying candidates, the module allows the follow up of the recruiting, throughout the collection of all the required data and the definition of the appropriate contract.

- Vacancy and substitution module. Basing on the data stored in the Personal data module, it evidences the present vacancies and it prospects the probable vacancies in the near future. From these evidences and perspectives, the module contributes to the definition of the profile of the potential candidate who would substitute the leaving employee.

- Carrier planning module. This module allows the planning of the carrier of each employee, basing on: the previous experiences, the willing of the employees, and the needs of the organization.

- Communication management module. This module offers a set of tools to communicate and to share information: among the employees, from the organization to the employees, and from the organization to external partners and the public. It can include videoconferencing tools, groupware, email system, file sharing tools, calendar and agenda sharing applications. In addition to the simple offer of these communication tools, the module allows the imposition of the process that the different communications have to follow in order to regulate the communication

activities and to have a communication system consistent with the organizational structure.

- Security module. This module manages the secured access to the application by users and administrators, through the assignment of an identification code, a password, the reading rights and the writing rights to the data and to the functions of the HRMS. Each user accesses the application through a secured login, which allows the identification of each user. This identification allows the limitation of the accessibility to the application only at the functionalities and at the data, for which the user has the authorization.

The list of modules of the HRMS shows the **potential existence of some computer-based Expert Recommending Service**. The combination of the Personal data module, the Search Engine module and the Competence management and personnel evaluation module gives the tools required to counsel the individuals about the experts who could have the researched specialized knowledge. The Competence management and personnel evaluation module offer the basis for assessing the knowledge domains of the employees. The Personal Data module stores this information on the knowledge domains of the employees. The Search engine module gives the possibility to retrieve the list of individuals with the researched knowledge and the contact information for directly starting a communication with them.

This potential existence of a computer-based Expert Recommending Service can concretize only with the expressed willing of the organization, otherwise this ERS is not implemented through adequate interfaces and tools that grant the exploitability of the technical feasibility.

Benefits

The introduction of the HRMS gives the opportunity to enhance the organizational management of the human resources. Nevertheless, just the introduction of the modules is not sufficient to improve the human resource management. An explicit intervention of the organization is required to have the expected return on the investment in the HRMS (Armstrong 2003).

This return can be classified in two main areas:

- the reduction of time and cost,
- the increase in the efficiency and effectiveness of the human resource management.

In particular the reduction of time and cost could concern:

- The time for the realization of reports to support the decision making.

- The time for the research of data and statistics on the personnel.
- The working load of the human resource management department.

Whereas, the increases in the efficiency and effectiveness regard:

- The support service of the human resource management department to the main business processes.
- The approach to the management of the personnel.
- The integration of the policies toward the personnel.
- The control over the human resources.
- The ability to change the human resource policies consistently with the organizational strategic changes.

The implementation of the Expert Recommending Service will add the benefit to **enhance the awareness** on the knowledge distribution among the employees to accelerate the contact between the knowledge seekers and the experts.

Conclusions

The Human Resource Management System has the **potential** to be, not only a tool for the management of the human resources, but also a tool for the management of knowledge for the organizational benefit (Figure 4). Nevertheless, this potential needs to be voluntarily tapped, in order to make it effective.
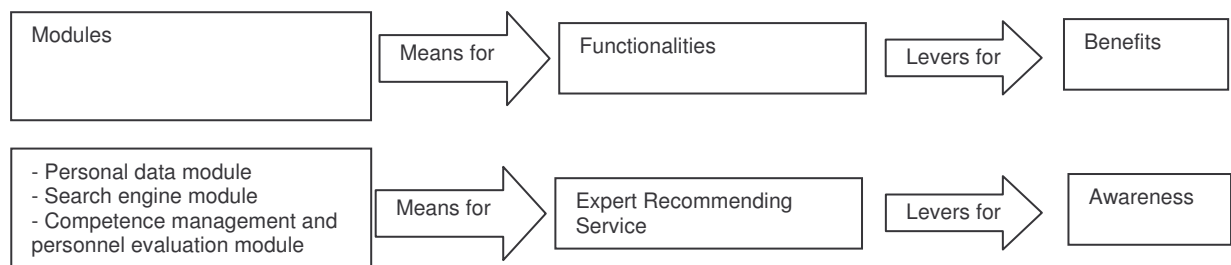
Figure 4 Causal relationship among modules, functionalities and benefits

A possible limit concerns the extent to which the Competence management and personnel evaluation module of the HRMS could be used to acknowledge the knowledge domains of the individuals. Maybe, a module supporting the evaluation of the personnel and the management of the competencies could not perfectly describe the knowledge domains of the individuals. If "knowledge" differs from "competence" a module that manages the information on the competencies of the employees could not be able to manage the information on the knowledge domains of the same employees.

This research adopts a pragmatic perspective over "knowledge" and "competence" that makes them largely overlapping. This study considers that in organizations, knowledge and competence are both employed to solve business problems and to make decisions. Knowledge and competence are ontologically different, but in the organizational contexts they tend to be directed toward the same aims, and so they get closer meanings.

Therefore it seems that the Expert Recommending Service could be provided by the HRMS, but the organization should be conscious of the importance of the service in order to concretize the potential of the HRMS as a provider of the ERS.

This research will hence contribute to raise awareness on the importance of the knowledge transfer and of the ERS in the organizations, in the tentative to promote the use of the HRMS also as ERS providers.

1.3 Research organization

This first chapter of the research has delineated the main argument through a general introduction on this study. This introduction included the presentation of the research context, the research object, the research propositions, the research framework, and the research relevance. This preliminary theoretical outlook ended with the summary of two preliminary empirical studies, the first one on the Expert Recommending Services in some organizational contexts and the second one on the Expert Recommending Services supported by Human Resource Management Systems.

The following chapters of this document will describe the rest of the research.

First of all, the author presents the literature review on the research topic. Starting from the theory of the resource-based view of the firm, the review passes through the knowledge-based view of the firm, which gives the theoretical ground to organizational knowledge management. Within the topic of knowledge management, the role of the Information Systems is described. At the end the specific type of Information Systems, aiming at the enhancement of the knowledge awareness, the Expert Recommending Service, is introduced.

Subsequently, the research model and the research methodology are illustrated. The literature review backs up the presentation of the conceptual model that is employed in the empirical part of the research. The Information Systems Success theories and models are declined to the research object, the Expert Recommending Services in the Knowledge Communities, in order to build the specific conceptual model for this research. The conceptual model is converted into the empirical research model and the suitable research methodology is selected, justified and presented.

Finally, the application of the methodology is reported. It includes the description of the context of the application and the results of the empirical research.

The document ends giving some arguments on the limits of the research, proposing some conclusions on the theoretical and empirical findings and pointing out the potential for future research in this research stream.

2 Literature review on Knowledge

This chapter and the next chapter examine the existing literature on the research objects: knowledge, Knowledge Management, Knowledge Management Systems, Knowledge Communities and Expert Recommending Service.

The order of the presentation is toward a **progressive focus on Expert Recommending Service**, which is the main object of this study.

The review begins with this chapter, which highlights the main research issues and results around knowledge in organizations. This first part includes the research topics of Knowledge Management, Knowledge Management Systems, as well as Knowledge Communities

In firms and universities, knowledge is variously worded. Among its different perspectives, this study accepts two complementary ones. From the first perspective, organizations can expressly involve them-selves in processes of Knowledge Management, which could include computer-based solutions in the form of Knowledge Management Systems. From the second perspective, people naturally establish several relationships through which knowledge is transferred, determining the development of Knowledge Communities. These two perspectives are presented in the following paragraphs.

In the present competitive environment, the organizations are reconsidering the relevance of their different organizational resources, in order to face the new market trends. The academic research describes and prescribes the reconsideration of the **organizational resources** and proposes in the resource-based view of the firm a strategy to improve the organizations' competitiveness. A branch of this theory, the knowledge-based view, focuses on the role of knowledge as source of sustainable competitive advantage and this study adopts this theory as strategic foundation of the research.

Therefore, the description of the knowledge-based view of the firm is described to contextualize the following topics of Knowledge Management and Knowledge Management Systems.

2.1 Knowledge and Knowledge Management

Knowledge-based view of the firm

The theory of the knowledge-based view of the firm affirms that **knowledge is the basis for the organizational sustained competitive advantage** (Grant 1996b; Grant 1996a; Spender and Grant 1996; Teece 2000; Lipparini 2002 page 14; Ruta and Turati 2002 page 3; Bock and Lee 2005). This theory is an evolution of the resource-based view of the firm (Barney 1996; Conner and Prahalad 1996; Barney 2001b) and, as previously noticed, it is used in this research as a reference theory for stating the role of knowledge in the firms, thanks to its capability to explain organization' performance and guide the strategy conception and implementation (Grant 1996b).

The theory of the resource-based view of the firm

Background

Strategic management field has, among its major research areas, the comprehension of the determinants of the competitive advantage for the organizations (Penrose 1959).

Among the different types of organization, this theory focuses on the organizations aiming at the production of goods and services, which Barney (Barney 1991) names "firms" and it does not take into direct consideration the organizations with social, political and religious ends. Even if a portion of the theory, and also of this study, is valuable for all types of organizations, the theory and this study are targeted on the organizations aiming at the production of goods and services, excluding the organizations with other ends.

The concept of **competitive advantage** has origin in the value creation and distribution in the economic exchanges. A firm has a competitive advantage when the value it has, by an economic exchange in which the firm partakes, is greater than the value it has, without its participation to the exchange (Brandenburger and Stuart 1996; Piccoli, Feeny et al. 2002).

The general reference framework in strategic management proposes that the organizations achieve a sustainable competitive advantage through the implementation of strategies that aim at the exploitation of internal strengths to match the external opportunities, and, at the same time, neutralizing the external threads and limiting the internal weaknesses (Ansoff 1965; Andrews 1971; Hofer and Schendel 1978) as described in Figure 5.
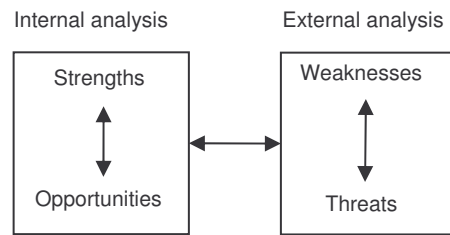
Figure 5 The traditional Strengths-Weaknesses-Opportunities-Threats Analysis

However, this framework has some limits, due to the assumptions it makes concerning the homogeneity of strategies and the mobility of the resources.

In term of homogeneity of the strategies, it assumes that organizations, in the same industry or strategic group, have identical strategies and strategic resources (Scherer 1980; Porter 1981; Rumelt 1984). In the strategic management, resources are defined as "assets and capabilities which are available and useful in detecting and responding to market opportunities and threads" (Sanchez, Heene et al. 1996).

In term of mobility of resources, this general reference framework assumes that even if the strategic resources are heterogeneously distributed within the same industry or strategic group, these strategic resources are rapidly equally redistributed in the industry or strategic group, thanks to the high mobility of these resources (Hirshleifer 1980; Barney 1986).

These two assumptions restraints the applicability of the framework and pushed the academic community to develop alternative theories trying to cope with the resource heterogeneity and immobility as potential sources of competitive advantage (Penrose 1959; Rumelt 1984; Wernerfelt 1984; Wernerfelt 1989).

Resource-based view

The theory of the resource-based view of the firm is the answer proposed by Barney (Barney 1991) to overcome the limits imposed by the traditional strategic framework. Barney's theory declares that organizations within an industry or a strategic group may have **heterogeneous strategic resources distribution** and that this heterogeneous distribution can persist along time since resources may not be perfectly mobile across organizations.

These assumptions of the theory of the resource-based view of the firm produce many effects on the analysis of the potential sources of sustained competitive advantage. The sustainability exists when the competitive advantage persists even if competing organizations duplicate the same effort, resisting therefore to "erosion by competitor behavior" (Porter 1985 page 20). This persistence is maintained because this firm possesses some **impediments to replication** of its strategy by its competitors (Wernerfelt 1984; Reed and DeFillippi 1990; Profili 2004).

The dimension of these impediments determines the lasting time, the easiness and the cost required to replicate the others' strategy (Piccoli and Ives 2005).

Properties of the resources

In order to be a **potential source of sustained competitive advantage**, a resource must be:

- Valuable. A resource is valuable when it enables the conception and implementation of successful strategies, because this resource exploits external opportunities or restrains internal weaknesses.

- Rare. A resource is rare when it is not possessed by current or potential competitors, otherwise this resource can be applied in the same way in the implementation of the same strategy, finally eroding the competitive advantage of the first mover.

- Imperfectly imitable. A resource is imperfectly imitable when organizations that do not possess it cannot obtain it. This limited imitation depends on the organization's history, the causal ambiguity and social complexity of its competitive advantage.

- Not equivalently substitutable. A resource is not equivalently substitutable by other resources when it cannot be replaced by another resource for the implementation of the same strategy.

The extent to which a resource has these properties determines the degree to which it can be potential source of sustained competitive advantage, because it affects the time, the difficulty and the cost for other firms to erode the competitive advantage (Figure 6).
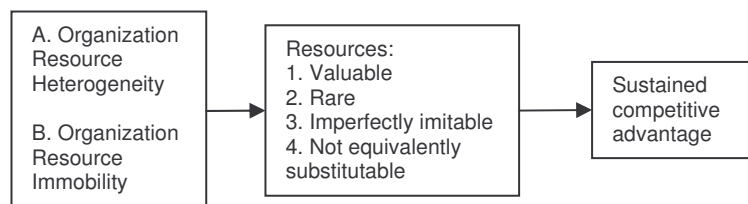
Figure 6 The key influences among the major factors of the theory of the resource-based view of the firm

Other attributes have been proposed by other researchers (Grant 1991; Amit and Schoemaker 1993; Black and Boal 1994; Collis and Montgomery 1995) but, beyond the different terms employed, there is a large consensus on the main attributes making the resources a potential source of sustained competitive advantage.

However, the potential source of sustained competitive advantage does not automatically cause a sustained competitive advantage. Its potential is made real by the managerial intervention.

On one hand, the potential of sustained competitive advantage is determined by the limited capabilities to homogenize and to mobilize resources, across competing organizations. On the other hand, the sustained competitive advantage is possible thanks to the capability of the managers to recognize and exploit the heterogeneity and immobility of the organization resources.

An analysis by the manager of the valuable, rare, imperfectly imitable and not equivalently substitutable resources is the starting point for the conception and implementation of a strategy that could give a sustainable competitive advantage (Barney 1991).

Sustainability

The sustainability resides in the possibility to **preserve the competitive advantage over time**. In order to preserve the competitive advantage the organization has to renew the impediments to replication of the strategy over time, through organizational learning and asset stock accumulation (Piccoli and Ives 2005). Organizational learning is "the capacity or processes within an organization to maintain or improve performance based on experience" (Nevis, Dibella et al. 1995 page 63). Asset stock accumulation is "the process by which a firm accrues or builds up a resource over time" (Piccoli and Ives 2005) as a result of a consistent regular investment on it.

Organizational learning can be operatively carried out through the repetition of the experiences, the analysis of the mistakes and the experimentation. In this way, it gives the possibility to learn, and to improve consequently the performances of the organization and finally to preserve the competitive advantage. The preservation of the competitive advantage over time determines the existence of the sustained competitive advantage.

At the same time, also asset stock accumulation could favor the competitive advantage preservation. The accumulation to the organization's stock of new portions of it is a mean used by the organizations to improve their competitiveness. The accumulation of stock by the organization that has already a competitive advantage is a tentative to preserve over time this competitive gap with the competitors. So the stock accumulation, at least at the pace of the competitors, is a way to preserve the competitive advantage.

Attainment and sustainability

The analysis of resources' attributes could bring to the identification of the resources that facilitate the attainment of the competitive advantage and those which sustain that advantage (Priem and Butler 2001a; Piccoli, Feeny et al. 2002). The resources that facilitate the

attainment of the competitive advantage are defined by Wade (Wade and Hulland 2004) "**ex ante limits to competition**" and include value and rarity. The resources that sustain that advantage are "**ex post limits to competition**" and include imitability and substitutability (Wade and Hulland 2004) (Figure 7).
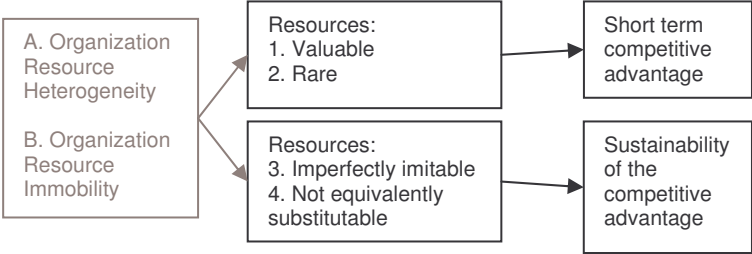
Figure 7 The characteristics of the resources for a short term competitive advantage and for the sustainability of the competitive advantage

The Figure 8 shows the influences among the major factors of the resource-based view from the temporal perspective, passing through the Resource analysis phase, the Competitive advantage phase and the Sustainability phase.
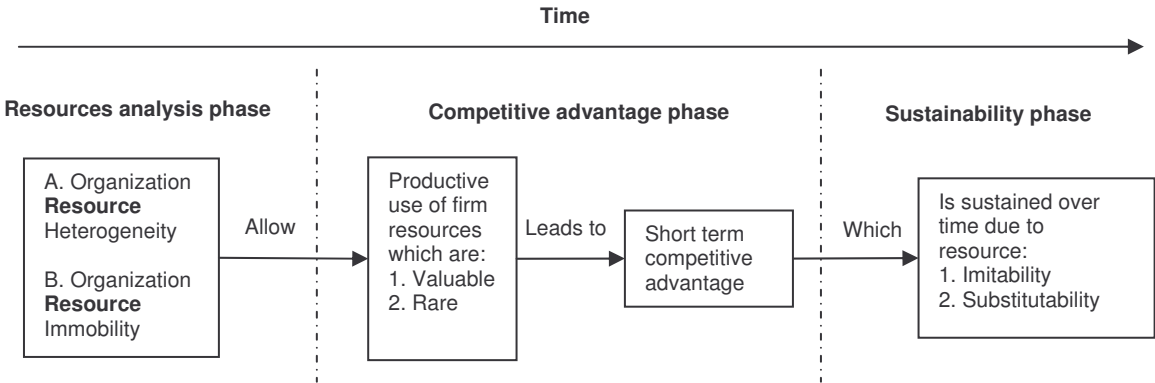
Figure 8 The resource-based view of the firm over time, adapted from (Wade and Hulland 2004)

Further development of the Resource based view

Since the proposal of Barney (Barney 1991), the resource-based view of the firm has been largely debated in the management disciplines (Fahy and Smithee 1999; Barney 2001a; Priem and Butler 2001a; Priem and Butler 2001b). Moreover it has been diffusely used in IS research (Wade and Hulland 2004; Piccoli and Ives 2005) even if the resource-based view of the firm was not originally suited to studying IS (Wade and Hulland 2004). Resource-based view is suited to frame the impact of the resources directly influencing sustainable competitive advantage. In fact, **information systems resources contribute indirectly to the sustained competitive advantage**, through other assets and capabilities (Wade and Hulland

2004), even if considerable research focuses on the direct role of IS in sustained competitive advantage (Piccoli and Ives 2005).

Nevertheless three points of the resource-based view of the firm provide benefits to IS researchers (Wade and Hulland 2004):

- The resource-based view makes the determination of the IS resources easier, thanks to the definition of the above-mentioned resource attributes.

- The resource-based view allows the comparison of the IS resources, among IS resources and between IS resources and non-IS resources, through the use of the resource attributes as comparing instruments.

- The resource-based view defines a clear link between resources and sustained competitive advantage, giving the possibility to measure the, direct or indirect, impact of IS resources to the sustained competitive advantage.

The theory of the knowledge-based view of the firm

Nowadays, knowledge is recognized as a valuable, rare, imperfectly imitable and not equivalently substitutable resource by larger portions of the scholar and practitioner communities. This recognition determined the explosion of research on **knowledge as source of sustainable competitive advantage**, which included the development of the theory of the knowledge-based view of the firm (Nonaka and Takeuchi 1995; Spender 1996a; Spender 1996b; Cole 1998).

The focus on the role of knowledge in the success of the organizations is determined by the assumption that knowledge is the primary source of value in the production (Conner and Prahalad 1996; Grant 1996b; Bock and Lee 2005). From this point of view all the production activities are knowledge dependent, because all the business processes and all the physical supports can be all conceived like embodiments of knowledge.

In line with the resource-based view, the resources of any Information System could contribute indirectly to the sustained competitive advantage, through leveraging knowledge in the firm.

Therefore, the main assertion of this theory is that knowledge is the basis for the organizational sustainable competitive advantage (Grant 1996b; Grant 1996a; Spender and Grant 1996; Drucker 1998; Teece 2000; Wenger and Snyder 2000; Ciborra and Andreu 2001; Hansen and Oetinger 2001; Teece 2003; Bock and Lee 2005) due to its unique properties (Figure 9).
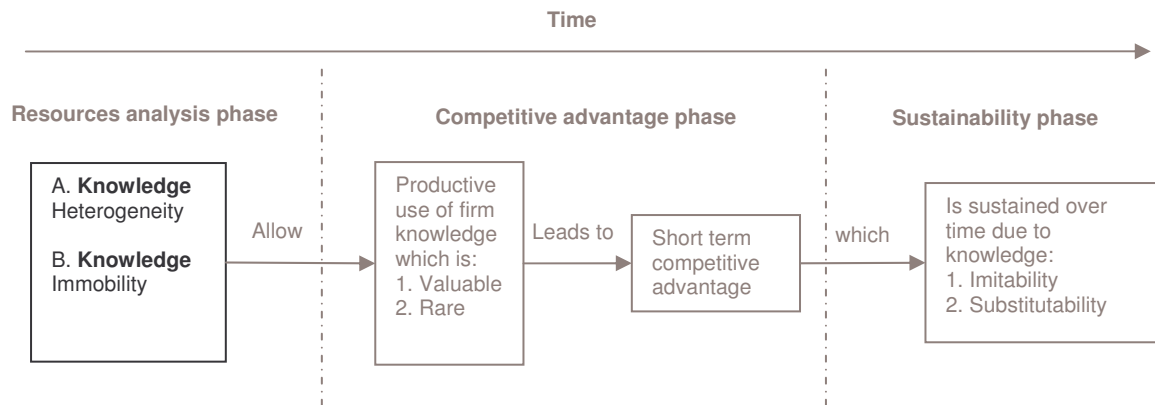
Figure 9 The knowledge-based view of the firm over time. Adapted from (Wade and Hulland 2004) and Figure 8, through the substitution of the general terms "organizational resources" with the specific organizational resource "Knowledge"

Knowledge transferability

Knowledge

The multiple types of knowledge (Alavi and Leidner 2001) determine different degree of its mobility among organizations as well as among individuals (Wernerfelt 1984; von Hippel 1994; Liebeskind 1996; Szulanski 1996; von Hippel 1998; Hoopes and Postrel 1999). While some researchers have explicitly distinguished the different types of knowledge and defined specific solutions for taking advantage of each of them (Nonaka and Takeuchi 1995; Boisot 1998; Markus 2001), this research has preferred to take attention on the **properties of knowledge**, without the aim of classifying knowledge. This approach allows the proposals of principles and processes that are compatible with the multiple types of knowledge, as far as this knowledge has the required properties, as similarly proposed by Nahapiet and Ghoshal (Nahapiet and Ghoshal 1998).

What is important for the prosecution of the work is the comprehensions of the properties of knowledge that make it a strategic source of sustainable competitive advantage in the organizations, hence its immobility and its heterogeneous distribution.

Since a consensus on a definition of knowledge is far to be achieved (Grant 1996b; Alavi and Leidner 2001; Brown and Duguid 2001; Sutton 2001) and a definition of knowledge is not compulsory for the understanding of the research, no definition of knowledge will be proposed.

Factors influencing transfer

Communicability

As already declared in the introduction of this document, the communication of knowledge from an individual or an organization and its reception and application by another individual or organization takes the name of knowledge transfer (Ko, Kirsch et al. 2005; Lin, Geng et al. 2005; Maier, Hadrich et al. 2005; Lichtenstein and Hunter 2006).

The knowledge transfer requires the existence of some kind of relationship between the sender and the recipient of knowledge (Harryson 2000). This relationship can be represented in the physical world by a communication channel between sender and recipient. Analytically, knowledge transfer is a simplification of the **process** required to transfer knowledge to another subject, the recipient. In fact, knowledge must be transformed into data in order to be transported and communicated on a communication channel. By the recipient, data is interpreted and integrated into the existing knowledge. Therefore knowledge transfer includes the conversion into data and its reinterpretation (Maier, Hadrich et al. 2005 page 7). So the knowledge transfer requires a relationship between individuals, and this relationship pass through several levels of codes, supported always by some kind of physical communication channel, as described in (Figure 10).

The easiness of communication of knowledge is a factor determining the degree of its immobility and its heterogeneity among organizations (Grant 1996b). In fact knowledge, once converted into data, can be duplicated and distributed to other individuals and organizations at a marginal cost proximate to zero.
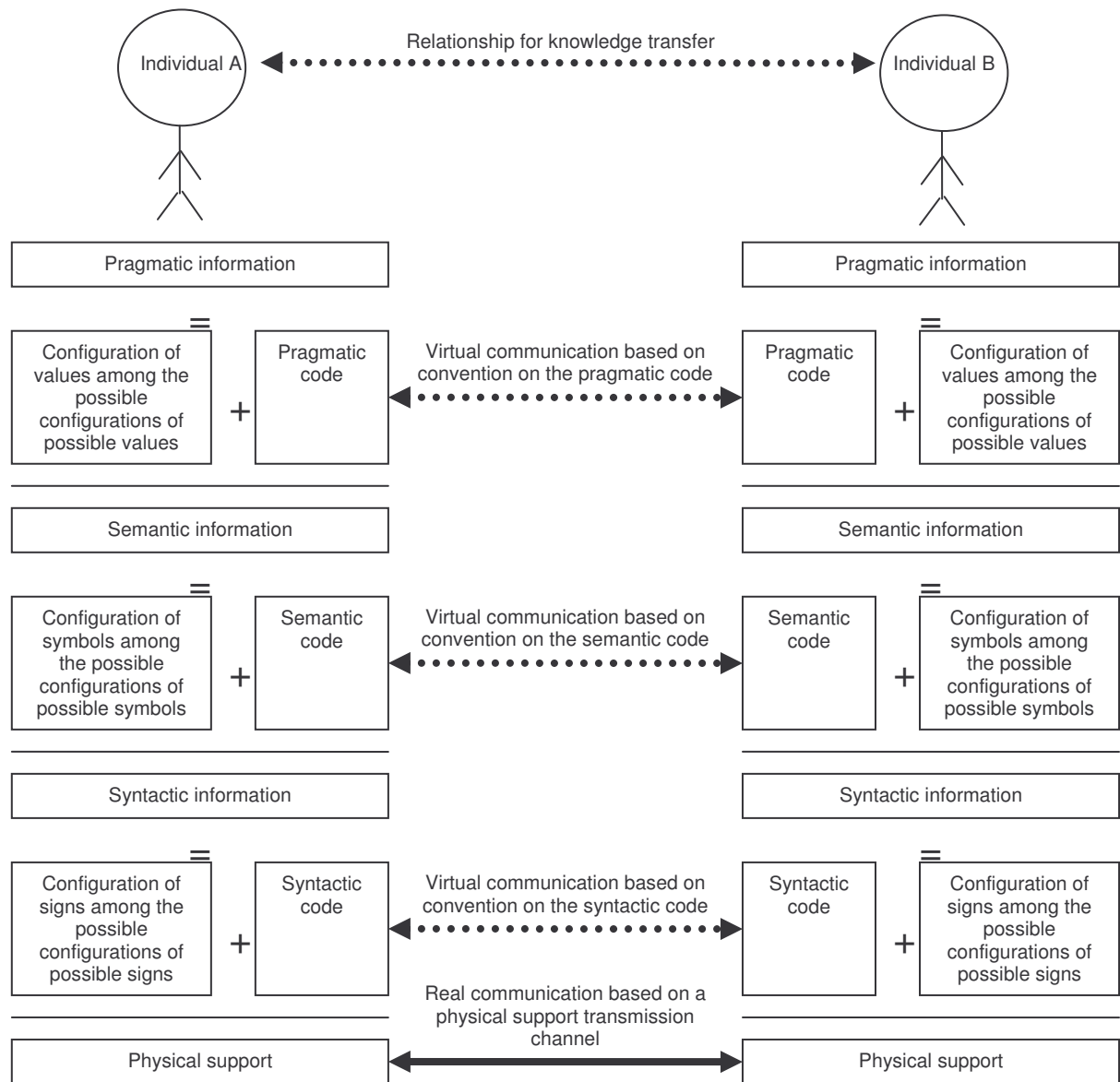
Figure 10 The communicability of knowledge between A and B

Therefore, the knowledge that is easy to convert into information and communicate is not a potential source of sustainable competitive advantage, because it could be rapidly duplicated and distributed to other organizations. On the opposite, the knowledge that is difficult to communicate, because difficult to convert into information, can be a likely source of sustainable competitive advantage, since it is not mobile and its heterogeneous distribution among the different organizations would not rapidly disappear.

Finally, the knowledge that cannot be absolutely converted, but only observed through its application and acquired through practice, is the most immobile knowledge (Kogut and Zander 1992; Gupta and Govindarajan 2000).

Motivation

The transfer of knowledge depends on the motivation of the sender in the specific knowledge transfer (Gupta and Govindarajan 2000). Crucial is also the willingness of the recipient to activate its cognitive processes to pay attention to and process what the sender is saying or doing (Vance 1997). These **two dispositions** evidently can be favored by the recognition of the perceived value of the transferring knowledge by the sender and the recipient (Gupta and Govindarajan 2000).

Polanyi (Polanyi 1982) posits, at this regard, the General Relevance Rule. It states that each individual thinks that "Close to me is relevant to me. That closeness can be in terms of space, time or relationship. What is close to me affects me; what is removed from me has no real impact on me" (Polanyi 1982).

So, if the recipients are not directly involved by their own proximity to the specific circumstances, willingness of the recipient to activate its cognitive processes could be reduced.

Polanyi (Polanyi 1982) nevertheless affirms the existence of a second rule, which mediate this possible lack of willing: the Rule of Transitive Relevance. It states that individuals think that "What is close to you may be relevant to me if you are close to me" (Polanyi 1982). So this is another factor that could motivate the potential recipients to welcome the transfer of knowledge.

Absorptive capacity

After that, the immobility of knowledge depends not only on its communicability and applicability but also on the absorptive capacity of the recipient of the communication or of the application acts (Cohen and Levinthal 1990; von Hippel 1994; Gupta and Govindarajan 2000; Huber 2001; Lipparini 2002 page 153; Lichtenstein and Hunter 2006). Knowledge receipt depends, in fact, on the **ability of the recipient** to aggregate the communicated knowledge or the observed knowledge to the previously existing knowledge. This aggregation is realized through the addition of the new knowledge to the existing one through an actual creation of new knowledge in the mind of the recipient (Cohen and Levinthal 1990; Szulanski 1996; Vance 1997; Lesser and Strock 2004).

Capacity of aggregation explains the place where decision-making should be accomplished. In case of partial but complementary knowledge to make a decision, the absorption capacity of the individuals determines who should aggregate the knowledge of the other to take the decision.

Redundancy

The knowledge transfer is possible as far as sender and receiver dispose of some knowledge redundancy (Nonaka and Takeuchi 1995), i.e. some **knowledge communalities**. The first required knowledge communality is common language, which means the sharing of the same interpretation code at the different levels: syntactic, semantic, pragmatic. After that, other knowledge communalities could exist, such the education and the professional background.

Specific knowledge of a particular circumstance could have limited communality with the specific knowledge of another particular circumstance and therefore the previous one can be hardly aggregated to the second one and vice versa (Hayek 1945; Jensen and Meckling 1992). The degree of redundancy is influenced by the limited capacity of the individuals to acquire knowledge (Simon 1991). In fact, the intrinsic limits of the human brain in acquiring, storing and process knowledge induce the individuals and organizations to specialize on specific areas of knowledge, in order to be unique among the competitors on a certain domain. This specialization has the effect of limiting the knowledge and language communalities, which is a fundamental element for a successful transfer of knowledge.

Appropriability

Another factor influencing the mobility of knowledge is the **ability of the recipient of knowledge to yield a return,** equal to the value created by the same knowledge at the sender. The problem of appropriability (Levin, Klevorick et al. 1987; Teece 1987) is determined by the need for practice, for the transfer of some knowledge and the duplicability, at a close to zero marginal cost of some other knowledge.

The knowledge that demands its application to be revealed, because it cannot be codified, and it demands its practice to be acquired knowledge, makes its transfer slow and costly. This knowledge is not directly appropriable and therefore highly immobile (Kogut and Zander 1992).

The knowledge that can be communicated easily determines its duplicability and its transfer possible, without losing it (Arrow 1984), and its acquisition, through its marketing availability (Arrow 1971).

In case of partial but complementary knowledge required to make a decision, appropriability influences the choice of the individual who will make this decision. The individual who has the most of the hardly mobile knowledge on the problem is the one who is the best in charge of aggregation of the other part of knowledge to make the decision.

With the exception of patents and copyrights, knowledge reveals complex problems of appropriability, due to its peculiar characteristics that makes most of the knowledge

inappropriate to be transferred on the market. This inappropriateness determines the restrains of the individuals and organizations to expose their knowledge to the competitors (Rosen 1991) and the degree of its immobility.

Beyond this set of properties of knowledge that influences its mobility and subsequently its qualification as potential source of sustainable competitive advantage, knowledge has other properties. Nevertheless these additional properties will be introduced in case of need, instead of giving a broad but likely misleading presentation of all of them.

The presented properties and their role in knowledge transfer are graphically represented in the Figure 11, which shows the **steps of the process of knowledge transfer** between individuals.

Starting situation

Individual A and individual B have partially different domains of knowledge.

Common domains of knowledge between A and B: K_1, K_2

Differing domains of knowledge between A and B: K_3, K_4, K_5

Individual A

Domain of knowledge: K_1, K_2, K_3, K_4

Individual B

Domain of knowledge: K_1, K_2, K_5

First step: check of the conditions

Check of the conditions for transferability of K_4 by A to B:

1. Communicability of K_4 by A

2. Willingness of B to received K_4 and of A to transfer K_4

3. Absorptive capacity of B to aggregate K_4

4. Redundancy of knowledge between A and B: K_1, K_2

5. Appropriability of K_4 by B

Individual A

B is willing to transfer K_4

Individual B

B is willing to receive K_4

B has the absorptive capacity to aggregate K_4

B has the capacity to acquire K_4

Second step: effective transfer

Transfer of K_4 by A to B. K_1 and K_2 are the domains of knowledge on which the transfer of K_4 by A to B is done

Individual A

A communicates or applies K_4

Individual B

B aggregates K_4

Ending situation

Individual B has K_4.

Individual A

Domains of knowledge: K_1, K_2, K_3, K_4

Individual B

Domains of knowledge: K_1, K_2, K_4, K_5

Figure 11 The knowledge transfer

Knowledge Management

As already introduced at the beginning, this potential source of sustainable competitive advantage can be converted into an actual sustainable competitive advantage when it is recognized by the individuals participating in the conception and implementation of the organizational strategy.

The limited human capability to overcome the immobility and heterogeneous distribution of knowledge should motivate the managers to an important effort aiming at the **management of knowledge, in order to take advantage of it**. The proposed efforts are very different basing on the adopted perspective, as discussed in the following section.

Roots and perspectives on knowledge management

The field of knowledge management has been from the very beginning a multidisciplinary field that caused the existence of multiple perspectives on knowledge management in theory and in practice. Maier (Maier 2002) has identified a large number of fields and disciplines variably dealing with knowledge (Table 1), in more concrete or abstract manners, and toward a technology-oriented or a social-oriented approach (Figure 12).

RESEARCH FIELD	CHARACTERIZATION
Organizational Change	Supports changes within organizations and changes of organizations with development, selection and learning models, thus Organizational Change represents an umbrella term for fields such as organizational development or organizational learning
Organizational Development	Is a methodical strategy for intervention, initiated through consulting and planned by management with the assistance of a change agent, concerning personal, interpersonal, structural, cultural and technological aspects
Organizational Learning	Claims that observable phenomena of change in organizations are connected with unobservable inter-personal processes of learning on a micro-social level (group) as well as a macro-social level (organization)
Organizational Memory	Is capable of storing things perceived, experienced or self-constructed beyond the duration of actual occurrence, and then retrieving these things at a later point in time, in analogy to an individual's memory
Organizational Intelligence	Provides a slightly different focus on organizational information processing than Organizational Learning, because Organizational Intelligence emphasizes collective processing of information and decision making
Organizational Culture	Is largely an implicit phenomenon only indirectly observable through concepts such as trust, norms, standards, unwritten rules, symbols, artifacts that (1) are the results of learning processes, (2) provide orientation and (3) are shared by the organization's members in a process of socialization

Theories of the Evolution of Organization	Apply evolution theories originally developed in philosophy, biology, and social sciences to organizations (e.g.: population ecology approach, self-organizing systems, organized chaos and evolutionary management)
Human Resource Management	In an institutional sense denotes an organizational subsystem that prepares, makes, and implements personnel decisions to secure availability and effectiveness of personnel
Information Processing Approach	Explains individual behavior (e.g.: problem solving, decision making) with concepts from cognitive psychology (such as: attitude, personality, definition of the situation, short and long term memory)
Systems Theory	Aims at the formulation of general laws and rules about states and behaviors of systems and provides the basis for many investigations, theories and concepts developed within Organization Science and Management Information Systems
Artificial Intelligence	Tries to establish the analogy between human and computer problem solving and applies a common set of methods (e.g.: mathematical logics, pattern recognition, search heuristics) to a variety of problem domains
Semantic Web	Aims at the making information on the web easily processable, through a standardization of the web publishing system, in order to add semantic code and semantic meaning to the rough data
Computer Science	Studies the theoretical foundations of information and computation and their implementation and application in computer systems speculating, among the several themes, on the possibilities of processing knowledge by computer systems
Strategic Management	Determines long-term goals and positioning of organizations and encompasses the entire process of formulation, implementation and evaluation of strategies to link strategic and operational decision making
Other Management Approaches	Focus on certain aspects of management, such as innovation management, or provide an alternative view of management, such as systemic or system-oriented management, and evolutionary management
Organizational Psychology	Studies human behavior and experience in organizations and was later extended to explicitly consider the system characteristics of organizations on the individual, group, and organizational level of abstraction
Organizational Sociology	Analyzes structural similarities of organizations that are seen as social systems of activities and offers a variety of perspectives and approaches to describe and interpret events and processes in organizations
Sociology of Knowledge	Views knowledge as socially constructed on the basis of the world view and influenced Organizational Learning and Knowledge Management in terminology and conceptualization with theories of social construction of reality

Table 1 Research fields influencing Knowledge Management. Adapted by Maier (Maier, Hadrich et al. 2005) with the addition of Computer Science and Semantic Web
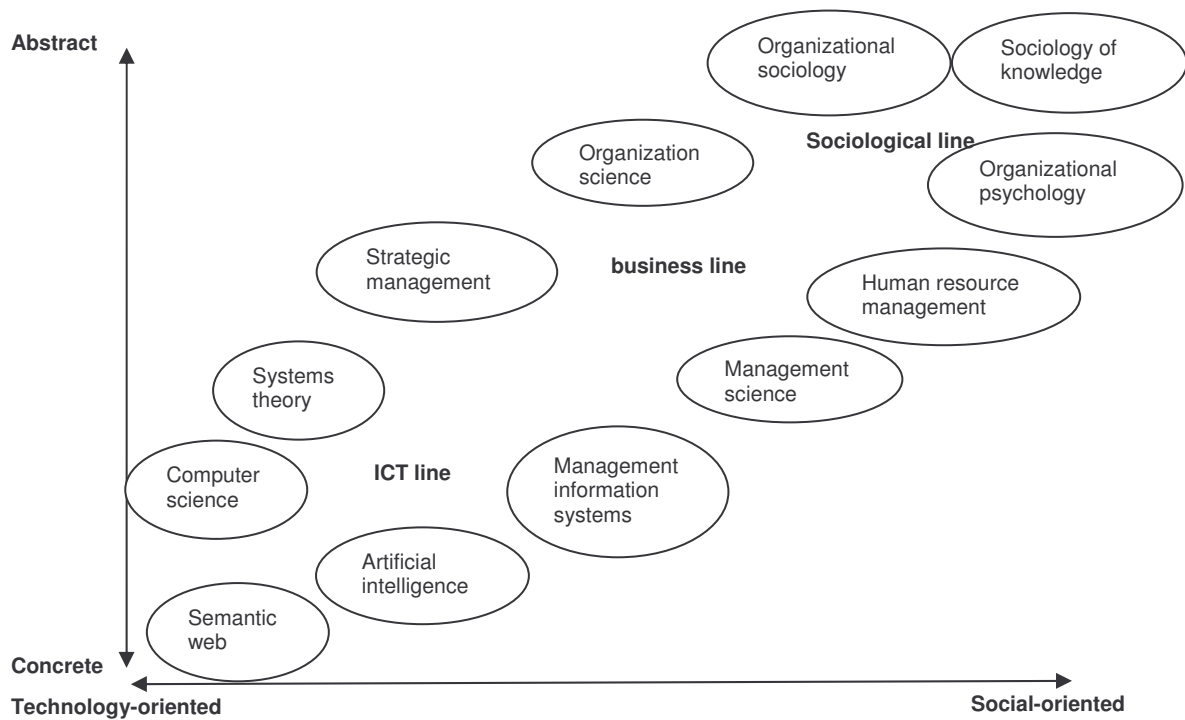
Figure 12 Lines of development of knowledge management. Adapted by Maier (Maier, Hadrich et al. 2005) with the addition of Computer Science and Semantic Web

Knowledge management is proposed as a research field that could enhance the management of knowledge in organizations, including concrete and abstract approaches, as well as technology and social orientations.

Knowledge management is an **integration** of the organizational approaches (as such: Organizational Sociology, Organizational Psychology, Organizational Change, Organizational Development, Organizational Learning, Organizational Memory, Organizational Intelligence, and Organizational Culture) to management discipline (as such: Human Resource Management, Strategic Management, Information Management). The integration of the management perspective in Knowledge Management determines the possibility and opportunity to intervene in the organizations to lever existing knowledge and to enhance the creation of new knowledge for the organizational benefit (Maier, Hadrich et al. 2005).

Individual Knowledge

Managers have to take into consideration the existence of different types of knowledge as each type requires different but complementary management approaches. Moreover, it should

be realized that knowledge is valuable when it is put into practice by individuals, who therefore are the critical elements of any knowledge-based competitive advantage. as already affirmed, individuals are considered **the only agents able to develop, transfer and operationalize knowledge** (Grant 1996b; Sutton 2001), in contrast with a part of the literature affirming the existence of also organizational knowledge (Nonaka 1994; Nonaka 1997; Stenmark 2001).

Individuals are the only source of the knowledge that cannot be easily communicated because it is accessible only through application and observation. But, even the knowledge codified into documents and the knowledge materialized into processes and artifacts have real effects only thanks to the human capabilities (Grant 1996b; Sutton 2001; Orlikowski 2002). Only through the human processes of sense making, decision making, and learning, knowledge is enacted, developed, and renewed (Choo 1998; Martinez 2004 page 34).

This focus and stress on the individual could bring to an underestimation of the role of the organization in this knowledge-based view theory. Actually, the limits of the mobility of knowledge determine the inability of the markets to solve the need of individuals' coordination in the accomplishment of the business processes (Grant 1996b; Pontiggia 1997 page 111). From this point of view, the organizations have the primary tasks of:

- coordination of the various individuals with different specialized knowledge, within its boundaries, and
- protection of knowledge from uncontrolled transfer outside the organization.

The organizations have to keep the conditions under which separate individuals accept to integrate their different specialized knowledge (Rosen 1991). Therefore, resources should be dynamically invested for the development of these conditions, through the creation of cooperative social contexts that facilitate the knowledge creation and transfer among specifically targeted individuals, within or between organizations (Ghoshal and Moran 1996; Lipparini 2002 page 65; Subramani and Venkatraman 2003; Sambamurthy and Subramani 2005). At the opposite, obstacles should be erected to prevent the transfer of knowledge where it is not fruitful for the organization.

In the cases where there is no need for specialization and integration of different individuals' knowledge to face uncertainty and enhance rationality, the organizations could not have reasons to exist (Martinez 2004 page 33).

In summary, this knowledge-based view highlights the importance of the individual as source of all the knowledge and the importance of the organization as source of the coordination of the individuals' knowledge for a common aim (Figure 13).
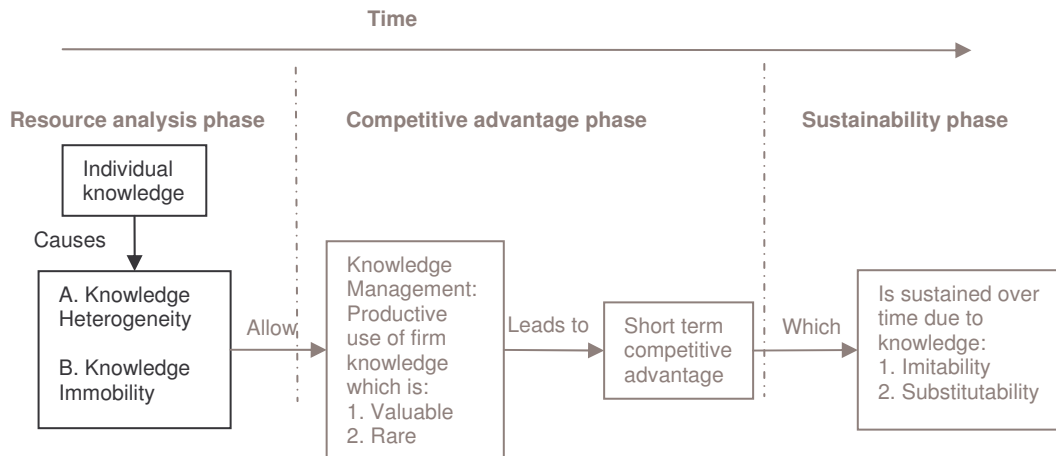
Figure 13 The role of individual knowledge in the knowledge-based view of the firm over time. Adapted from (Dewett and Jones 2001; Wade and Hulland 2004)

Coordination of individual knowledge

The acceptance of the assumptions affirming that only individuals can create and possess knowledge, and that the organizations can only coordinate the individual knowledge, imposes to reflect on the coordination within the organizations. In the knowledge-based view, coordination has the aim to **integrate the individuals' specialized knowledge** and it is partially in contrast with the Organization Theory (March and Simon 1974) and Organizational Learning and Management of Technology research (Brown and Duguid 1991; Nonaka 1994; Brown and Duguid 2001).

In particular, the Organization Theory proposes the coordination as the solution to reconcile and subordinate the disparate and conflicting aims of the organization's members. This coordination takes the form of authoritarian and hierarchical relations and bureaucratic processes.

An alternative and opposite solution, for the coordination of individual knowledge is the realization of egalitarian relations and volitional processes, which are potentially obtainable in the Knowledge Community (Ruta and Turati 2002 page 21; Kimble and Hildreth 2005; Thompson 2005).

Between these two extremes, most of the organizations find the form that better suites them. This study, hereafter, considers the complementary existence of both solutions within each organization.

Common knowledge among individuals

As already introduced, individuals can interact with each others and organizations can integrate the individual knowledge, if and only if there is common knowledge between the

parties (Nonaka and Takeuchi 1995; Grant 1996b; Nonaka and Konno 1998; Alavi and Leidner 2001; Jennex 2006). This common knowledge **allows the aggregation of new knowledge to the previously existing one and the integration of the knowledge of different individuals**.

The existence of common forms of symbolic communication is crucial for the communicability and hence the integration of knowledge. At the same time the communality of specialized knowledge determine the level of sophistication the new knowledge can be, in order to make possible its aggregation to the existing knowledge. A low degree of common knowledge imposes that the transfer of knowledge begins from the basic knowledge. A high degree of common knowledge allows keeping implicit the basics and directly transferring sophisticated knowledge. In case there is not at all common knowledge, between two individuals, knowledge transfer is impossible. On the opposite, the coincidence of the knowledge of two individuals makes the transfer of knowledge useless, since they already have all the knowledge of the other individual.

Moreover, a shared understanding about the context and the aim of the knowledge transfer facilitates the aggregation of the new knowledge to the existing one. This shared understanding reduces the need to explicit everything about the transferring knowledge, in order to complete the integration of individuals' knowledge (Polanyi 1966). This shared understanding is particularly useful for integrating the types of knowledge that are difficult to codify and to communicate, since it avoids the complexity of codification and communication of this knowledge.

Alternative solutions to this codification lever on:

- common cognitive schemata and frameworks (Weick 1979; Spender 1989),
- metaphors and analogies (Nonaka and Takeuchi 1995),
- stories (Brown and Duguid 1991).

This description on the Knowledge Management and knowledge transfer issues open the way to understand the support the Information Systems can offer to Knowledge Management and transfer.

2.2 Organization and Information Systems

In this section, the main themes of organizational capability and structure will forerun the introduction on the role of the organizational Information Systems in the organizational initiatives of Knowledge Management.

Organizational capability and structure

Consistent with the Knowledge-based view of the firm, the success of the organization depends on its ability to integrate this specialized knowledge, as far as the main aim of the organization is the integration of the individuals' knowledge for the accomplishment of the business processes (Grant 1996a; Von Krogh 1998). The capability of the organization, therefore, depends on the outcome of this integration.

The access and integration of specialized knowledge make the organizational offer potentially unique on certain desired aspects, in order to positively distinguish it to the offers of the competing organizations. This uniqueness is the outcome of the combination of a strategy of accessing and integrating specialized knowledge, consistent with the available knowledge, i.e. the available individuals.

This uniqueness, if appreciated on the market, is the competitive advantage of the organization. Nevertheless this competitive advantage is only a short-term one, if the resources, on which it is developed, are mobile among the organizations.

The conclusion of the knowledge-based view of the firm, in regards to the organizational capability, is that the **development of new knowledge** is the central point of the sustainable competitive advantage.

The organizational competitive advantage depends on the capability of the organization, and back warding this capability depends on the **integration choices** defined in terms of organizational structure. Grant (Grant 1996b), in its analysis of the knowledge-based view of the firm, indicates two main dimensions on which the internal structure is strategically defined: the role of hierarchy, and the location of the decision making and problem solving.

With respect to the first dimension, the hierarchy has revealed its effectiveness in organizations that are basing their competitive advantage on the integration of easily communicable knowledge. In these organizations the integration of the knowledge of the subordinates is performed by the superior and the ease of communication makes the transfer

of knowledge possible, without the need to transfer the individual with this specialized knowledge (Pontiggia 1997 page 24; Moschera 2000 page 110).

However, a strictly hierarchical internal structure reveals its limits when the organization manages knowledge that is difficult to communicate. In this case, the specialized knowledge of the subordinates cannot be effectively transferred to the superiors and integration in the hands of the superiors is not practical. Definitively, the extent to which knowledge is immobile in the organization determines the degree of unfeasibility of a hierarchical structure (Grant 1996b).

Regarding the second dimension, the location of the decision-making and problem-solving (von Hippel 1994; Pontiggia 1997 page 24; Gray and Chan 2000; Moschera 2000 page 110; Hasan and Gould 2001; Bonner, Baumann et al. 2002) has its origin and legitimization in the organization's ownership. On the opposite, the location of the decision making and problem solving should be done where the relevant knowledge exists, and hence by the organization's members.

The owner of the relevant, but immobile, knowledge has to participate in the decision making and problem solving processes for superior performance (Johnson, Zualkernan et al. 1987; Bradley, Paul et al. 2006), innovativeness and responsiveness (Hackbarth 1998). On the contrary, the mobile knowledge can be transferred upon the hierarchy, until the level where there is its integration with the immobile knowledge. This tendency of concentrating the decision making and the problem solving in the highest levels of the organization is mainly determined by the divergent individual goals among the personnel, even when there are incentives to achieve a goal alignment (Jensen and Meckling 1976).

The same logic is applicable to the definition of the appropriate boundaries of the organization. The existence of organizations is necessary when the market mechanisms do not provide appropriate solutions for marketing knowledge. Consistently, organizations should extend their boundaries till the degree that allows the efficient integration of knowledge by the market. Horizontally and vertically, the integration of the organization should be determined by the efficiency of the market in the transfer of knowledge. Where the market successfully performs the transfer of knowledge, then the organizational integration is not required. Otherwise, integration is recommended in order to keep the sustainable competitive advantage (Grant 1996b).

Information Systems for Knowledge Management

The organizational integration of knowledge can be achieved through different complementary mechanisms (Thompson 1967; Galbraith 1973; Van de Ven, Delbecq et al. 1976; Nonaka 1990; Grant 1996b). The one to which this research is concerned is represented by the information systems (IS) as mechanisms of Knowledge Management.

The resource-based view of the firm recognizes the **role of IS in sustaining firm competitiveness** (Wade and Hulland 2004). Knowledge Management research recognizes that the functionalities of the IS could have a critical role in the organizational integration of knowledge and the transfer of knowledge among individuals (Alavi and Leidner 2001). While the Information and Communication Technology (ICT) has primarily exploited the transfer of ease to communicate knowledge, IS scholars are doing efforts in the development of some computer-based supports for the integration of the knowledge that is difficult to codify and to communicate (Davenport and Prusak 1998; Alavi and Leidner 2001; Sambamurthy and Subramani 2005).

After a brief overview of the main characteristics of IS, the description will focus on the role of the IS supporting Knowledge Management.

Information systems

Description

In general, a system can be defined as "a set of parts coordinated to accomplish a set of goals" (Churchman 1979 page 29). Information Systems are systems that "**process information** by performing various combinations of six types of operations: capturing, transmitting, storing, retrieving, manipulating and displaying information" (Alter 1999). This research adopts a definition of information systems that includes the individuals, together with information, tools, and procedures, in the information systems (Alter 1999; De Marco 2000), in line with the socio-technical tradition (Pisoni 1979; Pontiggia 2001 page 10), obviously under the condition that these individuals perform at least one of the six types of operations defined for an information system.

Within this wide definition, many practical means of information exchange could be considered implementations of an Information System. Four major types of information systems can be classified based on their degree of formalization (Martinez 2004 page 116).

The informal Information Systems do not present any public and accepted agreement on the object of the Information System and on the way to perform the 6 types of operations.

Although there is not a common agreement, individuals present some commonalities of language, knowledge, and implicit agreements that allow the capturing, transmitting, storing, retrieving, manipulating and displaying of information.

The formal Information Systems present some conscious and explicit agreements on the object of the Information System and on the way to perform the 6 types of operations. In this case, communalities of language and knowledge are complemented by a set of formal rules and procedures that are agreed by the involved individuals.

This formalization can involve different means. Generally, formal Information Systems can be classified in paper-based or computer-based (Martinez 2004 page 117).

Paper-based Information Systems find in manual and paper tools the means for capturing, transmitting, storing, retrieving, manipulating and displaying information. The intervention of the individuals in any operation follows a predefined procedure that is shared and agreed among the members of the organization. On the other hand, computer-based Information Systems find in the computers the tools allowing the formal performance of the six basic operations, eventually completed by the individuals' interventions (Figure 14).

Informal	Formal paper-based IS	Formal computer-based IS	**Formalization**

Figure 14 Types of Information Systems

As a result of the wide concept of Information System, this study uses the term "Information Systems" to refer to any type of Information System: informal, formal, paper-based, and computer-based and including the individuals as component.

The presence of the human component in the Information System opens the possibility to use the Information Systems as systems aiming at the knowledge transfer and integration by the individuals. In fact, consistently with the previously defined concept of knowledge, knowledge is exclusively an output of the human cognitive processes. Therefore, an Information System excluding individuals cannot by it-self process knowledge, but only process information. The presence of individuals determines the possibility for an Information System to support the process of knowledge, which is performed by the individuals, who are part of the Information System.

IS supporting Knowledge Management

The focus of this part is about **the support that the IS provides to the transfer and integration of knowledge**.

Various initiatives can be put in place to facilitate this transfer of knowledge. These initiatives can be imposed formally by the organizations or proposed informally by single volitional members (Holthman and Courtney 1998).

Among the volitional solutions the literature proposes: unscheduled meeting, informal seminars and coffee break conversations. The major limit of this set of initiatives is the number of individuals involved, which is frequently limited and not rationally selected. Therefore, the knowledge could not reach its widest dissemination and the highest-potential recipients. If these flexible and simple solutions are effective in organizations with a small number of members, medium-size and large organizations cannot be sure that these informal and volitional solutions reach the expected recipients (Fahey and Prusak 1998).

Another limit concerns the completeness of the knowledge transfer. In fact, most of the time the sender starts the knowledge transfer without any rational planning of its content. The risk is to omit some particulars that could be crucial for the correct absorption by the recipient (Huysman, Creemers et al. 1998; Inkpen and Dinur 1998).

Formal transfer solutions proposed by the organization include, for example: training sessions, plant tours, apprenticeships, personnel transfers. They have the advantage to be rationally planned in order to reach all the targeted individuals and to transfer all the required knowledge. In fact, the transfer of the knowledge is assured by the possibility for the sender to communicate and to apply the knowledge that should be absorbed by the recipient (Fahey and Prusak 1998). However, these solutions could require a scheduling that restraints the occasional emergent opportunities for transferring knowledge.

All these initiatives can be accomplished without computer-based systems but ITC systems can enhance them and open new opportunities, as described in the following.

ICT systems

Description

Information and Communication Technology (ICT) systems include very different information technology and communication technology solutions linking information and people (Dewett and Jones 2001). The deployment of these technologies in the organization has the aim to enhance the quality and timeliness of its decision making, thus favoring its performance, efficiency and innovation (Huber 1990).

Starting from a wide literature review, Dewett (Dewett and Jones 2001) synthesizes the role of ICT systems in the link between the organization's characteristics and the organization's

outcomes. In particular, ICT systems can generate information **efficiencies and synergies** that can improve the organizational outcomes. The information efficiency lies in the cost and time savings that result by the use of ICT systems by the individuals for the performance of their tasks. Oppositely, the information synergy is the increased performance obtained by the use of the ICT systems by the individuals since they pool resources to collaborate or cooperate. These two results have an important influence on the main outcomes of the organization in terms of (Dewett and Jones 2001) (Figure 15):

- The ability to link and enable the organization members (Granovetter 1973; Granovetter 1983; Constant, Sproull et al. 1996; Edmonson and Moingeon 1998).

- The feasibility to create organizational memory, where storing codified information for its future retrieval (Leidner and Elam 1995; Anand, Manz et al. 1998; DeSanctis and Monge 1999).

- The accessibility to new information (Tushman 1977; Pickering and King 1995; Hansen 1999; Yan and Louis 1999).

- The promotion of the organizational efficiency (DeSanctis and Gallupe 1987; Kuperman 1998; Argyres 1999).

- The fostering of the innovation (Prahalad and Hamel 1990; Venkatraman 1994; Leavy 1998).
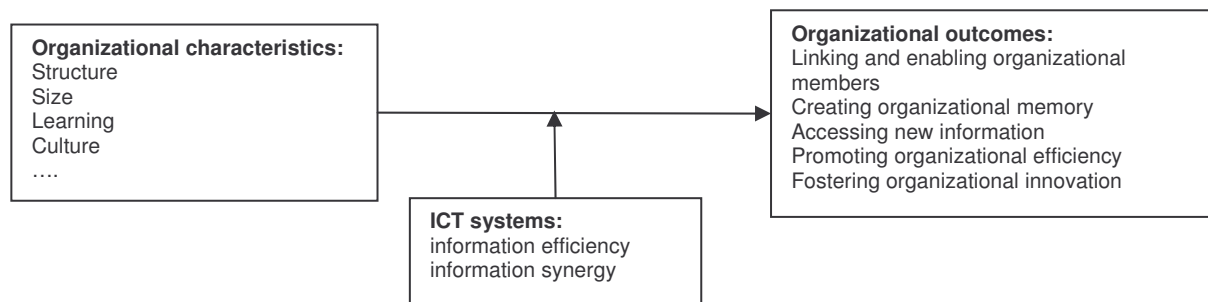
Figure 15 The role of ICT systems in the organization (Dewett and Jones 2001)

All these organizational outcomes can be sources of competitive advantages depending on the competitive environment faced by the organization. A specific strategic combination of the organizational characteristics and the ICT systems could, in fact, determines some organizational outcomes that result unique and appreciated to the point to obtain an advantage against the competitors (Porter and Millar 1985; Bakos and Treacy 1986; Holland, Lockett et al. 1992).

Recalling the statements of the knowledge-based view, the organizational characteristics about (1) the individuals' knowledge and (2) the organizational management of this knowledge, can determine a peculiar set of organizational outcomes that can drive to a sustainable competitive advantage.

Hence the ICT systems supporting the Knowledge Management can moderate this causal relationship from organizational characteristics to sustainable competitive advantage (Figure 16).
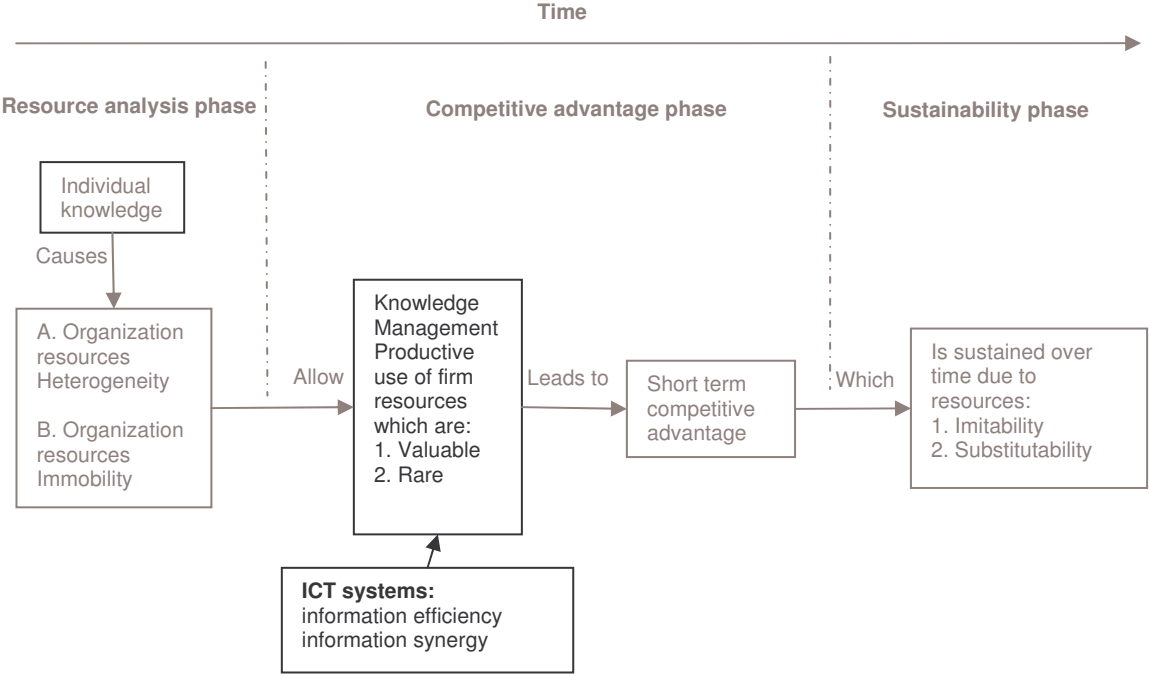
Figure 16 The role of ICT systems in the resource-based view of the firm over time. Adapted from (Dewett and Jones 2001; Wade and Hulland 2004)

Knowledge Management Systems

The ICT systems supporting the organizational management of knowledge are referred as Knowledge Management Systems (KMS) (Alavi and Leidner 2001). ICT seems an important enabler of the organizational management of knowledge (Figure 17). Nevertheless, other aspects have to be taken into consideration for a successful leverage of knowledge (Davenport and Prusak 1998; O'Dell and Grayson 1998b; Gemmo 2004).
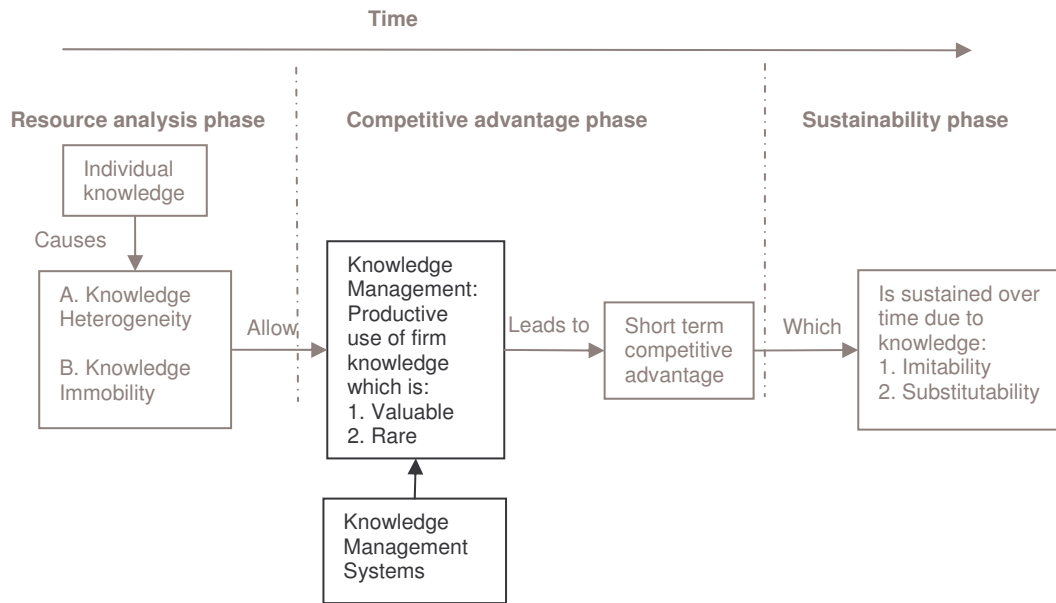
Figure 17 The role of Knowledge Management Systems in the knowledge-based view of the firm over time. Adapted from (Dewett and Jones 2001; Wade and Hulland 2004)

The different types of knowledge and the multiple uses of knowledge determine the variety of existing KMS (Alavi and Leidner 2001; Hodges, Moro et al. 2005). From the literature review, it is nevertheless possible to group this variety into 3 main kinds of applications (Alavi and Leidner 2001):

1. KMS for the codification and communication of best-practices for better decision making and problem solving (Davenport and Prusak 1998; O'Dell and Grayson 1998b; Markus 2001; Bonifacio and Merigliano 2002; Kim, Chaudhurry et al. 2002).

2. KMS for the creation of directories of the organization's knowledge in term of the knowledge domains of the organization members (Ruggles 1998; Huber 2001; Markus 2001; Kim, Chaudhurry et al. 2002).

3. KMS for the development of networks of individuals with different specialized knowledge, facilitating the connection and communication among the organization's members (Ruggles 1998; Huber 2001; Bonifacio and Merigliano 2002; Kim, Chaudhurry et al. 2002; Ryu, Kim et al. 2005).

Various ICT solutions could be effectively applied such as email, groupware, intranets, collaboration platforms (Boland, Tenkasi et al. 1994; Nonaka 1994; Alavi and Leidner 2001; Kim, Chaudhurry et al. 2002). Many other ICT solutions are proposed as KMS, but in line with the perspective of the knowledge-based view, which assumes that knowledge cannot persist isolated from the individuals, are not directly taken into consideration. For the theory

of the knowledge-based view of the firm, the IS solutions aiming at the storage and retrieval of knowledge under the form of repositories (Walsh and Unson 1991; Stein and Zwass 1995; El Sawy, Gomes et al. 1996; Vandenbosch and Ginzberg 1996; Weiser and Morrison 1998; Hodges, Moro et al. 2005) are actually ICT solutions that store and retrieve data or information, but not knowledge.

Under these assumptions, **ICT tools can only support the knowledge transfer**, assisting the communication of the part of knowledge that can be easily communicated, and the retrieval of the information on the knowledge domains of the organization members. In terms of ICT tools assisting communication: email, instant messaging, video and audio conferencing systems, electronic bulletin board, discussion groups, forum, are the major applications (Cranfield University 1998). In terms of ICT tools assisting the retrieval of the information on the knowledge domains: knowledge maps, corporate directories, personnel profiling systems are the most common solutions (O'Dell and Grayson 1998b; Huber 2001).

As already introduced in the first part of the document; one of the major advantages of the ICT solutions is the possibility to break the geographical barriers and to reach distant individuals (Robertson, Swan et al. 1996; Hansen, Nohria et al. 1999), augmenting the diversity of knowledge domains a single individual can access (Robertson, Swan et al. 1996). Moreover, this tendency is aggravated by the ascertainment that individuals are unaware of the knowledge domains of the other organization members (Kogut and Zander 1996).

The development of ICT solutions able to expand the extension and the richness of the individuals' contacts expose the individuals to new knowledge (Granovetter 1973; Granovetter 1983; Constant, Sproull et al. 1996; Robertson, Swan et al. 1996). Complementary, the communication with individuals, within a certain knowledge domain, through an ICT solution offering rich media for transferring knowledge, improves the mobility of knowledge (Hinds and Kiesler 1995).

As mentioned before, among the variety of Knowledge Management Systems, one kind of KMS, called "Expert Recommending Service", addresses the knowledge transfer between individuals it will be the main object of this research and wide description will be dedicated to it in the next chapter.

Limitations and open issues about the KMS

These ICT solutions for knowledge transfer have some clear limitations (Alavi and Leidner 2001).

So far, they focus mainly on one-to-one knowledge transfer, because they allow the **retrieval of the individuals with certain knowledge** and they allow the communication with the selected individuals. These ICT solutions are not completely developed for the transfer of knowledge that has tight interdependencies among the members of a group (Leonard and Sensiper 1998). The future evolution should extend the possibility of one-to-many and many-to-many transfer.

One-to-many transfer means the possibility to retrieval not a single individual but a group of individuals who have, together, the searched knowledge, as proposed by Yukawa and Kasahara (Yukawa and Kasahara 2001), and to enter into contact with all of them at once. Many-to-many transfer extends these possibilities to groups of individuals to retrieve and communicate with other groups of individuals.

Moreover, the offer to the individual of these ICT solutions does not assure its use and, consequently, the actual extension of their knowledge transfers (Alavi and Leidner 2001).

Another issue concerns the importance to limit the information overload, in which the individuals can fall once the ICT solutions offer large amount of information (Pontiggia 1997 page 22). Overload is studied in different cases of document retrieval (Dworan 1998; Powell 1998) and some ways to obtain only a limited set of high quality information need to be improved.

A further lack of investigation concerns the way to stimulate the pro-activity of the individuals with specialized knowledge to diffuse its knowledge to the potentially interested organization members. The ICT solution, for the retrieval of the individuals, with certain knowledge, makes easy, for the knowledge seeker, to demand to an individual, with the researched knowledge, to start the knowledge transfer. However, the possibility for the individuals with the specialized knowledge to target the individuals searching this knowledge is not yet achieved (Holtshouse 1998). A balance between the initiatives for requesting knowledge and the initiatives for offering knowledge could encourage and facilitate the knowledge transfer.

Finally, this facilitation of the knowledge transfer could induce the risk to underestimate the importance of the other sources of knowledge. In fact, the availability of heterogeneous sources of knowledge improves decision making and problem solving (Alavi and Leidner 2001).

2.3 Communities and knowledge

The Knowledge Management Systems have an evident role of moderators between organizational characteristics and competitive advantage, but the KMS by them-selves cannot assure any competitive advantage. It is therefore strategically crucial the definition of a set of organizational characteristics and mechanisms that gives the maximum competitive advantage.

As already introduced, different **mechanisms** are proposed in the literature for **the integration and transfer of knowledge** (Thompson 1967; Van de Ven, Delbecq et al. 1976; Levitt and March 1988; Brown and Duguid 1991; Nonaka 1994; Grant 1996b): the rules and directives, the sequencing of the work activities, the routines, the groups of problem solving and decision making, the conversion of knowledge, the communities of practice.

The selection of the mechanisms to adopt depends on the properties of the knowledge and the context where this knowledge has to be integrated or transfer.

While the first mechanisms are very suitable in stable ad simple environment, the later ones are adapted for more dynamic and uncertain context (Grant 1996b). In particular, contexts where tasks are complex (Perrow 1967) and uncertain (Galbraith 1973) demand, to the organization, to rely upon the continuous volitional interactions among the individuals and the creation of spontaneous, non-standardized coordination mechanisms (Boland and Tenkasi 1995; Grant 1996b; Hasan and Gould 2001). In these cases, the common knowledge, necessary for the integration and transfer of specialized knowledge, bases on some common practices among the individuals (Brown and Duguid 1991).

On the contrary, the mechanisms, like formal groups and teams, have a reduced ability to create spontaneous and non-standardized coordination, knowledge transfer, and knowledge integration (Favier, Coat et al. 1998; Griffith, Sawyer et al. 2003; Koeglreiter, Smith et al. 2006).

Part of the literature names this ensemble of individuals, volitionally interacting and coordinating each others basing on common practices, "community of practice". However the utilization of the term "community of practice" in different contexts, with very different senses, and the vagueness of the term "practice", bleach the meaning of "community of practice" (Ross 2003).

Therefore, within this study, the term "Knowledge Community" will be used, since it had a limited use so far in the literature (Botkin 1999; Paavola, Lipponen et al. 2002; Paavola,

Lipponen et al. 2004; Andriessen 2005a; Andriessen 2005b; Trier 2005). Its precise meaning has been already stated in the introduction of the work, but conveniently reported: a group of individuals that share a common practice, work, or interest as common knowledge, for the integration and transfer of specialized knowledge among the group's members.

This definition explicitly states the important role of the Knowledge Community in the transfer of knowledge. Moreover the knowledge transfers are conceived as the major aim of the Knowledge Community. These two reasons explain the choice of the term Knowledge Community to represent the groups of individuals that share a common practice, work, or interest.

In this way, the author overcomes also the limiting reference to "practice" in the term "Community of practice": in fact, it is not only the practice that allows the knowledge transfers and the knowledge integrations. In addition, the aims of this aggregation around a common practice remain implicit in the definitions of "Community of practice".

Instead of using the term "Community of practice", other alternative definitions exist: such as: "virtual communities of practice" (Kimble and Hildreth 2004), "networks of practice" (Brown and Duguid 2000; Brown and Duguid 2001), "digital knowledge networks" (Brown 2002), or "epistemic communities" (Goury and Spalanzani 2005; Thompson 2005; Conein 2006). The choice of the term "Knowledge Community" instead of these alternative propositions aims at highlight the disagreement of the other to a conception of knowledge as something that can exist in the external world as a product. The author thinks, in fact, that Knowledge is a prerogative of the human beings and their aggregations, such as the communities or in general the organizations.

Before, describing the role of the Knowledge Communities in knowledge management, the next section reviews the literature on communities of practice, taking into consideration the evolution of the concept of communities of practice and following the three-folder structure proposed by Kimble (Kimble 2005) and Cox (Cox 2004).

Communities

Communities of practice

Communities of practice have been largely study in different contexts, particularly, in business and education. However, since this research is oriented toward organizations producing goods and services, the research on communities of practice in education (Amhad, Piccoli et al. 1998; Avis 2002; Paavola, Lipponen et al. 2004) will not be taken into consideration.

It is valuable to recall that this research interest in the communities of practice is justified by the role of communities of practice **for the transfer and integration of knowledge**, and for the growing importance of knowledge for obtaining a sustainable competitive advantage.

Communities of practice: the first period

The first studies concerning communities of practice in the workplace (Brown and Duguid 1991; Lave and Wenger 1991) propose the community of practice as "**a set of relations among persons, activity, and world, over time**" (Lave and Wenger 1991 page 98). This set of relations is claimed as fundamental for the transfer or integration of knowledge, through the engagements in some sort of common practice with the other members of the community of practice (Lave and Wenger 1991).

These engagements over time increase the common knowledge among the individuals giving the possibility to access ever more sophisticated knowledge, and to understand more complex and uncertain tasks (Brown and Duguid 1991; Lave and Wenger 1991). But the degree of engagement can be very different among the members (Lave and Wenger 1991). The types and frequency of these engagements determine the dynamic and unplanned evolution of the community of practice and the continual aggregation of new knowledge.

The different engagements could be connected also to the different roles (Brown and Duguid 1991; Fox 2000) that could exist in the community of practice and by the influences of the wider social or organizational environments in which the community of practice exists (Fox 2000). The role of the environment, in which the community of practice is embedded, has a crucial role on the characteristics of the community of practice.

In particular in the organizations, communities of practice exist like a way to overcome the restrains and limits of the formal structures and activities for the benefits of the single individuals, the community of practice, or the organization (Brown and Duguid 1991; Krackhardt and Hanson 1993; Harryson 2000). The environment determines also the existence of intersecting communities of practice (Brown and Duguid 1991; Lave and Wenger 1991), because individuals could be members of different communities of practice at the same time basing on their partially different practices.

In summary, the first studies (Brown and Duguid 1991; Lave and Wenger 1991) describe the communities of practice as informal entities emerging from the common practice, outside the formal organizational structures and tasks. Moreover, these authors did not take into explicit consideration the role of the location of the different members of the communities of practice and the media of the interactions, evidently supposing the co-location of the members.

Communities of practice: the second period

After the first initiatives, the major author of the studies on the communities of practice was Wenger with his book titled: Communities of practice: learning, meaning and identity (Wenger 1998). In his book the idea of community of practice is more extensively defined and characterized by (Wenger 1998 pages 72-73):

1. "**mutual engagement**". The members, through their interactions, build social norms and relationships.

2. "**joint enterprise**". The members, through their interactions, understand which interests are common throughout the entire community of practice and are binding its members.

3. "**shared repertoire**". The members, through their interactions, develop a collective set of resources available to the members of the community of practice.

With this definition, Wenger (Wenger 1998) argues that communities of practice are identifiable everywhere, even if the members could not be conscious of their existence. So forth, the idea of the presence of intersecting communities of practice extents it-self to the notion of "constellation of communities" of practice (Wenger 1998 page 127).

This extension of their presence determines also major connections with the organizations embedding them. In fact, a community of practice concentrates, in its members, a specific domain of knowledge and makes the organization effective because the members' knowledge is mobilized, transferred, integrated for the accomplishment of organizational tasks, when the formal structure does not determine it (Harryson 2000) (Krackhardt and Hanson 1993).

Another advantage for the organization derives by the positive effects that the existence of communities of practice has on the perceived quality of the working environment and on the transfer of knowledge among the members. Thanks to the development of the ICT, this transfer of knowledge does not concern, anymore, only the co-located members. ICT does open the possibility of the existence of geographically distributed communities of practice, under the form of virtual communities of practice.

In addition, Wenger (Wenger 1998) starts a formalization of the evolution of the communities of practice defining their different stages, based on the degree of interactions, and the kinds of activities.

In summary, Wenger (Wenger 1998), following the main principles of the first studies, enriches the concept of community of practice, adding the sense of the mutual engagement, the joint enterprise, the shared repertoire and the evolution. Due to its focus on the working context, Wenger delineates also the important connections existing between the communities

of practice and the hosting organization, and the benefits for the organization in terms of task achievement, knowledge transfer and quality of work.

Communities of practice: the third period

In contrast with the previous period, the third period shows that the attention and books' publications on the communities of practice expand in different domains, and more authors are concerned (Wenger 2000a; Wenger and Snyder 2000; Wenger, Mc Dermott et al. 2002; Snyder and Briggs 2003; Snyder, Wenger et al. 2003; McDermott 2004).

The main innovation concerns the **managerial intervention** in the communities of practice for taking advantage of them at organizational level. For the organizational benefits, at first, the members, of the community of practice, should recognize the existence of the community of practice in it-self. This recognition would create a social fabric, enhancing the knowledge transfer and the knowledge integration.

Within this perspective, communities of practice could also be recognized, cultivated or even created rationally by the organization for aligning it to its objectives (Wenger, Mc Dermott et al. 2002). Some reserves remains only on the possibility to have a mandatory but still effective community of practice.

In addition to the previously identified organization's benefits, the communities of practice seem to have the potential to "drive strategy, generate new lines of business, solve problems, promote the spread of best practices, develop professional skills, and help companies to recruit and retain talent"(Wenger and Snyder 2000 pages 139-140), and "steward the knowledge assets of organizations" (Snyder and Briggs 2003). Particular attention is paid on the role of communities of practice to steward knowledge, facilitating the knowledge transfer and integration across formal groups and formal boundaries within the organization.

Also the life cycle stages of the communities of practice are reconsidered. From a classification based on the frequency and type of activities, the communities of practices are reclassified in term of their capability of steward knowledge.

In line with the possibility of intervening in the communities of practice, some instruments are also proposed to facilitate the passage from one stage to another one. In addition, the possibility of intervention and the benefits of the communities of practice convince Wenger (Wenger, Mc Dermott et al. 2002) to prospect the application of the guidance on the communities of practice also outside business organizations to all the social structures.

In summary, the publications of this period propose a radical change in the concept of community of practice. Communities of practice are now considered like levers that the organization can explore and exploit for its benefit and, particularly, for the management of

knowledge. Among the instruments the organizations should employ to take advantage of the potential of the communities of practice, it is clearly affirmed the role of the ICT tools, in particular, for the existence of communities of practice geographically distributed.

Communities of practice: summary and conclusion

This literature review shows the **evolutionary concept** of community of practice (Table 2). The communities of practice, from emergent entities, where knowledge can be transferred among individuals, are became managerial instruments, for managing knowledge for the organizations' benefit.

	FIRST PERIOD	SECOND PERIOD	THIRD PERIOD
Focus	Knowledge transfer in social structures	Knowledge transfer in working contexts	Guiding knowledge transfer in working contexts
Enactment and emergence	The community of practice emerges from the interpersonal relations over time make	The community of practice emerges from the mutual engagement, the joint enterprise and the shared repertoire	The community of practice is no more seen as enacted or emergent
Informal structure	The community of practice exists outside formal structures	The community of practice exists outside formal structures, but it is in relation with them	The community of practice has informal and formal structures
Relationship to outside world	The community of practice is a reaction to the outside world	The hosting organization has relations with and benefits of the community of practice	The hosting organization has formal influence on the community of practice for the organization's benefit
Development and evolution	A simple idea of evolution exists	Five stages of development based on type and frequency of interaction	Five stages of development based on its stewardship of knowledge
Degree of governance	The community of practice cannot be managed	The community of practice cannot be managed, but the hosting organization can enter in relation with it	The community of practice should be managed
Knowledge management	The actual knowledge transfer is spontaneous and not managed	The actual knowledge transfer is spontaneous and not managed	The management of the community of practice largely includes the management of the members' knowledge.
Co-location	The co-location is the default	ICT is taken into consideration like support for geographically	ICT is a key support for geographically distributed communities of practice

		distributed communities of practice	

Table 2 The comparison of the three periods (Kimble 2005)

Moreover, the role of ICT systems has been largely recognized as supports for the existence and effectiveness of the communities of practice, particularly the geographically distributed ones. At this regard, new terms have been coined like: "virtual communities of practice" (Kimble and Hildreth 2004), "networks of practice" (Brown and Duguid 2000; Brown and Duguid 2001), "digital knowledge networks" (Brown 2002), or "epistemic communities" (Goury and Spalanzani 2005; Thompson 2005; Conein 2006).

The recognition of the role of ICT systems in Knowledge Community motivates the investigation of the relationship between the information systems and the Knowledge Communities. In particular, within this research context, the members of the Knowledge Community are considered also users of the organizational information systems, and in particular of the ERS.

The possibility of management intervention in the Knowledge Community sustains the investigation on the characteristics of the Knowledge Community affecting the ERS success. The identification of these characteristics indicates the levers, in the hands of the management, to modify the Knowledge Community in order to make it more respondent to the organizational objectives.

Characteristics of Knowledge Communities

The three orientations on communities of practice put in evidence **different key characteristics** and several authors focused their research and classifications on some dimensions, neglecting aspects considered relevant by other researchers (Agresti 2003; Boughzala and Kaouane 2005; Goury and Spalanzani 2005; Stein 2005). In order to take advantage of the Knowledge Communities (KC) for managing knowledge, the organizations should recognize the specific characteristics of their own Knowledge Communities, since different Knowledge Communities should be specifically managed.

A description of the main characteristics identified by the literature review of different authors (Maier 2002 pages 156 ff; Andriessen 2005b) is reported in the following paragraphs.

Lifetime

In general, Knowledge Communities do not have a predefined duration; hence they are supposed to be entities lasting a **long indefinable time**. The origin of the Knowledge Community could be traced back to a specific initiative by a single individual or by a specific

group; nevertheless, once existing, the Knowledge Community has an autonomous life, which goes beyond the life span of the founder.

An individual, or a group of individuals could be identified as the founders of the Knowledge Community, but the Knowledge Community goes over the lifetime of the single individuals and it lasts until the members are interested in keeping it alive(Ferran-Urdaneta 1999; Wenger and Snyder 2000; Maier 2002; Andriessen 2005b).

Size

The size of the Knowledge Communities could vary a lot depending on the **number of individuals** sharing the same common knowledge and on the existing connections among the individuals. Previous research esteems that the Knowledge Communities with less than 20 or 40 members could be considered small Knowledge Communities, while the Knowledge Communities, with members exceeding the number of 100 or 150, could be defined large Knowledge Communities.

Knowledge Communities intensely interacting have rarely more than 50 individuals. The support of some Information System, on the contrary, could facilitate the management of larger Knowledge Communities (Ferran-Urdaneta 1999; Brown and Duguid 2001; Maier 2002; Andriessen 2005b).

Composition

A precondition, to be member of a Knowledge Community, is the sharing of same common knowledge among the individuals. Therefore, all the members have some knowledge that is shared among all the other members. The proportion of this common knowledge for all the members, in comparison to the **proportion of the specialized knowledge** of the single individuals, determines the heterogeneousness of the composition of the Knowledge Community.

Same major elements that influence the heterogeneousness of composition are: (1) the participation to the same organization, (2) the common educational and professional background, (3) the same culture and communication language (Collison 1999; Brown and Duguid 2001; Maier 2002; Andriessen 2005b).

Fragmentation

Within a Knowledge Community, part of the members could have a higher proportion of common knowledge. This condition could lead to the development of a Knowledge Community, gathering the members with this higher proportion of common knowledge, within the larger one. The members of this **sub-community** transfer and integrate their specialized knowledge based on this higher degree of common knowledge, facilitating the

knowledge transfers. This phenomenon could generate, within the larger Knowledge Community, different sub-communities, each one with a different base of common knowledge and dedicated to the transfer of different specialized knowledge.

At the same time, the larger Knowledge Community could be included in an even larger Knowledge Community that has only a smaller proportion of common knowledge among all the members. This super-community could gather members of different Knowledge Communities, but still sharing some common knowledge. The limited portion of common knowledge reduces the easiness of the knowledge transfers.

Finally, Knowledge Communities could intersect other Knowledge Communities with which they share only part of the members. Some individuals are members of both Knowledge Communities while others are members only of one of them, because different common knowledge exists (Maier 2002).

Geographical dispersion

The Knowledge Communities could be formed by members geographically dispersed. With the increase in distance, the physical contacts may be substituted by virtual ones, where ICT can play a crucial role in the preservation of the relationships among the members.

Knowledge Communities could be composed by members who live or work in the same building as well as in different continents. The **proximity** influences the possibility and frequency of face to face meetings and the importance of other solutions for transferring and integrating knowledge, hence the importance of ICT solutions (Maier 2002; Andriessen 2005b).

Mode of interaction

The geographical dispersion obviously influences the mode of interaction, motivating the use of **ICT solutions** for preserving interactions among the members. Nevertheless, also Knowledge Communities, with members close one to each other, could use ICT solutions for their interactions.

Interactions could be completely unsupported by ICT and, therefore totally face to face. On the other extreme, Knowledge Communities could exclusively rely on ICT support for the interactions among the members, who therefore do not have ever met the others face to face. Between these two extremes there could be various degree of ICT support for the Knowledge Community interactions (Maier 2002; Ruuska and Vartiainen 2003; Andriessen 2005b)

Degree of interconnection

The interactions among the members of the Knowledge Communities could involve two individuals at once or could involve groups of individuals. Knowledge Communities with a

low degree of interconnection have mainly **one to one interactions**. It means that each knowledge transfer or integration concerns only two Knowledge Community members at once.

Otherwise the single individuals could interact with a multitude of other members, determining one-to-many interactions. Moreover, also different portions of the Knowledge Community could reciprocally interact: a group of members could interact as a whole to another group of members, establishing many-to-many interactions (Brown and Duguid 2001; Maier 2002; Andriessen 2005a).

Frequency of interaction

The frequency of interaction of the members of the Knowledge Community describes the **intensity of the exchanges** existing among the members. Not all the members have the same frequency of interaction with the rest of the Knowledge Community. There are individuals who interact very rarely and others who have very frequent interactions.

In addition, the frequency of interaction relates also to the equality of participation of the different members to the interactions. In fact, some members could be very active and could communicate regularly. Whereas other members could be very inactive and almost never exchange communications with the others (Maier 2002; Andriessen 2005b).

Anonymity

Anonymity refers to the degree of visibility of the **identity** of the other members. The Knowledge Community members could keep their anonymity while interacting with the other members; hence they do not know each other and do not disclose their identity.

On the other hand, the identities of the members are evident to all the other members, knowing the personal information and the roles in the Knowledge Community of the individuals. Otherwise, there could be middle way solutions, where only a limited set of information is public partially hiding the individual identity. This partial anonymity could be imposed from the outside or could be agreed by the members or even the single members could specify to extent they maintain their anonymity. (Maier 2002; Andriessen 2005b)

Openness

The openness of the Knowledge Community describes the conditions under which an individual can join or leave the Knowledge Community.

Some Knowledge Communities could have completely permeable **boundaries** and therefore individuals could freely join and leave. Other Knowledge Communities have somehow restricted the access or the departure of the individuals. There could be a list of conditions to satisfy for joining or leaving the Knowledge Community. Otherwise, the access and the

departure could be established for each single case by the actual members or by other individuals or organizations. (Maier 2002; Andriessen 2005b)

Purpose

Knowledge Communities have aims that are generally accepted by the members and this common **aim** is a fundamental condition for the existence of the Knowledge Community. All the Knowledge Communities have the transfer and integration of knowledge, like basic purpose. But these knowledge transfers and integrations could have individual purposes, when transfers and integrations benefit only the single individuals. Otherwise these transfers and integrations could have collective purposes, when the Knowledge Community or another collective organization benefit of these knowledge transfers.

In addition, the specific purpose of each Knowledge Community could be variously defined. In some cases, it is totally implicit in the members, while in others it could be publicly stated and regularly revised. In this direction, Knowledge Communities could have also explicit agenda where concrete objectives are declared and for which specific resources are invested (Maier 2002; Andriessen 2005b) (Krackhardt and Hanson 1993).

Cohesion

The cohesion of the Knowledge Community depends on the **feeling** of the members about its existence and their sense of membership to the Knowledge Community. In fact, the existence of some Knowledge Communities could be not recognized by their members: the Knowledge Community exists, but its existence is not realized by its members.

Beyond the recognition by its members the cohesion of the Knowledge Community depends on the trust toward the other members and the sense of common identity, knowledge, and purpose (Botkin 1999; McDermott 1999a; Maier 2002; Andriessen 2005b).

Degree of governance

The Knowledge Community could be a completely self-regulated phenomenon or an organization can influence, to different degree, its existence. The degree of governance concerns the extent to which the Knowledge Community is influenced by an **external organization**. From the very beginning, the external organization could manage the Knowledge Community since this organization could even start the Knowledge Community, by entitling the founder to build up the Knowledge Community. Once existing a Knowledge Community could be managed through the definition of membership, constraints and rules.

The organization could try to govern the membership, the orientation, the aim of the Knowledge Community, though formal meetings and appointed positions responsible to stewarding the Knowledge Community, for the organizational benefits (Botkin 1999; Collison

1999; Ferran-Urdaneta 1999; Storck and Hill 2000; Wenger 2000b; Wenger and Snyder 2000; Brown and Duguid 2001; Maier 2002; Andriessen 2005b; Koeglreiter, Smith et al. 2006).

A synthesis of all these characteristics is proposed in Table 3 to sum up all the dimensions reviewed in the literature.

CHARACTERISTIC	DEFINITION	VALUES' SPAN		
Lifetime	The time passed from its creation	The KC is in creation	←→	The KC is created from centuries
Size	The number of individuals involved	A pair of members	←→	Many thousand members
Composition	The proportion of common knowledge among the members	A very small portion of common knowledge	←→	A very high portion of common knowledge
Fragmentation	The existence of overlapping and intersecting KC	No other KC	←→	Many KC overlapping and intersecting each others
Geographical dispersion	The geographical distance among the members	The members are co-located in the same building	←→	The members are dispersed all over the world
Degree of interconnection	The proportion of interactions that are between pairs of individuals	The members have only interpersonal relations	←→	The members have only communitarian relations
Frequency of interaction	The time elapsing between interactions among the members	The members interacts very rarely	←→	The members have continuous interactions
Anonymity	The degree of visibility of the identity of the members	The members do not know the identity of the other members	←→	The members have plenty of personal information on the other members, identity included
Openness	The conditions under which an individual con enter or exit the KM	The members are defined at the beginning and never changed	←→	There is a free entrance and exit to the KC
Purpose	The aims of the KM	The members pursuit individual and hidden	←→	The members have common and public objectives

		objectives		
Cohesion	The sense of membership perceived by the members	The members do not recognized the existence of the KC	←→	The members recognize and appreciate the KC
Degree of governance	The influence exerted by an external organization	The KC does not receive any external influence	←→	The KC is explicitly managed by an external organization

Table 3 Characteristics of the Knowledge Community

2.4 Knowledge Communities and Knowledge Management

As previously described, the Knowledge Communities could play a role in the management of knowledge at the organizational level because they can be manipulated by the management like mechanisms of knowledge management.

The role of Knowledge Communities in knowledge transfer

The practice, beyond the formal structures, for the accomplishment of tasks, jobs, or professions is the cornerstone for understanding the role of Knowledge Communities in Knowledge Management (Brown and Duguid 2001).

The organizational structure determines the existence of internal units and each unit is specialized in a particular practice. This specialization of the practice creates a significant common knowledge within the unit, which favor the mobility of knowledge. In the opposite, between different units, the common knowledge is marginal and the mobility of knowledge is difficult, due to the lack of common practice.

These effects exist both within a single organization and between different organizations. When units in different organizations have similar practices, the individuals of the different units share relevant common knowledge, which favors the transfer of knowledge between the members of the different units. On the other hand, units of different organizations, without common knowledge, find the transfer of knowledge very difficult.

The transfer of knowledge presents, therefore, different problems, mainly depending of the **similarity of the individuals' practices**, rather than depending on their membership to the same formal organization. The membership of the two individuals to different organizations does not inhibit the possibility to easily transfer knowledge, if they share a common practice. While this transfer is more difficult when the two individuals have different practices (Brown and Duguid 2001; Lesser and Strock 2004).

This understanding suggests to consider as key element of the knowledge transfer, not the individual, not the organization, but the Knowledge Community, where the individuals share common practices and knowledge domains (Tonneis 1971; Winter 1987). This communality overcomes the formal division in units, joints individuals officially separated, while keeps

separated individuals with different practices, but in the same unit (Figure 18 exemplifies the theory with two possible Knowledge Communities).
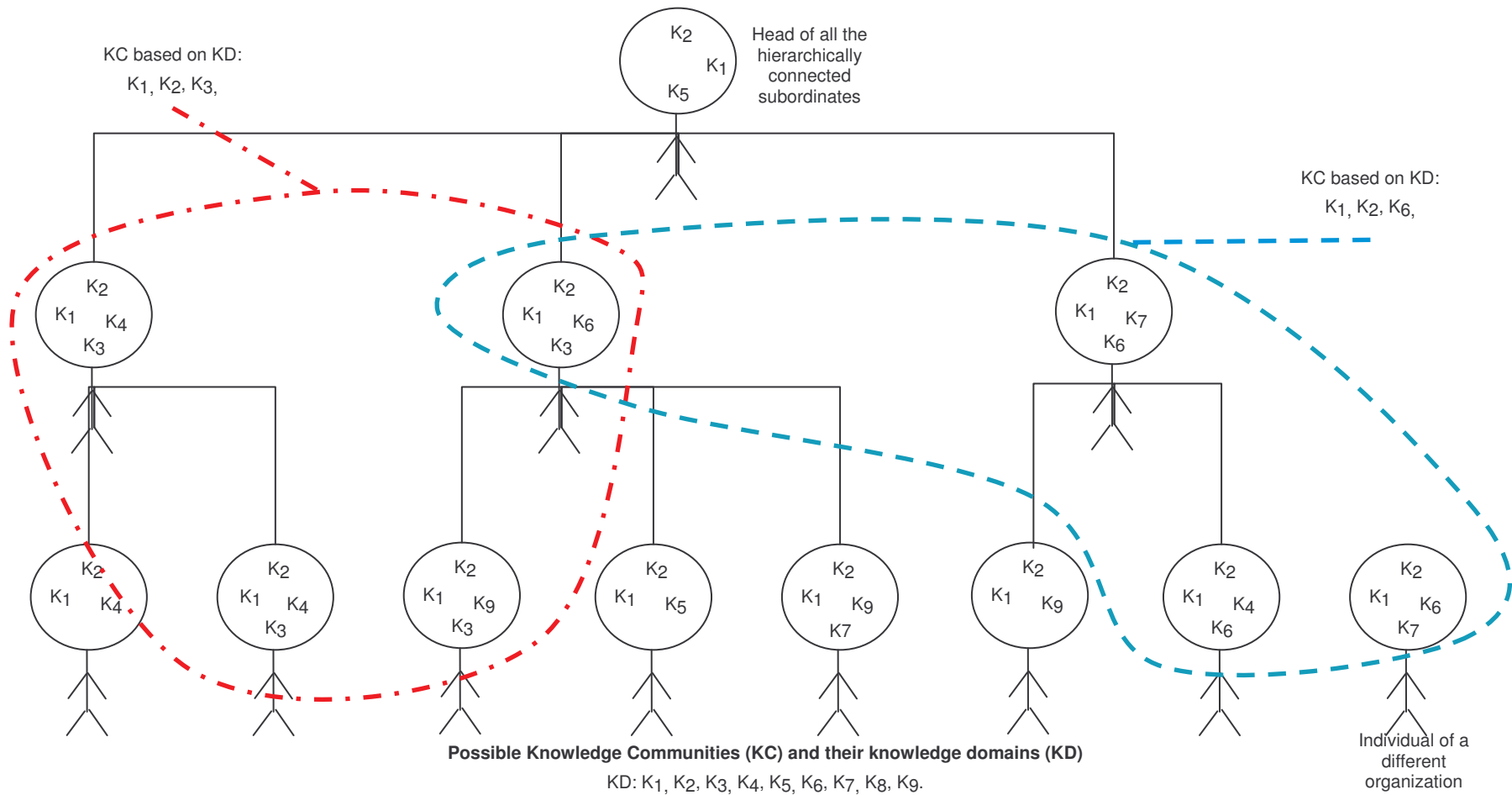
Possible Knowledge Communities (KC) and their knowledge domains (KD)

KD: K_1, K_2, K_3, K_4, K_5, K_6, K_7, K_8, K_9.

12 individuals members of formal organizations. The solid-line connection between individuals represent the hierarchical formal relationships.

Everyone is potentially member of a KC based on the KD: K_1, K_2

4 individuals of the same formal organization are potentially members of a KC based on the KD: K_1, K_2, K_3. The dash and dot line groups the members of this KC

4 individuals of the different formal organizations are potentially members of a KC based on the KD: K_1, K_2, K_6. The dash line groups the members of this KC

Figure 18 The Knowledge Communities and the organizational boundaries. The example shows how the KC, based on some specific knowledge domains, can go across the hierarchical boundaries.

The comprehension of the practices and knowledge domains of the individuals involved in the knowledge transfer or in the knowledge integration is a precondition to understand the requirements for the effective knowledge transfer or integration (Brown and Duguid 2001; Lesser and Strock 2004). The degree of common practice and knowledge could be considered an indicator of the degree of difficulty of the transfer or integration of knowledge.

From this perspective each organization contains different Knowledge Communities and the organization can be therefore imagined as a set of Knowledge Communities sharing some common practice and knowledge (Brown and Duguid 1991; Tuomi 1999). The Knowledge Communities provide the work context within which the Knowledge Communities' members develop, through the practice, their common knowledge and language as foundations of the knowledge transfer and integration (Arrow 1974; Orr 1986; Constant 1987; Cohen and Levinthal 1990; Hutchins 1991; Barley 1996; Orr 1996; Leonard and Sensiper 1998; Wenger 1998; Almeida and Kogut 1999; Cook and Brown 1999; Brown and Duguid 2001; Malone 2001; Marshall and Brady 2001; Koeglreiter, Smith et al. 2006; Lichtenstein and Hunter 2006).

Between different Knowledge Communities, the knowledge does not easily transfer, because the individuals miss some common knowledge and subsequently they have different assumptions and interpretations on the same subject. This could be critical if the different Knowledge Communities are within the same organization and have to transfer or integrate knowledge for the organizational benefit. The capability of the organization to manage this knowledge transfers and integrations between Knowledge Communities is a crucial element for its competitive advantage (Hoopes and Postrel 1999).

The common practice, on which the Knowledge Community is based, determines also the communality with the individuals doing the same practice in other organizations. This communality allows the creation of connections among different Knowledge Communities from separated organizations, with, however, a lower degree of common practice (Van Maanen and Barley 1984). The individuals of a Knowledge Community, within an organization, are members of the organization and, at the same time, members of the Knowledge Community that overcomes the organizational barriers and that joins individuals of different organizations (Arrow 1974; Alpert 1985; Constant 1987; Saxenian 1996; Knorr-Cetina 1999).

The benefit of these connections is the permeability of the single organization to the external knowledge, which could be transferred into the organization and internally integrated (Constant 1987). However this permeability works either ways. So the management must pay

attention to the knowledge transfers among different organizations, in order to avoid the uncontrolled diffusion of critical pieces of knowledge (Smith and Alexander 1988; Kreiner and Schultz 1993; Powell, Koput et al. 1996; von Hippel 1998; Bouty 2000). Nevertheless, research demonstrates that inhibiting the exit of knowledge transfer has the side-effect of stopping also the entering knowledge (Mounier-Kuhn 1994; Saxenian 1996). Therefore, instead of stopping it, organizations should try to regulate it, through a correct use of the knowledge barriers.

In summary, given these theoretical contributions, the Knowledge Communities can be clearly introduced, in the knowledge-based view of the firm, like a lever in the hands of the management to enhance the knowledge management (Figure 19).
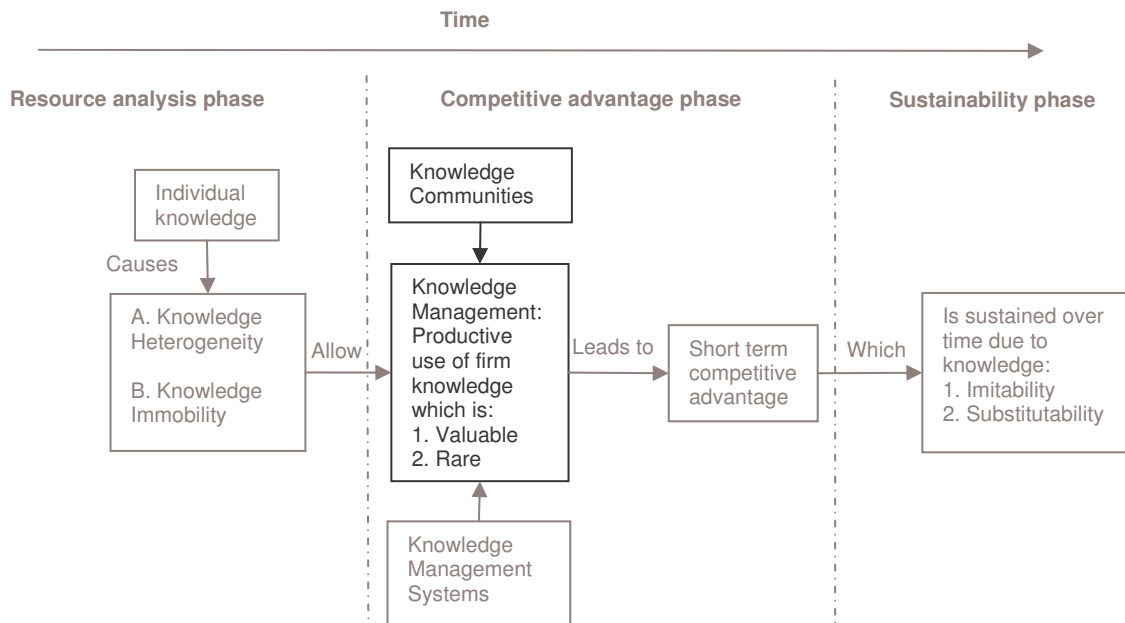
Figure 19 The role of Knowledge Communities in the knowledge-based view of the firm over time. Adapted from (Dewett and Jones 2001; Wade and Hulland 2004)

Barriers to knowledge transfer and integration

The existence of a Knowledge Community is the basic, but not unique element for knowledge transfer. Beyond the existence of the common practice and knowledge, other **factors affect the effectiveness of knowledge transfer**. The research (Cross, Parker et al. 2001; Markus 2001; Ruta and Turati 2002 page 24; Lesser and Strock 2004) sums up these different factors in three classes: awareness, access and perception.

Most individuals have a natural tendency to socialize and transfer what they know, but organizations have some conscious and unconscious hurdles that limit this natural tendency (Cross, Parker et al. 2001; Lesser and Strock 2004).

Awareness

The awareness regards the **acknowledgement** of the domains of knowledge of the other members and several studies were concerned about this barrier and its dimensions (Libby, Trotman et al. 1987; Beaudouin-Lafon and Karsenty 1992; Dourish and Bellotti 1992; Littlepage and Silbiger 1992; Tollmar and Sundblad 1994; Littlepage, Robison et al. 1997; Davenport, De long et al. 1998; Cross, Parker et al. 2001; Ruta and Turati 2002 page 151; Borgatti and Cross 2003; Kondratova and Goldfarb 2003; Baumann and Bonner 2004; Daassi, Favier et al. 2004; Denrell, Arvidsson et al. 2004). Being aware of the individuals who could be source of specialized knowledge, i.e. knowing what the other members know, is a

precursor to search a specific individual out, when specialized knowledge is required (Figure 20 exemplifies the awareness of a member of a Knowledge Community on the other members).

The partial recognition by an individual of the Knowledge of the Others members of the KC

KC based on KD:
$K_1, K_2, K_6,$

Knowledge awareness in the Knowledge Communities (KC)

KC (circumscribed by the dash line) based on the KD: K_1, K_2, K_6

The cloud callout in dot line describes the knowledge awareness of one member of the KC on the KD of the other members. This member is partially acknowledged of the KD of the other members, since for some of them he does not know some of their knowledge domains (the ones marked with the question mark: $K?$)

Figure 20 The awareness of a member on the knowledge of the other members of the KC. The example shows how a single individual could have a distort or partial representation of the distribution of knowledge among the members of the KC.

The number and distribution of the members of the Knowledge Community influence the possibility to acknowledge the knowledge domains of all the other members of the Knowledge Community. A recently-formed, large and geographically dispersed Knowledge Community faces the problems of knowing what the other members know. Also the structure of the organization influences this awareness, because it restrains the visibility on the knowledge existing outside the respective organizational unit.

This problem affects the transferability of knowledge, because it is difficult to find the right individual with the required specialized knowledge on time. This evidence directly impacts the single individuals when they seek a specialized knowledge, since they do not have the possibility to find the right individual with the required specialized knowledge. At the same time the individuals, sources of specialized knowledge, have difficulties in transferring their knowledge, because they cannot identify the potential recipients.

The Knowledge Community gives the ground for being partially aware of the distribution of knowledge among the other members, through the definition of common practice and knowledge. The interactions among the members are a way to be partially acquainted with the others. But not all the other members could be known and not all the knowledge domains of the others members could be recognized.

In summary, the decision to seek knowledge from someone is influenced by the seeker's perception of the others' knowledge domains and the choice of the individual to ask for the knowledge transfer depends on the personal estimation on the value of the others' knowledge.

Access

Access relates to the **possibility to enter in contact with the source of knowledge,** at the right time, to transfer or integrate the knowledge and it has been explored by different authors (Cross, Parker et al. 2001; Ruta and Turati 2002 page 151; Borgatti and Cross 2003; Kondratova and Goldfarb 2003; Lesser and Strock 2004).

The awareness is the precondition for accessing individuals with specialized knowledge, but knowing that there is a member with the searched knowledge does not determine automatically the access to that knowledge. Both the source of knowledge and the potential recipient of knowledge could have problem in getting into contact with the potential counterpart (Figure 21 exemplifies the access barriers of a member of a Knowledge Community toward the other members).

Reciprocal access: the members have no problem in getting into contact with the potential counterpart.

KC based on KD:
K1, K2, K6,

No access: the members have problems in getting into contact with the potential counterpart

Unidirectional access: a member has no problem in getting into contact with the potential counterpart, while the counterpart has some problems.
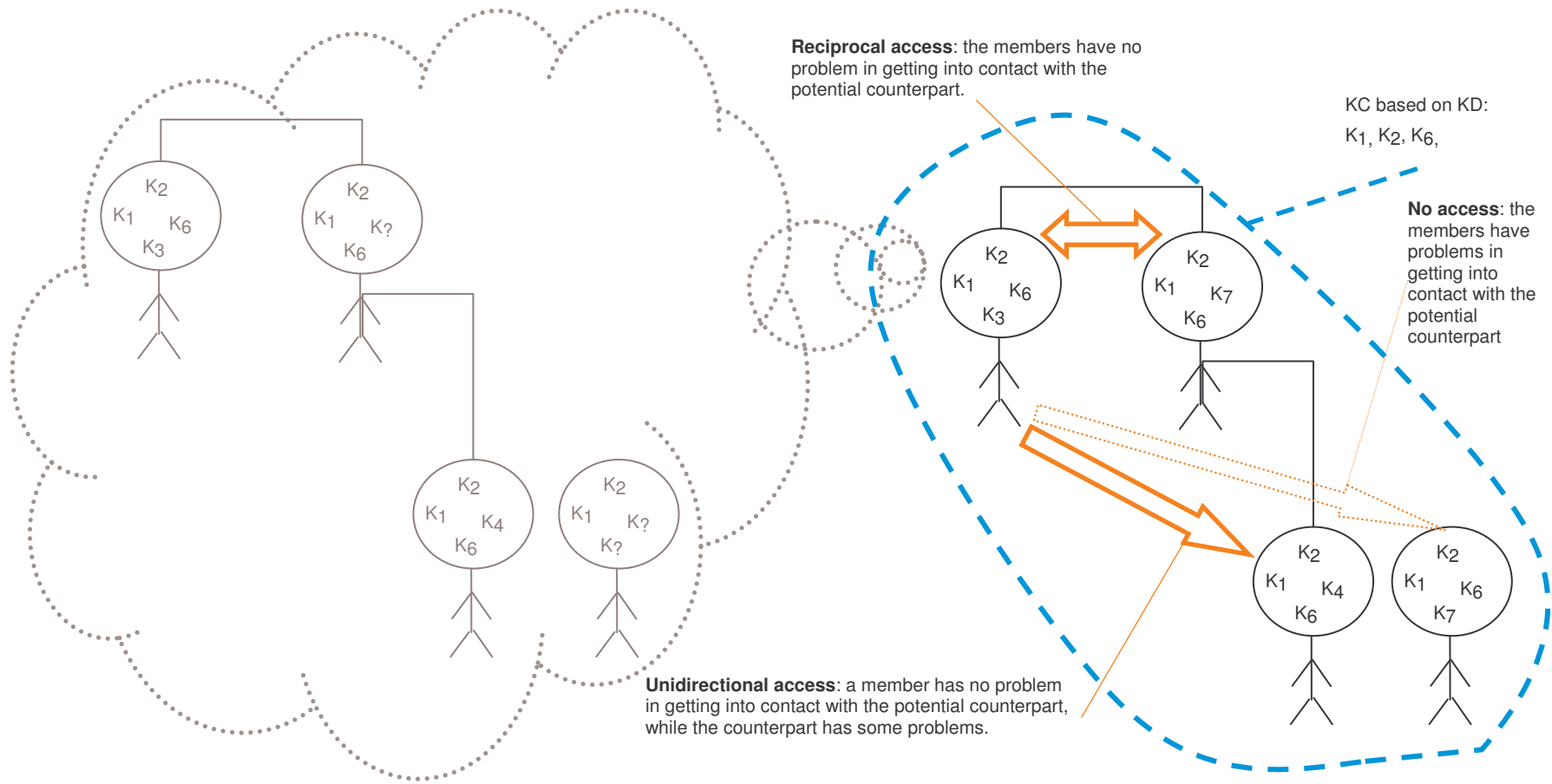
Access in the Knowledge Communities (KC)
The access of a member of the KC to the other members can be reciprocal, unidirectional access, or absent
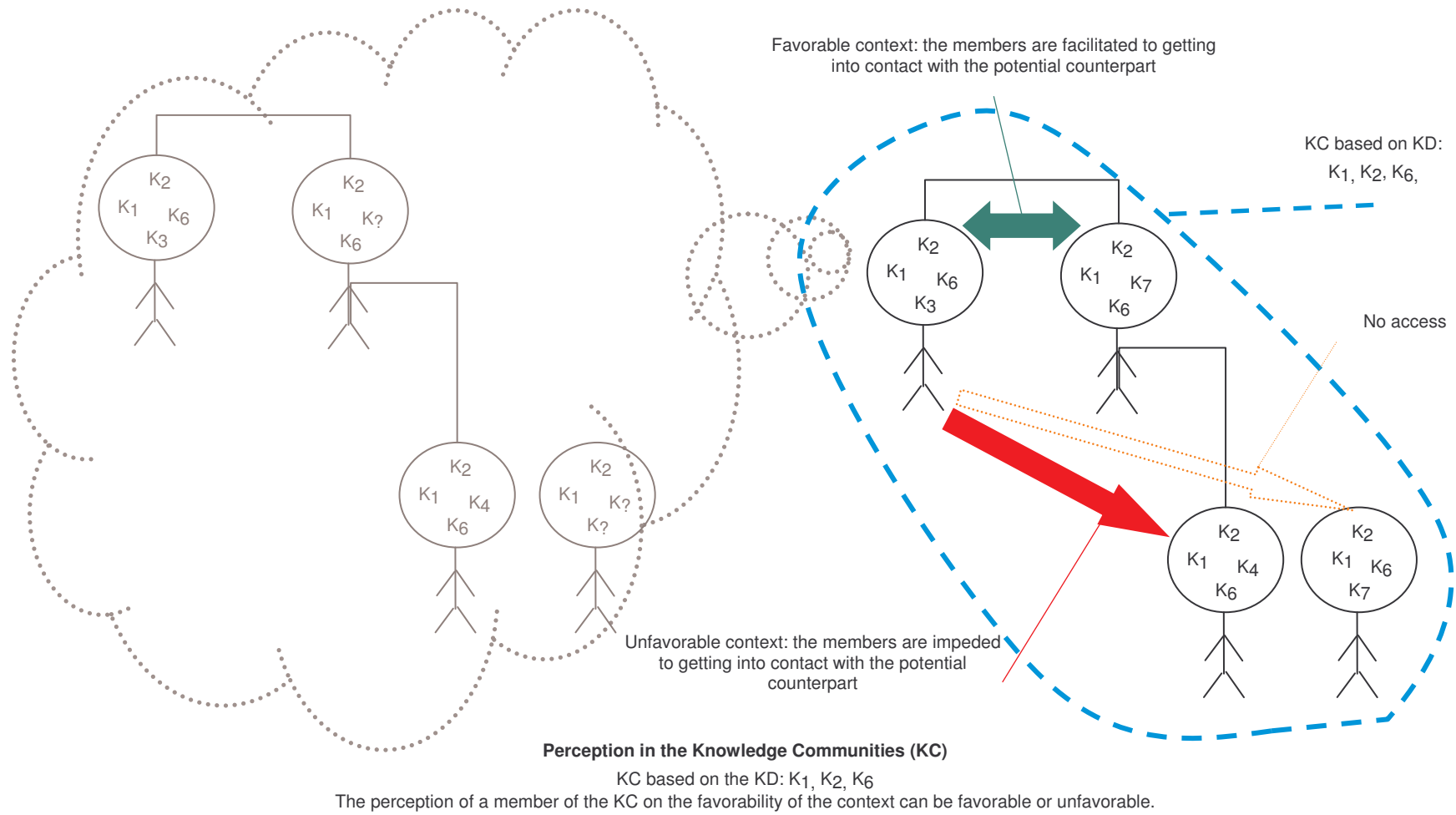
Figure 21 The access by a member to the knowledge of the other members of the KC. Basing on the relationship existing among the members there could be different types of access.

They could have limited time and energy and they could not be motivated to invest their limited resources in the knowledge transfer. This lack of motivation can be found in particular in the source of knowledge. In fact, the potential recipient of knowledge could be easily motivated to absorb new knowledge from the source since this new knowledge could be directly implied in solving concrete business problems. On the other hand, the benefit for the recipient could be, actually, hidden to the source of knowledge and even if the benefit is evident, it could not directly improve the conditions of the source of knowledge. The source of specialized knowledge could be therefore not motivated in this transfer.

Moreover, the awareness of the individuals on the knowledge domains of the other members could determine always the recurrence to the same source of knowledge, for the same knowledge, by different recipients of knowledge. This source of knowledge could be accessed by different members demanding the transfer of the same specialized knowledge, multiplying the effort required to the source. In this condition, the source could feel demotivated to answer all the requests of transfer of the same specialized knowledge.

Perception

The perception concerns the existence of **contextual variables facilitating the transfer** or integration of knowledge. A favorable perception should make the individual, who is source of knowledge, willing to transfer knowledge, and the individual, who is recipient of knowledge, keen to absorb knowledge (Figure 22 exemplifies the perception barriers of a member of a Knowledge Community toward the other members).

Favorable context: the members are facilitated to getting into contact with the potential counterpart

KC based on KD:
K_1, K_2, K_6,

No access

Unfavorable context: the members are impeded to getting into contact with the potential counterpart

Perception in the Knowledge Communities (KC)

KC based on the KD: K_1, K_2, K_6

The perception of a member of the KC on the favorability of the context can be favorable or unfavorable.

Figure 22 The perception on the possibility of knowledge transfers. Basing on the perception of each member of the KC, the knowledge transfers can be favored on restrained.

As indicated in the literature (Cross, Parker et al. 2001; Marshall and Brady 2001; Ruta and Turati 2002 page 151; Borgatti and Cross 2003; Kondratova and Goldfarb 2003; Lesser and Strock 2004), this favorable perception can be variously obtained.

The awareness and the accessibility give the possibility to transfer knowledge. But to make it effective communication or shared application between source and recipient is required. However this final step could be hampered by a context that restrains the behavior of the individual in terms of communication and shared application between the members of the Knowledge Community.

Internal competitiveness, rivalries, individualistic cultures, physical distances make difficult for an individual to demand the transfer of knowledge to another member. In these contexts, individuals have a personal disposition that limits the contacts among the members and limits the knowledge transfers.

Again, some professional cultures could overestimate the importance of creating new knowledge instead of transferring the existing one, or people do not accept the specialized knowledge coming from elsewhere.

The combination of these barriers with the general properties of knowledge, described at the beginning of the chapter, complete the list of conditions to achieve a **successful knowledge transfer.** The sorted and complete list of barriers is reported in the diagram of the Figure 23.
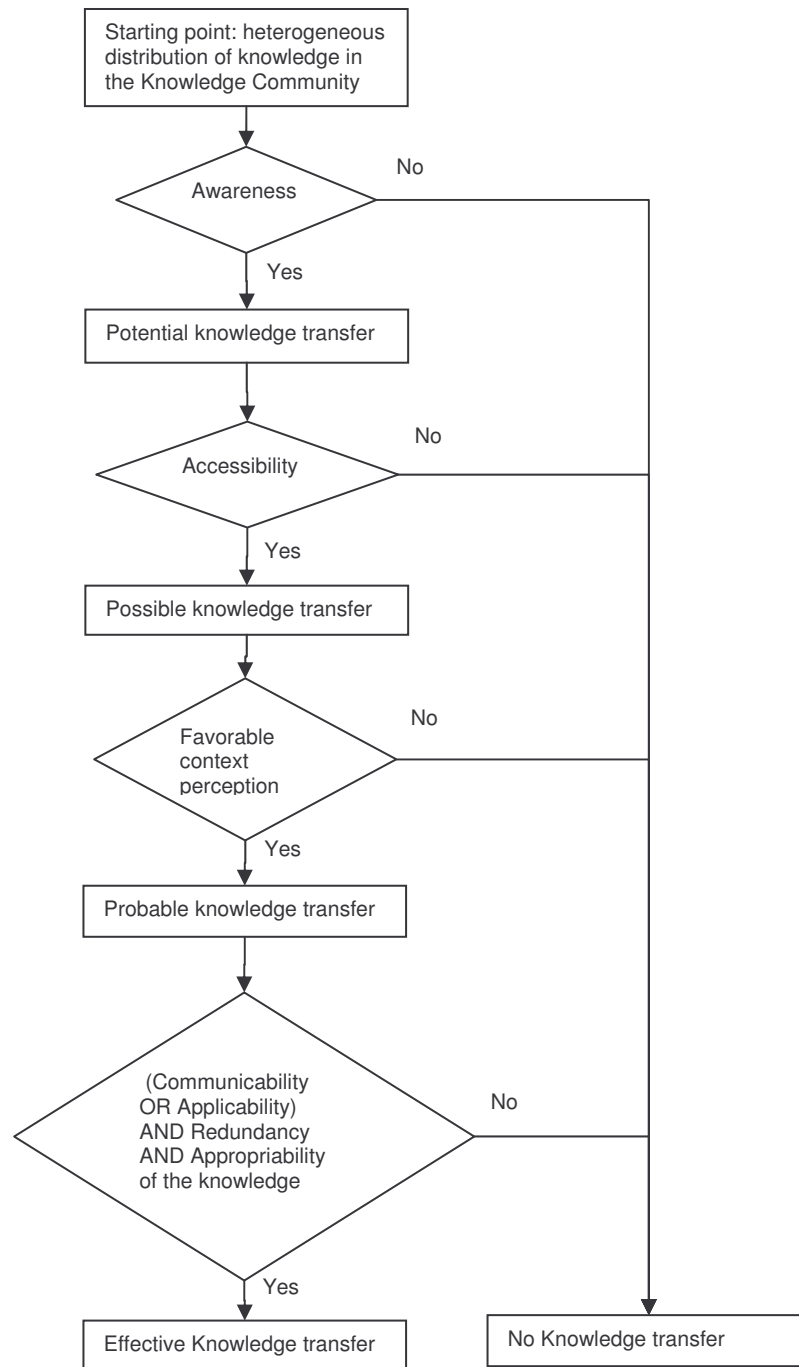
Figure 23 The knowledge transfer conditions (adapted from (Bouty 2000))

Managing Knowledge Communities

The emphasis of the role of practice and the above considerations make clear the strategic relevance of Knowledge Communities in knowledge transfer. Therefore, organizations should be aware of the value of their Knowledge Communities and act consistently (Brown and Duguid 2001).

The management of the Knowledge Community has **to facilitate the integration and transfer of knowledge** between different individuals and between different Knowledge Communities where

and when is beneficial for the organization. But at the same time the management of the Knowledge Community should limit the knowledge transfers that erode the organizational competitive advantage.

The management of the Knowledge Communities is very risky where Knowledge Communities are distributed among different organizations. In these cases, the single organization does not have full control of the levers for regulating the knowledge transfers and integrations among the individuals, who are members of different organizations, but participating in the same Knowledge Community. An organization that has individuals in a Knowledge Community that is not under the organization's control runs the risk of some uncontrolled knowledge transfers, which could reduce its competitive advantage. At the same time, this organization could take advantage of the participation of its members to this Knowledge Community because its members can absorb knowledge transferred by individuals of other organizations (Powell, Koput et al. 1996; Bouty 2000; Nooteboom 2000; Anand, Glick et al. 2002; Lee and Cole 2003).

A complete openness to any knowledge transfer among the individuals members of different organizations or a complete closeness to the knowledge transfers seem too risky. A balance have to be defined by the organizations (Demsetz 1988; March 1991; Sorensen and Stuart 2000). If in stable contexts this balance could be fixed once in time, in more dynamic, uncertain contexts, a constant rethinking of this equilibrium is necessary to keep the pace of external changes.

However, incautious organizational interventions could be source of negative consequences on the Knowledge Communities (Sitkin and Stickel 1996; Brown and Duguid 2001). The extent of the success of these initiatives depends on many aspects: the properties of knowledge to be transferred or integrated, the practice of the different Knowledge Communities, the characteristics of the Knowledge Communities. Nevertheless the success in the management of Knowledge Community, for an appropriate transfer and integration of knowledge, could be fruitful for the organization, in terms of uncovering its knowledge potential.

The organizations can practically intervene in the Knowledge Communities providing some sort of **resources**. These resources can modify the previously described barriers to knowledge transfer and integration making the Knowledge Communities more effective and more respondent to the organizational aims (Butera, Donati et al. 1997 page 155; O'Dell and Grayson 1998a; Cross, Parker et al. 2001; Millen, Fontaine et al. 2002; Wenger, Mc Dermott et al. 2002; Lesser and Strock 2004). Among the possible resources, KMS have been indicated like an effective solution to support knowledge transfer and integration in Knowledge Communities by vast portions of the research

community (Markus 2001; Bieber, Engelbart et al. 2002; Agresti 2003; Pan and Leidner 2003; Taylor 2004; Boughzala and Kaouane 2005).

KMS and other resources should be exploited to the promotion of the knowledge transfers, where there is an evident payoff for the organization, and to the disincentive of the knowledge transfers that corrupt the competitive advantage of the organization.

Each of the three barriers previously mentioned will be newly proposed, in order to highlight the possible interventions to regulate the knowledge transfer and integration.

Managing awareness barriers

First of all, the awareness of the knowledge of the other members of the Knowledge Community can be influenced by the organization facilitating or restraining the **access to the information on the knowledge of the other members**. Various solutions have been already described in the literature (Davenport, De long et al. 1998; Goodman and Darr 1998; O'Dell and Grayson 1998a; Cross, Parker et al. 2001; Bouthillier and Shearer 2002; Cross, Parker et al. 2002; Baumann and Bonner 2004; Denrell, Arvidsson et al. 2004; Lesser and Strock 2004).

The organizations can stimulate meetings and interactions with the others, at first to stimulate recognizability among the individuals. In fact, this recognition is considered a precursor of interaction and cooperation (Axelrod 1984; Turoff, Hiltz et al. 1993; Kondratova and Goldfarb 2003).

Through meetings and interactions, individuals have the possibility to establish ties with the others (Granovetter 1973) and get informed of the knowledge domains of the other individuals. These meetings could be particularly useful in case of newcomers, in order to be aware from the beginning of the knowledge of the other members, and, at the same time, the members of the Knowledge Community could be aware of the knowledge of the newcomers (O'Dell and Grayson 1998a; Cross, Parker et al. 2001; Baumann and Bonner 2004; Lesser and Strock 2004).

Another lever, in the hands of the organization, concerns the internal turnover, the staffing and the team building of the personnel. The assignment of the individuals to new contexts and tasks induces the individual to increase the awareness of the knowledge of the other members of the organizational unit where the individual has been assigned.

While the previous initiatives allow the development of individual awareness, formal internal assessments and audits could be used organization-wide to homogeneously evaluate the distribution of knowledge. An organizational IS could diffuse this information on the knowledge domain of all the members of the organization. This kind of Information System will be largely described in the

following section since it is one major research object of this study and it is referred to with the name of "Expert Recommending Service".

Managing access barriers

Different proposals are indicated to influence the accessibility of the other members of the Knowledge Community (Davenport, De long et al. 1998; Cross, Parker et al. 2001; Marshall and Brady 2001; Bouthillier and Shearer 2002; Cross, Parker et al. 2002; Baumann and Bonner 2004; Lesser and Strock 2004) (Kondratova and Goldfarb 2003).

First of all, communication systems should **grant the accessibility of the individual** with the specialized knowledge.

Secondly, a motivational system may address this issue facilitating the reciprocal engagement of the source of knowledge and recipient of knowledge to transfer knowledge (Butera, Donati et al. 1997 page 138; Deltour, Roussel et al. 2002), where they are useful for the organization. At the same time the motivation system should restrain the inconvenient knowledge transfers. As already described, the recipient of knowledge could directly benefit to the knowledge transfer in solving business problems. On the other hand, the source of knowledge could perceive only the efforts of the knowledge transfer, but, could scarcely benefit of the knowledge transfer. So, the motivational system should pay particular attention to the source of specialized knowledge.

Rewards and recognition should be particularly useful at the beginning of the management of the Knowledge Community in order to support consistent behavior of its members. But these incitements could only remain as long as the benefits of accessing and transferring knowledge among the individuals are not evident for all the Knowledge Community members. Once the benefits for the knowledge transfers overcome the cost, there would not be anymore need of external rewards and recognition (O'Dell and Grayson 1998a).

Moreover, it has been already mentioned that the source of specialized knowledge could be repeatedly questioned for the transfer of the same knowledge. In these cases, some systems could be developed to facilitate the one-to-many transfer of the same specialized knowledge. In this way the knowledge source would be invested of the knowledge transfer only once, but nevertheless the knowledge transfer would be beneficial for multiple knowledge recipients. This solution could save the time and energy of the source of knowledge, which could be deployed for other less recurrent tasks and, in particular, less recurrent knowledge transfers.

The accessibility could be enhanced also giving resources to the members in order to facilitate their reciprocal connections, overcoming possible time, space and hierarchical barriers. About time, Kondratova (Kondratova and Goldfarb 2003) suggests also that the accessibility should be assured

over time, granting the possibility to access the same individuals in differ moments, for motivate cooperation between people, in accordance to Axelrod (Axelrod 1984) principles.

Managing perception barriers

As reported by different authors (Davenport, De long et al. 1998; Bouty 2000; Marshall and Brady 2001; Lesser and Strock 2004; Wasko and Faraj 2005) (Deltour, Roussel et al. 2002; Kondratova and Goldfarb 2003), the Knowledge Community context influences the perception of the members on **the opportunity and possibility to contact the other members** to demand the transfer of knowledge.

The individualist culture, the competitiveness, the internal rivalries hamper the disposition toward the demands for the knowledge transfer. Some measures can be taken into consideration to control these factors. The organization could intervene on the perception of the individuals influencing the culture of the Knowledge Community members, the internal competitiveness and the rivalries among the members.

At first, individuals should be afraid to admit their lacks of knowledge and this behavior limits the possibilities of knowledge transfers. The safety in revealing personal limited knowledge opens the possibility to search knowledge where it could be expected, without being hindered by the hierarchical structure.

Cooperative behaviors incite the transfer of knowledge among individuals while competitive cultures among the Knowledge Community members reduce collaboration and hence knowledge transfers. Therefore the organization should try to influence the existing culture in order to orient the knowledge transfers where they are beneficial for the organization. In this argument, the leadership could have a critical role like example of correct behavior.

Moreover inspiring trust and protecting personal safety and privacy are other ways to support cooperation (Axelrod 1984; Andrews, Preece et al. 2002; Kondratova and Goldfarb 2003; Koeglreiter, Smith et al. 2006).

Collective motivational systems, instead of individual ones, could support a positive attitude of the individuals toward the benefit of the knowledge transfers. Moreover the recognition at the Knowledge Community or organization levels of the individuals partaking in the knowledge transfers, could allow the appreciation of their efforts. This reputation could be positively considered in the formal and informal personnel appraisal (Axelrod 1984; Deltour, Roussel et al. 2002; Kondratova and Goldfarb 2003). Finally, specifically defined policies and guidelines could be addressed to the Knowledge Community members in order to regulate the transfer of knowledge, describing the advantages and advantages, also through exemplar real cases.

In conclusion, this last section showed the role of Knowledge Management, Knowledge Management Systems and Knowledge Communities in reducing the knowledge transfer barriers. The inclusion of these evidences in the Knowledge-based view of the firm process over time allows the expansion of theoretical framework as shown in Figure 24.
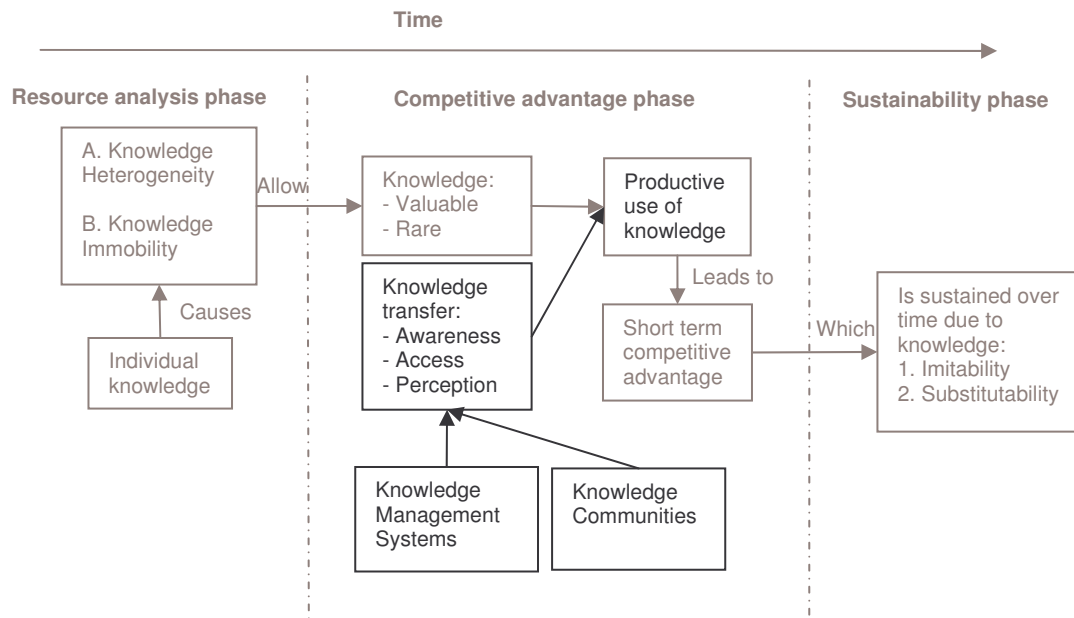
Figure 24 The knowledge transfer in the knowledge-based view of the firm over time. Adapted from (Dewett and Jones 2001; Wade and Hulland 2004)

2.5 Conclusions

The review of the literature on the Knowledge Management and on the Knowledge Communities reveals the importance of the knowledge transfers and the obstacles existing to achieve them. The Knowledge Communities seem playing a crucial role in facilitating the knowledge transfers, but some supplementary support could enhance their potential.

The next part of the literature review highlights the role of the Expert Recommending Services to enhance the effectiveness of the Knowledge Communities in knowledge transfers. In particular the role of the ERS toward the development of the awareness on the distribution of the knowledge among the other members of the organization will be reviewed.

3 Literature review on Expert Recommending Service

This chapter examines the existing literature on the main research object: the Expert Recommending Service.

This part underlines the major achievements on Expert Recommending Service and it hence describes the Information System providing this type of service, taking into account in particular Computer-based solutions.

As already explained in the previous chapter, knowledge awareness means the **acknowledgement of the domains of knowledge of the other members** and the lack of knowledge awareness or the partial knowledge awareness is the first barrier to knowledge transfer.

In order to enhance knowledge awareness Information Systems can play a crucial role.

3.1 Information Systems supporting Knowledge awareness: the Expert Recommending Service

Following the definition of Information Systems accepted in the previous chapter, Information systems are systems that "process information by performing various combinations of six types of operations: capturing, transmitting, storing, retrieving, manipulating and displaying information" (Alter 1999).

Consequently, Information Systems supporting knowledge awareness are **Information Systems that capture, transmit, store, retrieve, manipulate and display information on the knowledge domains of the individuals**. This support of knowledge awareness is achieved through the counseling of the individuals who could likely have the specialized knowledge, required by the potential recipient. This support can also be realized through the counseling of the individuals who could likely require the specialized knowledge, available by the source of knowledge.

Starting point of the information processing is the capturing of information on individuals concerning their knowledge domains. Several kind of information on the individuals can be sources of the knowledge domains, and some of them explored in the preliminary study, such as: their competences, their project participations, their task attributions, their responsibilities, their training programs, their education. The process ends with the display of the information on the knowledge domains of the individuals and the counseling of the individuals who could likely have specialized knowledge, or the counseling of the individual who could likely require specialized knowledge.

All the four major types of Information Systems proposed by Martinez (Martinez 2004 page 116), informal, formal, paper-based, and computer-based, can support knowledge awareness, as indicated by various authors (Davenport, De long et al. 1998; Goodman and Darr 1998; O'Dell and Grayson 1998a; Cross, Parker et al. 2001; Bouthillier and Shearer 2002; Cross, Parker et al. 2002; Razmerita, Angehrn et al. 2003; Baumann and Bonner 2004; Denrell, Arvidsson et al. 2004; Lesser and Strock 2004).

This Information System, supporting knowledge awareness, could be provided informally by single Knowledge Community members. Meetings and interactions with the other individuals expose to the possibility to get informed on the knowledge domains of the other members and to become aware of the specialized knowledge of the other individuals.

Informally, individuals use the personal information social networks (Borgatti and Cross 2003; McDonald 2003) and the weak ties (Granovetter 1973; Granovetter 1983; Lipparini 2002 page 74)

to develop their knowledge awareness, performing what Kanfer (Kanfer, Sweet et al. 1997) names "social navigation", because the retrieval is done by navigating through people and inanimate props, such as address book (Kanfer, Sweet et al. 1997; Crowder, Hughes et al. 2003; Martinez 2004 page 234).

This social navigation is based on what Wegner describes as "transactive memory system": a set of individual memory systems and the communication that takes place between those individuals (Wegner 1986). The transactive memory system among a group of people allows the individuals to be aware of who knows what, and who within the group is responsible for storing which types of information (Kanfer, Sweet et al. 1997).

As mentioned in the pervious chapter about the managing of the awareness barrier, a formal Information System could be provided to the Knowledge Community members. Some individuals within or outside the Knowledge Community could be entitled to provide information, on the knowledge domains of the members, to the other members. The organization, where the Knowledge Community is located, could offer a formal Information System that facilitates or restrains the access to the information on the knowledge domains of the other members. Internal assessment and audit could be formally proposed to evaluate the distribution of the knowledge in the organization like the basis for a correct awareness of the knowledge domains of the others. This information on the knowledge domains could be stored in a repository to which the access by the Knowledge Community members is regulated by the organization.

Finally, this Information System could exploit computers for the accomplishment of some of the operations of capturing, transmitting, storing, retrieving, manipulating and displaying information on the knowledge domains of the individuals (Davenport and Prusak 1998; Becerra-Fernandez 2000; Becerra-Fernandez and Sabherwal 2001; Alessandroni 2003; Mentzas, Apostolou et al. 2003 page 6; Razmerita, Angehrn et al. 2003; Yimam-Seid and Kobsa 2003; Liu and Dew 2004; Maier 2004).

Definition of IS supporting knowledge awareness

Independently from the type of Information System, this support of the knowledge awareness aims at providing information on the knowledge domains of the individuals. In order to avoid information overflow, the Information System supporting knowledge awareness should **provide information only on a precisely selected subset of all the individuals**.

This subset should include the individuals who have knowledge domains that could respond to the needs of the potential recipient, if the request comes from an individual in search of specialized knowledge. From the point of view of the individual in search of knowledge, these sources of knowledge represent the experts.

Otherwise the subset should include the individuals who could require knowledge that is in the availability of the individual accessing this Information System. This second solution describes an Information System that counsels to the sources of knowledge those individuals who could likely require their knowledge. From the point of view of the individuals, who are sources of knowledge, the others can be considered novices.

In general, Information Systems that propose, among all the stored entities, the subset that should most likely satisfy the users' requests are classifiable under the label of Recommender Information Systems. Actually, the term "recommend" is largely used in the literature for this kind of Information Systems (Resnick and Varian 1997 ; Linton and Schaefer 2000; McDonald 2000; McDonald and Ackerman 2000; Yimam-Seid and Kobsa 2000b; Yimam-Seid and Kobsa 2000a; McDonald 2001; Yukawa and Kasahara 2001; Linden, Smith et al. 2003; McDonald 2003; Plu, Agosto et al. 2004; Adomavicius and Tuzhilin 2005; Vignollet, Plu et al. 2005).

The recommendation could concern different entities such as: books, restaurants, routes. In case the recommendations are about individuals, who could likely have the required knowledge, the Recommender Information Systems are mainly declined as Expertise Recommendation (McDonald 2000; McDonald 2001), Expertise Recommender (McDonald and Ackerman 2000; Yimam-Seid and Kobsa 2000b), Recommending Collaboration (McDonald 2003), Contact Recommender (Plu, Agosto et al. 2004; Vignollet, Plu et al. 2005), Expert Recommender (Yimam-Seid and Kobsa 2000a), Expert Recommendation (Yukawa and Kasahara 2001). Nevertheless, other terms have been used: expertise locator, yellow or blue pages, skill management system, people-finder system (Hattori, Ohguro et al. 1999; Maier, Hadrich et al. 2005 page 43; Zhu, Eisenstadt et al. 2005).

In the following, "Expert Recommending" will be used to aggregate all these Information Systems that counsel, to the potential recipient, those individuals who could likely have the specialized knowledge that the potential recipient requires.

The choice of the term "Expert" comes from the conceptual closeness with the individual who could likely have the specialized knowledge that the potential recipient requires. Moreover following the definition of McDonald (McDonald and Ackerman 1998) an expert is an individual who has different levels of expertise about different knowledge domains. In this way the use of the term "Expert" explicitly states the reference to individuals, and supposes that the Expert has a certain degree of knowledge on the knowledge domain, in which the potential recipient is interested.

As already pointed out in the introduction of the research, this study prefers to explicitly refer to the service nature, instead of the product nature, of the Expert Recommender. As described by Allison

and Jonquet (Allison, Cerri et al. 2005; Jonquet and Cerri 2005) and Markus (Markus 2001), the potential recipient, seeking specialized knowledge, does not necessarily express, maybe is not even able to express, in advance, what specialized knowledge is required. Thus the potential recipient does not know exactly what the expert would transfer to satisfy the knowledge needs of the potential recipient. Therefore the term "service" appears more appropriate than "product" to describe this condition of only partial expression of the required knowledge, and its completion only as result of the interactions.

Recalling what already written, the Expert Recommending Service (ERS) is the Information System service of counseling to the potential recipient those individuals who could likely have the specialized knowledge that the potential recipient requires.

Architecture

The Expert Recommending Service is an Information System that evidently concerns the management of knowledge. It does not directly manage knowledge but it processes information on the knowledge domains of the individuals. This relationship with Knowledge Management and our perspective on the possible management of knowledge induce to consider the existence of the Expert Recommending Service in the context of Knowledge Communities. Within Knowledge Communities, Expert Recommending Service could link sources and potential recipients of knowledge and the common knowledge existing among the members would be the communality that would allow the knowledge transfer among sources and recipients.

Within the context of the Knowledge Community the Expert Recommending Service involves a series of **agents** and a set of major **interactions,** which are described in the following paragraphs.

Agents involved in the ERS

This study identifies **4 main types of agents**, interacting in the provision of the ERS (Figure 25):

1. ERS provider. Following the classification of Martinez (Martinez 2004 page 116), the service can be provided formally by a computer-based application, formally by a defined set of individuals who manually operates, or informally by the members of the Knowledge Community by them-selves.

2. ERS user. The potential recipients are single individuals who are in search of specialized knowledge and use the ERS to find it.

3. Individual managing the ERS. In case the ERS takes the form of a formal Information System, this study assumes the existence of a responsible of the ERS, someone who is in charge of its functioning. This responsibility could be taken in charge by the members of the Knowledge Community, the formally defined set of individuals who provides the ERS to

the Knowledge Community members, or the individuals in charge of the functioning of the computer-based application providing the ERS.

4. Individual providing information to the ERS. The Expert Recommending Service can be provided if the ERS provider is aware of the knowledge domains of the Knowledge Community members, hence the provider should get the information on the knowledge domains of the individuals. The agents who, somehow, provide this information to the ERS provider can be named ERS contributors. Individuals, software applications, organizational unit are examples of agents, who could contribute to the provision of the ERS through the supply of information concerning the knowledge domains of the Knowledge Community members.
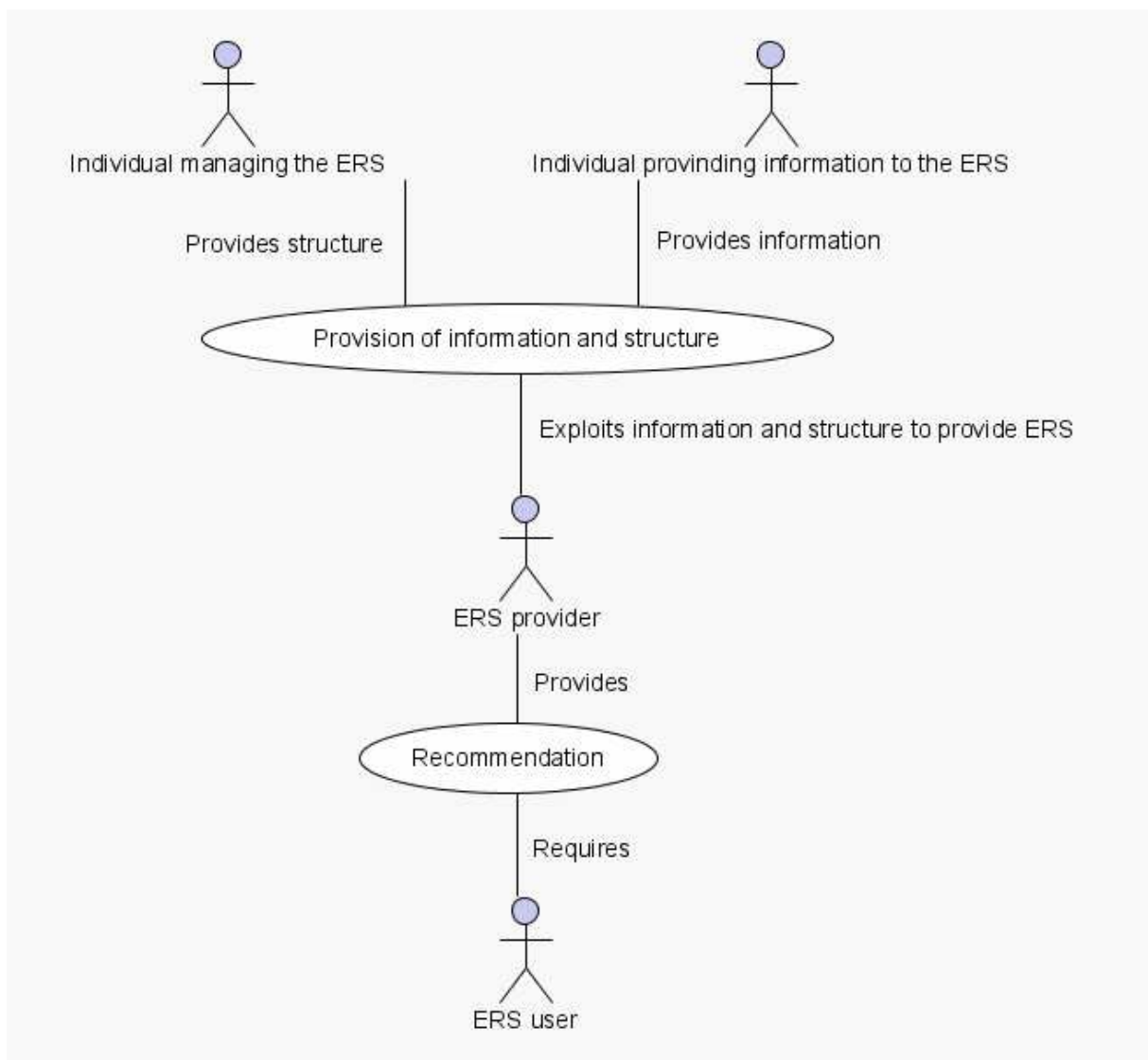

Figure 25 The agents involved in the ERS (UML use case diagram)

The interactions among the agents

These 4 types of agents interact in **three main ways**:

1. The recommendation: the ERS user requires to the ERS provider a recommendation, passing some parameters, such as the knowledge domain of interest. The ERS provider delivers as consequence, a list of the possible experts.

2. The provision of information: the ERS contributor provides information on the knowledge domains of the Knowledge Community members.

3. The provision of structure: the ERS responsible has to design and maintain the structure of the ERS and to control how it operates.

Computer-based Expert Recommending Services

The origin of the computer-based Expert Recommending Services could be traced back to the Expert Support Systems proposed by Liberatore and Stylianou (Liberatore and Stylianou 1995). After that research, several universities and enterprises have started the development of computer-based Expert Recommending Services. This review of the most important academic IS literature, follows the ones of Sim (Sim and Crowder 2004) and Liu (Liu 2003) and provides the description of some computer-based ERS. These ERS, developed in academic contexts, are complemented by two of the most relevant commercial computer-based ERS, developed in commercial enterprises. The ten reviewed computer-based ERS are described in the following, in the attempt to provide examples of **empirical solutions** of computer-based ERS (Table 4).

NAME	INSTITUTION	SOURCE	SIMILAR SYSTEMS
Expert Finder	University of Southampton (UK)	(Crowder, Hughes et al. 2003)	Expertise Matcher (Liu 2003)
Community of Science	Community of Science, Inc (USA)	http://expertise.cos.com	
Answer Garden 2	University of California (USA)	(Ackerman and McDonald 2000)	Grassroots (Kamiya, Roscheisen et al. 1996) ; Community Memory (Chaplin 1994) ; Spider (Boland, Tenkasi et al. 1994) ; Designer Assistant (Terveen, Selfridge et al. 1995) ; BSCW (Bentley, Horstmann et al. 1995) ; AskMe (http://www.askmecorp.com); Expertise Exchange Management System (http://www.participate.com)
Memoire	University of Southampton (UK) et	(Pikrakis, Bitsikas et al. 1998)	Yenta (Foner 1996) ; Expertise Browser (Cohen, Maglio et al. 1998)

	University of Athens (Greece)		
Know-who	University of Illinois (USA)	(Kanfer, Sweet et al. 1997)	Expertise Locator (Kauntz, Selman et al. 1996) ; Expert Finder (Mattox, Maybury et al. 1999)
Referral Web	AT&T Labs (USA)	(Kauntz, Selman et al. 1997)	Expertise Recommender system (McDonald and Ackerman 2000)
Expert Recommendation	NTT Corporation (Japan)	(Yukawa and Kasahara 2001)	Expert Finder (Vivacqua and Lieberman 2000) ; Agentware Knowledge Server (from Autonomy http://www.autonomy.com)(Lindgren 2002); Competence Knowledge Base system (Liao, Hinkelmann et al. 1999)
Ontologging	Insead (France)	(CALT_INSEAD 2004)	
Discovery Server	IBM (USA)	(IBM 2002)	Entopia Expertise Location (http://www.entopia.com); K2 Enterprise (http://www.verity.com)
Agilience	Agilience Inc. (USA)	http://www.agilience.com	

Table 4 Computer-based ERS

Expertise Finder

Expertise Finder has several autonomous agents and an ontology in order to identify the knowledge domains of the individuals. The ontology describes the knowledge domains and the relationship among the different ones. The agents are specialized in three different tasks. Some of them collect information from different database within the organization. Others receive this information and process it in order to make it compatible with the knowledge domain ontology. The last group of agents appropriately structures and publishes the information on the knowledge domains of the individuals. A prototype was developed for the recommendation of experts within the "Department of Electronics and Computer Science" and therefore the agents, the ontology and the database was set up to satisfy the specific requirement of this context. Hence, the main source of data was the database of the scientific publications and the results of the retrieval were the lists of the authors of the articles, in order of relevance for the researched keyword.

Community of Science

Community of Science is composed of a database and a web application that accesses this database. The web application includes two online forms. The first one has different fields the users have to fill with the description of their knowledge domains. This information is stored in the database and it is retrieved using the second online form, which allows querying the database. In fact, the form is structured in order to specify the different parameters of the retrieval, using keywords. At the end, the list of the individuals who have the research knowledge is published.

This system was created to be used on the Internet, inviting all the members of the research community to fill the first form with their data and to use the system to find the colleagues with required knowledge. Complementary to the provision of data by the user, a group of editors has been defined in order to improve the quality of stored data. They have been in charge of the addition of some missing data and the homogenization of the terms used to describe the knowledge domains by the individuals, through the support of a thesaurus.

Answer Garden 2

Answer Garden 2 has a database, storing a list of questions with their corresponding answers, and some complementary tools: Café ConstructionKit and Collaborative Refinery. In the database, the questions are classified, using Collaborative Refinery in a taxonomy, which organizes questions in branches, from the most general questions to the most specific ones.

The seeker of knowledge starts the research from the root of the taxonomy and moves among the branches in order to find the question with the desired level of specialization on the knowledge domain of interest. Once the right question has been identified, the system proposes the related answer, which should satisfy the request of the knowledge seeker.

Whether the seeker does not find a satisfying answer, there is the possibility to write a new question and send this question to the members of the organization. The sending of the question is managed by the Café ConstructionKit in order to deliver it firstly to the members who seem more likely in the position to answer the question. In case of no or negative answer the sending of the message is progressively extended to all the other members basing on the likelihood of their ability to answer at the question. Finally, the new answer will be included in the database in the branch where the seeker expected that answer. Nevertheless, the answerer can simply indicate the place, among the branches of the taxonomy, where an existing appropriate answer exists.

Memoir

Memoir is mainly based on a set of autonomous agents and on a database. The identification of the experts is based on the content of the browsed web pages: the individuals are considered experts in

the themes contained in the web pages that each individual has visited. The database stores information on the websites, the content of these websites and the individuals who have visited these web pages.

The agents query the database to find the individuals who have visited the pages containing the terms searched by the users. The agents are coordinated by a server, which defines the rules of the agents. Moreover, the server passes the requests, of the users to find the experts, to the agents. Finally an interface manager governs the interactions between the users and the server.

Know-who

Know-who works mainly through autonomous agents that process the content of the email messages in order to identify the knowledge domains of the individuals. The users ask questions to the system in their natural language and the system interprets the question and proposes an ordered list of individuals who could answer the question. This list is based on the proximity of the content of the exchanged email messages with the asked question and this list contains the contact details to establish a communication with the proposed experts. The order of the list is determined by the degree of confidence in the appropriateness of the individual to answer the question, obtained by the analysis of the content of the email messages with the support of a thesaurus.

Based on the frequencies of appearance of the terms, the system develops for each individual a space vector describing all the content of all the email messages exchanged by the individual. When the system received a question it creates a space vector of this question and compares this space vector to all the space vectors of the individuals. At first, the system proposes the individuals, with a space vector close to the space vector of the question, who have already directly exchanged any email message with the asker of the question. In case there are not individuals with a close space vector, who are in direct contact with the asker, the system proposes the individuals who exchange emails with the individuals with who the asker is in direct contact. This progressive enlargement goes on till some individuals are likely able to answer the question, since they have a space vector close to the one of the question.

Referral Web

Referral Web proposes the experts based on the analysis of the content of the public documents that contain the name of the individuals. This analysis of the content of the public documents determines the knowledge domains of the individuals mentioned in these documents. Moreover, if the analysis of the document reveals the presence of the name of another individual, the system assumes the existence of a relationship between the two.

These relationships between the individuals determined by the co-occurrence of the two names in the same document create the so-called electronic social network. This network is created by all the individuals of the organization and by the links between pairs of individuals that exist when there is the co-occurrence of the names in the same document. All the individuals and all the links form the electronic social network and everyone is in relationship to any other individual directly, or indirectly, passing through the colleagues that have links with the other individuals. The user in search of an expert can circumscribe the search of experts by defining the number of links can be explored to reach the potential expert.

Expert Recommendation

Expert Recommendation is composed of three main elements. There is a document repository that stores all the documents, whose authors are members of the organization. This repository stores also the descriptions of the knowledge domains, approached in these documents, the description of the knowledge domains of the authors, and the description of the knowledge domains of the organizational units, where the authors are located.

The analysis of the knowledge domains is performed by an information extractor that processes the documents, identifies the authors, and comprehends the concepts expressed in the documents. A dictionary-based concept base allows the positioning of the concepts in a predefined formal structure of concepts including the relationships among concepts and the substitutions among concepts and terms. Once the identification of the concepts, in a document, is completed, these concepts are referred to its authors, in order to obtain the knowledge domains of the authors. Subsequently the same concepts are used to identify the knowledge domains of the organizational unit of the authors.

The knowledge domains are represented by a space vector and also the research of an expert is converted into a space vector in order to compare it with the space vectors of the authors. The result is a list of authors, documents and organizational units that have a space vector close to the one of the research request.

Ontologging

Ontologging monitors, through a dedicated component, the user behavior in order to establish the sharing activities and attitudes of the users, specifically in terms of knowledge sharing and knowledge creation behaviors.

Such knowledge sharing and knowledge creation is evaluated according to the quantity of information that is shared and created using the system. Based on the degree of this information

sharing and information creation, users are classified in different categories that describe the attitude of the user in relation to the knowledge creation and the knowledge sharing. This classification is performed using heuristics, Near-terminology and Roger theory and using the activities, performed by the users, and their frequencies, like input data.

This general classification of the users for their behaviors concerning knowledge sharing and knowledge creation is completed by a manual description of the knowledge domains of the users. This description is realized following the rules of a knowledge ontology that describes the possible types of knowledge domains and the relationships between these domains. The combination of the description of the knowledge domains and of the users' behavior allows an estimation of the likelihood an expert, in a domain, will transfer his specialized knowledge to the knowledge seeker.

Discovery Server

Discovery Server is made of six main components. A set of databases stores all the information on the individuals and, specifically, the description of their knowledge domains. The information on the knowledge domains is collected by some Spiders that browse the databases in search of data useful for defining the knowledge domains of the individuals. The collected information is processed by the so-called Worker, a specialized tool that realizes the complete description of the knowledge domains of each individual.

The tasks of the Worker and of the Spiders are managed by a Scheduler, which distributes the different tasks to the different Spiders and orders the information to process by the Worker. The information collected by the Spiders and the information processed by the Worker are temporary stored in a queue database. Finally, the description of the knowledge domains of the individuals is memorized in a knowledge-map database. The individual is informed of the storage and has the owner right to modify, to cancel and to protect the personal and confidential information.

The determination of the knowledge domains of the individuals is based on the documents edited by the individuals, on external information provided by other databases, such as the database of the personnel, and on the manual provision of information by the users.

Agilience

Agilience determines the knowledge domains of the individuals in two major ways. It processes the content of the documents and of the email messages, through the support of a thesaurus, and it collects, directly from the users, information concerning their knowledge domains. The user, in search of an expert, has to write an email to a hypothetical expert and send it to the system. The system processes the email content and creates the list of possible experts for that question.

Complementary, the system proposes a list of users who could know an expert on the question and a list of documents that could contain information on the same knowledge domain of the question. At the reception of these lists, the user can resend the same email to the individuals proposed like experts or to the users, who could like know a suitable expert, asking them to forward the email to the right expert.

# 3.2 The key operations of Expert Recommending Service

In this section, the Information System providing the Expert Recommending Service is described in its main operations. The ERS can be theoretically decomposed in its key operations, in accordance with the possible operations of the Information Systems proposed by Alter (Alter 1999): **capturing, manipulating, retrieving and displaying** (Liu 2003; Yimam-Seid and Kobsa 2003; Maier, Hadrich et al. 2005). Each key operation is separately described, even if in reality these operations are intrinsically interconnected and intertwined.

In the previous chapter, the knowledge-based view of the firm allowed the assessment of the role of Knowledge Management Systems and Knowledge Community in influencing the knowledge transfer barriers (Figure 27).

The variables of the knowledge transfer
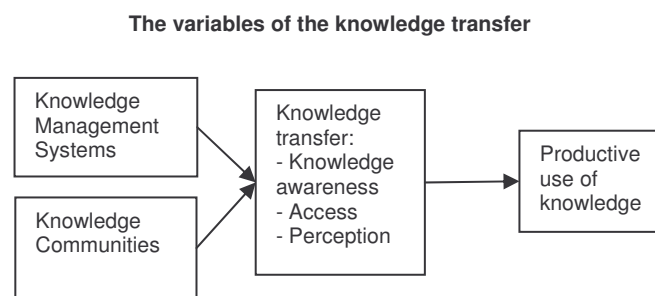
Figure 26 The Knowledge Management Systems and Knowledge Community influences on the knowledge transfer barriers, based on the knowledge-based view of the firm process

The progressive focus on the Expert Recommending Services and on their influence on Knowledge awareness induce to explicitly represent the ERS in the knowledge-based view process and to separate Knowledge awareness from the other barriers (Figure 27).
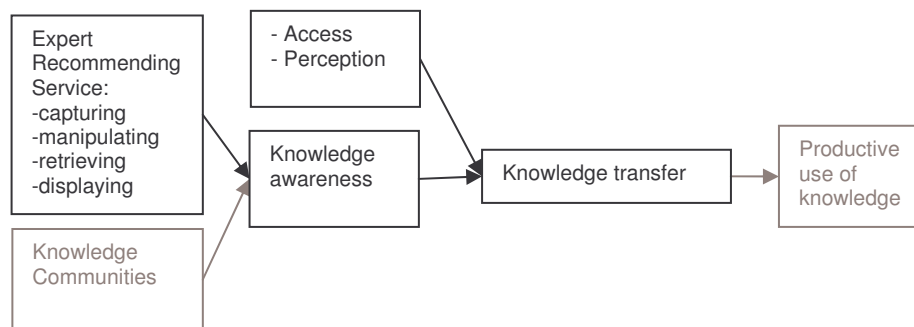
Figure 27 The ERS influence on the knowledge awareness, based on the knowledge-based view of the firm process

Capturing

The capturing involves the decision of what actions and utterances, among all the field of possible events, exhibit the knowledge of the individuals and the capture of the **tangible results or evidences** of these actions and utterances. These tangible results or evidences are called knowledge indications (Liu and Dew 2004), while the sources of these knowledge indications, i.e. the actions and utterances, are referred as knowledge indicators.

The following are examples of diverse possible knowledge indicators, proposed by Liu (Liu 2003):

- Answers to other questions. People ask questions face-to-face, in discussion forums, in newsgroups, in bulletin boards. When a person always answers questions on a particular topic, he/she is very likely to be an expert in that field. The quality of the answers, rated by the questioners, can be seen like an indication of the knowledge level.

- Email. By tailoring email contents it is possible to get vocabulary-based hints on the person's subjects of interest and knowledge level.

- Browsing behavior. The behavior on the web seems to respects the knowledge domains of the individuals. If one has knowledge in a particular area, this individual may spend more time on searching and reading related documents on the web. So, by tracking users' behavior, especially their preferences on the web, it is possible to deduce their knowledge.

- Membership. Association memberships can cover the areas of interest, although the areas of interest do not perfectly overlap the knowledge domains.

- Reputation and position. Reputation and position are important knowledge indicators because in Knowledge Communities, high reputation or position should be supported by high level of knowledge.

- Publications. Publications are good indications of a person's knowledge.

- Projects. People usually acquire valuable knowledge through undertaking projects.

- Recommendations. When a person recommends documents or people to the Knowledge Community, the quality of the documents can be evaluated by other users. The main assumption that relates quality of recommendations to the quality of knowledge is that experts can find more quality information than ordinary people. So, if a person always recommends high quality documents and people on a knowledge domain, this person must be very familiar with this knowledge domain. Finally this person should have knowledge on that knowledge domain.

These knowledge indicators should be monitored in order to observe the indications coming from the utterances and actions by the individuals. Any type of Information System allows capturing this data. Nevertheless the use of computer-based Information Systems could enhance the capturing efficiency, since some actions and utterances are already accomplished and stated using computers. These devises could be directly employed to capture the indications. These collected pieces of data are, therefore, exploitable in order to obtain information on the knowledge of the individual.

On the other hand, some actions and utterances are difficult to automatically record through computer-based Information Systems, such as a talk among colleagues at a coffee break.

Generally speaking, multiple indications should lead to a better description of the knowledge domains of the individuals (Liu 2003). Nevertheless, an Information System that records all the actions and utterances of all the individuals does not seem conceivable and economical. Only the actions and the utterances clearly connected to a valuable knowledge should be taken into consideration. Hence, many actions and utterances, even if potentially recordable, are not valuable of recording.

On the contrary, some actions and utterances are not automatically recordable, but they have great importance in giving indications of the knowledge of the individuals. In these circumstances, the ad-hoc expression by individuals of some indications of their knowledge could be critical for describing their electronically-hidden knowledge domains. Each individual could act directly to inform the Information System about the personal knowledge domains. A sort of form could exist in order to facilitate the direct indication by the individuals of their knowledge domains. In this form, each individual could express, using sentences or keywords, the knowledge consciously had. Moreover, it could be that even some other users of the Information System could add, under control, indications about other individuals.

All these ad-hoc expressions would integrate the indications directly recorded, in order to have the most complete and precise description of the knowledge domains of each individual.

Summarizing, the indications could be captured (Balmisse 2003; CALT_INSEAD 2004):

- Implicitly, when a system unobtrusively collects indications on the knowledge domains.
- Explicitly, when the individuals intentionally give indications on the knowledge domains.
- Complementary, when the indications are partially collected by the system and partially given by the individuals.

From a technological point of view, the database plays the central role in the storage of all the data concerning the knowledge indications of all the individuals. The implicit capture allows feeding automatically the database. A Tracker is a possible tool to collect the indications, dialoguing with the applications used by the individuals, from which the indications come. The explicit capture requires the intervention of the individuals. These individuals could be asked to feed an electronic form connected to the database, where they will input sentences and keywords describing their individual knowledge domains.

From a financial point of view, the value of automatically capturing these indications has to be balanced with the costs of the database connection, through the Tracker, to the other applications. Particularly valuable could be the connection with a human resource management Information System due to the quantity of knowledge indications that could contain for each individual.

Manipulating

Manipulating involves the **elaboration of the collected indications** in order to obtain an overall profile of the knowledge domains of each individual. The modeling methodology (Zuckerman and Albrecht 2001) is a particularly qualified elaboration process, because it infers relevant but unobservable information, such as the individual knowledge domains, from available rough data, such as indications coming from actions and utterances, implicitly or explicitly captured.

Through the definition of a set of rules of conversion and a set of properties to be valued for each individual, indications are transformed into a profile, as such a set of values for the corresponding set of properties, which takes the name of knowledge model of the individual. However the potential heterogeneity of the knowledge indications could cause many difficulties to manipulating operations (Liu 2003).

The resulting model (CALT_INSEAD 2003) is an explicit representation of some properties of the individual and, in the context of Knowledge Management, of the individual's knowledge domains. Eventually, this knowledge model could be modifiable directly by the individuals, in order to correct some inappropriate manipulations.

These final descriptions of the individuals, in term of their knowledge domains, are stored to be subsequently retrieved by the users in search of an expert.

There are principally two kinds of rules for manipulating indications that influence the retrieval operations (Liu 2003):

- Keyword-based rules: Knowledge domains are represented by a set of keywords.
- Concept-based rules: Knowledge domains are mapped to a set of predefined concepts, such as the concepts in a domain ontology.

The definition of the rules to be applied and the properties to be valued are typically a human activity, hardly passed by to a computer-based Information System. But computer-based Information Systems, in the form of IS design tools, can strongly support the creation of the rules and the properties. The part that the computer-based Information Systems can improve, is the application of the defined rules in order to assign the values to the defined properties. The software engines are the class of computer-based Information Systems that could answers to this need of applying rules to available data in order to obtain information not otherwise collectable.

Finally, the storage of the profiles of the individuals' knowledge domains could be done in a database. The software engine would supply the results of its manipulations to the database that would gather the profile of each individual.

Retrieving

Retrieving involves the **identification of the individuals** with a knowledge model consistent to the criterion established by the searching individual. This identification is obtainable examining the list of the knowledge models, and looking for individuals with the researched knowledge domain in the individual profile.

The researchable knowledge domains depend on the properties taken into consideration in the model and the identification of individuals depends on the values that each individual has on the properties of the individual knowledge model. During retrieval, the knowledge models including the researched knowledge domains are retained, while the knowledge models without the researched knowledge domain are overlooked. Therefore the retrieval succeeds when there is a positive matching between the researched knowledge domain and the knowledge domain attributed, at least to one individual.

Moreover a refinement of the retrieved individual could be performed in order to propose the ones who are in the best positions to answer the searcher, because they are geographically nearby, are not work overloaded, or have close knowledge domains (Balmisse 2003; Crowder, Hughes et al. 2003). Definitively, the retrieving should take account of also the characteristics of the searcher making the query (Crowder, Hughes et al. 2003) in order to propose the most suitable list of experts.

Computer-based Information Systems could largely enhance this operation through the query tools, which would go quickly through all the knowledge models and retrieve only the matching ones. In search for a specific knowledge, an individual could query the database of the knowledge models of the individuals, by defining the criterion for filtering the individuals. Individuals, with the specified knowledge domain, are selected, while the individuals, without the specified knowledge domains, are excluded in the result of the query.

The retrieving operation is mainly realized following three reference models:

1. boolean model,
2. vector space model,
3. probabilistic model.

Boolean model

The Boolean model ,as proposed by Liu (Liu 2003), is based on the set theory and the Boolean algebra. The Boolean model represents knowledge models by a set of index terms, representing the knowledge domains. The value of an index term is "1" if this term appears in a knowledge models, otherwise, the value is "0".

The queries are also expressed as Boolean expressions, which are composed of index terms linked by the standard logical operators: AND, OR, and NOT. A knowledge model is considered as relevant if it satisfies the query expression. The major drawback of the Boolean model, expressed by Liu (Liu 2003), is that a knowledge model is predicted to be either relevant or non-relevant without any notion of partial matches. The exact matching may lead to the retrieval of too few or too many knowledge models, without limited sorting possibilities. For its characteristics, the Boolean model is more suitable for data retrieval, rather than information retrieval. In fact, there are serious difficulties in translating the information need of the user into a Boolean expression, compatible with the retrieval model.

Vector space model

The vector space model, described by Salton and Liu (Salton, Wong et al. 1975; Liu 2003), overcomes some limits of the Boolean model. In particular the vector space model realizes also partial matches, through the association of weights to each index term appearing in the query and in each knowledge model. As reported by Salton and Buckley (Salton and Buckley 1988), various methods for weighting index terms have been developed. Its partial matching strategy allows retrieval of knowledge models that approximate the query conditions.

Knowledge models are represented as n-dimensional vectors, where n is the total number of index terms. Users' query can be similarly mapped into the vector space. The similarity between a knowledge model and a query can be quantified by the cosine of the angle between these two vectors. Its cosine ranking formula sorts the knowledge models according to their degree of similarity to the query that leads to more precise results than that of the Boolean model.

Probabilistic model

The probabilistic model, proposed by Robertson and Liu (Robertson 1977; Liu 2003), assumes that there is, for the given query, an ideal answer that contains exactly the relevant knowledge model. The querying process is, therefore, considered as the process of specifying the properties of the ideal answer. Index terms are used to characterize these properties. The probabilistic model attempts to predict the probability that a given knowledge model will be relevant to a given query according to the terms included in the knowledge model, and the probability that these terms are included in the knowledge model representing the ideal answer.

The probabilistic model improves the Boolean model in that knowledge models can be ranked in decreasing order of their probability of being relevant. However, it usually needs user assistance in the initial separation of knowledge model into relevant and non-relevant sets.

Displaying

Displaying involves **the presentation of any information** eventually useful to support the assessment of the retrieved knowledge models and the contact information of the individuals whom the retrieved knowledge models refer (Crowder, Hughes et al. 2003; Liu 2003).

Firstly, the indications used as input to the knowledge model, eventually in aggregated forms, could be useful to assess the quality of the knowledge of the individuals. Secondly, the information related to the media to contact the individuals with the researched knowledge, must be presented, like: name, surname, email address, telephone number, office location. Thirdly, other supplementary information concerning the individuals with the required knowledge could interest the knowledge seeker in order to acknowledge these individuals. This supplementary information could assume very heterogeneous forms, depending on the type of Knowledge Community and organization, such as: the curriculum vitae, the list of the personal interests, the references of the colleagues, the descriptions of the last job position. Finally, any other potentially useful information linked to the researched knowledge could be displayed, as alternative sources of knowledge, such as documents.

In addition, the individuals in the list could be ranked in order to make explicit the ones who are more likely able to satisfy the request of the searcher (Liu 2003).

An electronic portal could be a suitable computer-based IS that could enhance the display of these four types of information: the knowledge indications, the contact information, the supplementary information concerning the individuals, and the information related to the researched knowledge. Operatively, this portal could also contain the interfaces to the other computer-based IS mentioned so far, such as the form for explicitly collecting the indications, the retrieval form for querying the database, and the interface to define the rules and the properties for manipulating indications.

Summary of the operations

To summarize, these previous paragraphs have presented and analytically described each single key operation of the Expert Recommending Service, indicating also the support that computer-based IS can offer. As described in Table 5, specific computer-based IS could support the four key operations of the Expert Recommending Service and clearly enable precise activities.

OPERATIONS	CAPTURING	MANIPULATING	RETRIEVING	DISPLAYING
Main supporting computer-based IS	Tracker Editor Database	Software engine Database	Query tool	Electronic portal
Computer-based IS enables	Collection and storage of indications	Processing of indications and storage of models	Identification of experts	Single access point to expert's information

Table 5 Expert Recommending Service and the potential role of IT

The ten ERS reviewed from the literature are also described in relation to the four key operations of the Expert Recommending Services, showing how the same operation can be heterogeneously implemented.

NAME	CAPTURING	MANIPULATING	RETRIEVING	DISPLAYING
Expert Finder	Implicitly from the database of the publications	Based on the occurrence in the publications of the terms described in the ontology	Term-based	Sorted list of publications and authors
Community of Science	Explicitly from the indications provided by the users	Based on the occurrence of the indications of the users and on the descriptions provided by the editors of the system	Term-based	Sorted list of users
Answer Garden 2	Implicitly from the previous answers and the geographical localization of	Based on the occurrence of the terms in the answers and the geographical localization	Based on a taxonomy of questions and answers and term-based	List of the individuals with the closest knowledge, in case the answer is

				insufficient,
Memoire	Implicitly from the web navigation and the content of the visited web pages.	Based on the occurrence of the terms in the web pages and similarity of web navigation	Based on the URL of the web navigation and term-based	List of URLS and web users
Know-who	Implicitly from the content of the emails	Based on the occurrence of the terms in the email messages	Based on the occurrence of the terms in the questions	List of the correspondents who have written email with content close to the content of the asked question
Referral Web	Implicitly from the public documents available on the web	Based on the occurrence of the terms in the documents	Based on the terms and the electronic social network distance	List of the individuals in the same electronic social network
Expert Recommendation	Implicitly on the documents	Based on the occurrence of the concepts in the documents	Concept-based	List of documents, authors and organizations
Ontologging	Implicitly from the sharing behavior of the user and explicitly for other indications	Based on the quantity and quality of the knowledge sharing activities	Concept-based	List of users
Discovery Server	Implicitly from the interactions with the system and from remote databases and explicitly for other indications	Based on the quantity and quality of the activities performed with the system	Concept-based	Sorted list of users based on the proximity of the knowledge domains
Agilience	Implicitly from the content of documents and emails	Based on the occurrence of the terms in the documents and email messages	Term-based	Sorted list of users based on the proximity of the knowledge domains or knowing others with a similar knowledge domains to the researched knowledge

Table 6 Comparison of the ERS

Capturing

The most part of the reviewed ERIS take into consideration a very limited set of knowledge indicators. This is consistent with the experimental purposes of many of them. The developers tried to verify the feasibility of their conceptual reasoning and proposals on a limited set of knowledge indicators. On the opposite, the commercial ERIS, like Knowledge Discovery, do not respond to the same objective and hence they dispose of a wider set of knowledge indicators.

The inclusion of several other knowledge indicators could be envisaged to offer a more comprehensive representation of the knowledge domains of the individuals.

These possible additional knowledge indicators are identifiable among the indicators adopted in the other ERIS. The integration of the different knowledge indicators proposed in the reviewed ERIS could determine a quite comprehensive solution. However, the direct integration of different ERIS seems difficult for the heterogeneous standards adopted in their development.

Concerning the knowledge indications, they are captured for the vast majority implicitly. The individuals do not have to explicitly provide these indications to the ERIS, with only few exceptions. Several trackers and databases are exploited to achieve the capturing. The increase in the number of knowledge indicators for which the data are explicitly requested to the individuals, could improve the richness of collected data without an excessive development effort. In fact, the effort in the explicit collection is transferred to the individuals who would be in charge to explicitly provide their knowledge indications to the ERIS.

A balance between the two forms, explicit and implicit capturing is expected for the obtaining of more effective ERIS.

Manipulating

The most part of the ERIS manipulate data following the keyword-based rules and the terms contained in the knowledge indications are manipulated basing on their occurrences. This approach is sometime complemented with some other manipulations, based on the geographical localization, the navigation process, or more in general the work activities of the individual. The manipulation based on the occurrence of the terms assumes that more a term is repeated and more the individual has a deeper knowledge on the domain represented by that term. At the end, the number of the repetition of a term is considered a proxy to the degree of deepness of knowledge on the domain represented by that term.

The multiplicity of meanings of several terms determines the most serious limitation of this approach. The same term can be used with different meanings, but the keyword-based rules cannot

distinguish among these several meanings, putting all the occurrences of the same term together. Moreover the keyword-based rules cannot also solve the problem of using different terms with the same meaning. On the contrary, the concept-based approach solves the two problems distinguishing the different meanings of the same term and putting together different terms with the same meaning. These limitations of the keyword-based rules have been retrieved in several ERIS as the diffusion of the concept-based approach is limited.

A concept-based approach to the data manipulation could overcome these limitations but for the application of the concept-based rules is required the definition of the concepts and the establishment of the relationships between the concepts in an ontology. And this task is not easily attainable.

Retrieving

The most recurrent retrieval solution is the research by terms and the subsequent presentation of the individuals with that researched term in their respective knowledge profile. This list of individuals is sometime refined based on the complementary manipulated information, such as the geographical localization, in order to propose the most adapted individuals to the user. Nevertheless, the profile of the user is rarely taken into consideration in the proposal of the retrieved individuals. It means that the retrieval is generally not customized based on the knowledge profile of the user. Anyone would obtain the same list of individuals when the same keyword is used for the retrieving, without considering the specificities of the single user. The different levels of knowledge on the domain of the users should be taken into consideration to propose a list of experts that better respond to the real needs of the users. In addition to the different levels of knowledge, several other aspects of the users could be considered in the retrieving, such as the spoken languages, or the temporal availability to assist the users.

The retrieving relies for the majority of the cases of the ERIS on the Boolean model. The inclusion in the retrieved list depends by the presence or absence of the researched term in the knowledge profile. The Boolean model is applied also in the few ERIS with a concept-based retrieving operation. The presence of the concept in the knowledge profile of the individual discriminates in the retrieval or exclusion of the profile.

Vector space and probabilistic models could improve the quality of the retrieving allowing also the retrieval of the individuals with a partial match of the researched keywords, requiring however more complex rules of manipulating and retrieving.

Displaying

The majority of the ERIS displays a sorted list of the retrieved individuals even if it is not always explicit the sorting criteria. The presentation of an automatic evaluation on the degree of correspondence between what has been searched and what has been retrieved is infrequent. In the keyword research, for example, the number of occurrences of the keyword found for each individual is sometime not reported. The inclusion of this information in the displaying should favour the assessment of the appropriateness of the retrieval by the users.

In addition to this kind of information, the ERIS could display more information on the retrieved individuals. In general, a very limited set of information is displayed on the retrieved individuals, in addition to their name and surname.

This complementary information should contribute to the assessment of the individual to contact. However the inclusion of this information demands the extension of the knowledge indicators to consider in the manipulating operation. In fact, some pieces of information should be already available in the ERIS but not simply displayed, while other pieces of information are not available in the ERIS. So a reflection on the information to display could demand a revision of the entire process of the ERIS, to include new knowledge indicators.

In conclusion, the existence of this variety of solutions has to be matched with the organizational requirements and with the Knowledge Community characteristics, in order to effectively enhance knowledge awareness.

As described in the following paragraphs, in the organizational contexts some major limits hindered the success of the ERS.

3.3 Limits, success and perspectives of the ERS

In this final part of the literature review, there will be a synthesis of the limits of the ERS highlighted by the academic community, in particular in the measuring of the success, and the perspective advancement reported in the previous studies.

Limits

The Expert Recommending Service has the potential to enhance awareness on the knowledge distribution among the members of the Knowledge Community; nevertheless some limits are described in the literature.

In general, different authors (Huber 2001; Crowder, Hughes et al. 2003; Husson 2003) suggest that **reliability, transparency, security and clarity** for all agents involved in the ERS should enhance the perceived quality of the ERS and the trust toward the recommendations of the ERS.

The major limit of the ERS, with explicit capturing of indications, regards the motivation of the members to explicitly provide the information required to the ERS. In particular, the individuals are supposed to regularly update, at the pace of their knowledge enlargement, their descriptions of their knowledge domains (IBM 2002; Schwab and Kobsa 2002). At the same time, the explicit provision of indications by the users should be paired with the assurance of the quality of the provided information (IBM 2002; Schwab and Kobsa 2002). The self-assessment, of their knowledge by the individuals, seems particularly critical, because the assessment is extremely subjective and, at the same time, the involvement of other parties could be too costly (Becerra-Fernandez 2000). Nevertheless, the collection of only partial information on the knowledge domains of the individuals negatively influence the quality of the knowledge model (Liu and Dew 2004).

On the opposite, an automatic capturing of the indications frees the individuals to manage their profiles, but there is the risk of incongruent profilation (Yimam-Seid and Kobsa 2003).

The mixed solution, obtained by implicit and explicit data provision, allows each individual to modify the knowledge profile automatically generated by the ERS. This manual intervention is meant at improving the quality of the automatic output through the addition of some electronically-hidden information and to refine the personal knowledge profile.

Independently on the capturing solution, the management of personal information raises the ethical and privacy issues (Mentzas, Apostolou et al. 2003; Nabeth 2004; Patil and Kobsa 2004; Teltzrow and Kobsa 2004). Some researchers (Kobsa and Schreck 2003) propose the pseudonymity, like a way to satisfy the privacy concerns, while another study (Balmisse 2003) suggests to assure to the individuals the possibility to regulate the accessibility to the sensible data.

As described, technical and managerial problems exist about ERS, but the issue to which this study is more concerned is about the difficulties in measuring the success of the ERS.

Measuring success

At this point in time, an established framework to evaluate the success and the benefit of the Expert Recommending Service is not yet achieved.

On the main area of knowledge management, Nonaka (Nonaka 1991) states that **financial indicators should be completed by qualitative measurement** because some benefits of the knowledge management initiatives cannot be effectively financially measured. Bonifacio (Bonifacio and Merigliano 2002) speculates even that the statements on the impossibility to measure their success are a solution to cover the unsuccessful of the initiatives.

Nevertheless, several authors propose measuring proposals. In addition to the financial returns on investments, Davenport specifies some of the qualitative indexes that could be useful to evaluate the knowledge management project success such as (Davenport, De long et al. 1998):

- Growth in the resources, attached to the project, in terms of people or money;
- Growth in the volume of managed knowledge and its usage;
- The autonomy and self-sustainability of the project;

More specifically on knowledge transfer, Balmisse (Balmisse 2003) proposes some indicators of the success of the initiative encouraging knowledge transfer:

- The percentage of demands of knowledge transfer that effectively finish in the knowledge transfer.
- The elapsed time from the demand of knowledge transfer to the completion of the knowledge transfer.
- The frequency of interactions between sources of knowledge and recipient of knowledge.
- The time dedicated to the interactions between the sources of knowledge and the recipient of the knowledge.
- The path run by each demand of knowledge transfer to achieve the knowledge transfer.

Finally, on the specific subject of the Expert Recommending Services, the few authors (Mattox, Maybury et al. 1999; Liu and Dew 2004), who try to assess their success, have used:

- The time savings in identifying experts;
- The improvements in the precision and recall of the retrieval;
- The reductions in the inter-subject variability in reporting experts (measuring percentage of agreement of first, second and third of five experts).
- The richness in displaying information on the knowledge domains of the experts.

This review of the limits of the ERS and specifically on the measures of ERS success, revealed spaces of further investigation and the potential area of development of the ERS, as it has already proposed by some researchers.

Future perspectives

As reviewed, the Expert Recommending Services are appointed, by the academic community, of some limitations and to overcome these technical and managerial limits some **proposals** have been stated.

New strategies and methods are awaited to extend the degree of the implicit capturing of the knowledge indications, toward the realization of free of administration ERS (Balmisse 2003; Fensel, Staab et al. 2003), because the ERS are based to much on the explicit provision of indications, instead of implicitly capturing. Toward this aim, Maier (Maier 2004) proposes peer to peer ERS solutions, where each component, individuals member of the Knowledge Community or computer-based IS could accomplish the different operations required for offer of the ERS.

Complementary, Mattox (Mattox, Maybury et al. 1999) envisions the reduction of manual interventions by the introduction of standing retrieval queries. In this way the knowledge seekers could memorize their queries in the ERS and each seeker would be automatically notified when new experts would be identified by the Information System.

Moreover, Fensel and Liu (Fensel, Staab et al. 2003; Liu 2003) propose that the ERS should be more aware of the context of the captured indications and of the retrieving requests for proposing personalized capturing and retrieval.

Finally, Becerra-Fernandez (Becerra-Fernandez 2000) hopes that the ERS could extend its scope including recommendation not only of single individuals recognized like experts, but also recommending groups of individuals, who, altogether, have the required specialized knowledge.

3.4 Conclusions

The reported limits and the outlined research perspectives give interesting **hints to further research** on the ERS and Knowledge Communities. As already mentioned in the first chapter, the rest of the document will describe the results of the empirical research effort toward the reduction of some of the actual mentioned gaps.

The following empirical part will concern the Expert Recommending Service and the Knowledge Community. The combination of these two main domains with the notion of success of the IS, to be presented in the next chapter, will be the main focus of the following parts.

Assuming that an increase in the success of the ERS has a positive effect on the amount of the knowledge transfer, the author will try to understand the dimensions of success of the ERS, the characteristics of the ERS that favor its success, and the properties of the Knowledge Communities that affect the success of the ERS.

4 Research modeling

The literature review and the research relevance motivate to contribute to the advancement on the Expert Recommending Services. Within this previously described research context the contribution of this chapter will concern the framing of the conceptual model and the adopted methodology.

4.1 Conceptual model

The conceptual model section is composed by an introduction on the concept of measuring success, the presentation of the theories and models on success, and the definition of the conceptual model.

As already outlined, the author's contributions are:

1. To **describe** the success of the Expert Recommending Services within Knowledge Communities.

2. To **predict** the degree of the success of the ERS within the KC, depending on the characteristics of the ERS and of the KC..

3. To **identify** recommendable interventions to enhance the success of the Expert Recommending Services within Knowledge Communities.

These three research objectives altogether determine a conceptual model involving three main elements:

1. The **Expert Recommending Service**, which has been previously defined the Information System service that counsels, to the potential recipient of knowledge, those individuals, who could likely have the specialized knowledge that the potential recipient requires.

2. The **Knowledge Community**, which has been already defined as a group of individuals that share a common practice, work, or interest as common knowledge, for the integration and transfer of specialized knowledge among the group's members.

3. The **success of the Expert Recommending Service**, which is here precisely defined as the degree, to which the stakeholders of the ERS are better off. The stakeholders are represented by the ERS providers, the ERS users, the KC, the organization, and, in general, all the subjects involved in the ERS (DeLone and McLean 1992).

The model assumes two causal relations linking (Figure 28):

1. The Expert Recommending Service to the Success of the ERS, because this research assumes the influence of the characteristics of the ERS on its success.

2. The Knowledge Community to the success of the ERS, since this research assumes the influence of the characteristics of the Knowledge Community on the success of the ERS.
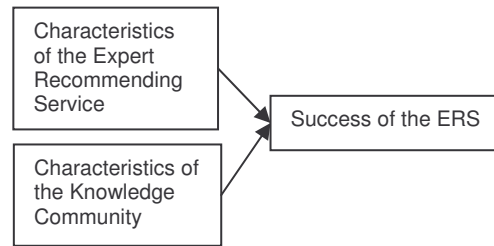
Figure 28 The conceptual model

Measuring the success

The issue of the success of the Expert Recommending Service falls into the wider issue of the success of the Information Systems.

The IS success is widely debated in the IS academic community (Briggs, De Vreede et al. 2003) and is conventionally described as the degree to which the stakeholders of the IS are better off (DeLone and McLean 1992). So, some sort of measurement has to be accomplished in order to established the degree to which the stakeholders of the IS are better off. Therefore the concept of measurement and the concept of IS success will be briefly described.

Measurement

Mari (Mari 2003) defines measurement as "an operation aimed at associating an information entity, the result of measurement, with the state of the system under measurement in reference to a give quantity, the measurand". The measurement is a specific kind of evaluation and its specificity, in the respect to the evaluation, depends on: ontological reasons, formal reasons, and informational reasons (Mari 2003).

1. Ontologically, the measurement is an evaluation that determines the values at the essential properties of a system.

2. Formally, the measurement is an evaluation that produces symbols that respond to a well codified language.

3. Informationally, the measurement is an evaluation whose results give the adequate information for the given goals.

The informational reasons introduce the **adequacy** of the measurement as depending on the objective. In the context of this research, the objective is the measurement of the ERS success. This objective implies that an evaluation, to be a measurement, must (Mari 2003):

- be recognized faithful,
- take into account pragmatic components,
- declare the estimated faithfulness,
- be inter-subjective,

- be objective.

Therefore, the selection of the instruments for the measurement is crucial and will be done in respect to the wide existing research in IS discipline on IS success.

IS Success

The concept of IS success is considered largely accepted in the IS research community, but there is an open debate on the instruments that properly measure the IS success (Rai, Lang et al. 2002). The reasons of this debate are determined by the presence of a variety of stakeholders and a multiplicity of dimensions of the IS success.

The success of the Information Systems differs for the **various stakeholders** involved in the IS and moreover, as sustained by Briggs (Briggs, De Vreede et al. 2003), the success of an Information System is, by no means, assured from any stakeholder's perspective. So, the success for a specific stakeholder could be a failure for another stakeholder, and this obliges to define which stakeholders' perspectives take into consideration in the measurement of IS success.

In addition, success has simultaneously many dimensions for each perspective. So different measurements have to be performed in order to have a multi-dimensional result of the success (Briggs, De Vreede et al. 2003).

The study of DeLone and McLean (DeLone and McLean 1992) was a turning point on the IS success issue, because the authors reviewed the empirically existing IS success instruments (over 100), and tried to group them into a taxonomy based on six factors: System Quality, Information Quality, IS Use, User Satisfaction, Individual Impact and Organizational Impact (DeLone and McLean 1992).

This work, even if it did not include an empirical test of the proposed model, has been referred by much of the following research in the IS discipline, but it did not obtain a unanimous approval as IS success instrument.

Theories and models on IS success

The IS research community proposes different IS research theories and models on IS success. Some IS success models are general enough to be applicable to any type of IS, while other theories are proposed to respond to the specificities of particular areas of investigation or a specific type of IS. Also researchers in the field of Knowledge Management have proposed their success models regarding Knowledge Management Systems.

The following paragraphs presents the theories, and their corresponding IS success models, from the main general IS success models to the ones specifically developed for Knowledge Management contexts.

The IS success models are presented giving the justification by the respective author for their introduction, the description of the models, with its founding theory, and, finally, offering a comparison with the previous models.

Davis' Technology Acceptance Model

Davis (Davis, Bagozzi et al. 1989; Davis 1989) pointed out, in accordance with other researchers (Edelmann 1981; Curley 1984; Sharda, Barr et al. 1988), that Information Systems "offer the potential for substantially improving" the users' performance. But the users' unwillingness to accept and use them obstructs the performance gains (Young 1984; Bowen 1986). Although user acceptance hac already been a long-standing research stream (Robey and Farrow 1982; Benbasat and Dexter 1986; Franz and Robey 1986; Markus and Bjorn-Andersen 1987), Davis (Davis 1989) perceived that the existing studies existing at that time were measuring acceptance through low quality instruments. Therefore the development of some improved measures seemed to Davis (Davis 1989) a research priority, with both theoretical and practical values.

So, Davis (Davis 1989) assumed that the success of the IS depended on the performance gains of the users, and that these gains were obstructed by the unwillingness to accept and use the IS. Giving the lack of high quality measures of acceptance of the IS, Davis proposed, therefore, the development of new measures for predicting and explaining IS use, the Technology Acceptance Model (TAM) (Davis, Bagozzi et al. 1989).

TAM is an **adaptation of the Theory of Reasoned Action** (TRA) (Fishbein and Ajzen 1975; Ajzen and Fishbein 1980). The TRA states that the individual behavior is determined by the behavioral intention to perform that behavior, and this intention is jointly caused by the personal attitude and the subjective norms. The TAM is an adaptation of the TRA for modeling user acceptance of IS and aims at providing an explanation of the determinants of the IS acceptance for the widest range of computer-based IS. Complementary to the explanation aim, TAM is proposed as (Davis, Bagozzi et al. 1989) a instrument to predict the usage. This quality enhances the possibility to study the impact of the external factors on user acceptance and to define the appropriate interventions for correcting the unwillingness to accept and to use the IS.

The TAM (Davis, Bagozzi et al. 1989) proposes Perceived Usefulness and Perceived Ease of Use as the principal determinants of the computer-based IS acceptance behavior. Perceived Usefulness (PU) is the prospective user's subjective probability that using a specific IS will increase the personal job performance within an organizational context. Perceived Ease of Use (PEOU) is the degree to which the prospective user expects the target computer-based IS to be free of effort.

PEOU positively influences PU and the person's Attitude toward using the IS, while PU positively influences the person's Attitude toward using the IS and the Behavioral Intention to use the IS.

The TRA relationships, which affirm the positive influence of Attitude, toward using the IS, to the Behavioral Intention, to use the IS, and the positive influence of Behavioral Intention to the actual IS Use, were maintained.

Davis added PEOU and PU to the main relationships of the TRA, while he excluded, in the TAM, subjective norms, which were included in the TRA. This choice was based on the judgment that subjective norms had uncertain theoretical and psychometric status.

Finally, Davis took into consideration the importance of the external variables that affect PEOU and PU. Davis considered that these external variables include many sources of influence such as: IS features, information accuracy, output quality, IS design characteristics, educational and training programs, documentation, user support. These external variables provide therefore the link between the internal beliefs and the individual differences, the situational constraints, and the managerially controllable interventions that could influence the users' behavior.

The enhancements of TAM in comparison with TRA reside mainly in the construction of PEOU and PU as the major beliefs influencing the attitude. In contrast with the TRA, which posits that the beliefs should be elicited anew for each new context, PEOU and PU are considered beliefs with general applicability. Moreover, TRA considers beliefs as a single construct, while TAM splits the beliefs in two distinct constructs, which enable to compare the relative influence of each belief toward Attitude (Figure 29).
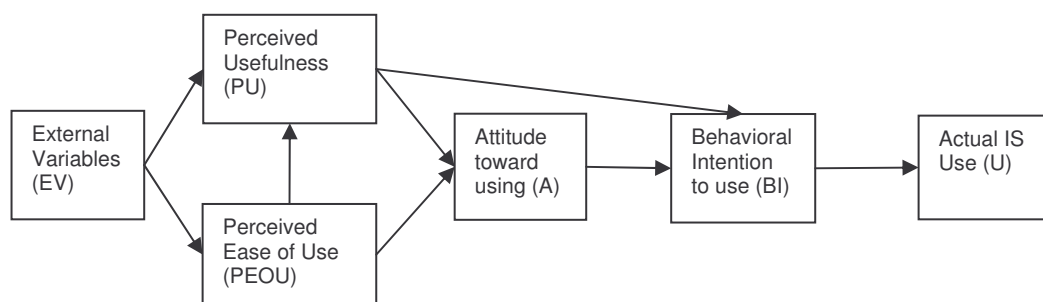
Figure 29 The Technology Acceptance Model

Davis (Davis, Bagozzi et al. 1989; Davis 1989) and, after him, many scholars, as reviewed by Legris (Legris, Ingham et al. 2003), empirically tested the TAM. Throughout the studies, TAM has been largely validated, with some few exceptions.

Some authors proposed partial modifications or additions to the original TAM, while others defined completely alternative theories and models to describe and predict IS acceptance and IS success (DeLone and McLean 1992; Seddon 1997; Venkatesh, Morris et al. 2003).

DeLone and McLean's IS Success Model

DeLone and McLean (DeLone and McLean 1992) observed the heterogeneity of the IS success measures. So, they assessed the importance, for IS research, to identify the outcome measure of the IS prescriptions in order to contribute to the world of practice. The definition of input variables should go with the definition of the output variables of the IS research, but for DeLone and McLean, the output variable remained underdeveloped.

DeLone and McLean accomplished a wide literature review on the studies about IS success. Their review brought them to synthesize the alternative and competitive theories and models on IS success and to formalize an overall and general IS success model. They ascertained the existence of a large number of studies attempting to identify the factors influencing the IS success, and to define the IS success construct.

In order to build a cumulative tradition on IS success models and to facilitate the comparison among the different proposed IS success models, DeLone and McLean organized the previous research into a comprehensive taxonomy with **six major dimensions of the IS success**: System Quality, Information Quality, Use, User Satisfaction, Individual Impact, and Organizational Impact. These six dimensions were finally organized in a model that should measure all the IS success dimensions, altogether.

Their taxonomy originated from the Shannon and Warren (Shannon and Warren 1949) work on communications and its adaptation to IS by Mason (Mason 1978). Shannon and Weaver (Shannon and Warren 1949) defined three levels of success: the technical level, the semantic level, and the effectiveness level. The technical level is about the accuracy and efficiency of the system that produces the information. The semantic level concerns the transfer of the intended meaning to the recipient. The effectiveness level regards the effect of the information on the recipient.

Mason (Mason 1978) adapted the Shannon levels to IS through the specification of the stages that the information flows, from its production, to its use or consumption and, finally, to its influence on the individual or organizational performance. The concept of influence of information on performance was a direct derivation of what Shannon and Weaver defined as "effect". In this way, Mason contributed to the description of the multi-dimensionality of the IS success and to the establishment of the different IS success measures at the different levels, for a complete and overall assessment of the IS success.

In the opinion of DeLone and McLean (DeLone and McLean 1992), IS researchers only partially assessed the IS success, while these IS researchers claimed to accomplishing an overall measure of the success.

The six dimensions proposed by DeLone and McLean (DeLone and McLean 1992) were appointed to measure the complementary levels of the IS success (Figure 30):

- System quality measures the information system itself.

- Information Quality measures the information system output.

- Use measures the recipient consumption of the output of the information system.

- User Satisfaction measures the recipient response to the use of the output of the information system.

- Individual Impact measures the effects of information on the behavior of the recipient.

- Organizational Impact measures the effects of information on the organizational performance.
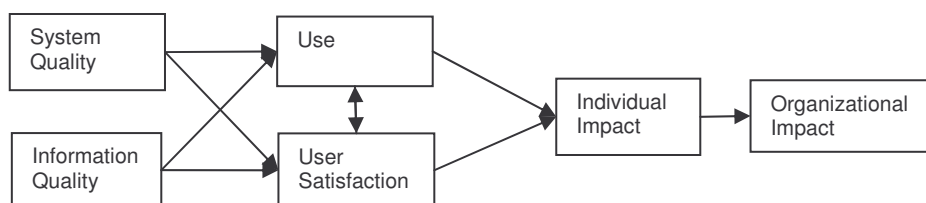
Figure 30 The DeLone and McLean's IS Success Model

The core aspects of this model, in comparison to the alternative ones, are:

1. The consideration of Use as an IS Success variable and as a precursor of Individual Impact.

2. The non specification of the causal path between Use and User Satisfaction as depending on the specific context.

DeLone and McLean (DeLone and McLean 1992) did not complete their model presentation with its empirical test. Nevertheless their model has been widely diffused and accepted in IS research (DeLone and McLean 2003; Jennex and Olfman 2003; DeLone and McLean 2004; Almutairi and Subramanian 2005).

Some authors proposed, nevertheless, alternative models of IS success, like Garrity and Sanders (Garrity and Sanders 1998), or in depth reinterpretation of the DeLone and McLean model, like Seddon (Seddon 1997), to the point of making a de facto new IS success model.

Seddon's IS Success Model

Seddon (Seddon 1997) appreciated the DeLone and McLean work (DeLone and McLean 1992) but he ascertained, along years of applications of the DeLone and McLean model, some limitations of this model.

Seddon (Seddon 1997) affirmed that the major qualities were about the provision of a schemata for classifying the various IS success measures in six dimensions, and the suggestion of temporal and

causal interdependencies between these dimensions of IS success. However, Seddon also claimed that the DeLone and McLean's IS Success Model included some incorrect interdependencies, because they mixed the temporal and causal ones.

Seddon realized the importance of distinguishing temporal from causal interdependencies and of excluding the temporal interdependencies from the IS success model. Hence, Seddon (Seddon 1997) remodeled the DeLone and McLean's IS Success Model, taking into consideration only the **causal interdependencies**. He specified the applicability of his model to four types of IS, as such: "some aspect of an application of information technology (IT), one individual application, a group of applications (including those of an entire organization), or an application of one type of IT" (Seddon 1997). Nevertheless, Seddon did not exclude the possibility to extend his model to IS departments and IS services, through the introduction in the IS success model of some constructs on the service quality of IS. He extended even the applicability of his model also to contexts where IS use was volitional.

The model proposed by Seddon was mainly composed of two parts: the behavioral model of IS use and the IS Success model. The behavioral model of IS use was only partially developed by Seddon because not directly included in the IS Success Model and because the author aimed at contributing principally to the definition of an IS success model.

The Seddon's IS Success Model is composed of seven IS success measures grouped in three classes:

- Measures of information and system quality. These measures include System Quality and Information Quality variables. "System quality is concerned with whether or not there are bugs in the system, the consistency of the user interface, ease of use, quality of documentation, and sometimes, quality and maintainability of the program code." "Information quality is concerned with the such issues as: relevance, timeliness, and accuracy of information generated by an information system." (Seddon 1997).

- General perceptual measures of net benefits of IS use. These measures include Perceived Usefulness and User Satisfaction. "Perceived usefulness is a perceptual indicator of the degree to which the stakeholder believes that using a particular system has enhanced the personal job performance, or the group's or organization's performance". "User satisfaction is a subjective evaluation of the various consequences evaluated on a pleasant-unpleasant continuum". (Seddon 1997)

- Other measures of net benefits of IS use. These measures are specified for each type of stakeholders: individuals, organizations, society because the measures that are important to one type of stakeholder are less likely important to the other stakeholders.

All these variables, indirectly through User Satisfaction, have an influence on the behavior of the IS user, which is not included in this IS Success Model, but in the Seddon's behavioral model. From the Technology Acceptance Model to the Seddon Model, the IS use reduced its relative importance as construct of IS success, at the point of being completely excluded by Seddon (Seddon) (Figure 31).
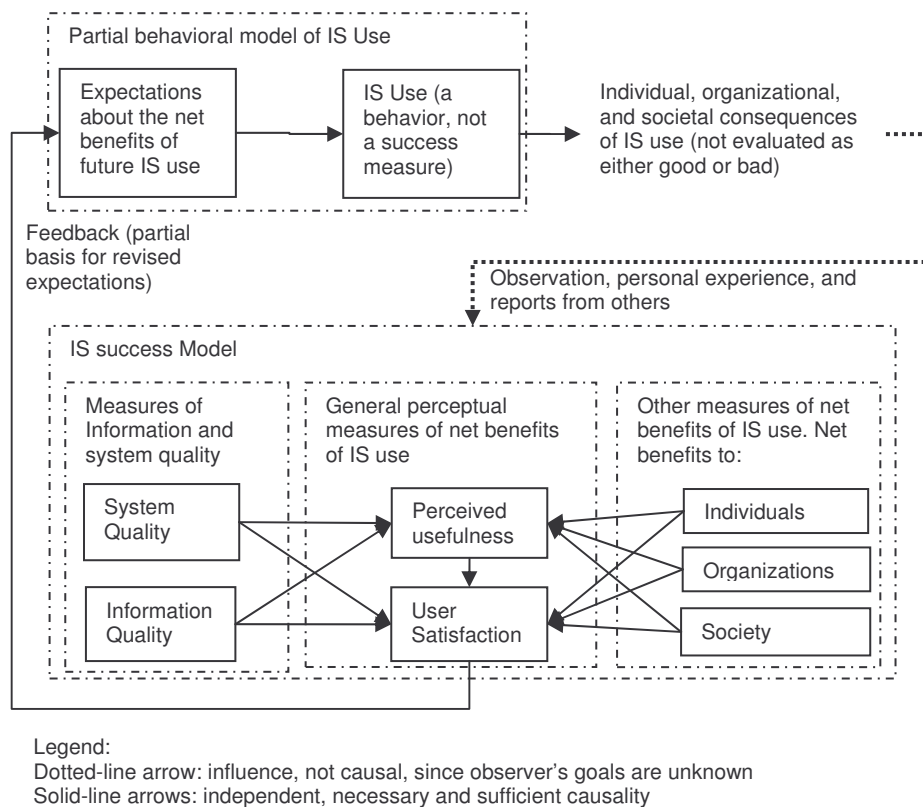
Figure 31 The IS Model

Seddon (Seddon) did not empirically test the proposed model at the time of its presentation. Other authors validated the model and compared it to the alternative ones, and in particular the DeLone and McLean IS Success model (Rai, Lang et al. 2002).

Even DeLone and McLean (DeLone and McLean 2003) appreciated some advancements proposed in the Seddon model (Seddon), but refused some other hypotheses.

Theories and models on KMS success

The researchers who proposed the three above-mentioned IS success models, aimed at the definition of an IS success model that could be of reference for the IS discipline, as a whole. These models were presented as general purpose IS success models, so they should be assessed in the specific Knowledge Management area, to evaluate their actual effectiveness to measure the success of the KMS.

At the same time, some specific KMS success models exist to specifically measure KMS success, without the scope of being applicable for the other types of Information Systems.

Applicability of general models to KMS success

The Technology Acceptance Model (Davis, Bagozzi et al. 1989) has been applied by Money and Turner (Money and Turner 2005) and partially by Ong et al. (Ong, Lai et al. 2005) for measuring KMS success.

Ong (Ong, Lai et al. 2005) tested a simplified version of the TAM with the addition of an external variable, perceived power security, which resulted an important construct in the KM context, influencing IS success.

Also Money and Turner (Money and Turner 2005) tested the TAM and verified its applicability to measure KMS success, even if the influence of Intention to use on Usage appeared lower correlation in comparison with the previous tests of the model on other types of Information Systems.

DeLone and McLean's IS Success Model (DeLone and McLean 1992), in its revised form proposed by the same authors (DeLone and McLean 2002), has been applied by Jennex and Olfman (Jennex and Olfman 2003), and Qian and Bock (Qian and Bock 2005).

Jennex and Olfman (Jennex and Olfman 2003) confirmed that KMS success can be measured on the improvement in the organizational effectiveness, based on: the use of the KMS, the satisfaction of the users, and the individual benefits of the KMS use.

Qian and Bock (Qian and Bock 2005) measured also the external variables positively influencing information quality of the KMS. The authors validated, for the main parts, the DeLone and McLean's IS Success Model, but some relations were not significant.

Seddon model (Seddon 1997), on the contrary, was not applied on KM context. Nevertheless, the author supposes that the similarity of the Seddon's IS Success Model to DeLone and McLean's IS Success Model (DeLone and McLean 1992), in particular in its revisited version (DeLone and McLean 2002), could grant its applicability to measure the KMS success.

In conclusion, the literature does not expose a priori constraints to the applicability of the three presented IS success models to the KM context to measure the success of the KMS, so these models **can be potentially applied** in the specific context of the KMS.

KMS-specific Success Models

Success models have been also specifically developed for the KMS in order to better to respond to the peculiar characteristics of the KM context. Jennex and Olfman (Jennex and Olfman 2005)

compare them in 2005 and their work is the primary source for the review of the KMS-specific success models.

Bots and De Bruiin (Bots and de Bruiin 2002) proposed an IS success model based on the value chain of the different phases of the **knowledge management process**. The KM initiative is considered successful if the activities of each phase of the KM process are well performed and if, at the end, these activities enhance the competitiveness of the organization (Figure 32).

Knowledge management and process evaluation

| Vision | | Determine strategy and policy | Make inventory Determine knowledge needs | Share Knowledge | Apply Knowledge | Return and plaisure |

Vision, External developments, Internal developments → Determine strategy and policy → Make inventory / Determine knowledge needs → Share Knowledge → Apply Knowledge → Return and plaisure

Figure 32 The Bots and De Bruiin's KMS-specific Success Model

Another model has been proposed by Massey et al. (Massey, Montoya-Weiss et al. 2002). This model levers on the work of Holsapple and Joshi (Holsapple and Joshi 2002) to highlight that KM success is determined by the success of the organizational change led by a by **KM strategy**. The degree of KM success is, therefore, related to the general improvement of the organizational performance (Figure 33).
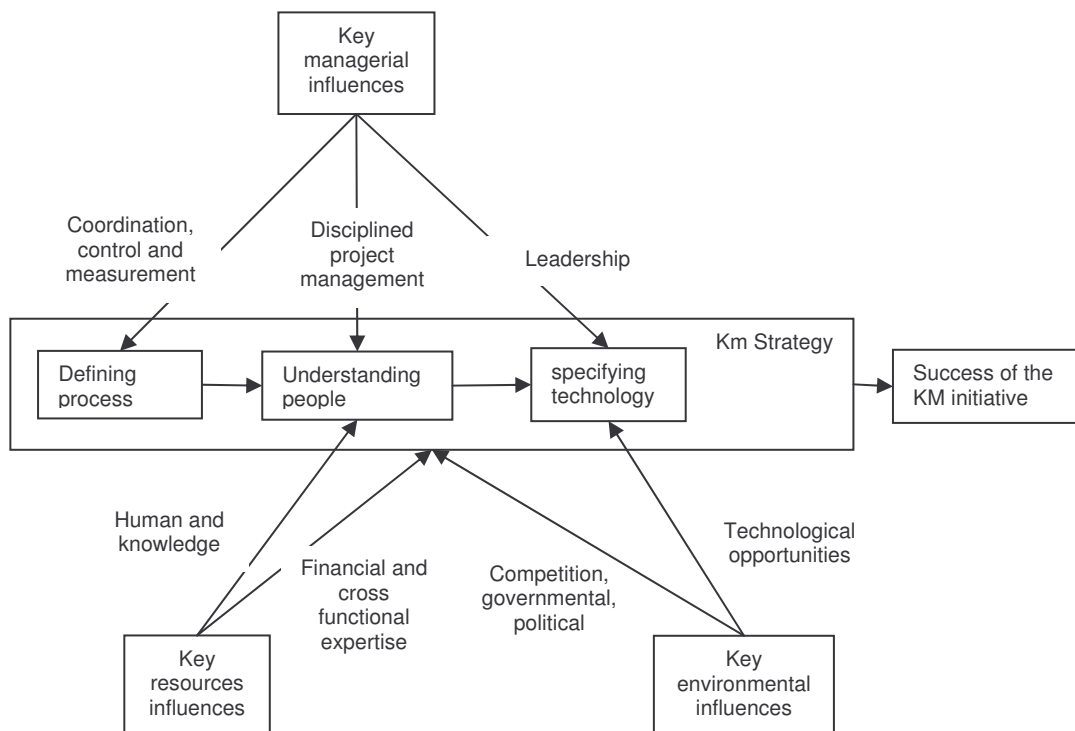
Figure 33 The Massey, Montoya-Weiss and Driscoll's KMS-specific Success Model

Finally, Lindsey (Lindsey 2002) assumed that KM success depends on the satisfaction with the KMS, which derives from the KM effectiveness. This KM effectiveness is backward determined by the Knowledge Process Capability and the Knowledge Infrastructure Capability. These two **Capabilities** are variables coming from the Organizational Capability Perspective Theory (Gold, Malhotra et al. 2001) and the Contingency Perspective Theory (Becerra-Fernandez and Sabherwal 2001) (Figure 34).
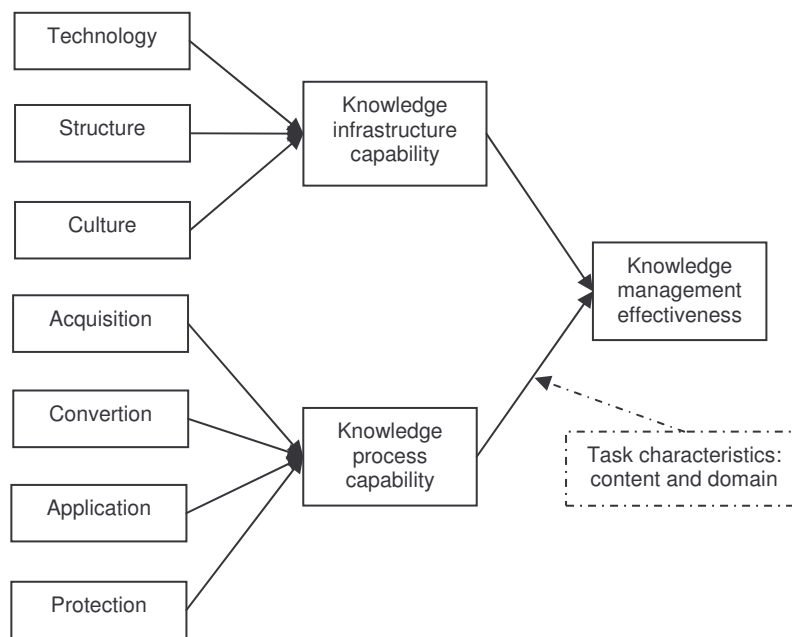
Figure 34 The Lindsey's KMS-specific Success Model

As assessed by (Folkens and Spiliopoulou 2004), these models were developed essentially referring to the single case under study. Therefore, they lack of a significant external validity.

Other authors proposed new models claiming their applicability to the KM context to measure KMS success, but, as affirmed by Kankanhalli (Kankanhalli and Tan 2004), they are defined only at an abstract level, and so their operationalization remains unaccomplished and very arduous.

Theory selection

The choice of the reference theory and the subsequent model for measuring the success of the Expert Recommending Service has to be balanced among this series of alternatives.

The first choice is between the selection of a general IS success model or of a KMS success model. For the reasons proposed by Kankanhalli (Kankanhalli and Tan 2004) and the considerations of Folkens (Folkens and Spiliopoulou 2004), the specifically developed KMS success models are not well suited for their application in this study. The models proposed by Bots and De Bruijn (Bots and de Bruiin 2002). Massey et al. (Massey, Montoya-Weiss et al. 2002), and Lindsey (Lindsey 2002) lack of significant external validity, which reduces the potential applicability in other contexts different to the original ones.

All such theories are not well suited to study the Expert Recommending Service since the ERS is a KMS that largely differs from the KMS referred by these authors. Instead, the general models for measuring IS success developed by Davis (Davis, Bagozzi et al. 1989), DeLone and McLean (DeLone and McLean 1992), and Seddon (Seddon 1997) have been successfully applied to a large variety of IS, including even some KMS. Therefore, the models proposed by Bots and De Bruiin

(Bots and de Bruiin 2002). Massey et al. (Massey, Montoya-Weiss et al. 2002), Lindsey (Lindsey 2002) are discarded as potential reference model for this study and the choice become restricted to one among the three general models of IS success of Davis (Davis, Bagozzi et al. 1989), DeLone and McLean model (DeLone and McLean 1992) and Seddon (Seddon 1997).

This choice depends on the suitability of the model to the type of IS under study. The **suitability** of the models will be reviewed with regard to:

- The types of IS to which the model can be applied. The author considers important the applicability of the model to informal as well as to formal paper-based IS and computer-based IS, because the ERS could be provided by all these types of IS.

- The dimensions of IS success. In particular the author values relevant the inclusion of Service Quality dimension, because this study assumes a service perspective, rather than a product perspective toward the IS.

- The applicability into volitional contexts. The Expert Recommending Service can be an IS with a volitional use and therefore the model should be applicable also into this context.

In terms of types of IS, Technology Acceptance Model (Davis, Bagozzi et al. 1989), and DeLone and McLean's IS Success model (DeLone and McLean 1992) were originally developed for computer-based IS, and they excluded paper-based and informal IS. Instead, Seddon prospected, from the beginning, the possibility to extend his IS success model to measure the success of paper-based and informal IS (Seddon 1997).

Regarding the dimensions of IS success, TAM limits them to IS Use, while the other two models accept the multidimensionality of IS success and consider several dimensions. Among these dimensions, the DeLone and McLean's IS Success Model (DeLone and McLean 1992) includes the IS Use, while Seddon (Seddon 1997) affirmed its exclusion because IS Use was assumed to be only a measure of the behavior of the users, but not a measure of IS success.

Concerning the voluntariness of the IS use, TAM and the DeLone and McLean's IS Success Model (DeLone and McLean 1992) was designed for non volitional IS use. The Seddon's IS Success model, on the contrary, is applicable also in contexts where IS use is volitional (the Table 7 shows the values of the three original models on the three properties: Types of IS, Dimensions of the success, Voluntariness).

MODEL	TYPES OF IS	DIMENSIONS OF THE SUCCESS	VOLUNTARINESS
Technology Acceptance Model (Davis, Bagozzi et al.	Specifically developed for computer-based IS.	It measures acceptance as dimension of IS success, only through the degree of IS use.	The model is defined for non volitional IS use

|			
1989)			
DeLone and McLean's IS Success Model (DeLone and McLean 1992)	Originally conceived for computer-based IS.	It considers the multidimensionality of the IS success, including IS use, but excluding Service Quality.	The model is defined for non volitional IS use
Seddon's IS Success Model (Seddon 1997)	Extensibility of the model also to paper-based and informal IS.	It considers the multidimensionality of the IS success, but IS use and Service Quality are excluded, but the author affirms the admissibility of Service Quality, on case basis.	The model can be applied to volitional and non volitional IS use

Table 7 Comparison of the models

The original versions of the three models have been modified, along the years, in order to respond to their respective major limitations. During the years, some authors overcame several points of their constraints through progressive extensions and revisions of the models, making them more compliant with the characteristics of the Expert Recommending Service and with the KM context (The Table 8 shows the extensions, during the years, of the three models on the three properties: Types of IS, Dimensions of the success, Voluntariness).

MODEL	TYPES OF IS	DIMENSIONS OF THE SUCCESS	VOLUNTARINESS
Technology Acceptance Model (Davis, Bagozzi et al. 1989)	It remains mainly focused on computer-based IS (Legris, Ingham et al. 2003), but it includes also applications on formal IS, not completely computer-based (Taylor and Todd 1995)	IS use, self-reported or objective, remains the dependent variable (Legris, Ingham et al. 2003)	Applicability of TAM is extended also to volitional IS use contexts (Taylor and Todd 1995; Venkatesh 2000)
DeLone and McLean's IS Success Model (DeLone and McLean 1992)	It is applied also to the IS departments, in charge of the delivery of information through: formal computer-based, formal paper-based and informal IS (Pitt, Watson et al. 1995; Jennex 2005)	Service Quality is included as IS success dimension (Pitt, Watson et al. 1995; DeLone and McLean 2003; Jennex 2005)	Applicability of the model is extended also to volitional IS use contexts (Rai, Lang et al. 2002)
Seddon's IS Success Model (Seddon 1997)	The author affirms the extensibility of the model to paper-based	Use and Intention to Use remain excluded from the IS success. Non-directional	The model was already applicable to both volitional and non

	IS and informal IS, but there is no empirical test in these contexts	path between Perceived Usefulness and Use is proposed (Rai, Lang et al. 2002). The inclusion of Use in the Success model is reaffirmed by Delone and McLean (DeLone and McLean 2003)	volitional IS

Table 8 Extensions of the models

As previously noted, the choice of the model relies on the possibility to apply it to volitional paper-based IS, and informal IS, and the inclusion of Service Quality. The model that better match these criteria is the **DeLone and McLean's IS Success Model**, which has also been validated in different contexts (The Figure 35 shows the reference model). This model has been taken as the reference model for the prosecution of the research.
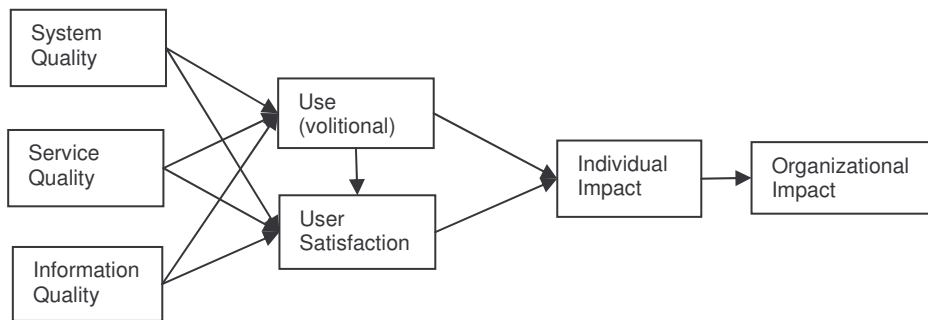

Figure 35 The IS Success Model used ad reference model of this study (DeLone and McLean 1992)

The model on the ERS success

This proposed concept model of IS Success partially includes the characteristics required by an ERS, because the IS Success Model takes into consideration the IS quality. Several constructs refer to IS quality in IS literature, such as: information quality, service quality, system quality, ease of use, functionality, reliability, flexibility, data quality, portability, integration, importance, accuracy, timeliness, completeness, relevance, consistency (DeLone and McLean 1992).

The principles of parsimony and completeness, which brought DeLone and McLean (DeLone and McLean 2003) to retain only three measures, informed also this study. The adoption of a service perspective on the IS counseling potential expert brought to the choice of Service Quality as the only variable of the IS quality, taken into consideration. The System Quality construct is not an adapted comprehensive measure since informal ERS cannot be measured with this variable, while the Information Quality construct will be taken into consideration in the operationalization of the

Service Quality construct (Figure 36 shows the causal link between the characteristics of the ERS and its Service Quality, which is a dimension of the overall Success of the ERS).
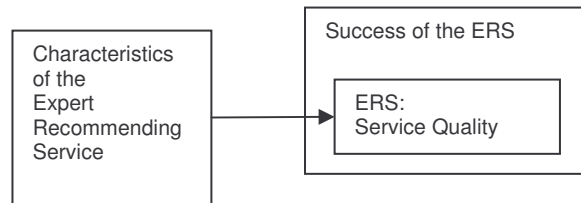
Figure 36 The ERS characteristics

Service Quality is a multidimensional variable and is concerned with (Jiang, Klein et al. 2002):

- Reliability: the ability to perform the promised service dependably and accurately.

- Responsiveness: the willingness to help service customers and provide prompt service.

- Assurance: the knowledge and courtesy of the individuals and their ability to inspire trust and confidence.

- Empathy: the provision of care and individualized attention to service customers.

The second specificity of the selected model is related to the inclusion of the Knowledge Community as a factor influencing the ERS success.

The characteristics of the Knowledge Community have been excluded, up to now, from the IS success model. The general models of IS success, in order to be applicable to the largest majority of IS, do not consider the Knowledge Community. In this study, the presence of a Knowledge Community is considered as an external variable influencing the success of the ERS (DeLone and McLean 1992).

The explicit consideration of Knowledge Community, as an external variable of ERS Success, depends on the already explained importance of the Knowledge Community in knowledge transfer (see the chapter on the literature review). As described in the previous sections, the knowledge transfer is facilitated by the existence of a Knowledge Community. As the Expert Recommending Service should enhance the knowledge transfers, the existence of a Knowledge Community should favor the success of the ERS (Figure 37).

The **characteristics of the Knowledge Community** that are the most relevant for the success of the ERS have not been identified yet, but they will rise from the grounded empirical data.
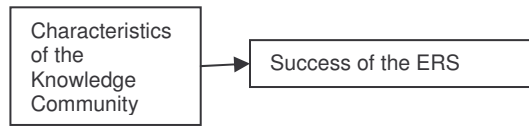
Figure 37 The ERS characteristics

The application of the selected IS success model to the context of the Expert Recommending Services leads to the definition of the conceptual model that proposes the following hypothesis (Figure 38):

- **H1**: The characteristics of the Knowledge Community have an influence on the degree of Success of the ERS.
- **H2**: The characteristics of the Expert Recommending Service have an influence on the degree of ERS Quality, in terms of Service Quality.
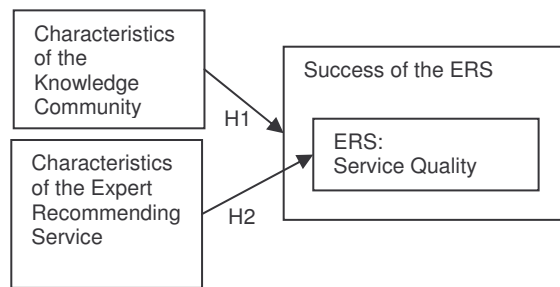
Figure 38 The two main hypotheses of the model

The combination of the conceptual model and the adopted general IS success model leads to the definition of all the hypotheses that will be studied in the following empirical research (Figure 39).
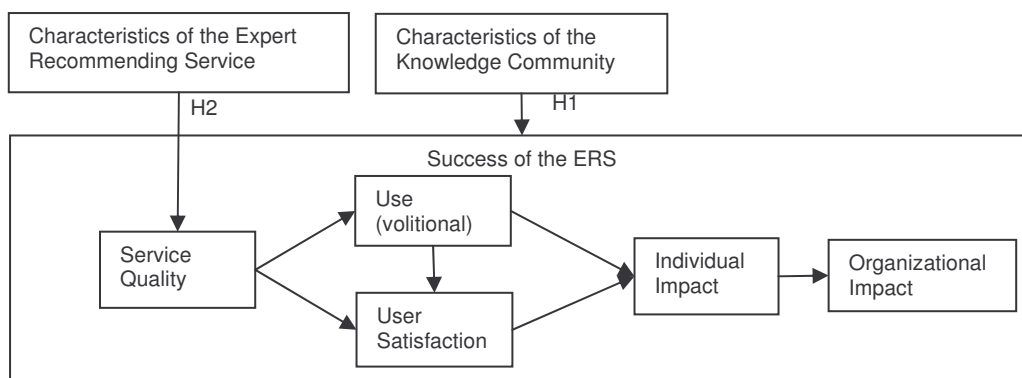
Figure 39 The final model

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4.2 Methodology

The epistemological foundation from which the empirical research is informed, is the positivism. The guidelines of Straub (Straub, Boudreau et al. 2004) Igalens and Roussel (Igalens and Roussel 1998) and Evrard, Pras et al. (Évrard, Pras et al. 2003) are followed to promote the quality of the results.

This research combines complementary **qualitative and quantitative research methods** to provide a richer contextual basis for interpreting and validating results (Igalens and Roussel 1998; Wood, Daly et al. 1999; Dennis 2001).

The multi-method approach, which combines qualitative and quantitative research methods, has been particularly supported as potential provider of richer context for interpreting and validating results (Jick 1979; Wynekoop 1985; Kaplan and Duchon 1988; Wood, Daly et al. 1999).

Multiple methods should (Benbasat, Goldstein et al. 1987; Brewer and Hunter 1989; Igalens and Roussel 1998; Wood, Daly et al. 1999; Évrard, Pras et al. 2003) :

1. Compensate the weaknesses inherent in each single individual method.
2. Provide more precise development of the hypotheses, investigation of these hypotheses, understanding of the results and more robust conclusions.
3. Favor the reliability and generalizability of the results.

Multi-method research can assume different perspectives (Bryman 1992). The one followed in this study is the evolutionary perspective. The evolutionary perspective is particularly useful when little research has been conducted so far on a particular phenomenon, or where research hypotheses require increased focus (Wood, Daly et al. 1999). This is exactly the case of this study because little research in IS discipline has been done and the hypothesized relationships between Knowledge Communities and ERS Success need to be developed.

Through an initial explorative study qualitative data were gathered to interpret a wide range of topics in the area of investigation. The collected data were analyzed and the findings represented the basis for the development of the hypotheses for the following quantitative study (Benbasat, Goldstein et al. 1987; Igalens and Roussel 1998; Wood, Daly et al. 1999; Évrard, Pras et al. 2003).

The definition of a first qualitative phase followed by a quantitative one has to be associated with the selection of the specific method for the qualitative study and the selection of the specific method for the quantitative study. The criteria of selection include (Wood, Daly et al. 1999):

- Internal validity: the extent to which some causal conclusions can be made from the study.
- External validity: the extent to which the results may be generalized to the population and to other contexts.

- Ease of replication: the ease with which the study can be repeated under the same conditions.

- Potential for theory generation: the potential to generate new theories.

- Potential for theory confirmation: the potential to test a theory and to provide supported findings.

- Cost per subject: the relative cost of the study.

Qualitative research methods

Myers (Myers 2004; Myers 2006) lists 4 types of qualitative research methods as the most widely accepted in IS.

- Action research. This method is characterized by the joint collaboration, within a mutually acceptable ethical framework, of the researcher and the subjects directly involved in the object under study (Rapoport 1970). In this way, action research aims to contribute both to the practical concerns of the involved subjects and to the theoretical concerns of the social science (Rapoport 1970). Action research tries to solve immediate problematic situations and simultaneously it tries to enlarge the theoretical knowledge (Clark 1972; Olesen and Myers 1999; Baskerville and Myers 2004; Lindgren, Henfridsson et al. 2004).

- **Case study research**. This method investigates a contemporary phenomenon, within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident (Yin 2002). This method poses the researcher as an external observer of the phenomenon in its real-life context. It aims to extend the knowledge on the phenomenon, without providing immediate solutions to the problems faced by the observed subjects (Benbasat, Goldstein et al. 1987; Dube and Pare 2003; Paré 2004; Straub, Boudreau et al. 2004).

- Ethnography. This method imposes a complete immersion in the field for a significant amount of time. It imposes to interact with the people that the researcher is studying, and it aims at placing the phenomena into their social and cultural contexts (Lewis 1985; Myers 1999).

- Grounded theory. This method is "an inductive theory discovery methodology, which allows the researcher to develop a theoretical account of the general features of a topic, while simultaneously grounding the account in empirical observations or data". It seeks to develop theory, which is grounded in data, systematically gathered and analyzed, through a continuous interplay between data gathering and analysis (Myers 2006).

Quantitative research methods

Straub, Gefen and Boundreau (Straub, Gefen et al. 2005; Straub, Gefen et al. 2006) reviewed the 8 major quantitative research methods, used in the IS community:

- Field experiment. This method involves the experimental manipulation of one or more variables within a naturally occurring system and subsequent measurement of the impact of this manipulation on one or more dependent variables (Boudreau, Gefen et al. 2001).

- Laboratory experiment. This method takes place in an artificial setting, especially created by the researcher for the investigation of the phenomenon. The researcher has expressly control over the independent variables and the random assignment of the research participants to the various treatment and non-treatment conditions (Jarvenpaa 1988; Boudreau, Gefen et al. 2001).

- Free simulation experiment. This method implies that the researcher designs a closed setting to closely reproduce a natural context and measures the response of the subjects as they interact within the designed system. These interactions are partially stimulated by the researcher, while the rest are free initiatives of the studied subjects (Fromkin and Streufert 1976; Jenkins 1985).

- Experimental simulation. This method employs a closed simulation model to closely reproduce a natural context, where the studied subjects are exposed to this simulation model and their responses are recorded. These responses are caused by events completely controlled by the researcher, who can determine the nature and the timing of these experimental events (Jenkins 1985)

- Adaptive experiment. This method involves the collection of measures at the beginning of the experiment and after the introduction of the independent variables. It does not require the random selection of the sample of the experiment, and the complete definition of the form of the model at the beginning (Jenkins 1985).

- Field study. This method employs non-experimental inquiries. It studies what occurs in the natural systems and does not allow, in any case, to the researchers to manipulate the independent variables or to control the influence of confounding variables (Klein and Myers 1999; Boudreau, Gefen et al. 2001).

- **Opinion research**. This method implies asking the studied subjects to express their attitudes, opinions, impressions and beliefs via questionnaires, interviews or other opinion gathering instruments. The gathered data is used to test a priori hypotheses or to generate new hypotheses (Jenkins 1985).

- Archival research. This method concerns the examination of any recorded data, mainly historical documents. The recorded data is a posteriori examined by the researcher to find causes and consequences of the events (Jenkins 1985).

Research method selection

Using the selection **criteria** proposed by Wood (Wood, Daly et al. 1999), the selected method for the exploratory phase is case study research. This choice has been mainly influenced by the cost and the potential for theory generation of case study research.

In terms of cost, the author faced a strictly limited time frame available that imposes the data collection within a short period of time. The time constraint causes to discharge action research, ethnography and grounded theory, since they require a long time frame for completion (Myers 2006).In terms of potential for theory generation, case study research has been largely recognized as a method that could enlarge theoretical knowledge and generate new theories (Myers 2006).

Basing on the Wood's criteria (Wood, Daly et al. 1999), the method for the confirmatory phase is opinion research. The main reasons for its selection are: the cost and the potential of the opinion survey for the theory confirmation.

The opinion survey, in particular through questionnaire, could be completed at a low cost per subject. The questionnaire could be auto-administrated to the subjects under study and data automatically collected through a web form. Concerning the potential for theory confirmation, the opinion survey could be efficiently used to test a research model and to confirm or to disconfirm the hypotheses of that model.

The integration of case study and opinion research has been already performed (Blanchet and Gotman 1992; Gable 1994) and it assures the complementary of research methods required to triangulate results (Table 9).

	CASE STUDY RESEARCH	OPINION RESEARCH
Internal validity	High	Low
External validity	Low	High
Ease of replication	Low	High
Potential for theory generation	High	Low
Potential for theory confirmation	Low	High
Cost per subject	High	Low

Table 9 Comparison of the research methods

Qualitative phase

The qualitative method is adopted to explore the characteristics of the Knowledge Communities, the characteristics of the Expert Recommending Services and the characteristics of the Success of the ERS and the potential relationships between them.

The application of the selected IS success model to the context of the Expert Recommending Services leads at the definition of the following preliminary propositions (Figure 40):

- P1: The characteristics of the Knowledge Community have an influence on the Success of the ERS.

- P2: The characteristics of the Expert Recommending Service have an influence on the Success of the ERS.

These propositions are explored through the qualitative method in order to establish precise hypotheses.
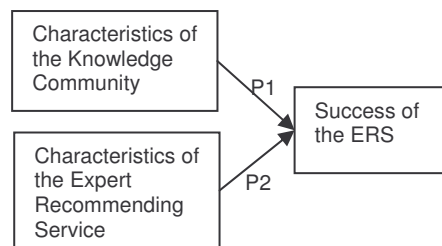
Figure 40 The model at the qualitative phase

Case unit

The unit of analysis identifies what constitutes the "case" and is related to the way the major research questions are defined (Yin 1994 pages 21-24). In fact, the definition of the unit of analysis must be consistent with the research questions in order to allow its adequate answering (Darke, Shanks et al. 1998).

In the first chapter the following research questions have been stated:

1. What are the dimensions of the success of the Expert Recommending Services?

2. What are the properties of the Knowledge Community that influence the success of the Expert Recommending Services?

3. To what degree the success of the Expert Recommending Services is influenced by the properties of the Knowledge Community?

To answer these questions, the unit of analysis is **the organization**, with its ERS and its KC.

This organization will be studied through the analysis of the Knowledge Communities that exist in the organization, the understanding of the Expert Recommending Services that are provided in the

organization, and the exploration of the relationship between Knowledge Communities and Expert Recommending Services.

Data collection and storage

The case unit is analyzed through the collection of primary and secondary data. Primary data sources are interviews, direct observation, and informal discussions. Secondary data sources are mainly a set of documents of the organization that are produced by the organizational information system.

A preliminary gathering of background information about the case foreruns the collection of primary data (Darke, Shanks et al. 1998). The main source of information is the internet web site of the organization. Supplementary, some internal secondary data is provided by the organizational referee.

After this preliminary step, the names and the positions of all the potential participants are obtained, in collaboration with the internal referee. The potential participants are contacted for an interview and the collection of some complementary secondary data (Darke, Shanks et al. 1998).

The **interviews** are semi-structured interviews (Kerlinger 1964; Emory 1980) to different people of the selected organization, in order to cover the maximum heterogeneity of the interviewees and explore convergence of information from the different sources (Yin 1994).

The interview guide lists the main themes and sub-themes to discuss in the interview and is drafted beforehand to find out the view of the different individuals. At the beginning of each interview an introduction on the reasons and the objects of the interview is performed (Blanchet and Gotman 1992 pag 75; Miles and Huberman 1994). This explanation is expected to reduce the researcher effects at the site, which biases the data collection (Miles and Huberman 1994; Darke, Shanks et al. 1998).

The interview guide is designed to learn what the individual's view is on: the characteristics of the interviewee, the description of the ERS, the description of the Knowledge Communities in the organization, the opinion on the success of the ERS.

The qualitative data produced by the interview survey is transcribed (Heritage 1984 page 238; Silverman 1993 page 117).

The transcription follows the convention proposed by Silverman (Silverman 1997) and the main symbols are reported in the following Table 10.

SYMBOL	DESCRIPTION
E	Interviewee
R	Interviewer

[	Left brackets indicate the point at which a current speaker's talk is overlapped by another's talk
]	Right-side brackets indicate where overlapping talk begins, or marks alignments within a continuing stream of overlapping talk
(#)	Numbers in parentheses indicate elapses time in silence in seconds
:::	Colons indicate prolongation of the immediately prior sound. The length of the row of colons indicates the length of the prolongation
____	Underscoring indicates some form of stress, via pitch and/or amplitude
( )	Empty parentheses indicate the transcriber's inability to hear what was said
=	Equal signs, one at the end of a line and one at the beginning, indicate no gap between the two lines
(aaa)	Parenthesized words are possible hearings
AAA	Capitals, except at the beginning of lines, indicate especially loud sounds relative to the surrounding talk
.hhhhh	A row of h's prefixed by a dot indicates an inbreath; without a dot, an outbreath. The length of the row of h's indicates the length of the in- or outbreath
((aaa))	Double parentheses contain author's descriptions rather than transcriptions
,.?!	Indicate speaker's intonation

Table 10 The conventions for the transcriptions

These transcriptions, the field notes on the direct observation and the collected secondary data are achieved in a repository.

Data analysis

Each transcript is analyzed in parallel with the prosecution of the other interviews in order to use the content of the previous interviews as source of questions to ask in the next interviews (Miles and Huberman 1994). This continuous refinement influences the composition of the interview guide and the deepness of the interviews on some specific aspects.

For the data analysis, the author assumes that interview data gives access to facts about the world (Silverman 1993 pages 90-91). The author processes the content to explain the characteristics of the ERS, the characteristics of the Knowledge Communities and the success of the ERS. For the data analysis and interpretation, the author chooses the thematic content analysis method (Berelson 1952; Grawitz 1996), which is based on a system of themes and sub-themes. The premise of content analysis is that the repetition of units in speech (such as words, phrases, sentences or paragraphs) points out the centers of the interests and the opinions of the speakers. The sentences, the parts of the sentences or the groups of the sentences are grouped based on the relation to the themes of: Knowledge Communities, Expert Recommending Services and success of the ERS. The list of themes and sub-themes is refined, during the prosecution of the interviews, based on the relevance and interest of the different **themes and sub-themes**. As soon as the analysis reveals the saturation and repetition of the same themes, the scheduling of new interviews was interrupted (Silverman 1997).

The coding system follows a descriptive codification approach, and the codes of the second level specializes the first level codes, as evident in the following Table 11.

Three main themes have been researched in the content concerning information on the Knowledge Community, the Expert Recommending Service and the Success of the Expert Recommeding Service. Each theme has several sub-themes basing on what the literature review indicated. Specifically, the theme "Knowledge Community" has 13 sub-themes reviewed in the literature and one sub-theme emerging from the empirical ground: Knowledge of the Others. The theme "ERS operations" have 4 sub-themes basing on the four main operations of this type of Information Systems and for them the degree of formalization has been taken into consideration. Finally, the theme "Success of the ERS" has 7 sub-themes based on the dimensions of IS success proposed by DeLone and McLean in their IS success model, which the author retained as the reference model for the development of the ERS success model.

THEME	SUB-THEME
Knowledge Community	
These sub-themes originate from the list of dimensions that describe the Knowledge Community proposed in literature review section	Lifetime
	Size
	Composition
	Fragmentation
	Geographical dispersion
	Mode of interaction
	Degree of interconnection
	Frequency of interaction
	Degree of governance
	Anonymity
	Openness
	Purpose
	Cohesion
	Knowledge of others
ERS success	
These sub-themes originate from the list of dimensions that describe Information Systems success proposed in conceptual model section	Service quality
	System quality
	Information quality
	Perceived usefulness
	User satisfaction
	Net benefit
	Use

ERS operations	
These sub-themes originate from the list of dimensions that describe Information Systems proposed in literature review section	Capturing
	Manipulating
	Retrieving
	Displaying
Interviewee	
	Role and responsibility

Table 11 The themes and sub-themes of the content analysis

A computer aided qualitative data analysis system is employed to support codification and analysis (Dohan and Sanchez-Jankowski 1998; Lewins and Christina 2005). Several instruments were reviewed, direct and indirectly by Lewins (Lewins and Christina 2005), and the choice favors the use of HyperResearch package. The selection of this packaged software is based on its easiness of use and its flexibility in building reports. The extracts of the transcripts used in the following chapter are directly obtained by this package.

Quantitative phase

As already explained in the paragraph titled "The model on the ERS success", the combination of the conceptual model with the DeLone and McLean model of IS success leaded to the definition of the preliminary empirical research model (Figure 39).

The variables presented in this preliminary research model (Figure 39) are adapted to respond to the ERS context, as described in the following table (Table 13) and graphically represented in the Figure 41.

VARIABLE OF PRELIMINARY MODEL (FIGURE 39)	CONTEXT ADAPTATION	VARIABLE OF REFINED MODEL (FIGURE 41)
Service Quality	The focus on the IS service called Expert Recommending Service sustained the adaptation of the variable from a general variable on the IS service quality to a specific variable on the ERS quality.	ERS Quality
Use	The variable has not been adapted	Use
User Satisfaction	The variable has not been adapted	User Satisfaction
Individual Impact	The focus on the Expert Recommending Service determined the identification of the most important impacts of the ERS on the referred stakeholders: the	Perceived Usefulness for the Individual

	ERS users. When the user is considered as the referred stakeholder of the IS success, as in this research, the general definition of "Individual Impact" proposed by DeLone and McLean (DeLone and McLean 1992) assumes a meaning that is similar to the meaning of the definition of Perceived Usefulness proposed by Davis (Davis 1989). So the general purpose variable Individual Impact is adapted to the ERS context and the the ERS users into the variable Perceived Usefulness for the Individual.	
Organizational Impact	The type of organizational impact, to which the ERS is directly related, is the information access. By the ERS the organization should benefit of an enhanced access to information on the experts, and subsequently, an improved access to the information by the experts. So, among all the possible organizational impacts (Mirani and Lederer 1998) the one to which this research pay attention is the information access benefit for the organization which takes the name of Perceived Usefulness for the Organization.	Perceived Usefulness for the Organization
Characteristics of the ERS	Consistently with the service perspective on the ERIS adopted in this research, all the characteristics of the ERS are included in the construct ERS Quality, as it is assumed that the end users evaluate the characteristics of the ERS by its service quality.	ERS Quality
Characteristics of the Knowledge Community	Among the several characteristics of the Knowledge Community reviewed in the literature and emerged through the case studies, the degree to which people know the others' knowledge domains seemed influencing, by the most, the ERS success. This degree of knowledge is formalized in the variable Knowledge of the Others. For its predominancy, over the other characteristics of the Knowledge Community, has been selected as the variable representing all the	Knowledge of the Others

| characteristics of the Knowledge Community. | |

Table 12 The conversion of the variables from the preliminary to the refined model

The utilization of the quantitative methodology of the opinion research imposes the definition of a construct for each variable of the refined model and the explicit definition of the hypotheses between the constructs.
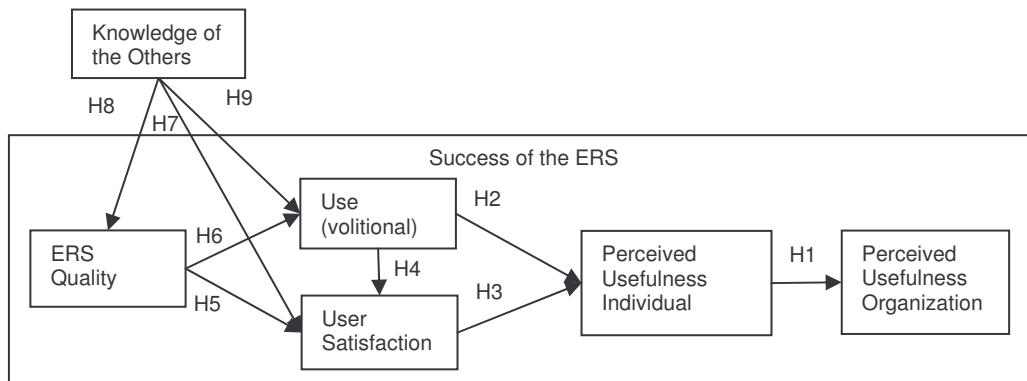
Figure 41 The refined model at the quantitative phase

Constructs

Perceived Usefulness to the Organization

Perceived Usefulness to the Organization measures the effects of the ERS on the organizational performance in line with the proposal of DeLone and McLean (DeLone and McLean 1992) with the variable Organizational Impact. As reported by Mirani and Lederer (Mirani and Lederer 1998) an IS can have several impacts on the organizations. The dimension, to which the ERS is directly related, is the information access. The organization should benefit of an enhanced access to information on the experts and subsequently access to the information from the experts. So, among all the possible dimensions on the perceived usefulness to the organization (Mirani and Lederer 1998) the one, to which this research pay attention to, is the **information access** benefit for the organization.

Perceived Usefulness to the Individual

Perceived Usefulness to the Individual measures the effects of the ERS on the individual performance in line with the proposal of DeLone and McLean (DeLone and McLean 1992) with the

variable Individual Impact. Individual Impact relates to the measurement of the recipient response to the use of the output of the information system (DeLone and McLean 1992). This definition is consistent with the construct Perceived Usefulness proposed by Davis in 1989 (Davis 1989): "the degree to which a person believes that using a particular system would enhance his or her performance". In relation to the ERS, the attention is directed to the service aspect of the IS. So, the Perceived Usefulness to the Individual related to the perceived **performance improvement** by the use of the ERS.

Use

Use measures the utilization of the ERS by the individuals in line with the proposal of DeLone and McLean (DeLone and McLean 1992) with the variable IS Use. The utilization of the ERS means the demand for counseling some experts by an individual.

Use could be measured through subjective measures of use (Lucas 1975; Lucas 1978; Maish 1979; Fuerst and Cheney 1982; Raymond 1985; DeLone 1988) or by objective measures of use (Swanson 1974; King and Rodriguez 1978; Lucas 1978; King and Rodriguez 1981). The consideration of informal ERS determines the preference toward **subjective measures of use**, due to the difficulties in collecting objective measures of the ERS use.

User Satisfaction

User Satisfaction measures the satisfaction of the user on the provision of the ERS that means on the answers obtained from the demands for counseling some experts. Satisfaction, as stated by Bailey and Pearson (Bailey and Pearson 1983 page 531) "in a given situation is the sum of the one's feelings or attitudes toward a variety of factors affecting that situation". Zviran and Erlich (Zviran and Erlich 2003) reviewed the utilization of the construct of User Satisfaction in IS discipline and they reported that different aspects are involved in user satisfaction measure. The considered aspects concern the user's emotional state following the reception of the ERS and in line with the proposal of Bhattacerjee and Premkumar (Bhattacherjee and Premkumar 2004), User Satisfaction involves two dimensions: **valence** (positive versus negative) and **intensity**.

ERS Quality

ERS Quality measures the global judgment relating to the superiority of the ERS (Parasuraman, Zeithaml et al. 1988). ERS Quality takes into consideration the ERS like a service instead of the ERS like product. As reported by Pitt (Pitt, Watson et al. 1995 page 137), a measure of the IS service quality is crucial for measuring IS success. The measure of Service Quality in IS discipline

took origin from the service quality scale developed in Marketing discipline by Parasuraman and Zeithaml (Parasuraman, Zeithaml et al. 1988). As already described in the paragraph "The model on the ERS success" (page 143), Service Quality is multidimensional and it extensively investigates the different aspects influencing the overall service quality perception (Jiang, Klein et al. 2002; Kettinger and Lee 2005), but in this research only an **overall assessment** of the ERS quality is researched.

Knowledge of the Others

Knowledge of the Others measures the degree to which people know each other. Knowledge of the Others is a component of the anonymity concept reviewed by Pinsonneault and Heppel (Pinsonneault and Heppel 1997-8) and it is based on social psychology (Mathes and Guest 1976; Johnson and Downing 1979; Propst 1979; Nadler, Goldbert et al. 1982; Solomon, Solomon et al. 1982). In relation to the ERS context, Knowledge of the Others is specifically related to the **Knowledge of the Others' knowledge domains**. This means that this variable measures the degree of awareness on the knowledge domains of the other members of the Knowledge Community. The qualitative phase highlights the importance of knowing each other and so Knowledge of the Others is added as an external variable to the IS success.

Hypotheses and case unit

The empirical research model is corroborated through **the test of the hypotheses** rising from the refined model. The process and ecology concepts provided the theoretical base for developing the temporal and causal influences among the dimensions of the IS success of the DeLone and McLean model of IS success proposed in 1992 and updated in 2003 (DeLone and McLean 1992; DeLone and McLean 2003).

ERS quality affects both Use and User Satisfaction. The amount of Use affects the degree of User Satisfaction, positively or negatively, and Perceived Usefulness for the Individual. Also User Satisfaction affects Perceived Usefulness for the Individual. Lastly, Perceived Usefulness for the Individual has some effects to Perceived Usefulness for the Organization.

So the hypotheses on the ERS Success are the following ones:

- **H1**: Perceived Usefulness for the Individual affects Perceived Usefulness for the Organization.
- **H2**: Use affects Perceived Usefulness for the Individual.
- **H3**: User Satisfaction affects Perceived Usefulness for the Individual.
- **H4**: Use affects User Satisfaction.

- **H5**: ERS Quality affects User Satisfaction.
- **H6**: ERS Quality affects Use.

In addition, the grounding relevance of Knowledge of the Others for the informal ERS success determines the addition of three more hypotheses:

- **H7**: Knowledge of the Others affects User Satisfaction. The degree of awareness on the knowledge domains of the members of the Knowledge Community could influence the satisfaction on the provision of the ERS. The individual who knows the knowledge domains of the other members could directly target the individuals who could provide a fully satisfying ERS.

- **H8**: Knowledge of the Others affects ERS Quality. The Knowledge of the Others could influence the choice of the person, whom to ask the provision of the ERS. The persons who have an extensive Knowledge of the Others could question the individuals who are more likely able to provide a high quality ERS.

- **H9**: Knowledge of the Others affects Use. The knowledge of the other knowledge domains could influence the use of the ERS. The complete Knowledge of the Others' knowledge domains makes the use of the ERS superfluous, since the individual can directly target the right expert, with the required knowledge, without passing through the ERS. On the other hand, the complete absence of awareness on the knowledge domains of the other could restrain the use of the ERS, since the individual does not know whom to ask for the ERS provision.

The definition of these three hypotheses is mainly based on the output of the qualitative phase. In general, the anonymity and, specifically, Knowledge of the Others has been successfully employed in IS discipline (Pinsonneault and Heppel 1997-8). Other authors support the hypothesis that people, searching for information, commonly explore personal communication prior to using formal sources (Wilson 1995; Hertzum and Pejtersen 2000) or unknown individuals (Granovetter 1983).

Finally, the link between characteristics of the Knowledge Community and the IS success, and subsequently the organizational performance, is well traced in Knowledge Management research (Lesser and Strock 2001; Lesser and Strock 2004; de Moor 2005; Thompson 2005; Koeglreiter, Smith et al. 2006).

All these hypotheses are tested through the quantitative method in order to confirm the empirical model

Case unit

While the unit of analysis remains the same between the qualitative phase and the quantitative phase, the level of analysis changes.

The single organization remains the unit of analysis, in accordance with the above-mentioned research questions, and the principles on the definition of the unit of analysis defined by Yin (Yin 1994 pages 21-24) and Darke (Darke, Shanks et al. 1998).

The individual is the new level of analysis to respond to the new aims. The interest is now toward the individuals, as members of certain Knowledge Communities and users of the Expert Recommending Service.

Data collection and storage

At this stage, the required data is too specific to have the possibility to find appropriate secondary data sources. Exclusively primary data are collected and the instrument employed to collect it is a questionnaire (an example is reported in the annexes).

The questionnaire is composed by the existing measures that the author evaluates as the most suitable to the research model. For each construct the existing scales are identified and then adjusted to the research object and to the context.

Knowledge of the Others

Knowledge of the Others measures the degree to which an individual knows the knowledge domains of each other individual in the domain under investigation. In IS discipline Knowledge of the Others was used by Pinsonneault and Heppel (Pinsonneault and Heppel 1997-8) for Group Support Systems. Their Likert-scale is declined to respond to the context under study. The original scale is composed of 7 items that refer to knowing the authors of the comments put in the Group Support System:

1. I believed others could identify my comments. Strongly disagree…strongly agree.

2. I believed that group members did not know each other well enough to identify the authors of comments. Strongly disagree…strongly agree.

3. I believed I had a distinguishing characteristic that allow other group members to identify my comments. Strongly disagree…strongly agree

4. I believed it was possible to identify the origin of the comments based on the author's personal characteristics. Strongly disagree…strongly agree.

5. I recognized the author of most comments. Strongly disagree…strongly agree.

6. I believed the group was large enough that it was impossible for any one to identify my comments. Strongly disagree…strongly agree.

7. I believed the group was large enough that nobody could trace comments back to their authors. Strongly disagree…strongly agree.

In other to be suitable to the ERS context and able to measure the degree to which people know each other knowledge domains, an important activity of adaptation has been performed. The 7 items are the following.

1. The colleagues know the knowledge domains where I have competencies. Strongly disagree…strongly agree.

2. Throughout the colleagues, everyone knows who the experts are in the different knowledge domains. Strongly disagree…strongly agree.

3. I have a specialization that allows me being recognized, among the colleagues, as qualified in certain knowledge domains. Strongly disagree…strongly agree.

4. It is possible to identify the experts in the different knowledge domains, among the colleagues. Strongly disagree…strongly agree.

5. I can recognize the experts in the different knowledge domains, among the colleagues. Strongly disagree…strongly agree.

6. The colleagues recognize me as qualified in certain knowledge domains. Strongly disagree…strongly agree.

7. The colleagues recognize the knowledge domains where the colleagues have competences. Strongly disagree…strongly agree.

ERS Quality

ERS Quality measures the global judgment relating to the superiority of the ERS (Parasuraman, Zeithaml et al. 1988). In this study only an overall assessment of the ERS quality is researched. Since the service quality scale originates from the Marketing discipline also the scale on the overall assessment of the ERS quality originates from the 3 item semantic scale used in the Marketing context by Spreng and Mackoy (Spreng and Mackoy 1996).

1. Overall, what is the level of service quality you receive from XXX service? very low/very high

2. Overall, what is the level of service quality you receive from XXX service? awful/excellent

3. Overall, what is the level of service quality you receive from XXX service? extremely poor/extremely good

In other to be suitable to the ERS context and to be able to measure the degree to which people overall judge the ERS like a service, the 3 items are adapted as follows:

1. Overall, what is the quality of the answers to your demands for recommending an expert? very low/very high.

2. Overall, what is the quality of the answers to your demands for recommending an expert? awful/excellent.

3. Overall, what is the quality of the answers to your demands for recommending an expert? extremely poor/extremely good.

Use

Use measures the utilization of the ERS by the individuals. The consideration of informal ERS determines the preference toward subjective measures of use. A variety of scales are used in IS discipline (DeLone and McLean 1992; DeLone and McLean 2003). Bajaj (Bajaj and Nidumolu 1998) proposed a scale with two items:

1. I currently use the XXX: not at all, less than once a week, about once a week, 2 or 3 times a week, 4-6 times a week, about once a day, more than once a day.

2. My current usage of the XXX is: 7-point semantic scale with endpoints: very infrequent/very frequent.

Bajaj (Bajaj and Nidumolu 1998) used one interval scale item and one semantic scale item for measuring use. In order to avoid the risk of mono-operationalization on the semantic scale, the author decides to add another item to the Use scale. The one item scale of Yoon and Guimaraes (Yoon and Guimaraes 1995) is added:

3. The XXX is used all the time. Strongly disagree…strongly agree.

The addition of this last question allows the composition of a two item semantic scale, which resolves the problem of mono-operationalization of the Use scale. The interval scale item of Bajaj remains included in order to analyze the perception of the time frequency of the use of the ERS, in terms of number of times the ERS is used per week or per day.

The three items in the context of ERS are the following:

1. I demand for recommending experts all the time. Strongly disagree…strongly agree.

2. I currently demand for recommending experts: less than once a month, once a month, few times a month, once a week, few times a week, once a day, more than once a day.

3. My current demands for recommending experts are: very infrequent/very frequent.

User Satisfaction

User Satisfaction measures the satisfaction of the user on the provision of the ERS that means on the answers to the demands for recommending experts. The considered aspects precisely concern the user's emotional state following the reception of the ERS, as proposed by Bhattacerjee and Premkumar (Bhattacherjee and Premkumar 2004), with their 4 item semantic scale:

1. I am___ with my use of XXX: Extremely terrible… extremely delighted.

2. I am___ with my use of XXX: Extremely dissatisfied…extremely satisfied.

3. I am___ with my use of XXX: Extremely frustrated… extremely contented.

4. I am___ with my use of XXX: Extremely displeased… extremely pleased.

In the context of ERS, the scale is adapted outputting this result:

1. About the answers to my demands for recommending experts, I am: Extremely terrible… extremely delighted.

2. About the answers to my demands for recommending experts, I am: Extremely dissatisfied…extremely satisfied.

3. About the answers to my demands for recommending experts, I am: Extremely frustrated… extremely contented.

4. About the answers to my demands for recommending experts, I am: Extremely displeased… extremely pleased.

Perceived Usefulness to the Individual

Perceived Usefulness to the Individual measures the effects of the ERS on the individual performance in line with the proposal of DeLone and McLean (DeLone and McLean 1992) with the variable: Individual Impact. At this regard, the scale used by Bhattacerjee and Premkumar (Bhattacherjee and Premkumar 2004) is selected as largely applied in the literature (Davis 1989; Taylor and Todd 1995; Karahanna and Straub 1999; Venkatesh and Davis 2000). This scale has the following 4 Likert items:

1. Using XXX improves my performance. Strongly disagree…strongly agree.

2. I find XXX to be useful for my studies. Strongly disagree…strongly agree.

3. Using XXX enhances my effectiveness. Strongly disagree…strongly agree.

4. Using XXX increases my productivity. Strongly disagree…strongly agree.

In the ERS context, the scale is adapted to relate specifically to the perceived performance improvement obtained by the demands for recommending experts.

1. Demanding for recommending experts improves my performance. Strongly disagree…strongly agree

2. I find the demands for recommending experts to be useful for my work. Strongly disagree…strongly agree

3. Demanding for recommending experts enhances my effectiveness. Strongly disagree…strongly agree

4. Demanding for recommending experts increases my productivity. Strongly disagree…strongly agree

Perceived Usefulness to the Organization

Perceived Usefulness to the Organization measures the effects of the ERS on the organizational performance in line with the proposal of DeLone and McLean (DeLone and McLean 1992) with the variable Organizational Impact. The dimension mainly affected by the ERS is the accessibility to the information. This accessibility to the information was operationalized by Mirani and Lederer (Mirani and Lederer 1998) in their scale Information Access, like a component of the Information Benefits macro-variable. Information Access is a Likert scale composed of the following 2 items:

1. The XXX enables faster retrieval or delivery of information or reports. Strongly disagree…strongly agree.

2. The XXX enables easier access to information. Strongly disagree…strongly agree.

The adaptation to the ERS context results in the following 2 item Likert scale:

1. In general in the organization, the demands for recommending experts enable faster retrieval of information. Strongly disagree…strongly agree.

2. In general in the organization, the demands for recommending experts enable easier access to information. Strongly disagree…strongly agree.

Questionnaire administration and data analysis

The administration of the questionnaire is anticipated by its reviewed by several people, mainly colleagues, and potential respondents. They suggested adjustments to the terminology, in order to improve the fitting of the questionnaire with the organizational context. The final version of the questionnaire was published on a **web** server, accessible by all the members.

The answering to the questionnaire was promoted through an email that was sent to the targeted individuals by the internal organizational referent. The targeted individuals were the organization members who perform the activities of recommending and searching experts. At the moment the response rate per week decreased to zero, a recall by email was sent.

The questionnaire was proposed via email but the answers were collected via a web form. In this way, the responses' data are automatically stored in the database.

Data are mainly analyzed through **Structural Equation Modeling statistical technique** but a preliminary analysis on the quality of data is performed before testing the structural model.

The data analysis is performed following the validation guidelines written by Straub, Bourdeau, and Gefen (Straub, Boudreau et al. 2004). These guidelines propose to assure:

- the content validity;
- the construct validity;
- the reliability;
- the manipulation validity;
- the statistical conclusion validity.

The statistical data analysis is supported by packaged software. SPSS and Amos were selected, after that several packages were reviewed, directly and indirectly (Gefen, Straub et al. 2000; Straub, Gefen et al. 2005; Straub, Gefen et al. 2006). The choice of these statistical packages resides in their partial integration and in the previous experience of the author on them.

Case selection

The combination of qualitative and quantitative methods should allow the triangulation of the data, which should cross-validate the achieved results, if these results, coming from different sources, converge and are congruent (Kaplan and Duchon 1988; Myers 2004; Straub, Gefen et al. 2004). The different sources are related to the different studies of cases, as a mean to overcome the problems involved in the study of a single case, reported by Lee (Lee 1989).

The entire empirical research, i.e. the qualitative and the quantitative phases, is applied in different contexts following the specification for a multiple-case study proposed by Yin (Yin 2002 page 54). The choice toward a **multiple case study** aims at exploring the Expert Recommending Services, the Knowledge Communities and their relationships with the Success of the ERS, in contrasting situations (Yin 2002 page 54). The author researches the theoretical replication, in these contrasting situations, and so few heterogeneous cases with contrasting characteristics are deliberately selected (Yin 2002 page 54), instead of seeking a direct replication in similar cases.

Such an approach aims at strengthening the external validity of the findings (Yin 2002 page 54). If the findings, from different cases, support the hypotheses, then the external validity of these findings will be stronger than the external validity obtainable from a single case study. Moreover, this external validity will be stronger also than the external validity obtained from a multiple case study of similar cases (Mason 1996 pages 93-94; Yin 2002 page 54).

The selection of the cases is conduced following the theoretical replication principles (Eisenhardt 1989; Yin 2002 page 54), which means that the same methodology is replicated in the attempt to find similarities and differences among the values of variables Expert Recommending Service, Knowledge Community, Success of the ERS, and to find relations between the cases.

The sampling of the cases follows a reasoning that aims at identifying cases with contrasting situations. This sampling method gives the freedom to change the number of cases, in the multiple

case study, during the prosecution of the research (Eisenhardt 1989; Silverman 2002 page 159). This freedom was balanced to the limited resources available that limits the total number of cases and the difficulties in identifying organizations that wish to participate to this study.

For all the cases, data are analyzed, firstly, by keeping separated the single cases, and, secondly, by comparing the cases (Eisenhardt 1989).

Among the many aspects about the ERS, the type of Information System providing the ERS seems the major contrasting point to discriminate among the cases.

As already reported in the literature review section, Expert Recommending Services are Information Systems that support the awareness on the knowledge distribution in the organization. All the four major types of Information Systems proposed by Martinez (Martinez 2004 page 116), informal, formal, paper-based, and computer-based, can support this awareness.

An increase in the **ERS formalization** exists, along this series of ERS providers. In this research the formalization level of the ERS distinguishes the cases in terms of the study object of the Expert Recommending Service (Figure 42).

Informal	Formal paper-based ERS	Formal computer-based ERS	**Formalization**

Figure 42 The formalization will discriminate between the Expert Recommending Services

A second differentiating element, among cases, is the characteristics of the Knowledge Communities.

The multiplicity of characteristics, as reported in the literature review section on Knowledge Community, induces to find a macro variable that could aggregate several characteristics. A first attempt found in the literature is made by Andriessen (Andriessen 2005a), who tried to aggregate these several variables on few main factors.

Andriessen (Andriessen 2005a) names the principal factor "Institutionalization". It describes to what extent the structure of the Knowledge Community and the relationships among its members are formalized and imposed by the management.

According to its level of **institutionalization** a Knowledge Community can be classified along a continuum between two extremes.

- To an extreme, there are Knowledge Communities highly institutionalized, at the point that they reflect the structure of the functional unit where the members work for. In this case, there is complete adherence between the membership to the Knowledge Community and the

membership to the organization, till its total superposition with the formal organization, where the members work for.

- At the other extreme, there are Knowledge Communities with no institutionalization at all, at a point that the Knowledge Community is invisible to the outsiders and eventually even to its members. There are no contract values among its members, no boundaries, no formalization, and no purpose. There are only few weak ties among the members of the Knowledge Community that make the Knowledge Community lives.

The institutionalization variable will be use to distinguish the different Knowledge Communities taken into consideration in this research (Figure 43).

Low: High: **Institutionalization**
Weak-tie community   Formal organization

→

Figure 43 The Institutionalization of the Knowledge Community

The success of the Expert Recommending Service will be used to further discriminate the cases. This study adopts the perspective of the individual users of the Expert Recommending Services, as reference stakeholders. The success of the Expert Recommending Service will be judged from the perspective of this group of stakeholders, and therefore the judgment will be about the perception of these individuals wishing to be better off.

The **multidimensionality** of IS success (DeLone and McLean 1992) obliges to take all its dimensions into consideration in the measurement of the success of the ERS.

The degree of ERS success distinguishes the different cases:

- To an extreme, there are the cases where a general feeling of unsuccessful ERS exists. In these cases the quality of the ERS is perceived like poor, the ERS is almost unused, the rare cases of use determines unsatisfied users and the there is not perception of the benefits that the ERS could produce for the individuals or for the organization.

- To the other extreme, there are the cases where the ERS is seen like largely successful. In these cases the ERS quality is positively appreciated, there is an extended use of the ERS, users are satisfied with their use experiences and the users perceive the usefulness of the ERS for them-selves and for the organization.

The perception of the users on the IS success, through its dimensions, will be used as the variable that discriminates on the success of the ERS among the different cases (Figure 44).
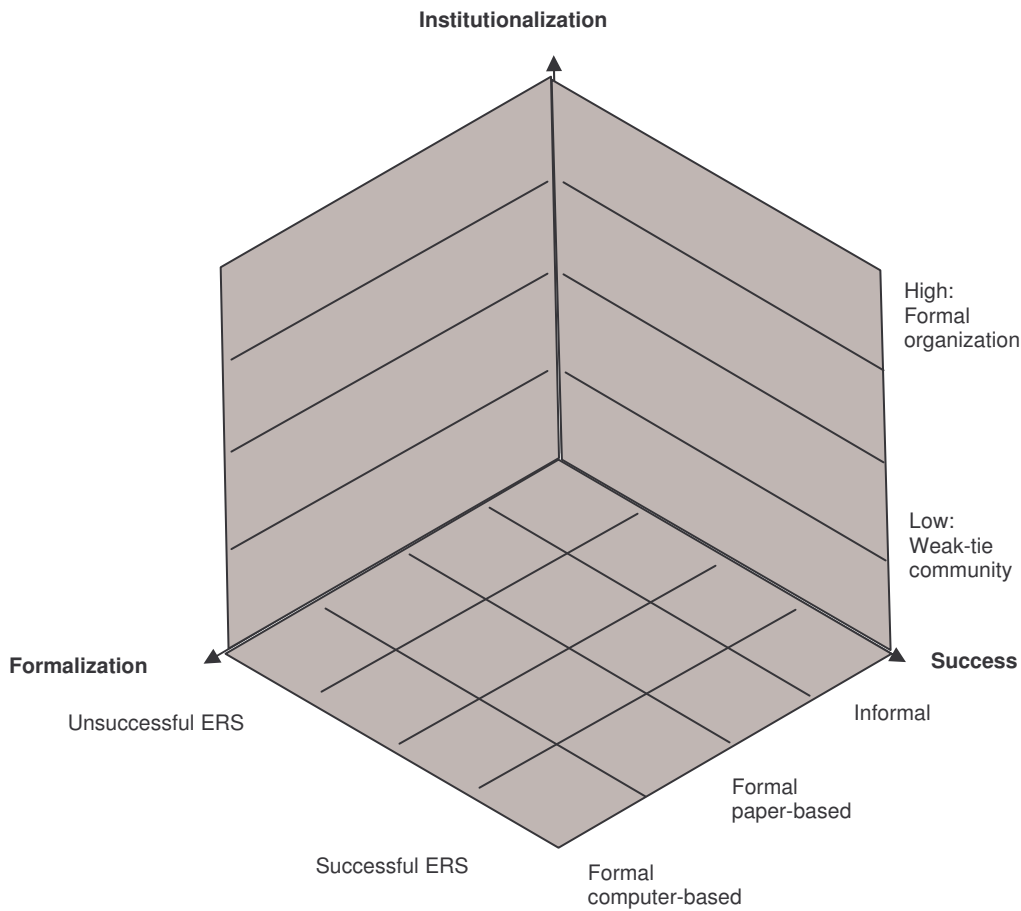
171

Figure 44 Degree of success of the Expert Recommending Service

These three dimensions allow the definition of a conceptual distance among cases, which can also be graphically represented in a **tri-dimensional space** (Figure 45).

Figure 45 The tri-dimensional space

The selection of the cases depends on their heterogeneousness with respect to the values of the variables characterizing the Knowledge Communities, the ERS, and the Success of the ERS, and the willingness of the organizations to directly benefit of the results of the study and to accept the conditions of the study.

The concluded presentation of the research model and methodology gives the basis to understand the empirical section of this study. The model and the methodology previously defined are applied and the results of the application reported.

5 Results

The results of this research are presented in the following pages. At first, a description of the three selected organizations is proposed. Subsequently, each case is analyzed on the three axes: the ERS, the KC, and the Success of the ERS and, later on, the comparison across the cases is accomplished. At the end the statistical analysis is performed and its main results proposed.

5.1 Case selection

Basing on the selection criteria previously described, three cases have been selected. At the beginning, a limited set of potential cases was available for the study. A promotion campaign was accomplished to attract some other organizations. At the end of the promotion campaign, the interested organizations were screened in order to find three organizations that apparently differ one another on the three axes:

- Expert Recommending Services;
- Knowledge Communities;
- Success of the ERS.

These **three organizations** are described in the following paragraphs.

NSS

NSS is the Italian subsidiary of a multinational corporation that provides **Information Technology services and solutions** worldwide. They combine mainly expertise in: consulting, system integration, outsourcing, infrastructure and server technology. This expertise is mainly employed in six vertical markets: financial services, public sector, communications, transportations, commercial, and media.

The global customer revenue in 2005 is $5800 million obtained, with the contribution of 37.000 employees in more than 100 countries worldwide. The Italian subsidiary includes around 550 employees, who are distributed in three locations in Milan, Rome, and Naple.

In terms of the three dimensions: Expert Recommending Services, Knowledge Communities, and Success of the ERS, NSS is preliminary evaluated as following:

1. ERS: a computer-based ERS seems to exist and to be integrated in the global enterprise information system. This computer-based ERS seems to be able to retrieve the list of the employees responding to some search parameters defined by the users, in terms of researched knowledge.

2. Knowledge Communities: the Knowledge Communities are inferred to exist around a common business activity, such as: consulting, system integration, outsourcing, infrastructure and server technology. At the same time, it is deduced the presence of Knowledge Communities aggregating employees on each specific vertical market: financial services, public sector, communications, transportations, commercial, and media.

3. Success of the ERS: the author noticed the presence of an internal project for an organizational restructuring of the personnel in the consulting business area, in order to favor the capitalization

of the individual knowledge across the vertical businesses. This project was a clear signal that the experts and their knowledge were perceived as not completely employed throughout the organization. So the ERS was perceived only partially successful.

MM

MM is a consortium in the making, composed by three business schools located in the same French town with their respective research centers in management. The members of the consortium provide **academic research and teaching** in the management discipline. The main research and teaching specialties are: accountability and control, finance, human resources, marketing and information systems. The main axes of research indeed are: technology management, entrepreneurship and innovation, agri-business management. The consortium includes approximately 110 PhD students, and 100 PhD professors, distributed among the three business schools.

In terms of the three dimensions: Expert Recommending Services, Knowledge Communities, and Success of the ERS, MM is preliminary evaluated as follows:

1. ERS: there is not a formal ERS at the level of consortium. In fact, the ERS is largely provided informally by the nearby colleagues, on request or proactively in case of apparent need of advice by a colleague.

2. Knowledge Communities: the Knowledge Communities seem to exist inside each business school, aggregating the personnel teaching management discipline. Moreover, the researchers are integrated in the national and international Knowledge Communities on their respective research axes and research specialties. On the other hand, a single Knowledge Community on management including all the PhD students and all the PhD professors of management in the same town does not clearly emerge like a very active entity.

3. Success of the ERS: the awareness on the knowledge of the colleagues seems limited only to the colleagues who share the same office or building. The members of the consortium of a business school seem lacking a clear understanding of the specialized knowledge of the colleagues in the other business schools. So, the recommendations of the experts are perceived successful inside each business school, while they are perceived not successful at the level of the MM consortium.

FST

FST is an Italia subsidiary of a multinational corporation that provides **pneumatic products, solutions, and services** worldwide. The corporation combines mainly expertise in: development, production, sales, and customization of pneumatic components and relative software for production

chain machines. In addition to this main business the organization offers a large service range of education, training, courses on pneumatic subjects, engineering, and business management in general.

The global customer revenue in 2005 is €1400 million obtained with the contribution of 10.000 employees in more than 50 countries worldwide. The Italian subsidiary includes around 180 employees who are distributed in five locations in Milan, Padova, Torino, Bologna, and San Benedetto del Tronto (AP). The Italian subsidiary has created a specialized controlled company, FST ETC, which is specialized in the business of education, training, and courses. It involves very few employees, but many free lance consultants, trainers and teachers.

The two organizations share the same building and some employees work in practice for the two organizations. Therefore, they are considered for the aim of this study as one main organization: FST.

In terms of the three dimensions: Expert Recommending Services, Knowledge Communities, and Success of the ERS, FST is preliminary evaluated as follows:

1. ERS: a computer-based ERS exists and is integrated in the corporate information system. This computer-based ERS has the functionality to retrieve the list of the employees responding to the specified organizational position and role, requested by the users.

2. Knowledge Communities: it is inferred the existence of Knowledge Communities, in Italy and worldwide, around a number of common professional roles, such as: sales, information systems management, or training.

3. Success of the ERS: the existence of an internal project for the improvement of the computer-based ERS is noticed, and the appointed reason for this project is the lack of precision of the present ERS and the imperative to be more responsive to the market demand of business solutions, through the integration of heterogeneous competences.
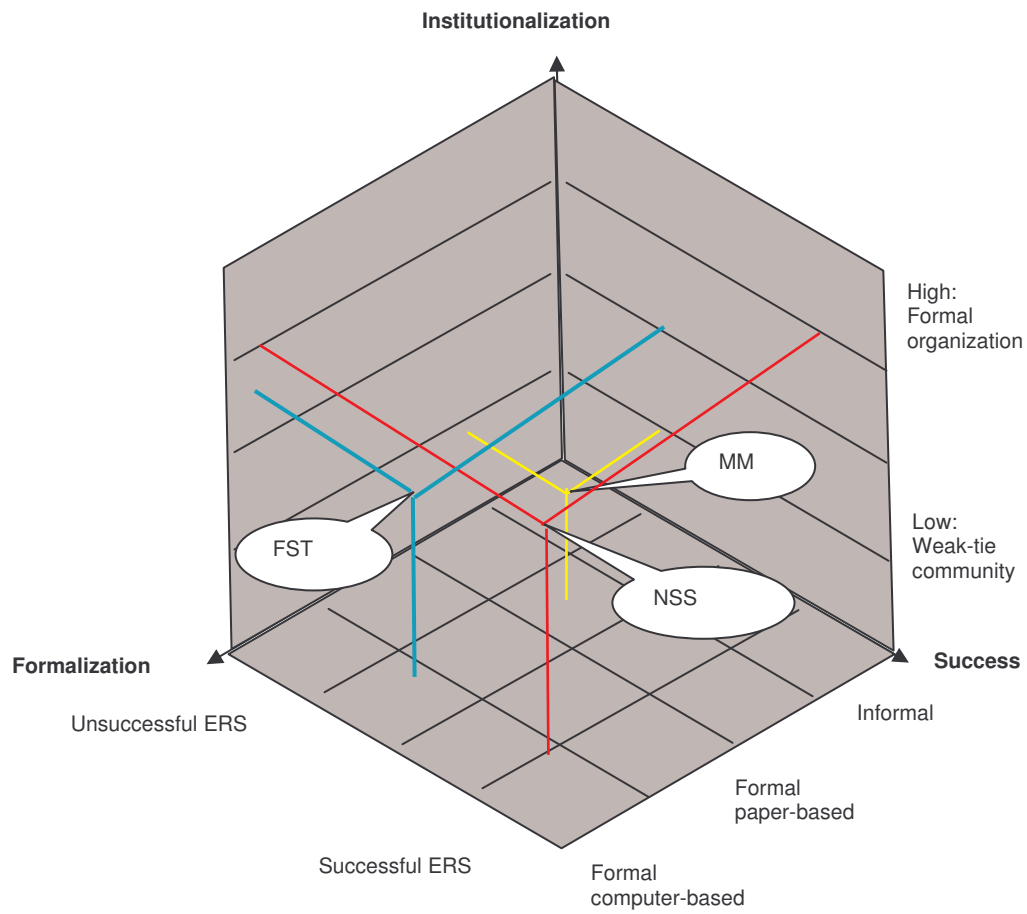
Positioning of the three cases

These three dimensions allow the definition of a conceptual distance among the cases and also their graphical representation in a tri-dimensional space (Table 13 and Figure 46).

	NSS	MM	FST
ERS	Computer-based ERS	Informal ERS	Computer-based ERS
KC	KC is overlapping the formal organization	Weak-tie KC	KC gathering people with professional communality.
ERS Success	Almost successful	Almost unsuccessful	Partially unsuccessful

Table 13 The values on the three dimensions

Figure 46 The tri-dimensional space and the preliminary position of the three cases

After this presentation, which justified the selection of these three cases, each one will be separately described.

5.2 NSS

The organization demonstrated its interest in the person of the responsible of the human resource management department and he indicated one member of his staff as the main referee for the interactions between the researcher and the organization. In accordance with this referee, a first set of two potential **interviewees** has been identified and this selection was based on the crucial role they seem playing in the provision of the ERS. The first two interviewees are:

1. A member of the human resource management department, because he is responsible for the content of the computer-based ERS.

2. A resource manager, because he is responsible of the allocation of the human resources to the business projects.

After that, a second set of other two potential interviewees was defined, this time targeting two employees directly involved in the main business of the organization:

3. A delivery manager, who is responsible of a business unit with around 15 members.

4. A software developer, who has a long standing experience in the organization.

After that, a third set of other two potential interviewees was defined:

5. A newcomer consultant, in order to have the point of view of an employee with a short experience in the organization.

6. A skill manager, because it seemed linking the business operations to the staff activities.

During the last two interviews, the saturation of the themes has been observed and therefore the schedule of other interviews was stopped (An extensive description of the characteristics of the interviewees is available in the Annexes).

Characteristics of the Knowledge Communities

After the presentation of the interviewees, the characteristics of the Knowledge Communities are delineated.

The Knowledge Communities are **not explicitly recognized** by the employees, but from their discourses, the existence of Knowledge Communities can be noticed.

These Knowledge Communities are described based on the characteristics outlined in the literature review section and presented in the following Table 14 (in the annexes a more discursive presentation is offered).

VARIABLE	NSS
Lifetime	The organizational restructure in the '90s determines the recombination of the employees in new KC

Size	Approximately 550 employees who are aggregated in different sub-communities basing on their allocation to a business unit.
Composition	The KC gathers employees working on the same business sector and in the same market.
Fragmentation	The fragmentation of the KC reflects the structure of the organization in sectors and in markets.
Geographical dispersion	The members of the KC on the same sector or market have different sub-communities for each location.
Mode of interaction	The most of the interactions are face to face of by mobile phone. Secondarily, the email, or the fixed phones are quite frequently used.
Degree of interconnection	The majority of interactions are between peers or between the superior and his subordinate.
Frequency of interaction	The interactions are frequent within the members of the same business unit.
Anonymity	There is not anonymity.
Openness	The membership to the KC depends by the membership to the organization, while the membership to a sub-community is influences by the formal allocation in the organization.
Purpose	For the organization, the KC are means for exploiting and recompensing the individual potential. For the members, the KC are facilitators of the information sharing and of the knowledge transfer.
Cohesion	The cohesion exists among the members of the KC, related to each single business unit. The cohesion is weak between different business units.
Degree of governance	The organization largely influences the KC characteristics, since the organization favors meetings among employees and defines the professional objectives and the working activities of the employees.

Table 14 The characteristics of the KC of NSS

Characteristics of the Expert Recommending Services

In the organization the Expert Recommending Service is not recognized with this name, but the interviewees clearly speak about services of recommending colleagues and about its provision has been directly observed.

The ERS is provided by a set of **computer-based systems and informally** between the colleagues.

The four operations of the ERS are described, in the following Table 15, for the two types of the ERS (in the annexes a more extensive description of the characteristics of the ERS).

OPERATION	NSS
Capturing	**Computer-based ERS**: the ERP module for the evaluation of the personnel, and curriculum vitae captures the information on the knowledge domains. **Informal ERS**: various sources exist such as the electronic repositories, and the personal information sharing.
Manipulating	**Computer-based ERS**: the data is stored in a central database but the manipulation is limited to some synthetic results. **Informal ERS**: the individuals manipulate without any regulation by the organization.
Retrieving	**Computer-based ERS**: the superiors can search and browse in the CV and in the evaluations of their subordinates. The subordinates do not have access to

	the retrieving operation.
	Informal ERS: the retrieval is obtained asking to the colleagues or the superiors.
Displaying	**Computer-based ERS**: the results of the personnel evaluation and the CV are displayed to the superiors, while the subordinates do not have access at all to this information.
	Informal ERS: the information is freely provided by the colleagues and the superiors.

<div align="center">

Table 15 The characteristics of the ERS in NSS

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Success of the ERS and relationship between ERS and its Success

The success of the ERS is multidimensional and involved the dimensions explained in the conceptual model section. The description of the success of the ERS is therefore reported on each of these dimensions.

Use

The retrieval of employees using the computer-based ERS is **limited** to the superiors and the human resource management staff. Exclusively the human resource management staff has the complete accessibility to the information on all the personnel. The superiors have access only to the information on their subordinates.

The subordinates do not have access to the operations of retrieval available in the computer-based ERS The only part of the computer-based ERS that is accessible to all the employees is the input of data, for the capturing of the information on the employees' knowledge domains. This data input by all the employees is compulsory and has periodical deadlines.

> *"Quindi ritornando a chi li utilizza: direi che è obbligatorio utilizzarlo"*

The data input to the computer-based ERS is performed mainly on time, while the information retrieval by the superiors is often delegated to the human resource management staff. The superiors complete the output of the computer-based ERS with the exploitation of the informal ERS, asking directly to their colleagues. More often, the superior does not use at all the computer-based ERS since he prefers the informal ERS.

> *"Di rado prima di fare questo giro {via the informal ERS}, vado a vedere se è aggiornato il CV {on the computer-based ERS}"*

> *"di norma {av}viene in questa modalità meno formale"*

The subordinates have no choice between the computer-based ERS and the informal ERS. They cannot access the computer-based retrieval functionality. So, every time they need help, but they are

not aware of the possible experts, they ask for the recommendation of some experts to their superiors or to their colleagues.

Service Quality

The computer-based ERS is perceived like a "simple", "ease", "innovative", "complete" service.

"Questi sistemi a tendina molto più belli e molto più semplici, anche per analfabeti."

"è un sistema molto più completo"

"è uno strumento potente"

Some aspects seem nevertheless negatively evaluated, in particular about: the data input, the homogeneity of the information displaying, the complexity of the retrieving form, and the time delay in information displaying.

Firstly, the data input is clearly stated like too complex and too time-consuming task. Much information is required and the provision of this information demands a long reflection for the employees and their superiors.

Secondly, the information displaying is not always homogeneous. There is not a standard for the editing of the curriculum vitae and the CV are stored, like freely edited MS-Word documents, in the central repository. Different languages and different presentation formats are used to edit the CV and the meaning of the content of the CV is not regulated by the organization. The absence of any manipulation and homogenization on the CV determines that they are presented as they have been stored, in different languages, formats and using different terms.

Thirdly, the parameters that the user has to set to run the retrieval of the employees are a lot and the range of their possible values unclear. So the definition of the correct query to retrieve the experts is not easily achievable, in particular for the infrequent users.

"Questi sistemi sono un po' leziosi, danno un po' fastidio."

"Per altro, il limite è che se non si ha il dizionario, per capire qual è il livello, si va per tentativi."

Finally, the storage of all the information in a central repository produces a sensible time delay, from the moment of the run of the query to the moment of the information displaying.

This time delay, the risk of failing in setting the correct parameters, and the heterogeneousness of the output are counterbalance limit the usage of the computer-based ERS. On the contrary, employees appreciate the kindness and readiness of the colleagues in providing the informal ERS and in general the quality of the informal ERS.

Information Quality

The quality of the information provided by the computer-based ERS is enhanced by the control of the superior on all the data inputted by the subordinates. Except for the content of the curriculum vitae, the other data are strictly structured and codified in order to reduce input errors.

> *"Se tutti {the CV} fossero scritti in inglese agevolerebbe la ricerca all'interno dell'azienda"*

So the displayed information is **correct** but the risk of the obsolescence of the data remains. The employees have the habits to update the personal data nearby the imposed deadline. Therefore in periods far from the last deadline the stored data could be obsolete.

The employees judge that the informal ERS provides high quality information. The colleagues and the superiors seem providing correct recommendations of the experts with the research specialized knowledge. The informal ERS also allows the exchange of some contextual information that favors the assessment of the needs of the employees and of the knowledge domains of the potential experts. Nevertheless the risk of getting a wrong piece of information through the informal ERS exists, as far as no organizational control is exercised.

> *"Non c'è sistema che garantisca la qualità, oppure no, dell'eventuale bufala rifilata a un collega"*

User Satisfaction

The employees seem **generally satisfied** of the ERS, even if some elements of dissatisfaction are highlighted in the interviews. The superiors are satisfied of the amount and completeness of information on their subordinates because this information gives an important support in the decision making.

> *"Credo che questa possibilità, da possibilità di vedere, veramente, di poter basare il proprio sistema decisionale su una serie di informazioni aggiornate che veramente in tempi rapidissimi si possono raccogliere, senza essere a livello di analisi costretti a dipendere evidentemente dagli altri, altre fonti"*

> *"Parliamo però di dati concreti, basiamo la nostra analisi su fatti e non su opinioni o su sensazioni"*

Moreover, the employees are pleased of the continuous improvement of the input data interface even if the quantity of required data is perceived exaggerated.

About the informal ERS, employees cite, as elements of satisfaction, the quality and timeliness of the recommendations and the trustworthiness in the provided information.

The negative aspects for the users of the computer-based ERS are mainly about the retrieving operation, because the required parameters to run the query seem excessive in number and complexity.

> *"questo può essere a volte un appesantimento"*

Moreover the time delay in the displaying of the information displeases the users.

> *"Adesso, sarebbe meglio avere dati veloci tali per cui se uno sbaglia anche l'impostazione non spende minuti per avere i risultati e poi l'aspetto di elaborazione, anche del look del dato, lasciarlo all'utente che poi se lo monta su Excel e si gestisce i dati"*

In addition, the employees find also unpleasant the data input since it is judged very long and cognitively exhausting.

> *"Sono molto burocratiche e gli portano via tempo sul progetto"*

On the other hand, the employees are satisfied of informal ERS, because the colleagues and the superiors provide high quality recommendations on the experts with the adequate knowledge.

> *"diciamo che come metodo funziona abbastanza bene"*

Perceived Usefulness

The main limit, for the subordinates, to perceive the usefulness of the computer-based ERS, sits in the **prohibition to access** the computer-based ERS retrieving operation. The subordinates are involved in the provision of data, but they do not access the information retrieving operation. Even though the superiors have the authorization to access the retrieval by computer-based ERS, some of them did not completely assess the usefulness of the capturing and of the retrieving using the computer-based ERS. In fact, these superiors state that they can have the same information asking it directly to the colleagues.

This limited perception of its usefulness reduces the frequency of the update of the personal information, in addition to the compulsory ones. This reduced frequency of update has the effect of decreasing the value of the stored information, because the risk of returning obsolete information rises.

In summary, the usefulness of the ERS, informal or computer-based is appreciated for its effectiveness in identifying the researched experts.

"Questo diciamo che potrebbe essere più utile per esempio se fosse qualcosa tra un interno all'Italia. Una persona a Roma che cerca sviluppatori, non ne trova e dice, guarda nel sistema e dice "Toh, a Milano c'è uno sviluppatore web che fa al caso mio""

The majority of the attempts of finding experts seems successful and the retrieved experts answer favorably to the requests of the colleagues. However, if the request implies for the expert a significant amount of time, then the direct superior of the expert has to approve it.

Net benefits

The net benefits are not quantitatively accounted by the organization. The perception of the interviewees is related to the reduction in the workload due to data management activities and the retrieval of information. The net benefits in the data management activities are related by the automation through the computer-based ERS of several operations, such as the storage of the information in the central repository. The net benefits in the retrieval of information concern the immediate response to the requests of experts using the computer-based ERS, once the parameters are defined.

"Il vantaggio è che rimane al paese proprio quella attività di (.4) consulenza, quindi più qualificata, più professionale, nei confronti dei capi e dei collaboratori e non c'è l'attività più triviale di inserimento dei dati"

This delegation, to the employees, of the data input produces a net benefit for the human resource management staff but a negative effect for the employees who are now obliged to inputting the data at the place of the human resource management staff. This negative effect for the employees determines also a negative net benefit for those employees who are not authorized to the computer-based ERS for the retrieval of the potential experts.

"loro hanno poco ritorno su questa attività qui"

The overall net benefit of the ERS is nevertheless perceived **positive** by the personnel. The ERS, computer-based or informal, allows the effective employment of resources for the organizational advantage since it facilitates the transfer of knowledge and the responsiveness of the organization.

Relationship between KC and Success of the ERS

Beyond the presence of a computer-based or an informal ERS, the interviewees **explicitly pointed out** the importance of some cohesion among the employees for an effective knowledge transfer, while, in general, their discourses put in prominence the importance of the existence of some Knowledge Community. In addition, to be integrative of the formal organization, these Knowledge

Communities should have a common purpose that should be consistent with the aims of the organization.

> *"il vero tema difficile da risolvere, non è quello di avere uno strumento che ti aiuti meglio, ma è quello che le dicevo prima, come trovare il modo di convincere tutti gli attori in causa che esiste un bene superiore, rispetto all'interesse. Ecco questo è l'aspetto più critico di questa attività, più che non il sistema in quanto tale."*

> *"noi siamo abbastanza uniti come team manageriale"*

> *"lo spirito di team all'interno è forte, quindi la prima reazione è quella di chiedere aiuto ai colleghi."*

The organization is conscious of the importance of the cohesion among the employees, and therefore it proposes some initiatives, such as the "team meetings", to stimulate it.

> *"team meeting dove non si parla solamente di lavoro, ma anche… Ci possono essere dei giochi di ruolo, solo per aumentare la coesione all'interno del gruppo"*

Once there is cohesion among the employees and agreement on the aims to pursue, the further step is the development of trust in the colleagues.

> *"Per quello che dicevo, poi sì gli strumenti sì, certo aiutano, sì ma poi alla fine la differenza la fa il rapporto quotidiano, la credibilità che si ha acquisita verso i colleghi"*

The specific characteristic of the Knowledge Community that is considered by the employees influencing the ERS success is the knowledge of the colleagues. Knowing the colleagues is an important factor influencing the trustworthiness toward them. This knowing could increase the personal awareness on the knowledge domains of these colleagues. This could reduce the need to ask for the provision of the ERS, since an individual knowing the colleagues would probably be aware of their knowledge domains. So he could directly address to the colleague who has the specialized knowledge that he required.

> *"grosso modo, le risorse si conoscono e soprattutto si conoscono i responsabili che sanno se quella risorsa è libera piuttosto che no"*

> *"Ci conosciamo tutti"*

This acknowledgement of the colleagues, specifically of their knowledge domains, is also sponsored by the organization in formal events called "Sharing over".

> *"è una cosa che viene effettuata abbastanza spesso all'interno della società: Sharing over. Diciamo la condivisione della conoscenza per sapere chi fa cosa, su quali progetti ha*

lavorato, proprio per non fare una compartimentazione stagna dei vari ambiti delle varie (specialità): "Io faccio questo, tu lavori in quel gruppo, fai quell'altro". Va sempre bene mantenere un amalgama in modo che le persone sappiano dove andare a pescare. Non solo i manager, ma anche i semplici attori, sviluppatori, gestori del database, architetti, eccetera, etc."

On the opposite, in case an employee does not know his colleagues, the ERS can be an important element to identify the potential experts.

"E' chiaro che, se anziché essere solo 200, strutturati in questa maniera, fossimo 1000, allora non tutti li conosci, allora forse sarebbe più facile avere bisogno di accede al sistema e da lì individuare chi {is the expert}"

Cohesion, and in particular the knowledge of the colleagues, seems the key characteristic of the Knowledge Communities that influences the success of the ERS.

In conclusion, the direct observation and the interviews highlight the influence that knowing the others has on the use of the ERS, the ERS Quality and the User Satisfaction.

5.3 MM

The director of one of the three research centers was the first executive who expressed his interest in the research. With his support, the two directors of the other research centers and the three deans of the three business schools were involved and convinced to authorize this study.

The first round of interviews was addressed to the three research center directors and the three business school deans. The dean of a business school was unavailable for the time of the study and so this interview was bypassed.

The second round of **interviews** was addressed to some PhD students and some PhD professors, without any direction role in the six organizations participating at the consortiums. A PhD student and a PhD professor for each school/center were extracted from the list of their PhD students and their PhD professors. Nevertheless, the unequivocal inclusion of each member of the consortium in one business school and one research center was not possible. Several members were, simultaneously, members of different research centers and were teaching in different business schools. Also some of the interviewed PhD students and some of the interviewed PhD professors were, at the same time, involved in different research centers or in different business schools. This was particularly accentuated in the research center MRC, since this center has not the legal authorization to prepare PhD students alone.

The general availability of the members of the consortium toward the study gave the advantage to easily extend the sample of interviewees, beyond the original estimation. This accessibility of the members was particularly useful, due to the relieved heterogeneity perceived among the different business schools and the different research centers.

After the 14th interview the author perceived the saturation of the themes. Two other interviews were already scheduled and therefore they were performed. At the end, 16 interviews were completed (In the annexes an extensive description of the interviewees).

Characteristics of the Knowledge Communities

After the presentation of the interviewees, the characteristics of the Knowledge Communities are delineated.

The Knowledge Communities are **explicitly recognized** by some of the members of the consortium since they talks about "communauté". Also the others, who do not expressly mention the Knowledge Communities, give clear indications of the existence of some Knowledge Communities in the consortium. These Knowledge Communities are described based on the characteristics

outlined in the literature review section and the presentation synthetically reported in the following Table 16 (in the annexes a more extensive presentation).

VARIABLE	MM
Lifetime	The KC originates few decades ago, with the diffusion of the management scientific discipline in the town. This KC is now under strong reshape due to the start-up of the official consortium among the business schools and the research centers.
Size	Approximately 220 members who are aggregated in different sub-communities basing on their research, teaching subjects, and affiliation.
Composition	The involvement in research or in teaching activities on management in town is the common denomination among the members. Beyond this communality, they are members of different organizations, or they have different educational background.
Fragmentation	The main KC is fragmented in different intersecting sub-communities. These sub-communities are specialized in a teaching or research subject or they gather people of the same business school or of the same research center.
Geographical dispersion	The business schools and research centers are located in the same town, but some members have teaching and research activities also elsewhere.
Mode of interaction	The interactions take place mainly through face to face communications or via email. Some other used communication tools are the telephone, and the instant messaging.
Degree of personal interconnection	The majority of interactions are between peers, during the informal meeting, or assembly interactions, during the formal group meetings.
Frequency of interaction	The interactions are volitional and they depend largely on the individual attitude. Some members interact intensively, while others are largely autonomous and independent.
Anonymity	There is not anonymity.
Openness	The membership to the KC can be achieved by the inclusion in one of the research centers or in one business school of the consortium. To joint a research center the individual has to explain his professional interest to the director, while to joint a business school the individual has to teach there.
Purpose	For the organization, the KC is a mean to promote the scientific visibility and recognition of the teaching and of the research activities in management in the town. For the members, the participation in the KC aims to the improvement of the quality of the teaching and of the research activities.
Cohesion	The cohesion is growing thanks to the intervention of the deans and of the directors. There are some frictions and some conflicts between the research centers and between the business schools, caused by a spirit of competition existing among them.
Degree of governance	The management of the consortium stimulates the interactions and the cohesion among the members of the KC. Nevertheless the individual behavior is autonomously determined by each member because each member has a large professional autonomy in teaching and research.

Table 16 The characteristics of the KC in MM

Characteristics of the Expert Recommending Services

Within this organization there is no explicit recognition of the presence of an Expert Recommending Service, but the interviewees clearly speak about services of recommending colleagues through both computer-based and informal services.

The ERS is provided by **different computer-based systems and informally** by the colleagues. The four operations of the ERS are described for these two types of the ERS.

Inside the MM, the computer-based ERS has a restricted diffusion and is composed by heterogeneous solutions. The computer-based ERS is limited to the research centers and the three research centers have different and separated computer-based ERS. The research center FR started a project for the development of a computer-based ERS but the center stopped it before its ending. So the description of the computer-based ERS is limited at two research centers: the MRC and the GRC (In the following Table 17 the synthetic description, in the annexes the analytical description of the characteristics of the ERS).

OPERATION	MM
Capturing	**Computer-based ERS**: some different and separated solutions among the schools and the centers, like Excel worksheets and web pages, are employed to collect the individual competence profile. **Informal ERS**: various sources exist, and the work outputs and the exchanges at the meetings are the main ones.
Manipulating	**Computer-based ERS**: there is not manipulation of the captured data. **Informal ERS**: the individuals manipulate the information without any regulation by the organization.
Retrieving	**Computer-based ERS**: the retrieval is performed browsing among the worksheet or the web pages, but there is not a search engine. **Informal ERS**: the retrieval is obtained asking to the colleagues.
Displaying	**Computer-based ERS**: the description of the members is provided in the worksheet and in the web pages. **Informal ERS**: the information is freely provided by the colleagues.

Table 17 The characteristics of the ERS in MM

Success of the ERS and relationship between ERS and its Success

The success of the ERS is multidimensional and involved the dimensions explained in the conceptual model section. The description of the success of the ERS is therefore reported on each of these dimensions.

Use

The use of the computer-based ERS is **compulsory** for the MRC and GRC research centers' members, for the provision of their data to the ERS. The direction of the two research centers

imposes to their respective members this data entry, but with different frequency. The GRC demands it yearly for the publication of the annual report, while the MRC, for the recent introduction of the computer-based ERS, has not yet defined a minimum frequency of update of the stored data.

The retrieval of the experts using the computer-based ERS is possible using the Microsoft Excel worksheet solution proposed by MRC, or the web-based application proposed by the GRC.

The Microsoft Excel worksheet solution proposed by MRC is accessible only to the members of the research center MRC since the worksheet has been distributed only to its members. However, it seems not used.

> "R : Est-ce que vous avez jamais accédé ? E : no"

The web-based application proposed by the GRC is publicly accessible to everyone connected to the Internet. Nevertheless the members of the GRC do not use it to retrieve the experts.

The informal ERS is the almost exclusively solution for obtaining information on the potential experts on a specific domain.

> "qualcuno mi ha detto: "conosco qualcuno che lavora da Sanofi". Mi ha dato il numero di telefono e ho chiamato"

> « Elle m'avait donné le nom d'une personne qui travaillait ici »

> « Et au fur et à mesure je disais que j'avais ce genre de problème, c'est XXX qui est à coté qui m'a dit « Tiens je sais que YYY avait ce genre de problème. Pose lui la question sur cette méthodologie, s'elle pourrait t'aider » »

> « je les dis de voir quelqu'un, chez un collègue »

> « on les envoie chez les collègues qui sont plus »

Service Quality

The two computer-based ERS are **not perceived as high quality services** as their services are very limited in terms of variety, completeness, and update of the data and in terms of the proposed functionalities.

> "Pour le moment il est relativement statique »

On the other hand, the informal ERS is much more considered a high quality service. There is a shared appreciation of the attention and of the availability of the members to recommend experts to the other colleagues.

« J'avais toujours des bons conseils de ma directrice de thèse. »

Nevertheless, some critics are expressed on the quality of the service. In particular these perceptions come from the requests of recommendations to individuals who are not members of the same research center or business school, and between members with different ages and positions.

« C'est un principe nazi, la méthodologie est la même, comme pour le petit sergent de l'armée. J'en ai été bavé quand j'étais militaire, «je suis chef et je vous en fais baver ». Donc je pense que la recherche est en train de ça. On a l'impression qu'on doit souffrir pour chercher, donc il faut souffrir. »

Information Quality

The quality of the information provided by the computer-based ERS is **poor** in comparison with the richness and flexibility obtainable from the informal ERS. The main problems on the two computer-based ERS reside in the obsolescence and in the limited quality of the data. Data of the GRC computer-based ERS are generally updated only once a year, while the data of the computer-based ERS of the MRC have never been updated yet. Moreover the quantity of information on the knowledge domains of individuals is limited at the point of being largely partial.

« il y a la liste de membres, une liste d'activités et pas d'autre »

So, the quality of information of the computer-based ERS is in general negatively appreciated. The judgment on the information quality provided by the informal ERS is better even if heterogeneous. Many attempts of retrieving experts from the colleagues obtain responses with high quality information.

"il m'a donné des excellents éléments"

« C'est quelqu'un qui m'avait donné des bons conseils »

Nevertheless, some members reports that the informal ERS do not provide always good information because the returned information is incomplete, wrong, or absent at all.

« Mais d'ailleurs sur cette méthodologie, ce n'est pas tellement {XXX} qui m'a aidé le plus, car il m'a envoyé des textes qui étaient très anciens. »

« Il m'a répondu de débrouiller moi, chercher sur les sites…Il ne m'a pas donné la réponse quand il aurait pu me la donner, il l'a gardé pour lui »

User Satisfaction

The computer-based ERS of the research center MRC and of the research center GRC are perceived as very **marginal** solution for finding experts. People do not express any satisfying judgment on these two computer-based ERS. The preponderance of the informal ERS put aside the two computer-based ERS, which are seen just a little better than nothing, but not very significant.

So, the reflections of the interviewees are mainly about the informal ERS and the general feeling is of large satisfaction.

> *« D'ailleurs je suis content »*

Nevertheless, some imprecise recommendations are determined by the not complete the sharing of information on the knowledge domains of the colleages.

> *"Mais d'ailleurs sur cette méthodologie, ce n'est pas tellement XXX qui m'a aidé le plus, car elle m'a envoyé des textes qui étaient très anciens, qui datent 92. Mais ça m'a permit d'avoir une première lecture. »*

Perceived Usefulness

The computer-based ERS are not perceived very useful. The FR research center does not even complete its project of developing a computer-based ERS because it was perceived **not useful**.

> *« Répertorier sur un plan graphique des compétences clés pour quoi faire ? »*

Similarly, the MRC research center members are aware that the computer-based ERS does not positively influence the recommendations of the experts.

> *« Donc ce tableau on l'a constitué, il est accessible, mais on s'aperçoit que ce n'est pas véritablement lui que crée que les gents travaillent ensemble, c'est plus les réunions informelles. »*

> *« ce n'est pas parce que on va mettre un tableau à disposition avec la liste des compétences de chacun que les gents vont chercher des compétences là »*

The computer-based ERS is seen not useful also for the presence of a very useful informal ERS. The usefulness of the informal ERS is express in its capacity to find the right experts on the specific searched knowledge domain.

> *« je voulais trouver quelque chose de précis. Sans elle je n'aurait pu avancer »*

> *« Elle a était très utile. »*

Net benefits

The net benefits of the computer-based ERS are not quantitatively and qualitative accounted by the research centers.

The MRC has not yet even thought to an evaluation of the net benefits of their Microsoft Excel worksheet. In general the net benefit of this ERS only relates to a perception of a better acknowledgement of the knowledge domains of the colleagues. Nevertheless, the director of the center supposes to obtain greater benefits from the publication on the web site of the research center of the information on the knowledge domains of the individuals.

> *"Donc ça a était un premier pas pour mettre à jour des besoins et par fois de réponses à ces besoins. « J'ai besoin d'une relecture en français car je suis étranger ». Il y a des gens qui on dit « je peux fait la relecture sur les publications »"*

Also the GRC research center does not estimate the net benefit of its computer-based ERS. Nevertheless, it is considered useful, especially for the individuals outside the center, even if any evaluation has been carried out. Moreover its utility derives from a data collection that is exploited for other aims, as such the annual reports. For this aim, the web-based collection of data is considered important to have updated information at the time of the report redaction.

The net benefit of the informal ERS is **perceived positive** as it allows the effective counseling of the experts both within the formal organization, the Knowledge Community and the outside world, giving the opportunity to develop partnerships.

> *« Pour permettre ici d'avoir une visibilité sur ce qu'on fait »*

Relationship between KC and Success of the ERS

The first members to be questioned to retrieve some potential experts are the ones geographically proximate and trusted by the seeker. The people with whom the members share their offices and with whom the members have a longstanding relationship are the main providers of the ERS. There is an obstacle to ask for the provision of the ERS, and to ask for help, in general, to the members with, whom there is not a personal relationship, or affinity.

> *"je me prend mal aller solliciter quelqu'un que je ne connais pas personnellement"*

> *« je demande de l'aide à des collègues que je connais en qui j'ai confiance et qui je sais que je peux appeler pour avoir une réponse dans le cas ou j'ai besoin. »*

> *« Je pense que c'est par affinité, en tout cas pour moi, c'est plus par affinité, donc c'est les personnes que je connais, que je côtoie fréquemment. J'aurais plus allé les voir leurs demander une information que un doctorant que je ne connais pas. Donc c'est plus par affinité »*

On the contrary where a **personal relationship** or an affinity between two persons exists being members of the same Knowledge Community, or not, does not influence the request of ERS, and the request for help in general.

> *"ils sont des chercheurs extérieurs mais c'est plus un contact personnel qui m'a fait travailler ensemble. Ce n'est pas parce que je lu un article et j'ai décidé de travailler avec personne. Il y a avant un travail de collaboration un contact interpersonnel"*

This need for a personal relationship is more important for newcomers and PhD students, because there is a sort of hierarchical distance between PhD students and PhD professors.

> *« Peut être que plus tard quant la réputation, quant la reconnaissance, en tant que chercheurs est plus établi, on a plus d'expérience, c'est plus simple de travailler avec des gens sans les connaître, mais pour le moment c'est un peu (1.0) »*

At the same time, in general members of the MM Knowledge Community seem to know each other quite enough. Many of them studied or worked together or they are working together now. The rest had the possibility to meet the others during the meetings, the conferences, and the workshops proposed by the MM consortium.

> *« je les connaisse bien »*

> *"je les connaissais en effet, je les avais déjà vus, j'ai déjà discuté avec eux en effet."*

The newcomers, on the contrary, do not know the other members and so they exploit the structure of the business schools and the structure of the research centers, in the departments and in the research groups to target the potential experts, without passing through the ERS.

> *« comme il y a beaucoup de sous-groupes, on sais déjà plus ou moins qui fait partie de quoi et puis dès que dans les sous-groupes on aborde les sujets de recherche, on sais qui fait quoi »*

5.4 FST

The organization demonstrated its interest in the person of the Chief Executive Officer, who remained the direct internal referee for the entire process of data collection. He was the first interviewee and, at the end of his interview, a first set of five potential interviewees was listed in order to cover the crucial roles in the provision of the ERS and the heterogeneous professions in the organization. The five potential **interviewees** accepted to participate in the study and they were:

1. Sales director, who is responsible of the all the sales of the organization.
2. Sales area manager, who coordinate the sales representative of a geographical area.
3. IT director, who is responsible of the IT infrastructure in coordination with the international corporation.
4. Chief Human Resource Officer, who is in charge of the management of the personnel.
5. Chief Operation Officer of FST ETC, who defines the commercial offer of the subsidiary.

The coverage of these roles and professions brought to the saturation of the themes and therefore the schedule of other interviews was stopped (An extensive description of the characteristics of the interviewees is available in the Annexes).

Characteristics of the Knowledge Communities

After the presentation of the interviewees, the characteristics of the Knowledge Communities are delineated.

The Knowledge Communities are **not explicitly recognized** by the employees, but the existence of Knowledge Communities can be noticed, from their discourses. These Knowledge Communities are described based on the characteristics outlined in the literature review section and synthetically reported in the following Table 18 (offering in the annexes an extensive presentation).

VARIABLE	FST
Lifetime	The suppression of the production facility and the development of the education business in the '90s determine a reshape of the KC.
Size	Approximately 180 employees between FST and FST ETC. The FST ETC has also around 100 free-lance consultants.
Composition	The KC are composed by employees doing the same professional activity.
Fragmentation	The KC fragmentation follows the organizational divisions in functional units.
Geographical dispersion	The organization has several locations in Italy and the KC are distributed across them.
Mode of interaction	The interactions are face to face or by IT tools. The telephone and the Lotus Notes application are used especially for the employees temporarily outside the organization.
Degree of interconnection	The majority of the interactions are personal, while another part of the interactions involve the whole selling team or the whole organization.

Frequency of interaction	The frequency of interaction is high between members of the same team, or between the superior and his subordinate, or between the employees on the same business process.
Anonymity	There is not anonymity.
Openness	The membership to the KC depends by the membership to the organization, or by the inclusion like a free-lance consultant.
Purpose	For the organization, the KC have the principal aim of giving support to the resolution of business problems. For the single employees, the KC are a way to share information on business matters.
Cohesion	A significant cohesion seems to exist among the employees, even if some conflicts are evident and the annual survey reveals also some negative aspects on the personnel cohesion.
Degree of governance	The organization influences the KC and in some way limits their strengthening, because they are seen like a risk for the organizational efficiency and effectiveness.

Table 18 The characteristics of the KC in FST

Characteristics of the Expert Recommending Services

In the organization the Expert Recommending Service is not recognized as is, but the interviewees clearly speak about the services of recommending experts and the provision of recommendation of colleagues has been directly observed and explored in the computer-based ERS.

The ERS is provided **by a computer-based system and by informal communications** between the colleagues. The four operations of the ERS are described, in the following Table 19, for the two types of the ERS: the computer-based ERS and the informal ERS (in the annexes the analytical description of the characteristics of the ERS).

OPERATION	FST
Capturing	**Computer-based ERS**: the ERP module for the evaluation of the personnel captures the information on the knowledge domains. **Informal ERS**: various sources exist such as the electronic repositories, the internal magazine, and the personal information sharing.
Manipulating	**Computer-based ERS**: the data is stored in a central database, but there is not any kind of manipulation. **Informal ERS**: the individuals manipulate without any regulation by the organization.
Retrieving	**Computer-based ERS**: All the users can browse the organizational chart. The superiors can see also the results of the evaluation of the personnel and the CV. **Informal ERS**: the retrieval is obtained asking to the colleagues or the up to the international headquarters.
Displaying	**Computer-based ERS**: the results of the personnel evaluation and the CV are displayed to the superiors. The subordinates access exclusively the name of the employees having a specific position and role in the organizational chart. **Informal ERS**: the information is freely provided by the colleagues and the superiors.

Table 19 The characteristics of the ERS in FST

Success of the ERS and relationship between ERS and its Success

The success of the ERS is multidimensional and involved the dimensions explained in the conceptual model section. The description of the success of the ERS is therefore reported on each of these dimensions.

Use

The use of the computer-based ERS is **compulsory** to all the employees for the data entry, concerning the personnel evaluation, the definition of the professional objective and the training scheduling.

On the opposite, the use of the computer-based ERS to retrieve experts is volitional. The differences in the accessibility of the information on the knowledge domains of the individual cause part of the differences in the frequency of use by the employees. The employees confirm the use of the computer-based ERS.

> *"lo strumento internet e intranet lo utilizzo"*

Nevertheless, the informal ERS is much more employed.

> *"l'organizzazione informale vince tutt'ora"*

In general, the employees demand to their hierarchical superiors for the provision of the ERS.

> *"mi capita spessissimo di essere il punto dove convergono la cosiddetta domanda e offerta, o di essere richiesto per fornire informazioni su dove andare a reperire conoscenze o esperti"*

The more the superior is high in the hierarchy the more he is demanded to counsel on the experts worldwide.

> *"sono spesso richiesto per avere informazioni su qual è l'esperto in grado di fare una cosa a livello internazionale."*

Service Quality

The computer-based ERS and the informal ERS are perceived **ease** services, as far as the required expert is located in the same country of the seeker.

> *"all'interno di FST Italia è più facile"*

When the expert is not available in the country, the ERS becomes more complex and of lower quality. The reason for this decreased quality is recognized in the absence of any manipulation on

the data in order to structure them into an overall description of the knowledge domains of the colleagues. Another factor negatively affecting the service quality is the fact that there are different tools assisting the ERS provision, but they are not integrated in one ERS solution.

> *"In questo momento non abbiamo in Festo s.p.a. un software specifico che gestisca la mappatura di queste competenze, abbiamo però tanti strumenti non collegati fra loro che da tempo utilizziamo"*

So the general and agreed evaluation is that the ERS quality should be improved, through the enhancement of the computer-based ERS.

> *"penso che lo strumento vada migliorato"*

> *"credo che non sia uno strumento ancora ben costruito"*

Information Quality

Although, the ERS quality is **not appreciated** by the employees, the information provided by the ERS, which is the recommendation of the potential expert, is positively evaluated.

> *"infine arrivo all'informazione in genere abbastanza affidabile ma sicuramente basata su giudizi soggettivi"*

The problem consists in the time and the energy required obtaining this high quality information. The existence of different tools, the absence of manipulation of data into homogeneous descriptions of the knowledge domains, and the partial accessibility to the data, require time and energy to the employees in search for an expert.

User Satisfaction

The time to find an expert is one major point of **dissatisfaction** for the employees. Actually, the computer-based ERS alone is not always sufficient to rapidly find the experts, so the employees turn to the informal ERS.

> *"se dovessi mettere una scala da uno a dieci prenderebbe la sufficienza proprio scarsa da mio punto di vista"*

Nevertheless, the introduction of the computer-based ERS has been appreciated by the employees.

> *"intranet sicuramente è stato un buon passo."*

But the computer-based ERS is considered not enough, in particular because the data is not adequately manipulated to help the retrieval of the right experts.

"lo strutturare queste informazioni è un'esigenza improrogabile,"

The problem of data manipulation is crucial at the international level, especially because also the informal ERS is not effective, since the awareness on the knowledge domains of the employees abroad is not high.

"il problema che stiamo affrontando è la facile reperibilità dell'informazione, un'informazione per tanto disponibile sul sistema informativo non automaticamente è facilmente disponibile o facilmente reperibile specialmente a livello internazionale"

"parlando di esperti non basta più sapere qual è l'esperto sotto il proprio tetto della propria azienda ma spesso è indispensabile sapere qual è l'esperto nel mondo dell'azienda appartenente alla multinazionale"

However, the informal ERS requires a lot of time to provide the name of the expert and it requires a previous establishment of some sort of relationship among the individuals. These relationships require a long time to be built and they do not always exist where required. For all these reasons the employees demand a more satisfying computer-based ERS.

"penso che lo strumento vada migliorato, perchè in prospettiva diventa difficile, quello dell'organizzazione informale, perchè i tempi di risposta a delle richieste sono sempre più stretti, mentre il tempo per instaurare delle relazioni umane è sempre più lungo"

Perceived Usefulness

The presence of the computer-based ERS and the availability of the informal ERS are considered of **crucial utility** in the organization. Moreover, the increasing internationalization of the business and the decreasing of the expected time-to-market make the ERS always more important.

"l'esigenza di conoscere le competenze specifiche nel dettaglio degli individui è un'esigenza sempre più sentita in quanto ci troviamo in un business sempre più complesso, dove il cliente spesso richiede prodotti e servizi di complessità sempre maggiore. Quindi conoscere chi sa far cosa e chi è esperto in cosa è sempre più sentita"

However the actual ERS do not respond to the expectations of the employees and its usefulness is limited.

"sarebbe utile, anche se poi io penso sempre che se la persona ha una competenza tra virgolette in un diploma o una passata esperienza, se poi non l'ha messa in pratica o non la tiene allenata è sicuramente una competenza da rispolverare, è arrugginita messa lì,"

This limited usefulness is empirically expressed by the employees by their lack of awareness on the knowledge domains of the colleagues.

> *"sapere che tu hai un background nell'industria automobilistica è utilissimo per il team, tante volte lo scopri per caso"*

Net benefits

The net benefits are not quantitatively accounted by the organization, but some perceptions of a positive net benefit are registered. The perception on the net benefit by the interviewees is related to the improvement in the **speed** of finding the required information and the correct experts for the solution of the business break down. In fact, for the organization, the ERS reduces the wrong allocation of resources.

> *"tiri dentro un magazziniere in un problema nel quale non serve, questo è il punto"*

In addition, the single employees take advantage of the ERS in terms of the increase in the information sharing on the knowledge domains of the colleagues.

Relationship between KC and Success of the ERS

Beyond the presence of a computer-based ERS or an informal ERS, the interviewees pointed out the importance of the **informal relationships** among the employees for an effective knowledge transfer.

These informal relationships can be built along time and they are considered crucial the provision of a high quality ERS.

> *"oggi nel giro di poco queste relazioni sono aumentate"*

In fact, the employees consider that ERS is useful only whether there is cohesion and knowledge of the other colleagues.

> *"è necessario, per la diffusione dei contenuti, delle conoscenze e degli aspetti innovativi, c'è quella che si chiama organizzazione informale che è fondamentale"*

The informal relationships existing among the Knowledge Community members are the key for the diffusion of knowledge among the colleagues and the Knowledge of the Others is the element that determines a successful ERS.

> *"Questa informazione è in questo momento gestita in base a conoscenze individuali"*

> *"vale per il momento la rete di conoscenze informali,"*

"all'interno del gruppo conosciamo tutte le funzioni disponibili e le persone che svolgono quelle funzioni"

"a livello internazionale in base alla mia posizione ho più opportunità di altri di incontrare gente, di conoscere persone, di avere contatto con loro e sapere esattamente cosa sanno fare meglio di altri e di conseguenza sono spesso richiesto di avere informazioni su qual è l'esperto in grado di fare una cosa a livello internazionale."

The importance of the cohesion and of the Knowledge of the Others, nevertheless, is not considered self sufficient by the organization. The employees stated that organization should propose and it proposes a set of formal tools, such as the computer-based ERS, in order to complete and even overcome the informal relationships. This is fundamental for the newcomers, who have not yet built these required informal relationships, and they do not know their colleagues.

"organizzazione informale che è fondamentale, che non deve diventare un alibi, per dire dato che la struttura, l'organizzazione informale è necessaria, allora io non costruisco un sistema, perchè tanto se non conosco le persone il sistema non funziona. Questo non è vero. Non è vero perchè un sistema strutturato in un modo corretto, quando soprattutto ti mancano le relazioni informali, è l'unico supporto che tu puoi avere."

5.5 Comparisons across cases

After the presentation of the three cases, their comparison is proposed for:

1. the characteristics of the Knowledge Communities;
2. the characteristics of the ERS;
3. the success of the ERS and the relationship between ERS and its success.

Characteristics of Knowledge Communities

The Knowledge Communities across the cases differ on the variables reported in the literature review (Table 20).

VARIABLE	MM	NSS	FST
Lifetime	The KC originates few decades ago, with the diffusion of the management scientific discipline in the town. This KC is now under strong reshape due to the start-up of the official consortium among the business schools and the research centers.	The organizational restructure in the '90s determines the recombination of the employees in new KC	The suppression of the production facility and the development of the education business in the '90s determine a reshape of the KC.
Size	Approximately 220 members who are aggregated in different sub-communities basing on their research, teaching subjects, and affiliation.	Approximately 550 employees who are aggregated in different sub-communities basing on their allocation to a business unit.	Approximately 180 employees between FST and FST ETC. The FST ETC has also around 100 free-lance consultants.
Composition	The involvement in research or in teaching activities on management in town is the common denomination among the members. Beyond this communality, they are members of different organizations, or they have different educational background.	The KC gathers employees working on the same business sector and in the same market.	The KC are composed by employees doing the same professional activity.
Fragmentation	The main KC is fragmented in different intersecting sub-communities. These sub-communities are specialized in a teaching or research subject or they gather people of the same business school	The fragmentation of the KC reflects the structure of the organization in sectors and in markets.	The KC fragmentation follows the organizational divisions in functional units.

	or of the same research center.		
Geographical dispersion	The business schools and research centers are located in the same town, but some members have teaching and research activities also elsewhere.	The members of the KC on the same sector or market have different sub-communities for each location.	The organization has several locations in Italy and the KC are distributed across them.
Mode of interaction	The interactions take place mainly through face to face communications or via email. Some other used communication tools are the telephone, and the instant messaging.	The most of the interactions are face to face of by mobile phone. Secondarily, the email, or the fixed phones are quite frequently used.	The interactions are face to face or by IT tools. The telephone and the Lotus Notes application are used especially for the employees temporarily outside the organization.
Degree of interconnection	The majority of interactions are between peers, during the informal meeting, or assembly interactions, during the formal group meetings.	The majority of interactions are between peers or between the superior and his subordinate.	The majority of the interactions are personal, while another part of the interactions involve the whole selling team or the whole organization.
Frequency of interaction	The interactions are volitional and they depend largely on the individual attitude. Some members interact intensively, while others are largely autonomous and independent.	The interactions are frequent within the members of the same business unit.	The frequency of interaction is high between members of the same team, or between the superior and his subordinate, or between the employees on the same business process.
Anonymity	There is no anonymity.	There is no anonymity.	There is no anonymity.
Openness	The membership to the KC can be achieved by the inclusion in one of the research centers or in one business school of the consortium. To join a research center an individual has to explain his professional interest to the director, while to join a business school the individual has to teach there.	The membership to the KC depends by the membership to the organization, while the membership to a sub-community is influences by the formal allocation in the organization.	The membership to the KC depends by the membership to the organization, or by the inclusion like a free-lance consultant.
Purpose	For the organization, the KC is a mean to promote the scientific visibility and	For the organization, the KC are means for exploiting and	For the organization, the KC have the principal aim of giving

	recognition of the teaching and of the research activities in management in the town. For the members, the participation in the KC aims to the improvement of the quality of the teaching and of the research activities.	recompensing the individual potential. For the members, the KC are facilitators of the information sharing and of the knowledge transfer.	support to the resolution of business problems. For the single employees, the KC are a way to share information on business matters.
Cohesion	The cohesion is growing thanks to the intervention of the deans and of the directors. There are some frictions and some conflicts between the research centers and between the business schools, caused by a spirit of competition existing among them.	The cohesion exists among the members of the KC, related to each single business unit. The cohesion is weak between different business units.	A significant cohesion seems to exist among the employees, even if some conflicts are evident and the annual survey reveals also some negative aspects on the personnel cohesion.
Degree of governance	The management of the consortium stimulates the interactions and the cohesion among the members of the KC. Nevertheless the individual behavior is autonomously determined by each member since each member has a large professional autonomy in teaching and research.	The organization largely influences the KC characteristics, because the organization favors meetings among employees and defines the professional objectives and the working activities of the employees.	The organization influences the KC and in some way limits their strengthening, because they are seen like a risk for the organizational efficiency and effectiveness.

Table 20 The comparison of the KC

The comparison across the Knowledge Communities of the three cases highlights their **heterogeneousness**. This distinction impacts directly on the Institutionalization variable, which is the variable employed to synthetically classify the Knowledge Communities in this research.

The MM Knowledge Community is the least institutionalized Knowledge Community. The directors and the deans promote, through several public initiatives and the communications, the creation and the formalization of the Knowledge Community. But the autonomy of the members is so large that the aggregation in Knowledge Communities is obtainable only by the desire of the members, who define also their forms.

The NSS Knowledge Community is the most institutionalized Knowledge Community. The organization supports the creation of the Knowledge Communities and the strengthening of the relationships among colleagues. These interventions are directed to the development of the Knowledge Communities that would overlap the organizational structure, in order to obtain a more efficient and effective organization, by facilitating the information sharing and the knowledge transfer.

The FST Knowledge Community is slightly less institutionalized than the NSS Knowledge Community. In this organization, the Knowledge Communities are formed around the professional activities of the employees, similarly to the NSS Knowledge Communities. But, in contrast with the NSS, the organization does not incentive their creation, because the organization considers them like a risk for the effectiveness of the organization, because personal conflicts can menace the lean business process.

A synthesis of these conclusions con be graphically reported in the on the line representing the degree of institutionalization of the KC, as visible in the Figure 47.
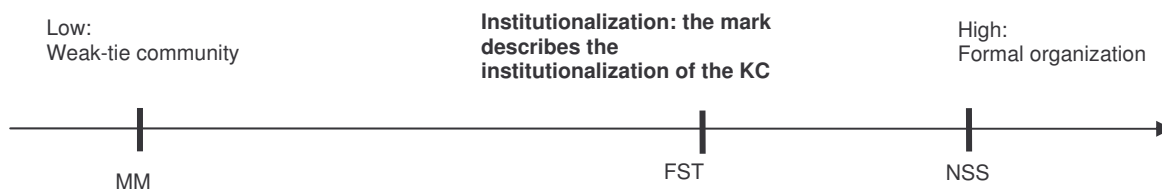
Figure 47 The institutionalization of the KC

Characteristics of the ERS

The Expert Recommending Services across the cases differ on the four main operations taken into consideration for their provision, as indicated in the literature review (Table 21).

	MM	NSS	FST
Capturing	**Computer-based ERS**: some different and separated solutions among the schools and the centers, like Excel worksheets and web pages, are employed to collect the individual competence profile. **Informal ERS**: various sources exist, and the work outputs and the exchanges at the meetings are the main ones.	**Computer-based ERS**: the ERP module for the evaluation of the personnel, and curriculum vitae captures the information on the knowledge domains. **Informal ERS**: various sources exist such as the electronic repositories, and the personal information sharing.	**Computer-based ERS**: the ERP module for the evaluation of the personnel captures the information on the knowledge domains. **Informal ERS**: various sources exist such as the electronic repositories, the internal magazine, and the personal information sharing.
Manipulating	**Computer-based ERS**: there is not manipulation of the captured data. **Informal ERS**: the individuals manipulate the information	**Computer-based ERS**: the data is stored in a central database but the manipulation is limited to some synthetic results. **Informal ERS**: the	**Computer-based ERS**: the data is stored in a central database, but there is not any kind of manipulation. **Informal ERS**: the individuals manipulate

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	without any regulation by the organization.	individuals manipulate without any regulation by the organization.	without any regulation by the organization.
Retrieving	**Computer-based ERS**: the retrieval is performed browsing among the worksheet or the web pages, but there is not a search engine. **Informal ERS**: the retrieval is obtained asking to the colleagues.	**Computer-based ERS**: the superiors can search and browse in the CV and in the evaluations of their subordinates. The subordinates do not have access to the retrieving operation. **Informal ERS**: the retrieval is obtained asking to the colleagues or the superiors.	**Computer-based ERS**: All the users can browse the organizational chart. The superiors can see also the results of the evaluation of the personnel and the CV. **Informal ERS**: the retrieval is obtained asking to the colleagues or the up to the international headquarters.
Displaying	**Computer-based ERS**: the description of the members is provided in the worksheet and in the web pages. **Informal ERS**: the information is freely provided by the colleagues.	**Computer-based ERS**: the results of the personnel evaluation and the CV are displayed to the superiors, while the subordinates do not have access at all to this information. **Informal ERS**: the information is freely provided by the colleagues and the superiors.	**Computer-based ERS**: the results of the personnel evaluation and the CV are displayed to the superiors. The subordinates access exclusively the name of the employees having a specific position and role in the organizational chart. **Informal ERS**: the information is freely provided by the colleagues and the superiors.

Table 21 The comparison of the characteristics of the ERS

The comparison of the three cases points out the distinctions existing among the Expert Recommending Services. The main commonality among the cases is the existence of **some sorts of informal ERS and some sort of computer-based ERS**. The informal Expert Recommending Service is quite similar among the cases and the members of the Knowledge Communities autonomously collect information and ask to the colleagues to find experts and to counsel experts to the others.

The main differences are in the computer-based ERS. Nevertheless, even in the computer-based ERS, some similarities can be identified.

In all the three cases, the computer-based ERS have some access limitations. In MM, only the members of the DPS can access the worksheet with the knowledge domains of the colleagues. In

NSS and in FST, only superiors can access the data stored in the central repository on the knowledge domains of the colleagues, captured for the personnel evaluation.

The difference between NSS and FST is in the access right of the subordinates. While in NSS the subordinates do not have any kind of access to the computer-based ERS, in FST the subordinates can browse the organizational chart to see the name of the employees covering a targeted position.

Going beyond these organizational rules and considering the functional aspects, the computer-based ERS of NSS reveals a slightly higher degree of formalization, than the degree of formalization of the computer-based ERS of FST, while MM computer-based proposes far less formalization.

Firstly, the NSS's computer-based ERS captures a wider range of data, than FST's computer-based ERS. Secondly, the manipulation is not very developed in both the ERS, but in NSS there is the possibility to have some synthesis of the collected data. On the contrary, this synthesis is not possible at all in the FST's computer-based ERS. Thirdly, the retrieval in NSS can be done through the browsing and the searching, while in FST is only through the browsing of the organizational chart. Finally, the displaying in NSS includes also the Curriculum Vitae, which is absent in the FST computer-based ERS.

The complementary existence of informal and formal ERS induces the representation of the degree of formalization of the analyzed ERS through a segment. This segment starts for all the three cases in the Informal ERS area, because all the three cases have an informal ERS. The segments end around the computer-based ERS, because all the three cases have some sort of computer-based ERS. However the segments end at different points because the degree of formalization of the three computer-based ERS is different: the ERS of MM is the least formalized, while the ERS of NSS is the most formalized (Figure 48).
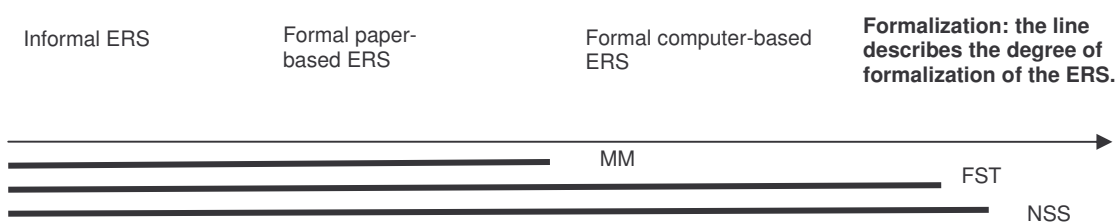
Informal ERS	Formal paper-based ERS	Formal computer-based ERS	**Formalization: the line describes the degree of formalization of the ERS.**

```
                                                          →
─────────────────────────────── MM
───────────────────────────────────── FST
─────────────────────────────────────── NSS
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Figure 48 The formalization of the ERS

Success of the ERS

The success of the Expert Recommending Services across the cases differs on the several success dimensions, defined by the literature review (Table 22).

	NSS	MM	FST
Use	The ERS, principally the informal ERS, is extensively used for retrieving experts.	The computer-based ERS in not used, while in the informal ERS is largely employed.	Both versions of the ERS are used, even if the informal ERS is more exploited.
Service Quality	The service quality is appreciated, but some points of improvement are highlighted.	The service quality is heterogeneously evaluated, from a very high appreciation to a very negative one.	The service quality is appreciated for retrieving experts within the national boundaries, while its quality decreases in the international context.
Information Quality	The computer-based ERS assures a higher information quality, than the information quality assured by the informal ERS.	The computer-based ERS provides poor information, while the informal ERS gives high quality information.	The quality of the information is in general appreciated, even if some improvements are demanded.
User Satisfaction	The superiors are satisfied of the availability of data, but they are unsatisfied by some operations of the computer-based ERS.	The users are generally satisfied by the informal ERS, but not satisfied by the computer-based ERS.	The computer-based ERS has been considered an important addition but users remain not satisfied by the ERS.
Perceived Usefulness	The ERS is perceived useful by the superiors, but not useful by the subordinates, because they are not authorized for the computer-based ERS retrieval.	The computer-based ERS is considered not useful, while the informal ERS is declared very useful.	In principle the ERS is claimed to be crucially useful but the actual ERS does not respond to the expectations.
Net Benefit	There is not an accountability of the net benefits, but the perception is toward some sort of positive net benefit.	There is not an accountability of the net benefits, but the perception is toward some sort of positive net benefit.	There is not an accountability of the net benefits, but the perception is toward some sort of positive net benefit.

Table 22 The comparison of the success of the ERS

The comparison of the three cases points out the distinctions existing among the success of the Expert Recommending Services, both for the informal versions and for the computer-based versions.

In general, the **computer-based ERS are less successful** than the informal ERS, because the computer-based ERS have limited functionalities and provide limited amount of information.

Specifically, the computer-based ERS, available to the members of the MM Knowledge Community, is unsuccessful because it provides very limited amount of information and through solutions that are inappropriate to retrieve the experts in the Knowledge Community. The computer-based ERS of the FST Knowledge Community is partially unsuccessful because it provides the recommendations on the experts, but by means that make the retrieval difficult and not very precise. The NSS computer-based ERS is just better than the previous ones. Its partial success resides in the volume of data proposed and in the possibility of the retrieval operation. On the contrary, its limits are related to the prohibition to the subordinates to access it and its rare use by the superiors, who prefer the informal ERS.

In terms of the informal ERS, the least successful is the one available to the FST Knowledge Community. It does not provide adequate counsels of experts, at the international level, though the market demands it, while at the national level, it remains excessively time consuming.

The informal ERS of the MM Knowledge Community presents some elements of success but also some sable sides. The informal ERS is well appreciated since it provides adequate information on the potential experts. However, some members claim that the quality is not always of the expected level and hence negatively appreciated.

The informal ERS of the NSS is the most successful one, but not completely successful for its users. This ERS is appreciated, used, and the recommended experts are considered adequate to the problem at hand. Nevertheless, in some cases there is the perception that the colleagues are restrained to provide the best ERS to their colleagues, for the competition existing among them.

The different appreciations of formal and computer-based ERS induce to mark separately, for each case, the degree of success for the computer-based ERS and for the informal ERS, as reported in the Figure 49.
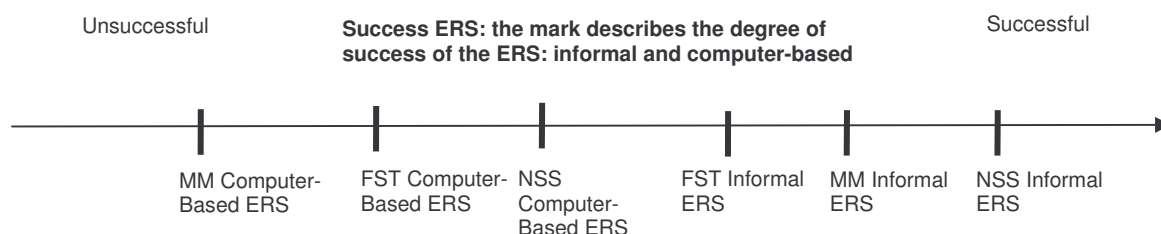
Figure 49 The Success of the ERS

Relationship between KC and Success of the ERS

Across the three cases, a grounded relationship between the Knowledge Community and the Success of the ERS rises. The success of the ERS seems influenced by the existence of the Knowledge Community.

In general the presence of a well-established Knowledge Community stimulates the demand for the ERS provision. Knowing the others is the main aspect of the Knowledge Community that seems influence the success of the ERS.

This relation is not well established in the literature, even though some contributions are already published. Wilson (Wilson 1995), Hertzum and Pejtersen (Hertzum and Pejtersen 2000) suggest that people, searching for knowledge, commonly explore their personal communications, prior to using the formal sources. These **personal communications** are determined by the trust toward the others and by the Knowledge of the Others (Koeglreiter, Smith et al. 2006). Markus (Markus 2001 page 66) affirms that some differences exist in the selection of the experts due to the different characteristics of the individuals. The awareness on the knowledge distribution can be one of the characteristics of the individuals that could influence the selection of the experts. It can be possible that different Knowledge Communities, in terms of the differences in the Knowledge of the Others, can influence the way to ask and provide the ERS, and definitively the success of the ERS.

As reported by Maier et al. (Maier, Hadrich et al. 2005), the members of the Knowledge Communities are more effective and efficient when there is an infrastructure supporting them, and the ERS can be a component of this infrastructure (Martinez 2004 page 234) .

Knowing the others and being aware of the knowledge domains of the others result important for the success of the ERS. In particular the dimensions that seem influenced by the Knowledge of the Others are the quality of the ERS, the use of the ERS, and the users' satisfaction.

These preliminary results are taken into account in the quantitative phase.

Conclusion

The qualitative phase of the research allows the verification of the preliminary distance supposed existing among the cases on the three dimensions: Institutionalization, Formalization, and Success (Table 23).

	NSS	MM	FST
ERS Formalization	Informal and computer-based ERS	Almost informal ERS	For the most par informal, but also computer-based ERS
KC Institutionalization	Overlapping the formal organization of the business units	Weak-tie community	Based on the professional communality of the

			functional units.
ERS Success	Almost successful	Almost unsuccessful	Partially unsuccessful

**Table 23 The comparison of the three cases on the three dimensions**

The analysis of three cases reports the **heterogeneousness** of the Knowledge Communities, and of the Expert Recommending Service, which influences the Institutionalization of the Knowledge Communities, the Formalization of the Expert Recommending Service and the Success of the ERS. The completion of the analysis has slightly modified the preliminary positioning of the three cases on these three synthetic dimensions. In particular the FST's ERS is partially less successful than expected and also partially less formalized. Nevertheless, the cases remain substantially different and they can be used for a multiple case study, respecting the theoretical replication principles.
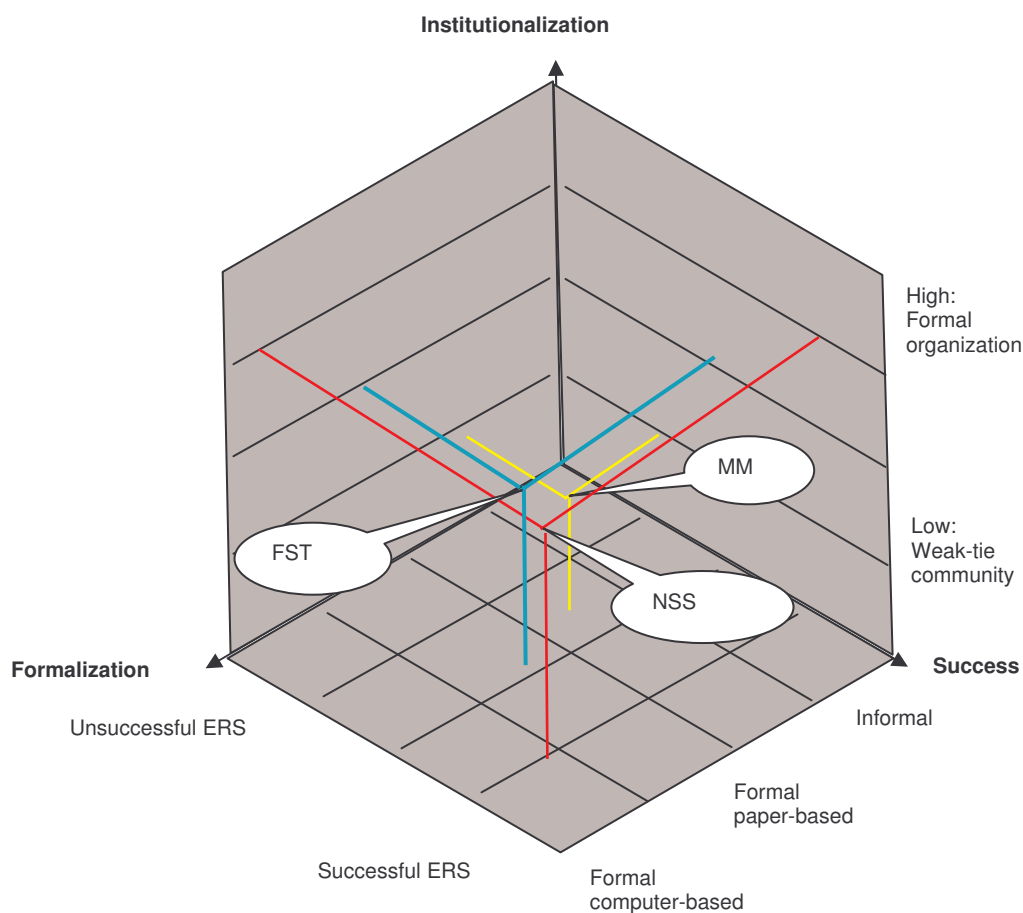
Figure 50 The distribution of the three cases in the three dimensional space (only the success computer-based ERS is marked in the chart, and the likelihood average of the success expressed for informal and computer based ERS)

The main original result is the importance of the Knowledge Community for the Success of the ERS and specifically the role of the Knowledge of the Others on the quality of the ERS, the use of the ERS and the users' satisfaction. These elements will be included in the quantitative phase of the

empirical research, which will test the model represented in the Figure 51, as the main result of the qualitative phase.
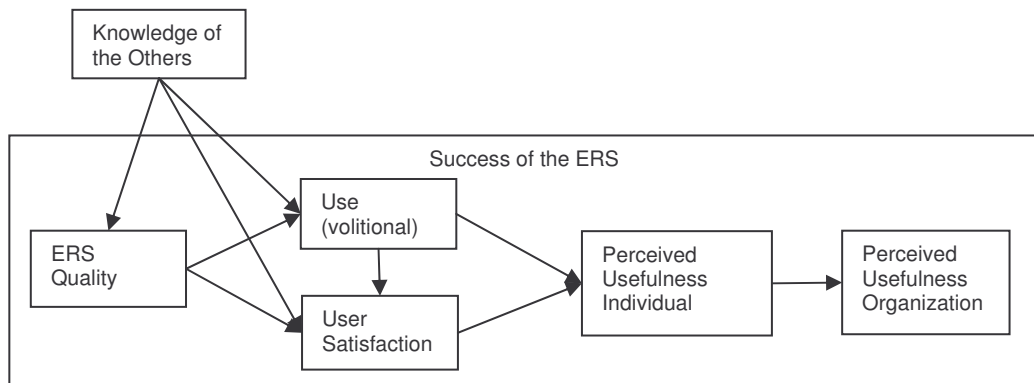
Figure 51 The model resulted from the qualitative phase

5.6 Statistical analysis

As already mentioned in the section on the methodology description, the quantitative data was collected through the diffusion and promotion of an online questionnaire at the three organizations. The questionnaire was available on a web server, and the link to the web page was communicated via email by the organizational management.

In NSS, the Human Resource Department director sent an email to the subset of all the Italian employees, with the exclusion of the administrative personnel. The exclusion of this part of the employees was based on the perception, by the Human Resource Department, that administrative personnel was not the kind of the personnel, whom the Expert Recommending Services should firstly be addressed. The total number of employees reached by this communication was 465.

In FST, the CEO sent an email to all the 180 employees of the organization, FST ETC included. In this organization the issue about the definition of a subset of employees did not rise. All the employees received this communication, because the CEO estimated that all of them were involved in the demand and in the provision of the ERS.

In MM, the three deans of the business schools and the three directors of the research centers sent the email to all their respective teachers of the business school and their respective researcher of the research centers, excluding all the other personnel of the six institutions. All the 210 participants to the consortium were invited to fill the questionnaire.

After few weeks, a recall to fill the questionnaire was sent to all the targeted individuals. The collection of data ended after two weeks from this recall.

As previously mentioned, the quantitative phase of the empirical research has been validated following the **validation guidelines proposed by Straub, Bourdeau, Gefen** (Straub, Boudreau et al. 2004) and basing, like practical guide, on the book of Byrne on the SEM (Byrne 2001).

5.7 Sample size and demographics

278 responses to the questionnaire were collected and 13 of them were eliminated because the fill of the questionnaire was largely partial or evidently randomly performed. The responses used for the quantitative analysis were **265**: 51 from FST (response rate 28%), 44 from MM (response rate 21%), and 170 from NSS (response rate 36%).

Number of answers

MM

Gender	
Male	20
Female	23

Age	
younger than 30	12
30-39	17
40-49	12
50-59	2
60 or older	1

Research Center	
ERFI	12
CEROM	6
CREGO	24

Business school	
Groupe Sup de Co	7
MESI	4
EAI	19
Other	9

Professional title	
Doctorant(e)	12
Docteur	6
Maître de Conférences	16
Professeur des Universités	5

Years in the research center	
Less than 3 years	16
3-10	19
11-20	7
more than 20 years	2

Years in the business school	
Less than 3 years	13
3-10	19
11-20	7
more than 20 years	2

Years of research	
Less than 3 years	10
3-10	21
11-20	10
more than 20 years	3

Years of teaching	
Less than 3 years	8
3-10	19
11-20	15
more than 20 years	2

Workplace	
always in the same organization's building	5
mainly in the same organization's building	11
equally partitioned	22
mainly out of the organization's building	6
always out of the organization's building	0

Use of the ERS	
Less than once a month	0
once a month	1
few times a month	2
once a week	18
few times a week	19
once a day	4
more than once a day	0

FST

Gender	
Male	34
Female	14

Age	
younger than 25	0
25-34	11
35-44	14
45-54	20
55 or older	4

Functional Unit	
Sales direction	8
Sales force	21
Sales administration	6
Technical direction	6
Financial direction	5
Information Systems	0
Process and quality management	0
consulting, training and education	1

Location	
Assago (MI)	32
Padova	5
Bologna	2
S. Benedetto del Tronto (AP)	1
Torino	5

Education	
Secondary school certificate	42
University degree	5

Years in the organization	
less than a year	3
1-5 years	10
6-10 years	10
more than 10 years	26

Years doing the same job	
less than a year	5
1-5 years	18
6-10 years	11
more than 10 years	15

Workplace	
always in the same organization's building	13
mainly in the same organization's building	11
equally partitioned	7
mainly out of the organization's building	13
always out of the organization's building	5

Use of the ERS	
Less than once a month	0
once a month	1
few times a month	4
once a week	20
few times a week	15
once a day	9
more than once a day	0

NSS

Gender	
Male	119
Female	51

Age	
younger than 25	3
25-34	61
35-44	61
45-54	34
55 or older	11

Functional Unit	
Commerce Industry-Consumer & Products	12
Commerce Industry-Media	19
Financial Services	18
Outsourcing & Infrastructure Services	8
High Performance Centre	49
Systems & Technology	24
Technology Consulting Services	15
Solution & Development for Media Solutions	15
Sales&Marketing	4

Location	
Milano	83
Roma	72
Napoli	9
Other location	4

Education	
Secondary school certificate	61
University degree	108

Years in the organization	
less than a year	23
1-5 years	49
6-10 years	49
more than 10 years	49

Years doing the same job	
less than a year	28
1-5 years	94
6-10 years	29
more than 10 years	18

Workplace	
always in the same organization's building	22
mainly in the same organization's building	35
equally partitioned	29
mainly out of the organization's building	41
always out of the organization's building	43

Use of the ERS	
Less than once a month	0
once a month	3
few times a month	11
once a week	67
few times a week	63
once a day	23
more than once a day	1

Figure 52 Descriptive of the sample

The dimension of the sample, the number of the questioned items, and the number of the variables of the analysis limit the suitable statistical methods. The sample of 265 answers, the 18 items measured, on the 6 variables, make the structural equation modeling a suitable method able to ensure trustworthy results (Boudreau, Gefen et al. 2001; Gefen 2003).

The structural equation modeling is considered an advanced statistical method that should be preferred, if possible, for the potential sophistication of the obtainable results (Boudreau, Gefen et al. 2001; Gefen 2003).

The compatibility of the data with the structural equation modeling assumption and the sophistication of the results that can be obtained using structural equation modeling induce the author to select this statistical method as the principal one for the quantitative analysis.

Following the guidelines proposed by Boudreau, Gefen and Staub (Boudreau, Gefen et al. 2001; Gefen 2003), the quantitative analysis involves the test of: the content validity, the construct validity, the reliability, the manipulation validity and the statistical conclusion validity. All these tests will be described in the next paragraphs.

5.8 Content validity

Content validity concerns the representation, by the instrument, of the content of a given construct, in terms of measurement, substance, and straightforward definition of the construct (Kerlinger 1964; Cronbach 1971; Smith, Milberg et al. 1996; Straub, Boudreau et al. 2004).

The literature review, and the opinions of some experts have been used to assess the content validity of the instrument (Straub 1989).

The literature review detailed in the previous chapters has been the primary source. Concomitant with the literature review, the author asked several experts, colleagues, and users of the ERS to **screen the items** for finding those which did not appear consistent with the constructs and with the identified dimensions of each construct.

This step brought to a refinement of the instrument in terms of the kind and the number of the questions. In particular, the constructs Knowledge of the Others, and Perceived Usefulness constructs were directly modified.

Knowledge of the Others

The original scale used by Pinsonneault (Pinsonneault and Heppel 1997-8) was judged redundant. The 7 items for measuring the perception of the awareness on the knowledge domains among the colleagues seemed excessive. The revision brought to the inclusion of only 4 items each of one measuring a specific aspect of the individual perception on:

- The awareness of the colleagues on the knowledge domains of the respondent (k1).
- The awareness of the colleagues on the knowledge domains of the other colleagues (k2).
- The awareness of the respondent on the knowledge domains of the colleagues (k3).
- The awareness of everyone on the knowledge domains of everyone else (k4).

Perceived Usefulness

The original scale used by Bhattacherjee (Bhattacherjee and Premkumar 2004) revealed an ambiguity on one of the items. The item number 4, which tries to synthesize the "usefulness" concept, results misleading. The other 3 items resulted well explaining and completely covering the concept and so the item 4 was excluded. The three remaining items concerned: the performance, the productivity and the effectiveness as the complementary aspects of the usefulness.

5.9 Construct validity

Construct validity concerns the operationalization and the measurement between the constructs (Straub, Boudreau et al. 2004). The aim is to have items that together are a reasonable operationalization of the construct (Cronbach and Meehl 1955) and that discriminate among the constructs.

Convergent validity relates to the loading of the items to the same construct, while discriminant validity relates to the loading of the items to other constructs (Straub, Boudreau et al. 2004).

The discriminant validity, the convergent validity, the factorial validity, the nomological validity, the predictive validity, and the common methods bias control have been applied to assess the construct validity of the instrument.

Discriminant validity

The discriminant validity distinguishes the reflection of the items to a specific construct from the items that reflect the other constructs (Gefen, Straub et al. 2000). The confirmatory factor analysis, used in covariance-based SEM, is the technique employed to test discriminant validity. Preliminarily to **confirmatory factor analysis** in AMOS, confirmatory factor analysis is run in SPSS with Varimax Rotation and Minimum Eigenvalue criteria of 1.

The result showed that Service Quality construct and User Satisfaction construct load on the same factor (Table 24).

Rotated Component Matrix(a)				
	Component			
	1	2	3	4
k1	0,137359	0,172396	0,682689	0,157522
k2	0,263248	0,179168	0,733497	0,03173
k4	0,169854	0,22621	0,78778	0,15337
k3	0,233696	0,139471	0,81666	0,151277
q1	0,713262	0,220006	0,067026	0,116501
q2	0,763257	0,310094	0,221703	0,166028
q3rev	0,53605	0,00937	0,132782	-0,07118
us1	0,79308	0,318763	0,214069	0,239962
us3	0,755046	0,381322	0,225584	0,135986
us2	0,713155	0,314478	0,283349	0,231707
us4	0,769662	0,366076	0,24373	0,16643
u1	0,097376	0,136877	0,201422	0,878169
u3	0,28098	0,321131	0,200734	0,70626
pui2	0,21332	0,709657	0,2277	0,277171
pui3	0,317089	0,735946	0,221596	0,189397
pui1	0,20594	0,795484	0,108608	0,186113
puo2	0,293516	0,795194	0,166908	0,028576
puo1	0,264882	0,780224	0,242321	0,05617

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a   Rotation converged in 6 iterations.

Table 24 The first rotated component matrix

A second order confirmatory factor analysis on Service Quality construct and User Satisfaction construct highlighted an unexpected loading on the second factor of the item q3rev. The item q3rev appeared as the potential source of the failed test of the discriminant validity (Table 25).

Rotated Component Matrix(a)		
	Component	
	1	2
q1	0,678348	0,284866
q2	0,865324	0,158935
q3rev	0,17839	0,975885
us1	0,907916	0,174961
us3	0,86464	0,216904
us2	0,877435	0,09184
us4	0,905304	0,151862

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a   Rotation converged in 3 iterations.

Table 25 The second order rotated component matrix

An outlook at the reliability and convergent validity of the Service Quality construct confirmed the inadequacy of the item q3rev (Table 26).

Reliability Statistics	
Cronbach's Alpha	N of Items
0,651021	3

Table 26 The reliability of the Service Quality construct

The reason was traced back to some misunderstandings due to the negative formulation of the sentence. Cronbach's Alpha of the scale is not acceptable. The deletion of the item q3rev would improve Cronbach's Alpha of the scale, higher up to 0,715 (Table 27).

Item-Total Statistics			
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
q1	8,954198	3,722032	0,522503	0,472214
q2	8,916031	4,000585	0,527288	0,480656
q3rev	9,312977	3,733088	0,360819	0,715069

Table 27 The item-total statistics of Service Quality construct

So, item q3rev was deleted and confirmatory factor analysis run again.

Again Service Quality scale and User Satisfaction loaded on the same factor (Table 28).

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Rotated Component Matrix(a)				
	Component			
	1	2	3	4
k1	0,123474	0,178489	0,681383	0,172124
k2	0,248068	0,17806	0,735943	0,036081
k4	0,193215	0,20827	0,790327	0,137834
k3	0,240653	0,126604	0,819518	0,142022
pui1	0,227127	0,796283	0,106554	0,196473
pui2	0,246899	0,701451	0,226343	0,277727
pui3	0,344348	0,726365	0,222147	0,188605
puo1	0,28947	0,772686	0,243297	0,055414
puo2	0,340668	0,773041	0,170129	0,010422
q1	0,724616	0,189713	0,076947	0,088238
q2	0,794231	0,26779	0,233053	0,125171
u1	0,134862	0,128012	0,196058	0,877481
u3	0,305865	0,313578	0,197975	0,708369
us1	0,825311	0,275825	0,225296	0,198763
us2	0,757353	0,267232	0,294235	0,185439
us3	0,776467	0,346355	0,235973	0,103929
us4	0,80761	0,320475	0,255487	0,121781

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a   Rotation converged in 5 iterations.

Table 28 The second rotated component matrix

A second order confirmatory factor analysis on Service Quality construct and User Satisfaction construct highlighted a critical situation. Service Quality scale loaded on the two factors. The preference to avoid mono-operation bias, deleting the item q2, determined the acceptance of the Service Quality scale as is (Table 29).

Rotated Component Matrix(a)		
	Component	
	1	2
q1	0,336953	0,94035
q2	0,844191	0,278913
us1	0,890007	0,287579
us3	0,820151	0,353465
us2	0,830784	0,29829
us4	0,857712	0,335996

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a   Rotation converged in 3 iterations.

Table 29 The second order rotated component matrix for Service Quality and User Satisfaction constructs

A second order confirmatory factor analysis on Perceived Usefulness construct was required to verify the discriminant validity between Perceived Usefulness to the Individual and Perceived Usefulness to the Organization (Table 30).

Rotated Component Matrix(a)		
Component		
	1	2
pui1	0,808822	0,371471
pui2	0,863945	0,280338
pui3	0,687156	0,527319
puo1	0,358137	0,861532
puo2	0,347902	0,860097
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.		
a	Rotation converged in 3 iterations.	

Table 30 The second order rotated component matrix for Perceived Usefulness to the Individual and Perceived Usefulness to the Organization

The result confirmed the discrimination between the two scales.

The use of AMOS confirmed the discriminant validity. The χ^2 of the original model is compared with the alternative model where the constructs in question are united as one construct. The resulted χ^2, in the original model, shows the discriminant validity of the constructs if it is significantly smaller to the alternative ones (Segars 1997; Gefen 2003).

The actual χ^2 is 153 and significantly smaller than the Independence model value (3126) (Table 31).

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	49	153,294	104	0,001	1,474
Saturated model	153	0	0		
Independence model	17	3125,968	136	0	22,985

Table 31 The comparison of the χ^2

The standardized regression weights, the correlations and the factor score weights do not present any anomaly that suggests failed discriminant validity (Table 32, Table 33, Table 34).

Standardized Regression Weights			Estimate
q1	<---	sq	0,648
q2	<---	sq	0,859
us1	<---	us	0,915
us2	<---	us	0,845
us3	<---	us	0,848
us4	<---	us	0,903
u1	<---	u	0,653
u3	<---	u	0,872
k1	<---	k	0,614
k2	<---	k	0,703
k4	<---	k	0,813

k3	<---	k	0,835
pui1	<---	pui	0,805
pui2	<---	pui	0,793
pui3	<---	pui	0,838
puo1	<---	punbi	0,867
puo2	<---	punbi	0,859

Table 32 The standardized regression weights

Correlations			Estimate
pui	<-->	punbi	0,869
k	<-->	punbi	0,537
us	<-->	punbi	0,683
u	<-->	punbi	0,552
sq	<-->	punbi	0,705
k	<-->	pui	0,566
us	<-->	pui	0,721
u	<-->	pui	0,649
sq	<-->	pui	0,682
us	<-->	k	0,617
u	<-->	k	0,545
sq	<-->	k	0,58
us	<-->	u	0,602
sq	<-->	us	0,997
sq	<-->	u	0,605

Table 33 The correlation estimates

Factor Score Weights/1

	puo2	puo1	pui3	pui2	pui1	k3	k4	k2	k1
punbi	0,32	0,331	0,095	0,062	0,06	0,009	0,008	0,004	0,003
pui	0,111	0,115	0,295	0,193	0,187	0,009	0,008	0,004	0,003
k	0,009	0,01	0,008	0,005	0,005	0,234	0,198	0,113	0,08
u	0,002	0,002	0,039	0,026	0,025	0,02	0,017	0,01	0,007
us	0,003	0,003	0,019	0,012	0,012	0,011	0,009	0,005	0,004
sq	0,037	0,038	-0,02	-0,013	-0,013	-0,003	-0,003	-0,002	-0,001

Factor Score Weights/2

	u3	u1	us4	us3	us2	us1	q2	q1
punbi	0,002	0,001	0,005	0,003	0,004	0,007	0,058	0,018
pui	0,05	0,015	0,046	0,028	0,031	0,056	-0,037	-0,012
k	0,022	0,007	0,023	0,014	0,016	0,028	-0,005	-0,002
u	0,425	0,129	0,013	0,008	0,009	0,017	0,028	0,009
us	0,007	0,002	0,201	0,125	0,139	0,249	0,135	0,043
sq	0,02	0,006	0,178	0,111	0,123	0,221	0,112	0,035

Table 34 The factor score weights

So the discriminant validity is considered achieved.

Convergent validity

Convergent validity is evidenced when items that are thought to reflect a construct converge or are highly correlated with one another, in comparison with the convergence of the other items that reflect different constructs (Straub, Boudreau et al. 2004). **Confirmatory factor analysis in covariance-based SEM** is the technique employed to test convergent validity. As reported by Gefen (Gefen, Straub et al. 2000), acceptable heuristics are GFI> 0,90, NFI> 0,90, AGFI>0,80 (or >0,90).

The heuristics demonstrated the fitness of the model (Table 35).

Model	NFI (Delta1)	GFI	AGFI
Default model	0,951	0,938	0,909

Table 35 The NFI, GFI, AGFI

Factorial validity

Factorial validity can be used to assess at the same time convergent validity and discriminant validity (Straub, Boudreau et al. 2004). It assures that the items load cleanly on the constructs (factors), upon which they are posited to load, and do not cross-load on the constructs, upon which they should not load (Straub, Boudreau et al. 2004). The items' measures of the variables should not cross-load within each distinct causal stage of the model (Straub, Boudreau et al. 2004).

The confirmatory factor analysis in the covariance-based SEM is the technique employed to test factorial validity (Straub, Boudreau et al. 2004). The **fit statistics** of this CFA should be above the thresholds described for convergent validity (Gefen, Straub et al. 2000).

So the actual values of NFI, GFI, and AGFI assure the factorial validity of the instrument.

Nomological validity

The nomological validity implies the judgmental comparison with previous instruments and with theoretical research stream of the used instrument. The constructs of the model should be compared with the previous ones. The previous validation and test of the instruments, against a variety of persons, settings, times, technologies, support the nomological validity of the actual model (Straub, Boudreau et al. 2004).
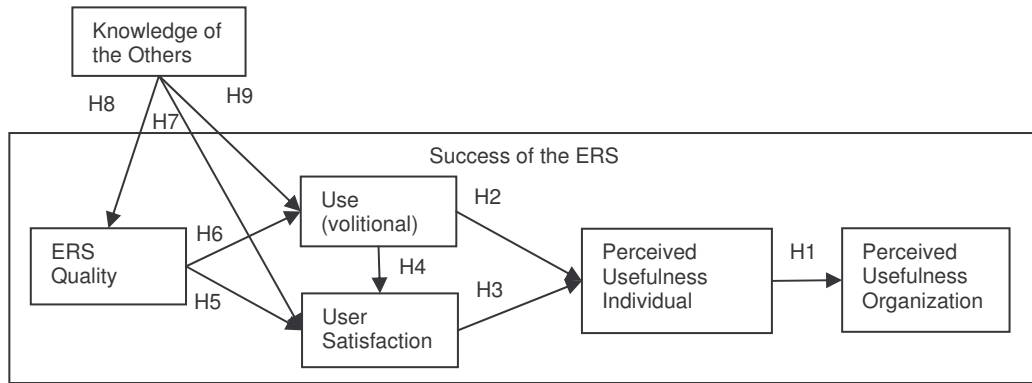
Figure 53 The model at the quantitative phase

All the constructs take origin from what has been **already used** in the IS discipline and several studies have adopted these constructs (Table 36).

CONSTRUCT	NAME OF SOME OF THE PREVIOUS CONSTRUCTS AND AUTHORS USING THEM
Knowledge of the Others	Knowledge of the Others (Pinsonneault and Heppel 1997-8)
ERS quality	Service Quality (Parasuraman, Zeithaml et al. 1988), Overall service quality (Spreng and Mackoy 1996)
Perceived usefulness Individual	Individual Impact (DeLone and McLean 1992),
Perceived usefulness Organization	Organizational Impact (DeLone and McLean 1992)
User satisfaction	User satisfaction (Bhattacherjee and Premkumar 2004), Information Access (Mirani and Lederer 1998)
Use	Use (Yoon and Guimaraes 1995; Bajaj and Nidumolu 1998)

Table 36 The previous adoption of the constructs

In addition, all the hypotheses have been already tested in the IS discipline. Even the relationships between Knowledge of the Others and the construct of IS success have been tested in the more comprehensive construct of Anonymity, of which Knowledge of the Others is considered a dimension (Table 37).

HYPOTHESES	INDEPENDENT	DEPENDENT	PREVIOUS HYPOTHESES
H1	Perceived Usefulness Individual	Perceived Usefulness Organization	(Jurison 1996; Teo and Wong 1998)
H2	Use	Perceived Usefulness Individual	(Goodhue and Thompson 1995) (Weill and Vitale 1999)
H3	User Satisfaction	Perceived Usefulness Individual	(Seddon and Kiew 1994; Etezadi-Amoli and Farhoomand 1996)
H4	Use	User Satisfaction	(DeLone and McLean 1992)

H5	ERS Quality	User Satisfaction	(DeLone and McLean 2003)
H6	ERS Quality	Use	(DeLone and McLean 2003)
H7	Knowledge of the Others	User Satisfaction	Anonymity --> Satisfaction (George, Easton et al. 1990; Jessup and Tansik 1991)
H8	Knowledge of the Others	ERS Quality	Anonymity --> Quality (Connolly, Jessup et al. 1990; George, Easton et al. 1990)
H9	Knowledge of the Others	Use	Anonymity --> Number of comments (Connolly, Jessup et al. 1990; George, Easton et al. 1990)

Table 37 The previous tests of the hypotheses

The robustness of this model, in terms of nomological validity, is verified at the test of the structural model in the Structural Equation Modeling (Straub, Limayem et al. 1995; Straub, Boudreau et al. 2004). The similarity of significance among studies that use the same validated instruments (Straub, Limayem et al. 1995; Straub, Boudreau et al. 2004) is an indication of the nomological validity.

In the test of the structural model, all the hypotheses are significant, except H4, which states the influence of Use on User Satisfaction. An extensive discussion on the relationship between Use and User Satisfaction exists in literature, and the empirical tests present heterogeneous results (DeLone and McLean 1992; McKeen, Guimaraes et al. 1994; Seddon 1997; Gelderman 1998; Downing 1999; DeLone and McLean 2003; Garrity, Glssberg et al. 2005). This hypothesis, which is not significant, could be therefore judged in line with some theoretical research streams (Seddon 1997).

Predictive validity

The predictive validity establishes the relationship between measures and constructs by demonstrating that a given set of measures, posited for a particular construct, correlates with or predicts a given outcome variable (Straub, Boudreau et al. 2004), to the benefit of the practitioner community.

The data collection at once does not allow the assessment of the predictive validity. Straub, Boudreau and Gefen (Straub, Boudreau et al. 2004) consider it only an optional practice because it is not necessary for scientific authenticity. Therefore predictive validity was **not assessed**.

Common methods bias control

The common methods bias is also known as "method halo" or "methods effects". It occurs when data is collected via only one method (Campbell and Fiske 1959), because the different pieces of data share part of the variance that the items have in common with each other due to the data collection method rather than to hypothesized relationships (Straub, Boudreau et al. 2004).

In order to reduce it, questions' distribution, in the questionnaire, was **randomized** (Cook and Campbell 1979; Straub, Boudreau et al. 2004).

5.10   Reliability

The reliability concerns the measurement of the constructs in order to assess the correctness of the items as operationalization of each construct (Straub, Boudreau et al. 2004). The reliability is calculated basing on the extent to which the measures of the items of the same construct correlate together (Straub, Boudreau et al. 2004). The quality of the reliability determines the **accuracy** of the measure, as approximation of the true scores of the latent variable (Cronbach 1951).

Internal consistency, split half, test-retest and alternative form, inter-rater or inter-coder reliability, unidimensional, reliability and mono-operation bias control are the 6 techniques use in the IS community to assess reliability (Straub, Boudreau et al. 2004).

As Straub, Boudreau and Gefen (Straub, Boudreau et al. 2004) point out, the combination of techniques to calculate reliability strengthens this component of instrument validation. So, this study combines different techniques.

Internal consistency

The internal consistency measures the construct through a variety of items, within the same instrument. The different items measuring the same construct, even if they vary in wording and in the position in the questionnaire, should have scores that highly correspond with each other (Grover, Cheon et al. 1996; Straub, Boudreau et al. 2004).

Cronbach's α (Cronbach 1951) is the most common technique to assess internal consistency. Cronback's α test demands that the all items related to a construct should be identically or highly scored, for being consistent on the same construct. However, very high (0,95 or greater) **Cronback's α** opens the suspect that the respondent recalled the previous responses and therefore he did not naturally respond to the specific question (Campbell and Fiske 1959). In accordance to Nunnally's rule of thumb (Nunnally 1978), Cronback's α should be 0,70 or greater for a confirmatory research, while 0,60 for an exploratory research.

SPSS 11.0 has been used to test the Cronback's α for the constructs, which is confirmed above the threshold (Table 38).

Scale	N of Items	Cronback's α	Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Perceived usefulness (individual benefit)	3	0,851	pui1	9,792307692	4,566735967	0,737189396	0,783171395
			pui3	9,869230769	5,805227205	0,725148754	0,799244866
			pui2	9,946153846	5,078170478	0,721196255	0,791323063
Knowledge of	4	0,825	k1	13,19465649	10,86234682	0,547086186	0,826583323

			k2	13,82824427	10,44931415	0,616185567	0,795439056
the Others			k4	13,1870229	9,984045509	0,702882773	0,755592629
			k3	13,17175573	9,836287327	0,74420827	0,73686378
Service quality	2	0,715	q1	4,675572519	1,101240092	0,558369761	
			q2	4,63740458	1,297139598	0,558369761	
Perceived usefulness (organizational benefit)	2	0,857	puo1	4,817829457	1,371354025	0,749694675	
			puo2	4,996124031	1,451346786	0,749694675	
	4	0,935	us1	13,765625	7,058578431	0,874104966	0,906144745
			us2	13,828125	7,538970588	0,813075599	0,925942407
			us3	13,828125	7,037009804	0,836196266	0,918430654
User satisfaction			us4	13,73828125	6,750842525	0,866678018	0,908798602
	2	0,728	u1	3,907692308	1,852450252	0,572205292	
Use			u3	3,626923077	1,941357291	0,572205292	

<div align="center">Table 38 The Cronback's α for the constructs</div>

Split half

The split half test proposes to divide the scale into equal sub-scales, in order to assess their reliability (Straub, Boudreau et al. 2004). The average correlation between items is used as reliability coefficient (Nunnally 1978) and the cutoff value proposed by Segars (Segars 1997) is 0,50.

SPSS 11.0 has been used to test the **correlation** between the halves of each construct and the values resulted over the cutoff (Table 39).

CONSTRUCT	ITEMS	FIRST SUB-SCALE	SECOND SUB-SCALE	CORRELATION BETWEEN FORMS
Knowledge of the Others	k1, k2, k4, k3	k1, k2	k4, k3	0,688
Service quality	q1, q2	q1	q2	0,558
Perceived usefulness (individual benefit)	pui1, pui2, pui3	pui2, pui3	pui1	0737
Perceived usefulness (organizational benefit)	puo1, puo2	puo2	puo1	0,750
User satisfaction	us1, us2, us3, us4	us1, us3	us2, us4	0,902
Use	u1, u3	u1	u3	0,572

<div align="center">Table 39 The correlation between halves</div>

Test-retest and alternative form

The test-retest aims at determining whether an instrument will produce the same scores from the subjects every time (Straub, Boudreau et al. 2004). Test-retest involves the administration of the

instrument to the same sample group twice (Cronbach 1951; Nunnally 1978; Hendrickson, Massey et al. 1993; Torkzadeh and Doll 1994).

The alternative form test involves the comparison of the scores between other instruments for the same construct at different points in time (Nunnally 1978; Peter 1979; Straub, Boudreau et al. 2004).

The comparison across time of the instrument is subject to several inevitable threats. The answers may be similar because the respondents simply recall the previous answers (Cook and Campbell 1979). This test-retest threat can be attenuated through a longer time between test and retest (Rogers 1995). However the lengthening of the time interval could affect the scores of the instrument since some events that change the individual position toward the constructs could occur (Peter 1979).

Several elements induce to **exclude** the test-retest and the alternative form methods: the time limits, the difficulties of getting the answers to the questionnaire, and the existence of several ongoing initiatives concerning the ERS in the different research contexts that could change the individual position toward the constructs.

Inter-rater or inter-coder reliability

The inter-rater and the inter-coder reliability regards the collected data that is not in a natural quantitative form (Straub, Boudreau et al. 2004). This reliability method is used therefore for unstructured and semi-structured discourse in the interview transcripts data. The transcript data could be coded in order to analyze and interpret its underlying meaning (Straub, Boudreau et al. 2004).

The exclusive use of 7 point Likert scales and 7 point semantic differential **item scales** excludes the need of the codification of some transcript data.

Unidimensional reliability

The unidimensionality refers to the measurement, by each item, of one and only one latent construct (Anderson, Gerbing et al. 1987; Segars 1997; Gefen 2000). The test should not reveal that a measurement item significantly reflects more than the latent construct, to which it is assigned (Straub, Boudreau et al. 2004). Each construct should not show parallel correlational patterns among the measures within the set of the measures presumed to be making up the same construct and among the measures outside that set (Anderson, Gerbing et al. 1987)

The **covariance-based SEM** is used to test unidimensional reliability. The exam of the first and second order models determines that the posited structure of the constructs is unidimensional (Straub, Boudreau et al. 2004). First order factor is the most macro level conceptualization of a construct and it is composed of more than one second order factor (Gefen 2000).

The examination of the modification indices and the residual matrix reveal the eventual problems with the unidimensionality of some item measures. The magnitude of these indices, greater than 5,0, seems to indicate that a high degree of cross-correlation exist between some factors and some particular indicators within the model (Burr 1976; Anderson and Gerbing 1988; Joreskog and Sorbom 1989; Segars 1997). The examination of the actual modification indices revealed some cases greater than 5,0. However their associated reduced Parameter Change gave confidence in the unidimensionality of the constructs (Table 40 and Table 41).

Covariances			M.I.	Par Change
e21	<-->	sq	10,573	0,058
e20	<-->	sq	4,785	-0,048
e13	<-->	e21	4,79	0,09
e12	<-->	pui	4,005	0,095
e12	<-->	us	4,989	-0,061
e12	<-->	sq	5,385	0,066
e6	<-->	punbi	4,436	-0,104
e6	<-->	e27	4,227	-0,102
e11	<-->	e12	7,178	-0,086
e10	<-->	pui	5,125	0,057
e9	<-->	u	4,647	0,054
e9	<-->	e7	10,177	0,097
e2	<-->	e21	8,991	0,072
e2	<-->	e20	8,918	-0,089
e2	<-->	e12	9,887	0,119

Table 40 The covariances

Regression Weights			M.I.	Par Change
pui3	<---	q2	5,436	0,093
pui1	<---	k2	5,734	-0,103
us4	<---	k1	4,05	-0,046
us2	<---	u3	5,701	0,055
q2	<---	k1	6,013	0,067

Table 41 The regression weights

Moreover, theory suggests that any high residual value between these items and the other indicators indicates that the subsequent path modeling with these indicators may be compromised due to a lack of item unidimensionality. The standardized residual covariances do not show high residual values and so they confirm the unidimensionality of the instruments (Table 42).

Standardized Residual Covariances/1									
	puo2	puo1	pui3	pui2	pui1	k3	k4	k2	k1
puo2	0								
puo1	0	0							

pui3	0,149	0,369	0						
pui2	-0,111	-0,587	-0,236	0					
pui1	-0,156	0,153	-0,024	0,327	0				
k3	-1,07	0,029	-0,262	0,029	-1,344	0			
k4	0,144	0,197	-0,166	0,674	-0,311	0,166	0		
k2	0,401	0,76	1,227	0,447	-0,843	-0,071	-0,141	0	
k1	-0,271	0,616	1,259	1,409	0,02	0,065	-0,194	-0,105	0
u3	0,248	0,317	-0,124	0,49	-0,297	-0,605	-0,179	0,144	0,661
u1	-1,292	-0,604	0,045	0,487	-0,527	0,613	0,614	0,102	0,911
us4	0,182	0,213	0,222	-0,214	-0,334	-0,104	-0,056	0,777	-0,478
us3	0,715	0,195	1,019	0,719	0,389	0,001	-0,473	1,146	0,49
us2	0,034	-0,017	0,098	0,401	-0,587	0,148	0,608	0,998	0,842
us1	-0,34	-0,475	-0,009	-0,277	-0,689	-0,38	-0,699	0,121	-0,16
q2	0,248	-0,062	0,92	-0,875	-0,789	-0,347	-0,419	0,849	1,285
q1	-0,017	-0,509	0,885	0,571	-0,233	-0,044	-0,147	-0,173	-0,58

Standardized Residual Covariances/2								
	u3	u1	us4	us3	us2	us1	q2	q1
puo2								
puo1								
pui3								
pui2								
pui1								
k3								
k4								
k2								
k1								
u3	0							
u1	0	0						
us4	-0,401	-0,273	0					
us3	-0,228	-0,332	0,219	0				
us2	1,162	-0,334	-0,288	-0,085	0			
us1	0,027	0,045	0,037	-0,178	0,218	0		
q2	0,144	-0,561	-0,021	-0,333	-0,114	0,187	0	
q1	0,334	-0,844	0,178	0,366	0,181	-0,239	0	0

Table 42 The standardized residual covariances

Mono-operation bias control

Mono-operation bias expresses the risk of missing the measurement of the construct when only an item is used for measuring the construct. This mono-operationalization threats the reliability and there are no means to validate the metric: it may be right or wrong (Cook and Campbell 1979; Straub, Boudreau et al. 2004). To avoid this risk each construct in this instrument has been measured with **more than one item** (Table 43).

CONSTRUCT	ITEMS	N OF ITEMS
Knowledge of the Others	k1, k2, k4, k3	4
Service quality	q1, q2	2
Perceived usefulness (individual PU (Seddon))	pui1, pui2, pui3	3
Perceived usefulness (net benefit for the individual)	puo1, puo2	2
User satisfaction	us1, us2, us3, us4	4

| Use | u1, u3 | 2 |

Table 43 The number of items for each construct

5.11   Manipulation validity

Manipulation validity measures the extent to which the treatments are perceived by the subjects (Bagozzi 1977). This method can only be applied into the experimental settings to see the extent of the influence on the dependent variable by the manipulation of the independent variables (Straub, Boudreau et al. 2004). The case study methodology does not accept the experimental procedures, and so this validity is **not been verified**.

5.12   Statistical conclusion validity

The statistical conclusion validity assesses the mathematical relationships between the variables of a model. It is a method to infer whether the statistical formulation correctly expresses the true covariation (Cook and Campbell 1979). It deals with the quality of the statistical evidence of covariation model, in relation to the eventual sources of error, the inappropriate statistical tool usages and biases (Straub, Boudreau et al. 2004).

First generation statistical tools, such as regression, have been supplemented by second generation statistical tools, such as Structural Equation Modeling (SEM) (Gefen, Straub et al. 2000). The SEM techniques are the set of tools to assist in establishing whether there is statistically a critical realism in the relationship between the variables or the sets of variables (Cook and Campbell 1979).

The advantage of the SEM, in comparison with the first generation tools, is the possibility to accomplish a single, systematic, and comprehensive analysis among the multiple constructs simultaneously (Gerbing and Anderson 1988).

Two types of SEM exist: the covariance-based SEM and Partial Least Squared SEM. Covariance-based SEM examines the entire matrix of covariances or correlations, including the ones that are not specified in the model. Partial Least Squared SEM, on the other hand, examines the proposed model alone, ignoring the covariances and the correlations that are not specified in the model (Gefen, Straub et al. 2000).

The choice of the methodology among the regression, the covariance-based SEM and the Partial Least Squared SEM depends on several aspects of the study, such as: the objective of the overall analysis, the objective of the variance analysis, the theory base, the assumed distribution, the sample size. A comparison on these 5 aspects have been performed and synthesized in the following table for the choice of the method (Table 44).

ISSUE	THIS STUDY	COVARIANCE-BASED SEM	PARTIAL LEAST SQUARED SEM	LINEAR REGRESSION
Objective of the overall analysis	It shows that the null hypothesis of the entire model is plausible, rejecting the path-specific null hypotheses of no effect	It shows that the null hypothesis of the entire model is plausible, rejecting the path-specific null hypotheses of no effect	It rejects a set of path-specific null hypotheses of no effect	It rejects a set of path-specific null hypotheses of no effect

Objective of the variance analysis	Overall model fit	Overall model fit	Variance explanation	Variance explanation
Theory base	There is a sound theory base for a confirmatory research	A sound theory base is required. It supports only confirmatory research	it supports both exploratory and confirmatory research	It supports both exploratory and confirmatory research
Assumed distribution	The distribution is multivariate normal	The distribution has to be multivariate normal, if estimation is through Maximum Likelihood. Otherwise, some deviations from the multivariate normal are supported with other estimation techniques	The distribution should be multivariate normal but it is relatively robust to some deviations from the multivariate distribution	The distribution should be multivariate normal but it is relatively robust to some deviations from the multivariate distribution, and with several established methods of handling the non-multivariate distributions
Sample size	265	At least 100-150 cases	At least 10 times the number of items in the most complex construct	Support smaller sample size, although a sample of at least 30 is required

Table 44 The comparison of the methodologies

The compatibility between the characteristics of this study and the covariance-based SEM requirements determines the employment of this method for the statistical conclusion analysis, through the AMOS 6 application.

The run of the model in Amos 6 shows that the **overall fitness** of the model is good, with all the indices over the respective threshold (Table 45, Table 46 and Table 47), The Post-hoc analysis is even not foreseen, because the Modification Indexes are not large enough to suggest the ad hoc modification of the model.

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	43	170,623	110	0	1,551

Table 45 The CMIN of the model

Model	RMR	GFI	AGFI	PGFI
Default model	0,058	0,929	0,902	0,668

Table 46 The RMR, GFI, AGFI of the model

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	0,944	0,93	0,979	0,974	0,979

Table 47 The NFI, RFI of the model

In terms of the single hypotheses, all the nine hypotheses are statistically significant except the causal relationship of Use on User Satisfaction, which is therefore not validated (Table 48, Table 49 and Table 50).

Regression Weights			Estimate	S.E.	C.R.	P
sq	<---	k	0,337	0,073	4,621	***
u	<---	sq	0,644	0,183	3,518	***
u	<---	k	0,419	0,113	3,709	***
us	<---	sq	1,362	0,253	5,389	***
us	<---	k	0,155	0,073	2,105	0,035
us	<---	u	0,085	0,064	1,334	0,182
pui	<---	u	0,401	0,095	4,235	***
pui	<---	us	0,684	0,093	7,323	***
puo	<---	pui	0,797	0,062	12,916	***

Table 48 The regression weight estimates

Standardized Regression Weights			Estimate
sq	<---	k	0,542
u	<---	sq	0,353
u	<---	k	0,369
us	<---	sq	0,787
us	<---	k	0,144
us	<---	u	0,09
pui	<---	u	0,332
pui	<---	us	0,536
puo	<---	pui	0,881

Table 49 The standardized regression weight estimates
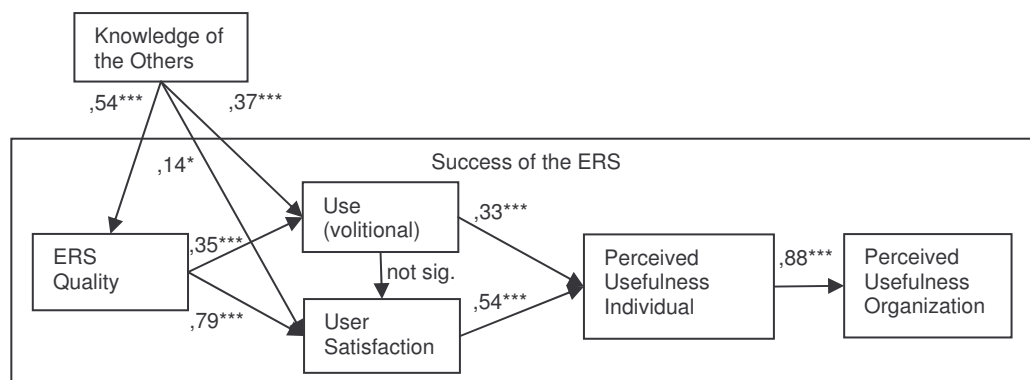
Figure 54 The model at the quantitative phase (Standardized regression weights. "*" significant at the 0,001%; "*" significant at the 0,05%; "not sig." not significant at 0,05%)**

Hypotheses	Independent	Dependent	confirmation
H1	Perceived Usefulness Individual	Perceived Usefulness Organization	Yes
H2	Use	Perceived Usefulness Individual	Yes
H3	User Satisfaction	Perceived Usefulness Individual	Yes
H4	Use	User Satisfaction	No
H5	ERS Quality	User Satisfaction	Yes
H6	ERS Quality	Use	Yes
H7	Knowledge of the Others	User Satisfaction	Yes
H8	Knowledge of the Others	ERS Quality	Yes
H9	Knowledge of the Others	Use	Yes

Table 50 The confirmed hypotheses

The analysis offers evidence that the external variable Knowledge of the Others has a significant impact on ERS Success variables: User Satisfaction, ERS Quality, and Use. The variable ERS Quality has also a positive influence on User Satisfaction and Use. Reversely, the variable Use is not resulted significantly influencing the User Satisfaction like it was hypothesized. The two variables Use and User Satisfaction have a positive effect on the variable Perceived Usefulness for the Individual. Finally, the variable Perceived Usefulness for the Individual has a significant impact on Perceived Usefulness for the Organization.

In conclusion, with the **exception of H4 between Use and User Satisfaction**, the structural model is overall significantly confirmed. The modifications indexes show also that any post hoc analysis would bring a relevant improvement in the model (Byrne 2001).

5.13   Research answers

Giving all these qualitative and quantitative data the answering to the three research questions, which has been defined at the beginning of the document, can now be completely given.

First research question: what are the dimensions of the success of the Expert Recommending Services?

The reviewed literature proposed different models of the Information Systems success. The reasoned choice of the DeLone and McLean model and its adaptation to the ERS context is proven as a satisfactory solution to measure the ERS success. The confirmation of all the hypotheses, with one exception, confirm the quality of the DeLone and McLean model of IS success for measuring the ERS success , and the quality of its adaptation to the specific context.

The final retained dimensions of the success of the Expert Recommending Services are: ERS Quality, Use, User Satisfaction, Perceived Usefulness for the Individual, and Perceived Usefulness for the Organization (Figure 55).
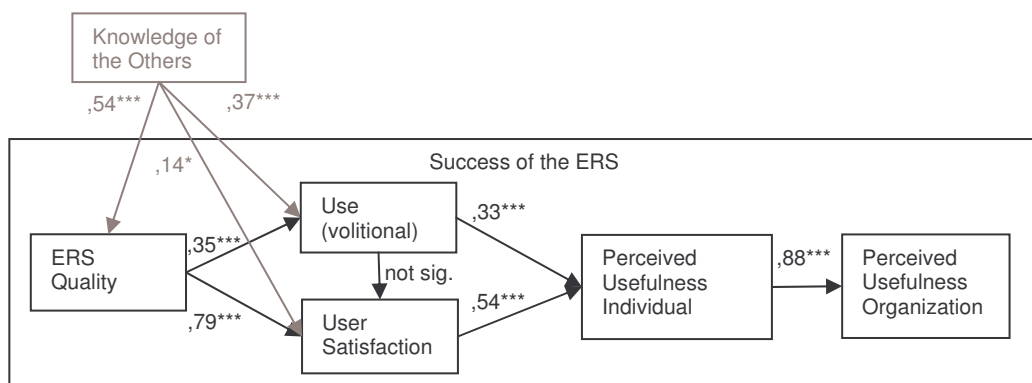
Figure 55 The dimensions of the success of the Expert Recommending Services

Moreover, the statistical tests validated also the choice of the ERS Quality as the variable that synthetically represents the ERS characteristics and demonstrated its significant influence on the other dimensions of the ERS success (Figure 56).
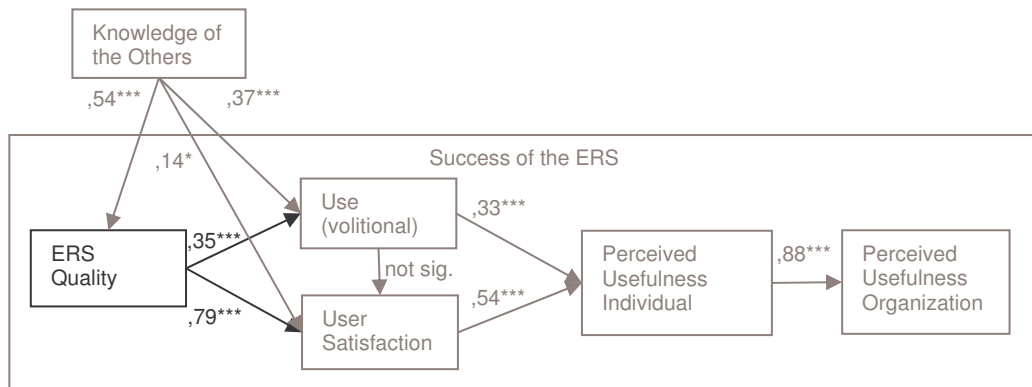
Figure 56 The dimension ERS Quality validity

Second research question: what are the properties of the Knowledge Community that influence the success of the Expert Recommending Services?

The specificities of the ERS put in evidence, by the literature review and by the case study methodology, the crucial influence of the Knowledge Community in the success of the ERS, by means of its properties. The awareness on the knowledge domains of the other members of the Knowledge Community emerged as the most important characteristic of the Knowledge Community that influences the ERS success. This characteristic has been formalized in the variable Knowledge of the Others, which measures the degree to which an individual know the others' knowledge domains.

Third research question: To what degree the success of the Expert Recommending Services is influenced by the properties of the Knowledge Community?

Among the several properties of the Knowledge Community proposed in the literature and emerged in the empirical study, only the for the variable Knowledge of the Other its degree of influence on the ERS success has been estimated. All the three hypotheses have been confirmed and the statistical conclusion validity assessed that the standardized regression weight estimates equal 0,54 on ERS Quality, 0,14 on User Satisfaction, 0,37 on Use. These results show that the characteristics of the Knowledge Community influence the success of the ERS, by means, at least, of the variable Knowledge of the Others. This influence has been qualitatively perceived, by the case studies, also for several other characteristics of the Knowledge Community but not so strongly. The apparent strength of the link between Knowledge of the Others and ERS success has brought to focus only on that single variable among the possible several ones (Figure 57 The influence of the Knowledge of the Others on the Success of the ERS

).
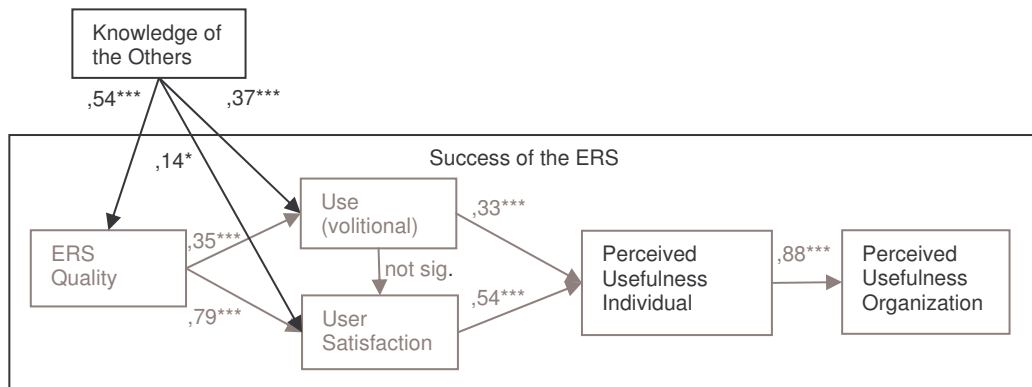
Figure 57 The influence of the Knowledge of the Others on the Success of the ERS

The answering to the three research questions represents the main original output of the research. The demonstration of the influence of the Knowledge Community in the success of the Information Systems contributes to the exploration of the reasons of the unsuccess of the ERIS. Moreover, these evidences strengthen the idea of the close relationship existing between Knowledge Communities and Knowledge Management Systems, which is not always taken into appropriate consideration in the IS literature and organizational practice.

The overall considerations on the original contribution of this work favours the delineation of the main conclusions on this research.

5.14   Conclusions

The analysis of the data on the three cases, through qualitative and quantitative methods, supports the research hypotheses. This almost successful test of the research model favors some constructive discussions on the obtained results and a series of conclusions on the different elements taken into consideration during the research.

All these elements will be presented in the following and final chapter, which is completely dedicated to the discussions and to the conclusions.

6 Discussions and conclusions

This ending part of the document presents the discussions and the conclusions on the entire study.

At first the most important results of the research will be summed up and this summary will favor the considerations on their generalization.

Subsequently the causes of these results are prospected and the implications for the practitioners are outlined. Finally, the research contributions, limits, and perspectives are stated, through a threefold reparation in theoretical, methodological and managerial points of view.

6.1 Most important results

The most important results of this research concern: the characteristics of the Knowledge Communities, the characteristics of the Expert Recommending Services and the influence that the Knowledge Communities have on the Success of the Expert Recommending Service.

This research puts in evidences the heterogeneousness of the Knowledge Communities about their characteristics, identified in the literature (Maier 2002; Andriessen 2005a). This heterogeneousness is in line with the results of several authors (Cox 2004; Hildreth and Kimble 2004; Paavola, Lipponen et al. 2004; Andriessen 2005a; Kimble 2005; Steiny 2005; Thompson 2005).

This study highlights also the differences existing among Expert Recommending Services implemented in different organizations. Following the classification of Martinez (Martinez 2004), the observed Expert Recommending Services were from informal to computer-based ERS. Differences were also pointed out among ERS of the same type, as reported by Adomavicius (Adomavicius and Tuzhilin 2005), and Resnik (Resnick and Varian 1997) on the recommender information systems they studied.

In addition, the author explored and confirmed the **influence of the Knowledge Community** on the Success of the Expert Recommending Service. Seddon (Seddon 1997) highlights that the observations, the personal experiences, and the reports of the consequences of the IS use have an impact on IS success. If these observations, personal experiences and reports take places in a Knowledge Community, then the characteristics of this Knowledge Community can influence directly the IS Success of the ERS.

The qualitative phase shows that, among the several elements characterizing a KC, knowing the other people is a crucial element of influence on the ERS Success. This novelty is confirmed by the results of the quantitative phase, and by the previous studies on this variable. In fact, knowing of the others has been already considered a factor influencing IS success (Pinsonneault and Heppel 1997-8). Now the role of this variable is tested in the ERS context.

6.2 Generalization

The rigor in the applied methodology, the regularity in the outcomes across the cases, and the statistical significance of the results allow the generalization of the results (Hofstede, Neuijen et al. 1990; Darke, Shanks et al. 1998; Paré 2002; Yin 2002; Dube and Pare 2003). The results generalization concerns mainly the ERS Success and the relation between the Knowledge Community and the ERS Success.

ERS Success

The first generalization regards the success of the ERS. The **results of this study are mainly consistent with the previous research** in Information Systems discipline on the success of the Information Systems. This consistency with the previous results strengthens the potential of the generalizations.

Several authors (Seddon and Kiew 1994; Jennex and Olfman 2003; Roldán and Leal 2003; DeLone and McLean 2004; Almutairi and Subramanian 2005) have evaluated the success of the IS basing on the DeLone and McLean's model (DeLone and McLean 1992), as the author does. The DeLone and McLean model is confirmed a viable model to describe the success of IS, in different organizational contexts, and for different kind of Information Systems. System quality, IS use, User satisfaction, Perceived Usefulness for the Individuals, and Perceived Usefulness for the Organization are the key dimensions of the IS success and confirmed general good measures to assess degree of the success of the IS.

Previous research has omitted to explore the success of the Expert Recommending Services, even if a few studies exist on the broader theme of the Knowledge Management Systems (Jennex, Olfman et al. 1998; Jennex and Olfman 2003; Money and Turner 2005). While the validity of the DeLone and McLean model is well established, this research contributes to test its validity for the ERS. This research studies the success of the Expert Recommending Services in three different organizations and the confirmation of the DeLone and McLean model for the ERS supports the applicability of the model also to other Expert Recommending Services.

In summary, the success of the ERS, whatever the organizational context, can be effectively measured through the combined measurement of: the ERS quality, the ERS use, the user satisfaction, the perceived usefulness for the individual and the perceived usefulness for the organization.

Knowledge Community and ERS success

The second generalization regards the role of the Knowledge Community in the success of the ERS. The author has qualitatively explored the influence of the Knowledge Community on the success of the ERS. In addition, the author has quantitatively confirmed that Knowledge of the Others has a positive impact on the ERS Quality, the Use and the User Satisfaction.

The Knowledge Communities have been described like an adapted organizational mechanism for enhancing knowledge transfer (Boland and Tenkasi 1995; Grant 1996b; Hasan and Gould 2001). The first aim of the ERS is to improve the awareness on the knowledge domains of the others, to overcome a barrier to knowledge transfer (McDonald 2000; McDonald and Ackerman 2000; Yimam-Seid and Kobsa 2000b; Yimam-Seid and Kobsa 2000a; McDonald 2001; Yukawa and Kasahara 2001; McDonald 2003; Plu, Agosto et al. 2004; Vignollet, Plu et al. 2005). Therefore, an evident relationship between Knowledge Communities and the ERS exists with regards to the knowledge transfer.

The characteristics of the organization (Raymond 1985; Essex, Magal et al. 1998; Bourdon and Vitari 2003), of the users (Hartwick and Barki 1994; Yoon, Guimaraes et al. 1995; Essex, Magal et al. 1998; Markus 2001; Bourdon and Vitari 2003), and of the management support (Yoon, Guimaraes et al. 1995; Essex, Magal et al. 1998; Finlay and Forghani 1998) have been already indicated like factors affecting IS success.

All these factors are partially included in the set of characteristics that describe the Knowledge Communities. Therefore, the **Knowledge Community can be considered as having an influence on IS success**, as the author reports. In particular, the author concludes that the success of the ERS is influenced by the degree of the users' awareness on the knowledge domains of the other members of the Knowledge Community.

Nevertheless, the influence of the variable Knowledge of the Others on the ERS success is not studied in other contexts to assure the external validity of this specific result. The author hence is confident on the external validity and therefore the generalizability of the results that show the influence of the Knowledge Community on the IS success.

6.3 Causes of the results

The causes of these outcomes can be traced back into the explanation of the reasons of IS success and the description of the barriers to the knowledge transfer.

IS success

The causes of the IS success are proposed by DeLone and McLean (DeLone and McLean 1992), basing on the Shannon and Weaver (Shannon and Warren 1949) work on communications, and its adaptation to IS by Mason (Mason 1978). DeLone and McLean affirm the existence of 6 major dimensions of IS success: System Quality, Information Quality, Use, User Satisfaction, Individual Impact, and Organizational Impact. They structurally link these six dimensions by a set of temporal and causal interdependencies.

These **proposed relationships** between dimensions have been adopted in this study thus they explain the outcomes of this research:

1. The Perceived Usefulness for the Organization is caused by the Perceived Usefulness of the Individual.
2. The Perceived Usefulness for the Individual is caused by the Use and the User Satisfaction.
3. The User Satisfaction is caused by the ERS Quality.
4. The Use is caused by the ERS Quality.

These statements affirm that the quality of Expert Recommending Service positively influences its use by the members of the organization and the satisfaction on the users toward the ERS. The frequent use of the ERS and the satisfaction of the users have a direct positive impact on the perceived usefulness of the ERS for the members of the organization and this usefulness perception for the individuals causes the perception of the usefulness of the ERS for the entire organization.

In contrast with the DeLone and McLean's IS success model (DeLone and McLean 1992), the relationship between Use and User Satisfaction is not statistically significant. The causes of this statistical result can be traced back into the justifications of Seddon for a respecification of the DeLone and McLean model (Seddon 1997). Seddon (Seddon 1997) argues that Use is not a dimension of the IS success and that Use does not causes User Satisfaction. Another possible cause for this result can be detected by the potential existence of a reverse relationship, between Use and User Satisfaction: several authors proposes that user satisfaction causes the use of the IS (Guimaraes and Igbaria 1997; Igbaria and Tan 1997; Gelderman 1998). The presence of alternative propositions does not facilitate the identification of the univocal cause of the non-significance of the influence of Use on User Satisfaction.

Knowledge of the Others

This research has identified an **external cause to ERS success**: the Knowledge Community. Specifically the variable Knowledge of the Others affects ERS Quality, Use, and User Satisfaction. As explored by other authors (Lesser and Strock 2001; Lesser and Strock 2004; de Moor 2005; Thompson 2005; Koeglreiter, Smith et al. 2006), part of the IS success is caused by the characteristics of the Knowledge Community possibly in place. Among the set of identified characteristics (Maier 2002; Andriessen 2005a) of the Knowledge Community the one that emerges as the main dimension influencing the ERS success is Knowledge of the Others. This means that a high degree of awareness, by the members of the Knowledge Community, on the distribution of the knowledge among the other members, has an impact on the ERS Success, as such: ERS Quality, Use, and User Satisfaction. Knowledge of the other members and the general issue of cohesion and anonymity have already demonstrated to partially cause the IS success (Pinsonneault and Heppel 1997-8).

Concerning the specific type of IS called ERS, the awareness of the knowledge domains of the others, as a cause of ERS success, is an unexplored causal relationship. Nevertheless, such relationship seems reasonable, is empirically supported, and stated in closely related fields by different authors (Granovetter 1983; Wilson 1995; Hertzum and Pejtersen 2000). The relationships with regards to Knowledge of the Others that are empirically supported in this study are the following ones:

1. The Knowledge of the Others partially causes the degree of quality of the ERS. The individuals who have an extended awareness on the knowledge domains of the others could target the individuals, who are likely in the right position to provide a high quality ERS. The awareness on the knowledge domains of the other members causes the right selection of the ERS provider and therefore the high standing of the returned quality of the ERS.

2. The Knowledge of the Others partially causes the extent to which the ERS is required. The precise and complete awareness of the others' knowledge domains causes the inutility of the Expert Recommending Service because the single individual can directly target the right expert. On the other hand, the total unawareness of the knowledge domains of the other causes the inability to target a suitable provider of the ERS. A certain degree of awareness causes the use of the ERS and the increase in this awareness stimulates the frequency of use of the ERS.

3. The knowledge of the Other partially causes the degree of user satisfaction. The degree of awareness on the knowledge domains of the members of the Knowledge Community partially causes the satisfaction on the provision of the ERS. The individual who knows the knowledge

domains of the other members could directly target the individuals who could provide a fully satisfying ERS, determining an overall satisfaction on the service.

6.4 Implications

The research results lead to define some implications for practitioners on IS success and on the role of the Knowledge Community, and in particular of the Knowledge of the Others, on ERS success.

IS success

In line with a well-affirmed tradition in Information System discipline, IS success is a multidimensional and structurally composed variable (DeLone 1988; DeLone and McLean 1992; Garrity, Glssberg et al. 2005; Jennex and Olfman 2005; Liu, Olfman et al. 2005; Qian and Bock 2005). The success of an IS initiative is caused by multiple elements, on which the actors can intervene to favor the success of their specific information system.

Consistently with this research stream, IS success can be favored by:

- defining a high quality IS;
- favoring the use of the IS;
- satisfying the users' expectations on the IS;
- assuring the usefulness of the IS to the individual and to the organization.

This **set of levers** implies, that the promoter of an IS should pay attention to them and intervene in order to achieve them.

These levers are valid in general for the IS, but also for the type of IS investigated in this study: the ERS. The organizations with an ERS, whatever the type, could improve the success of their ERS by insisting on the quality of the ERS, the use, the users' satisfaction and the perceptions of its usefulness.

Knowledge of the Others

In addition to the levers for the success of the ERS mentioned above, the existence of a Knowledge Community emerges like an element influencing the success of the ERS. The organizations should therefore stimulate the creation or the **strengthening of their Knowledge Communities** because they facilitate, at the end, the identification of the right experts.

The interventions by the organizations on the Knowledge Communities is a phenomenon described in the IS literature by many authors (Botkin 1999; Collison 1999; Ferran-Urdaneta 1999; Allee 2000; Storck and Hill 2000; Wenger 2000b; Wenger and Snyder 2000; Brown and Duguid 2001; Maier 2002; Andriessen 2005b; Koeglreiter, Smith et al. 2006). In line with the propositions of these authors, the results of this study affirm that organization should intervene in the Knowledge Community for the organizational benefit.

In particular the variable Knowledge of the Others emerges as the main element influencing the success of the ERS. The organizations, interested in the success of their ERS, should take into consideration this variable and explore the means to increase the awareness on the knowledge domains of the others, since this could lead to a higher degree of ERS Success.

When the individuals of an organization do not know each others, the interventions of the organization should stimulate the reciprocal knowledge, because it has an impact on the success of the ERS. The risk that the individuals do not know the other knowledge domains is high in case of: mergers and acquisitions, high number of members, rapid turnover of the personnel, dispersion of the people in different locations. In these cases the organization should intervene to stimulate the acknowledgement of the others to positively influence the success of the ERS.

6.5 Research contributions

In this last part of the work, the author tries to concisely recapitulate the research contributions based on the objectives and the obtained results. In the following, the research limitations are highlighted and the last section discusses the possible paths for future research.

The research contributions of this study are threefold: theoretical contributions, methodological contributions and managerial contributions. Each one is separately described in the following sections.

Theoretical contributions

The major theoretical contributions of this research regard the exploration of the characteristics of the Knowledge Communities, of the characteristics of the Expert Recommending Services and of the kind of influence that the Knowledge Community has on the Success of the ERS.

Characteristics of the Knowledge Community

About the characteristics of the Knowledge Community, the review of the literature, started from the works by Maiers and Andriessens (Maier 2002 pages 156 ff; Andriessen 2005b), led to the **systematization of the several characteristics** of the Knowledge Communities into a set of main ones:

1. Lifetime. It describes the origin and the past of the KC.
2. Size. It defines the number of members of the KC.
3. Composition. It delineates the profile of the members of the KC.
4. Fragmentation. It reports the subdivision of the KC in sub-communities, super-communities, or intersecting communities.
5. Geographical dispersion. It relates to the geographical distance that exists among the members of the KC.
6. Mode of interaction. It lists the communication means that the members use to interact.
7. Degree of interconnection. It measures the prevalence of the one-to-one interaction in comparison the other types of the interactions (one-to-many, and many-to-many).
8. Frequency of interaction. It assesses the number of interactions among the members per unit of time.
9. Anonymity. It points out the degree of the recognition of the other members of the KC.
10. Openness. It states the possibility and the rules that govern the membership to the KC.

11. Purpose. It indicates the aims of the KC.

12. Cohesion. It refers to the feelings of membership and unity of the KC.

13. Degree of governance. It puts in evidence the intervention of some external entities on the KC.

Characteristics of the ERS

Another relevant contribution of this research is the description of the Expert Recommending Services. Starting from a literature review on IS (Churchman 1979 page 29; Pisoni 1979; Alter 1999; De Marco 2000; Pontiggia 2001 page 10) and the classification of the IS proposed by Martinez (Martinez 2004 page 116-118), the ERS has been classified and described in their **main operations**.

The ERS can be:

- Informal: the individuals use their personal information social networks to receive the recommendations on the experts.

- Formal paper-based: a set of individuals is in charge to counsel individuals on the potential experts.

- Formal computer-based: an IT system recommends the experts to the users.

The main functions of an ERS are the following:

1. Capturing. It involves the decision of what actions and of what utterances are worthy to collect the knowledge indications and the effective collection of these indications.

2. Manipulating. It involves the elaboration of the collected indications in order to obtain an overall profile of the knowledge domains of each individual.

3. Retrieving. It involves the identification of the individuals with a profile that is consistent with the criterion established by the searching individuals.

4. Displaying. It involves the presentation of the useful information to support the assessment of the retrieved individuals.

The influence of the Knowledge Community on the Success of the ERS

The final major contribution of this research is the identification of a relationship between the Knowledge Community and the success of the ERS. The literature review reports that Knowledge Communities could have a positive role in knowledge transfer (Thompson 1967; Van de Ven, Delbecq et al. 1976; Levitt and March 1988; Brown and Duguid 1991; Nonaka 1994; Grant 1996b; Martinez 2004 page 88).

The ERS aims at reducing the first barrier to knowledge transfer, which is the unawareness of the knowledge distribution among the members (Libby, Trotman et al. 1987; Littlepage and Silbiger

1992; Littlepage, Robison et al. 1997; Davenport, De long et al. 1998; Cross, Parker et al. 2001; Ruta and Turati 2002 page 151; Borgatti and Cross 2003; Kondratova and Goldfarb 2003; Baumann and Bonner 2004; Denrell, Arvidsson et al. 2004; Qureshi and Keen 2004).

This study makes a step forward, defining that the **Knowledge Community influences directly the success of the ERS**. However the any evaluation on the effectiveness of the knowledge transfers, generated by the ERS, remains unfold. Nevertheless, what is clearly evident is that a specific aspect of the Knowledge Community influences the success of the ERS. The degree of awareness of the knowledge domains of the other members has a positive impact on the ERS success, and specifically on: the ERS quality, the use of the ERS, and the user satisfaction.

Methodological contributions

Also the methodological contributions can be classified in three main areas: the methodological contribution of the analysis of the Knowledge Community, the methodological contribution of the analysis of the Expert Recommending Service, and the methodological contribution of the consideration of the Knowledge Community like an external variable to the ERS success.

Characteristics of the Knowledge Community

Several authors propose different classifications of the Knowledge Communities and heterogeneous lists of the dimensions, on which these classifications are performed (Maier 2002; Cox 2004; Paavola, Lipponen et al. 2004; Andriessen 2005a; Kimble 2005; Thompson 2005).

The first methodological contribution relates to:

1. The review of the literature to find all the dimensions proposed to distinguish among the Knowledge Communities.
2. The combination of the different dimensions into an overall list of dimensions that aims to contain the most relevant dimensions.
3. The application of this list of dimensions to different Knowledge Communities, to check its workability.

In summary, this research contributes to propose a **methodology to describe the Knowledge Communities** thus to distinguish them based on the main identified dimensions.

Characteristics of the ERS

The second main methodological contribution is related to the characteristics of the ERS. This research combined theoretical and empirical data to schematize the characteristics of the ERS, and it follows the paths traced by the first few initiatives to categorize the recommender systems (McDonald 2001; Liu 2003; Adomavicius and Tuzhilin 2005).

The adopted methodology involved:

1. A literature review of the main operations of the Information Systems and of the ERS.

2. A review of the Expert Recommending Services in order to explore their functionalities.

3. A description and a differentiation of the ERS studied, based on the set of the defined operations.

Hence, this study contributes to the proposal of a **methodology to classify ERS** and to distinguish the ERS, basing on their functionalities, along the main operations of the ERS.

The influence of the Knowledge Community on the Success of the ERS

An extensive literature exists on the IS success and on the methodologies to measure it (DeLone and McLean 1992; DeLone and McLean 2003; DeLone and McLean 2004; Garrity, Glssberg et al. 2005; Liu, Olfman et al. 2005). The final major methodological contribution concerns the method adopted to identify **the dimension of the Knowledge Community that has impact on the IS success**.

The used method followed these steps:

1. A literature review on the potential dimensions of the Knowledge Community that could influence the ERS success.

2. A collection of qualitative data on the Knowledge Community dimensions and their relations to the ERS success.

3. The establishment of the most important characteristic of the Knowledge Community affecting the ERS success.

4. The quantitative data collection to confirm the hypothesis of causal relationship between the selected characteristic of the Knowledge Community and the success of the ERS.

The main methodological contribution at this regards is related to the process of the selection and of the test of the most important characteristic of the Knowledge Community.

Managerial contributions

The main managerial contributions of this study are presented in the three-fold classification used for the theoretical and methodological contributions. At first the managerial contributions on the Knowledge Community will be presented. Secondly, the managerial contributions on the ERS are pointed out and finally the managerial contributions on the influence of the Knowledge Community are stated.

Characteristics of the Knowledge Community

The main managerial contribution concerning the Knowledge Communities relates to the proposition of a **solution to understand the characteristics of the Knowledge Communities.** The theoretical framework on the Knowledge Community identifies 13 main dimensions. The corresponding methodology explains how data on the Knowledge Communities can be collected and analyzed. With these available instruments, the organizations have the possibility to collect data on their Knowledge Communities and to interpret this data, in order to understand if the Knowledge Communities exist and what characteristics they have.

This managerial instrument, in association with a strategic statement of the role that the Knowledge Communities have to play in the organization could direct the managerial interventions to modify the characteristics of the Knowledge Communities, as suggested by several authors, such as: Vestal (Vestal and Lopez 2004), Tremblay (Tremblay 2004), Stuckey (Stuckey and Smith 2004), Moran (Moran and Weimer 2004), Martin (Martin, Hatzakis et al. 2004), Manville (Manville 2004), Kimball (Kimball and Ladd 2004), Callahan (Callahan 2004), Bradshaw (Bradshaw, Powell et al. 2004), and Wenger (Wenger, Mc Dermott et al. 2002).

Characteristics of the ERS

The second managerial contribution of this research is about the **description of the characteristics of the ERS**. The organizations have the opportunity to assess the type of the ERS existing in their organization: informal, formal paper-based, or formal computer-based. In addition, the organizations have a framework to evaluate how each, of the four main operations of the ERS, is performed.

This could be a starting point to improve the quality of the ERS, which is an independent internal variable of the IS success (DeLone and McLean 1992; Seddon 1997; DeLone and McLean 2003).

Moreover the research proposes a classification of the ERS, based on their functionalities for each of the four main operations. The organizations could use this classification to define their functional requirements for their ERS and to screen the available solutions basing on their functionalities. So, the organizations can develop an enhanced internal solution for the ERS or improve the selection of an external solution. This proposed support is just a preliminary step toward the definition of a method to select packaged ERS software. Nevertheless, it could be already helpful, if integrated with some most structured methods, proposed elsewhere in the literature (Morisio and Tsoukiàs 1997; Maiden and Ncube 1998; Ochs, Pfahl et al. 2001; Patel and Hlupic 2003).

The influence of the Knowledge Community on the Success of the ERS

The final managerial contribution is about **the relationship between the Knowledge Community and the ERS success**.

The assessment that the Knowledge Community, and in particular the Knowledge of the Others variable, has an impact on ERS success, gives to the organizations a new lever to improve the success of their IS and of their ERS.

The ERS success results consistent with the general models of IS success (DeLone and McLean 1992). The organizations have the possibility to influence the success of their ERS by improving the perceived usefulness for the organization, the perceived usefulness for the individual, the use of the ERS, the user satisfaction, the quality of the ERS.

In addition to this set of levers, the organizations can intervene on the ERS success acting on the Knowledge Community (Wenger, Mc Dermott et al. 2002). In particular the knowledge of the individuals on the others' knowledge domains seems crucial. The organizations can increase the success of their ERS by improving the reciprocal knowledge among the members of the Knowledge Community. The organizations should nevertheless pay attention to not distort excessively their Knowledge Communities, otherwise they can lose their effectiveness or even disappear (Gongla and Rizzuto 2004).

6.6 Research limitations

Despite the several contributions, this research presents also multiple limits. The perceived limits are reported in the following and they are classified in one of the three main typologies: theoretical, methodological, and managerial ones.

Theoretical limitations

Three major theoretical limits are outlined and they concern the IS success model, the Knowledge Community and the knowledge transfer measurement.

Firstly, the selected IS success model (DeLone and McLean 1992) has more than a decade of history and it can be considered surpassed by other more recent theories and models. Several alternative (Garrity and Sanders 1998) or enhanced models (Seddon 1997) of the DeLone and McLean model (DeLone and McLean 1992) has been proposed. This obsolescence has been perceived also by the authors of the original model and they updated it (DeLone and McLean 2003). They reaffirmed its validity by accepting some proposed modifications, but leaving its general structure unchanged. The large diffusion of the original model in the literature leaded the author to its choice, especially to counterbalance the originality of the IS type under study. This conservative choice can be evaluated like a limit of the research, because it does not take into consideration the enhancements proposed by newer theories and models on the IS success.

A second theoretical limit is the assumption that the Knowledge Community is an independent variable in the model. In fact, it is plausible that the use of the ERS could modify the characteristics of the Knowledge Community, in line with the statements of several authors that affirm that the Information Systems can modify the Knowledge Communities (Goodman and Darr 1998; Hattori, Ohguro et al. 1999; Pan and Leidner 2003; de Moor 2005). In the author's model, any feedback from the IS success to Knowledge Community and, specifically to Knowledge of the Others variable is not taken into consideration. Nevertheless, a feedback might exist indeed. The individuals, who received an expert recommendation, extend their degree of the Knowledge of the Others, and in particular of the proposed expert.

A final theoretical limit concerns the exclusion in the model of any explicit measurement of the knowledge transfer, which is one aim of the ERS. The counsels on the potential experts aim to facilitate the matching between the demand and the offer of knowledge and, so forth, the transfer of knowledge between demand and offer. However, this transfer is not actually measured. The information diffused by the ERS does not assure that the related knowledge is transferred between the expert and the recipient.

Methodological limitations

Four major methodological limits are reported and they are about the application of the IS theories to an informal IS, the consideration of only one variable of the Knowledge Community, the absence of any analysis of the social networks, and the exclusion of other variables from the IS success.

A first major methodological limit is about the application of the IS theories and models, rather than a computer-based Information System, to an informal Information System, which could be considered at the frontier of the Information Systems discipline. The limited development in the organization, the disintegration of the ERS in different tools, and the restricted diffusion among the members of the computer-based ERS in the cases at hand, brought to focus on the informal ERS for the quantitative phase of the research. The models and the methodologies mainly proposed for the computer-based information systems (DeLone and McLean 1992) have been applied on these informal ERS. The importance of these applications is nevertheless partially justified by the increasing importance of the service side of the Information Systems (DeLone and McLean 2003; Kettinger and Lee 2005).

A second noticeable methodological limit refers to the statistical consideration of only one aspect of the multidimensional reality of the Knowledge Communities. Several principal dimensions result from the literature review and they are observed in the qualitative phase. Only one dimension, the Knowledge of the Others, is tested in the quantitative phase. This reduction from the qualitative phase to the quantitative phase limits the comprehensiveness of the results about the Knowledge Communities. The influences of the other characteristics on the IS success, on the Knowledge of the Others, and on the link between Knowledge of the Others and IS success, remain unexplored.

A third remarkable methodological limit concerns missing the perspective of the Social Network Analysis (Breiger 2002). This methodology could have brought a deeper insight in the relationships among the members of the Knowledge Communities. The absence of ties, the weak ties and the strong ties between the members (Granovetter 1973; Granovetter 1983; Borgatti 2004) could have been explored giving additional information on the Knowledge Communities.

The last main methodological limit related to the exclusion of many variables that have been demonstrated as having an influence on the IS success (Rai, Lang et al. 2002; Briggs, De Vreede et al. 2003; Bourdon, Vitari et al. 2004; Qian and Bock 2005). The principle of parsimony guided the choice of the variables to include in the model, but, nevertheless many other variables could be reasonably included in the model. The exclusion of many potential variables determines the increase of the potential error of the measurement, which reduces the quality of the output and the robustness of the results.

Managerial limitations

The most important managerial limit is about the **uncertainty** that the suggestions to improve of the ERS success are actually effective. In fact, the results of the analysis have not yet been translated into some organizational interventions to improve the ERS success. So the effects of the potential interventions remain uncovered. The general consensus on the DeLone and McLean's model of IS success (DeLone and McLean 1992) gives a certain degree of confidence on the results of the interventions on the identified variables. However, the novelty of the type of the studied IS, the ERS, makes the effectiveness of the interventions more uncertain.

Another connected limit is on the possibility to manage the Knowledge Communities. The study reports that to improve ERS success, the acknowledgement of the knowledge domains of the others members of the Knowledge Community is important. So the organization should intervene to favor this reciprocal knowledge among the members. However as reported in the literature, Knowledge Communities can only be partially managed (Wenger, Mc Dermott et al. 2002; Kimble and Hildreth 2004).

6.7 Research perspectives

The perspective follow up of this research is mainly toward the reduction of the research limits. Therefore, there will be some indications of the possible further developments of the research in order to respond to the theoretical, the methodological and the managerial limits.

Theoretical perspectives

The main theoretical limits were about the use of a conservative model of IS success, the consideration of Knowledge Community like independent variable, and the absence of the measurement of the knowledge transfer.

So the research perspectives to **overcome these theoretical limits** concern the use of a more recent model of IS success, the definition of a feedback from the ERS success to the Knowledge Community variable, and the measurement of the knowledge transfer.

About the model of IS success, after the DeLone and McLean model (DeLone and McLean 1992), several other models have been proposes. The IS models specifically suited for Knowledge Management initiative, like ERS (Jennex and Olfman 2005) are of large interest. Their application could be an interesting perspective toward the use of a more adequate and recent IS success model.

Concerning the feedback from the ERS success to the Knowledge Community, some studies report that the IS could influence the KC (Goodman and Darr 1998; Hattori, Ohguro et al. 1999; Pan and Leidner 2003; de Moor 2005). Therefore the creation of a causal link between the ERS success dimensions and the Knowledge Communities characteristics, and, first of all, the Knowledge of the Others variable, should be established.

Finally, some sort of measuring systems should be introduced for the measurement of the knowledge transfer. The importance of the knowledge transfers is largely debated (Swap, Leonard et al. 2001; Bhagat, Kedia et al. 2002; Nadler, Thompson et al. 2003; Song, Almeida et al. 2003; Lin, Geng et al. 2005), but the development of a solution for its effective measurement it is far to be achieved. A contribution on this regard seems therefore important.

Methodological perspectives

The principal methodological limits highlighted in the previous section concern the adoption of an IS success model used for computer-based IS to informal IS, the statistical measurement of only one dimension of the Knowledge Community, the absence of any analysis of the social networks and finally, the exclusion of other potential factors influencing ERS success.

In order to overcome this limits some research perspectives are possible: the quantitative study of computer-based ERS, the consideration of some other dimensions of the Knowledge Communities, the **analysis of the social networks**, and the definition of the other factors that could impact on the ERS success.

Concerning the first perspective, the future research should find cases where a computer-based ERS exists and it is diffused throughout the organization. If a statistically adequate number of employees (Gefen, Straub et al. 2000) has access to the retrieval functionality of the computer-based ERS, the quantitative assessment of the ERS success becomes possible.

Relating to the dimensions of the Knowledge Communities, the actual study explored several dimensions in the qualitative phase, but it measured only one dimension in the quantitative phase. The evaluation of the other dimensions could be advantageously considered in the quantitative phase. It seems actually important to have a more comprehensive understanding of the influence of the Knowledge Communities on the ERS success.

Referring to the analysis of the social network, this work only superficially circumscribed the existence of sub-communities and the different strengths of the ties between members. The Social Network Analysis methodology (Breiger 2002) could offer a clearer understanding of the networks and communities in the three organizations and the ties within and between them.

The last methodological perspective refers to the examination of the other external factors of the IS success that complement the influence of the Knowledge Community. Several other variables are reported as important for the IS success (Rai, Lang et al. 2002; Briggs, De Vreede et al. 2003; Bourdon, Vitari et al. 2004; Qian and Bock 2005). An analysis of the most relevant ones in the Knowledge Management initiatives, and in the ERS success could extent the clarity of the factors affecting ERS success.

A possible method to preliminarily explore these other variables, inside or outside the Knowledge Community, is through the analysis of the collected data by case study, in order to find the effects of the peculiarities of each separated organization to the statistical results.

Managerial perspectives

The two main managerial limits regard the lack of application of the results of this study and the possibility to intervene in the Knowledge Community by the management. So the respective perspectives are related to the **translation** of the results of this study into managerial practice and the assessment of the extent to which Knowledge Communities can be managed.

The results of this study have not yet been applied in any of the three observed cases or in other organizations. To verify the viability of the proposed interventions, their empirical application is wished by the author. So, the next step could be the definition of three research reports, one for each

participating organization. They will be submitted to the management in order to promote the interventions that should have the potential to improve the ERS success.

The second managerial perspective regards, on the other hand, the evaluation of the degree of intervention that is possible in the Knowledge Community without negatively impacting on its usefulness for the organization. A study on the Knowledge Communities that are "cultivated" (Wenger, Mc Dermott et al. 2002) could give some insights on the limits of the interventions on the Knowledge Communities. This result would bring benefits to the organizations, wishing to manage their Knowledge Communities for the organizational advantage.

References

Abecker, A. and S. Decker (1999). Organizational Memory: knowledge acquisition, integration and retrivial issues in knowledge-based systems. <u>Lecture Notes in Artificial Intelligence</u>. Heidelberg, Springer-Verlag**:** 113-124.

Ackerman, M. S. and C. A. Halverson (1998). <u>Considering an Organization's Memory</u>. CSCW, Seattle, ACM Press.

Ackerman, M. S. and D. W. McDonald (2000). "Collaborative Support for Informal Information in collective memory systems." <u>Information Systems Frontiers</u> **2**(3/4): 333-347.

Adomavicius, G. and A. Tuzhilin (2005). "Toward the next generation of recommender systems: a survey of the state-of-the-art and possible extensions." <u>IEEE Transactions on Knowledge and Data Engineering</u> **17**(6): 734 - 749.

Agresti, W. W. (2003). "Tailoring IT support to communities of practice." <u>IT Professional</u> **5**(6): 24 - 28.

Ajzen, I. and M. Fishbein (1980). <u>Understanding attitudes and predicting social behavior</u>. Englewood Cliffs, NJ, USA, Prentice-Hall.

Alavi, M. and D. E. Leidner (1999). <u>Knowledge management systems : issues, challenges, and benefits</u>. AIS.

Alavi, M. and D. E. Leidner (2001). "Review: Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues." <u>MIS Quarterly</u> **25**(1): 107-136.

Alessandroni, A. (2003). Panoramica sulle soluzioni di mercato per la gestione della conoscenza. Seminario di studio "dai sistemi documentali al KM: un'opportunità per la pubblica amministrazione".

Allee, V. (2000). "Knowledge Networks and Communities of Practice." Retrieved 16 November 2002, 2002, from http://www.odnetwork.org/odponline/vol32n4/knowledgenets.html.

Allison, C., S. A. Cerri, et al. (2005). "Services, Semantics and Standards: Elements of a Learning Grid Infrastructure." <u>Applied Artificial Intelligence Journal</u>.

Almeida, P. and B. Kogut (1999). "Localization of knowledge and the mobility of engineers in regional networks." <u>Management Science</u> **45**(7): 905-917.

Almutairi, H. and G. H. Subramanian (2005). "AN EMPIRICAL APPLICATION OF THE DELONE AND MCLEAN MODEL IN THE KUWAITI PRIVATE SECTOR." Journal of Computer Information Systems **45**(3): 113-122.

Alpert, D. (1985). "Performance and paralysis: the organizational context of the Americal Research University." Journal of Higher Education **56**(3): 905-917.

Alter, S. (1999). "A general, yet useful theory of information systems." Communications of the Association for Information systems **1**(13): 71.

Amhad, R., G. Piccoli, et al. (1998). Effectiveness of virtual learning environnements in basic skill business education : a field study in progress. ICIS.

Amigoni, F. and S. Beretta (1998). Information technology e creazione di valore: analisi del fenomeno SAP. Milano, Italy, Egea.

Amit, R. and P. J. H. Schoemaker (1993). "Strategic Assets and Organizational Rent." Strategic Management Journal **14**: 33-46.

Anand, V., W. H. Glick, et al. (2002). "Thriving on the Knowledge of Outsiders: Tapping Organizational Social Capital." Academy of Management Executive **16**(1): 87-101.

Anand, V., C. C. Manz, et al. (1998). "An organizational memory approach to information management." Academy of Management Review, **23**(4).

Anderson, J. C. and D. W. Gerbing (1988). "Structural equation modeling in practice: a review and recommended

two-step approach." Psychological Bulletin **103**: 453-460.

Anderson, J. C., D. W. Gerbing, et al. (1987). "On the Assessment of Unidimensional Measurement: Internal and External Consistency, and Overall Consistency Criteria." Journal of Marketing Research **24**: 432-437.

Andreu, R. and C. Ciborra (1996). "Organisational learning and core capabilities development: the role of IT." The Journal of Strategic Information Systems **5**(2): 111-127.

Andrews, D., J. Preece, et al. (2002). "A conceptual framework for demographic groups resistant to on-line community interaction." International Journal of Electronic Commerce **6**(3): 9-24.

Andrews, K. R. (1971). The concept of corporate strategy. Homewood, IL, Dow Jones Irwin.

Andriessen, J. H. E. (2005a). Archetypes of Knowledge Communities. Communities and Technologies, Milano.

Andriessen, J. H. E. (2005b). Characterising Knowledge Communities. Community and Technology Conference. Milan, Italy.

Ansoff, H. I. (1965). Corporate strategy. New York, McGraw-Hill.

Argote, L. (1999). Organizational learning: Creating, retaining, and transferring knowledge. Norwell, MA, USA, Kluwer.

Argyres, N. S. (1999). "The impact of information technology on coordination: Evidence from the B-2 "Stealth" bomber." Organization Science 10(2): 162-180.

Armstrong, M. (2003). A Handbook of Human Resources Management Practice, Kogan Page Limited.

Arrow, K. L. (1971). Essays in the theory of risk bearing. Chicago, IL, USA.

Arrow, K. L. (1974). The limits of organization. New York, W. W. Norton.

Arrow, K. L. (1984). Information and economic behavior. Collected Papers of Kenneth J. Arrow. Cambridge, MA, USA, Belknap Press. 4.

Avis, J. (2002). "Social Capital, Collective Intelligence and Expansive Learning: Thinking through the Connections. Education and the Economy." British Journal of Educational Studies 50(3): 308-326.

Axelrod, R. (1984). The evolutions of cooperation. New York, USA, Basic Books.

Bagozzi, R. P. (1977). "Structural Equation Models in Experimental Research." Journal of Marketing Research: 209-236.

Bailey, J. E. and S. W. Pearson (1983). "DEVELOPMENT OF A TOOL FOR MEASURING AND ANALYZING COMPUTER USER SATISFACTION." Management Science 29(5): 530-545.

Bajaj, A. and S. R. Nidumolu (1998). "A feedback model to understand information system usage." Information & management 33: 213-224.

Bakos, J. Y. and M. E. Treacy (1986). "Information Technology and Corporate Strategy: A Research Perspective." MIS Quarterly 10(2): 106-119.

Balmisse, G. (2003). Knowledge management et outils informatiques, Knowledge Consult: 56.

Bannon, L. and K. Kuuti (1996). Shifting Perspective on Organizational Memory From Storage to Active Remembering. HICSS, IEEE Computer Press.

Barley, S. R. (1996). "Technicians in the workplace: Ethnographic evidence for bringing work into organization studies." Administrative Science Quarterly 41(3): 404-440.

Barney, J. (2001a). "Is the Resource-based "View" a Useful Perspective for Strategic Management Research? Yes." Academy of Management Review 26(1): 41-56.

Barney, J., B., (1996). "The resource-based theory of the firm." Organization Science 7(5).

Barney, J. B. (1986). "Strategic factor markets: expectations, luck and business strategy." Organization Science 21: 1231-1241.

Barney, J. B. (1991). "Firm resources and sustained competitive advantage." Journal of Management **17**: 99-120.

Barney, J. B. (2001b). "Resource-based theories of competitive advantage: a ten-year retrospective on resource-based view." Journal of Management **27**: 643-650.

Baskerville, R. and M. D. Myers (2004). "Information Systems: Making IS Research Relevant to Practice—Foreword." Management Information Systems Quarterly **28**(3): 329-335.

Bassetti, M. (2000). Un sistema integrato di gestione delle risorse umane : integrated human resources management information system : resoconto di un'esperienza. Milano.

Baum, J. A. C. and P. Ingram (1998). "Survival-enhancing learning in the Manhattan hotel industry, 1898–1980." Management Science **44**: 996–1016.

Baumann, M. R. and B. L. Bonner (2004). "The effects of variability and expectations on utilization of member expertise and group performance." Organizational Behavior & Human Decision Processes **93**: 89-101.

Beaudouin-Lafon, M. and A. Karsenty (1992). Transparency and awareness in a real-time groupware system. ACM symposium on User interface software and technology, Monteray, California, USA, ACM Press.

Becerra-Fernandez, I. (2000). "The role of artificial intelligence technologies in the implementation of People-Finder knowledge management systems." Knowledge-Based Systems **13**: 315-320.

Becerra-Fernandez, I. and R. Sabherwal (2001). "Organizational Knowledge Management: A Contingency Perspective." Journal of Management Information Systems **18**(1): 23-55.

Benbasat, I. and A. S. Dexter (1986). "An investigation of the effectiveness of color and graphical presentation under varying time constraints." MIS Quarterly **10**(1): 59-84.

Benbasat, I., D. K. Goldstein, et al. (1987). "The Case Research Strategy in Studies of Information Systems." MIS Quarterly **11**(3): 369-386.

Bennis, W. and P. Biederman (1997). Organizing genius: the secrets of creative collaboration. Reading (Mass), Addison-Wesley.

Bentley, R., T. Horstmann, et al. (1995). Supporting collaborative information sharing with the World Wide Web: the BSCW shared workspace system. WWW Conference.

Berelson, B. (1952). Content analysis for the social sciences and humanities. Reading, MA, Addison-Wesley.

Bhagat, R. S., B. L. Kedia, et al. (2002). "Cultural variations in the cross-border transfer of organizational knowledge: an integrative framework." Academy of Management Review **27**(2): 204-221.

Bhattacherjee, A. and G. Premkumar (2004). "Understanding changes in belief and attitude toward information technology usage: a theoretical model and longitudinal test." MIS Quarterly **28**(2): 229-254.

Bieber, M., D. Engelbart, et al. (2002). "Toward Virtual Community Knowledge Evolution." Journal of Management Information Systems **18**(4): 11-37.

Bishop, K. (2000). Can Tacit Knowledge Really be Managed. ALIA, Canberra.

Black, J. A. and K. B. Boal (1994). "Strategic Resources: Traits, Configurations and Paths to Sustainable Competitive Advantage." Strategic Management Journal **15**: 131-148.

Blanchet, A. and A. Gotman (1992). L'Enquete et ses méthodes: l'entretien. Paris, éditions Nathan.

Bock, G.-W. and J.-N. Lee (2005). "Behavioral intention formation in knowledge sharing: examining the roles of extrinsic motivators, social-psychological forces, and organizational climate." Management Information Systems Quarterly **29**(1): 87-111.

Boisot, M. H. (1998). Knowledge Assets. New York, Oxford University Press.

Boland, R. J. and R. V. Tenkasi (1995). "Perspective making and perspective taking in communities of knowing." Organization Science, **6**(4).

Boland, R. J., R. V. Tenkasi, et al. (1994). "Designing information technology to support distributed cognition." Organization Science **5**(3).

Bonifacio, M. and D. Merigliano (2002). "Knowledge e Management: sono compatibili?" Economia e Management **3**.

Bonner, B. L., M. R. Baumann, et al. (2002). "The effects of member expertise on group decision-making and performance." Organizational Behavior & Human Decision Processes **88**: 719-736.

Borgatti, S. P. (2004). "Granovetter's Theory of the Strength of Weak Ties." Retrieved 14/06/2004, 2004, from http://www.analytictech.com/networks/weakties.htm.

Borgatti, S. P. and R. Cross (2003). "A Relational View of Information Seeking and Learning in Social Networks." Management science **49**(4): 432-445.

Botkin, J. W. (1999). Smart business: how knowledge communities can revolutionize your company. New York, USA, The Free Press.

Bots, P. W. G. and H. de Bruiin (2002). Effective Knowledge Management in Professional Organizations: Going by the rules. Hawaii International Conference on System Sciences, IEEE Computer Society Press.

Boudreau, M.-C., D. Gefen, et al. (2001). "Validation in Information Systems Research: A State-of-the-Art Assessment." Management Information System Quaterly **25**(1): 1-16.

Boughzala, I. and F. Kaouane (2005). Vers un cadre méthodologique pour la conception et l'évaluation des communautés professionnelles virtuelles. Colloque de l'AIM, Toulouse.

Bourdon, I. and C. Vitari (2003). "The key success factors of the Knowledge Management Systems : a proposal of an explication model (original title : " Les facteurs clés de succès des Systèmes de Gestion des Connaissances : proposition d'un modèle explicatif ")." Cahier de recherche du CREGO(13).

Bourdon, I., C. Vitari, et al. (2004). The key success factors affecting KMS adoption: quantitative results. Colloque de l'AIM, Evry, France.

Bourdon, I., C. Vitari, et al. (2003). Les facteurs clés de succès des Systèmes de Gestion des Connaissances : proposition d'un modèle explicatif. Colloque AIM, Grenoble (France).

Bouthillier, F. and K. Shearer (2002). "Understanding knowledge management and information management: the need for an empirical perspective." Information Research 8(1).

Bouty, I. (2000). "Interpersonal and Interaction Influences on Informal Resource Exchanges between R&D Researchers across Organizational Boundaries." Academy of Management Journal 43(1): 50-66.

Bowen, W. (1986). The puny payoff from office computers. Fortune: 20-24.

Bradley, J. H., R. Paul, et al. (2006). "Analyzing the structure of expert knowledge." Information & management 43(1): 77-91.

Bradshaw, P., S. Powell, et al. (2004). Building a Community of Practice. Knowledge Network. P. Hildreth and C. Kimble. London, UK, Idea Group Inc.

Brandenburger, A. M. and H. W. Stuart (1996). "Value-Based Business Strategy." Journal of Economics and Management Strategy 5(1): 5-24.

Breiger, R. L. (2002). The analysis of social networks. Handbook of data analysis. M. Hardy and A. Bryman, Sage Publications: 30.

Brewer, J. and A. Hunter (1989). Multimethod research. A synthesis of styles, Sage Publications.

Briggs, R. O., G.-J. De Vreede, et al. (2003). "Special Issue: Information Systems Success." Journal of Management Information Systems 19(4): 5-8.

Brown, J. S. and P. Duguid (1991). "Organizational learning and communities of practice." Organization Science, 2(1).

Brown, J. S. and P. Duguid (2000). The Social Life of Information. Boston, MA, USA, Harvard Business School Press.

Brown, J. S. and P. Duguid (2001). "Knowledge and organization: a social perspective." Organization Science 12(2): 198-214.

Brown, P. (2002). "Digital Knowledge Networks: Linking Communities of Practice with Innovation." Journal of Business Strategies **19**(1): 43-54.

Bryman, J. (1992). Quantitative and qualitative research; further reflections on their integration. Mixing methods: qualitative and quantitative research. J. Branner. Avebury.

Burr, R. S. (1976). "Interpretational confounding of unidimensional variables in structural equation modeling." Sociological Methods and Research(5): 3-51.

Busnelli, M. (2004). L' innovazione nella gestione delle risorse umane: l' introduzione dei sistemi ERP. Business Management. Castellanza, Varese, Italy, Università Carlo Cattaneo.

Butera, F., E. Donati, et al. (1997). I lavoratori della conoscenza. Milano, Italy, FrancoAngeli.

Butera, F. and A. Failla (1992). Professionisti in azienda. Milano, Italy, Etas libri.

Byrne, B. M. (2001). Structural Equation Modeling with AMOS. Mahwah, New Jersey, USA, Lawrence Erlbaum Associates.

Callahan, S. (2004). Cultivating a public sector knowledge management community of practice. Knowledge Networks. P. Hildreth and C. Kimble. London, UK, Idea Group Inc.

CALT_INSEAD (2003). User modeling issues in the context of Knowledge Management Systems. Corporate Ontology Modeling and Management. O. Consortium, Ontologging Consortium**:** 88.

CALT_INSEAD. (2004). "Corporate ontology modeling and management system." Retrieved 5 April, 2004, from http://www.ontologging.com/index.htm.

Cameron, K. S. and D. A. Whetten (1983). Organizational effectiveness: a comparison of multiple models. New York, USA, Accademic Press.

Campbell and Fiske (1959). "Convergent and discriminant validation by the multitrait-multimethod matrix." Psychological Bulletin **41**(2): 81-105.

Camuffo, A. (1995). "La gestione delle risorse umane basata sulle competenze: moda o rivoluzione?" Cuoa Notizie. Temi e proposte di formazione **2**.

Chaplin, D. (1994). Community Memory. Department of Computer Science, Lancaster University. Lancaster, United Kingdom.

Choo, C. W. (1998). The knowing organization. Oxford, UK, Oxford University Press.

Churchman, C. W. (1979). The systems approach. New York, Dell Publishing.

Ciborra, C. and R. Andreu (2001). "Sharing Knowledge across boundaries." Journal of Information Technology **16**: 73-81.

Clark, P. A. (1972). Action Research and Organizational Change. London, Harper and Row.

Cohen, A. L., P. P. Maglio, et al. (1998). The expertise browser: how to leverage distributed organizational knowledge. Workshop on Collaborative and Cooperative Information Seeking in Digital Information Environments at CSCW, Seattle, WA.

Cohen, W. M. and D. A. Levinthal (1990). "Absorptive Capacity: A New Perspective on Learning and Innovation." Administrative Science Quarterly **35**(1): 128-152.

Cole, R. E. (1998). "Introduction." California Management Review **40**(3): 15-21.

Collis, D. J. and C. A. Montgomery (1995). "Competing on resources: strategy in the 1990s." Harvard Business Review,.

Collison, C. (1999). "Connecting the new organization: How BP Amoco encourages post-merger collaboration." Knowledge Management Review **2**(1): 12-17.

Compeau, D. and C. A. Higgins (1995). "Computer Self-Efficacy: Development of a Measure and Inital Test." MIS Quarterly **6**(2): 189-211.

Conein, B. (2006). Communauté épistémique et réseaux cognitifs : coopération et cognition distribuée.

Conner, K. R. and C. K. Prahalad (1996). "A resource-based theory of the firm: knowledge versus opportunism." Organization Science, **7**(5).

Connolly, T., L. M. Jessup, et al. (1990). "Effects of anonymity and evaluative tone on idea generation in computer-mediated groups." Management Science **36**(6): 689-703.

Constant, D., L. Sproull, et al. (1996). "The kindness of strangers: the useful of electronic weak ties for technical advice." Organization Science, **7**(2): 119-135.

Constant, E. W. (1987). The social locus of technological practice: Community, system, or organization. The social construction of technological systems: new directions in the sociology and history of technology. W. Bijker, T. Hughes and T. Pinch. Cambridge, MA, MIT Press**:** 223-242.

Cook, S. N. and J. S. Brown (1999). "Bridging epistemologies: the generative dance between organizational knowledge and organizational knowing." Organization Science **10**(4): 382-400.

Cook, T. D. and D. T. Campbell (1979). Quasi Experimentation: Design and Analytical Issues for Field Settings. Chicago, USA, Rand McNally.

Costa, G. (2002). Economia e direzione delle risorse umane. Torino, Italy, UTET Libreria.

Counsnet. (2005). "Counsnet." 2005, from www.counsnet.com.

Cox, A. (2004). What are communities of practice? a critical review of four seminal works. Organizational Knowledge and Learning Conference.

Cranfield University (1998). The Cranfield information Strategy Knowledge Survey: Europe's State of the Art in Knowledge Management. The Economist Group.

Cronbach, L. J. (1951). "Coefficient alpha and the internal structure of tests." Psychometrica **16**(3): 297-334.

Cronbach, L. J. (1971). Test validation. Educational Measurement. R. L. Thorndike. Washington, D.C., USA, American Council on Education**:** 443-507.

Cronbach, L. J. and P. E. Meehl (1955). "Construct Validity in Psychological Tests." Psychological Bulletin **55**(4): 281-302.

Cross, R. and L. Baird (2000). "Technology is not enough : improving performance by building organizational memory." Sloan Management Review,.

Cross, R., A. Parker, et al. (2002). A bird's-eye view: using social network analysis to improve knowledge creation and sharing. Somers, NY, USA, IBM Institute for Business Value**:** 19.

Cross, R., A. Parker, et al. (2001). "Knowing What We Know: Supporting Knowledge Creation and Sharing in Social Networks." Organizational Dynamics **30**(2): 100-120.

Crowder, R., G. Hughes, et al. (2003). An agent based approach to finding expertise in the engineering design environment. International Conference on Engineering Design, Stockholm.

Curley, K. F. (1984). "Are there any real benefits from office automation." Business Horizons **4**: 37-42.

Daassi, M., M. Favier, et al. (2004). L'évolution de la conscience collective au sein des équipes projet virtuelles : une étude longitudinale. Colloque de l'AIM, Evry, France.

Darke, P., G. Shanks, et al. (1998). "Successfully completing case study research: combining rigor, relevance and pragmatism." Information Systems Journal **8**(4): 273-289.

Darr, E. D., l. Argote, et al. (1995). "The acquisition, transfer, and depreciation of knowledge in service organizations : productivity in franchises." Management Science **41**(11).

Davenport, T. H. (1997). "Ten principles of knowledge management and four case studies." Knowledge and Process management **4**(3).

Davenport, T. H., D. W. De long, et al. (1998). "Successful knowledge management projects." Sloan Management Review,.

Davenport, T. H. and L. Prusak (1998). Working knowledge: how organizations manage what they know. Boston, MA, Harvard Business School Press.

Davis, F., R. P. Bagozzi, et al. (1989). "User Acceptance of Computer Technology: A Comparison of Two Theoretical Models." Management science **35**(8): 982-1003.

Davis, F. D. (1989). "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology." MIS Quarterly **13**(3): 319-340.

De Marco, M. (2000). I sistemi informativi aziendali: Temi di attualità. Milano, Italy, Franco Angeli.

de Moor, A. (2005). Toward a design theory for community information systems. International Conference on Human-Computer Interaction, Mahwah, NY.

Deetz, S. (1996). "Describing differences in approaches to organization science: rethinking Burrell and Morgan and their legacy." Organization Science **7**(2): 191-207.

DeLone, W. H. (1988). "Determinants of Success for Computer Usage in Small Business." MIS Quarterly: 51-61.

DeLone, W. H. and E. R. McLean (1992). "Information systems success : the quest for the dependant variable." Information Systems Research **3**(1): 60-95.

DeLone, W. H. and E. R. McLean (2002). Information Systems Success Revisited. Hawaii International Conference on System Sciences, IEEE Computer Society.

DeLone, W. H. and E. R. McLean (2003). "The DeLone and McLean Model of Information Systems Success: A Ten-Year Update." Journal of Management Information Systems **19**(4): 9-30.

DeLone, W. H. and E. R. McLean (2004). "Measuring e-Commerce Success: Applying the DeLone & McLean Information Systems Success Model." International Journal of Electronic Commerce **9**(1): 31-47.

Delphi Group (1998). The Language of Knowledge. Boston, Delphi Group**:** 5.

Deltour, F., C. Roussel, et al. (2002). Accompagner la gestion des connaissances par intranet : pour une politique de RH contextualisée. e-GRH : Révolution ou évolution ? M. Kalika. Paris, France, Editions Liaisons**:** 195-224.

Demsetz, H. (1988). "The theory of the firm revisited." Journal of Economic Organizations **4**(1): 141-161.

Dennis, A. R. (2001). "Conducting research in information systems." Communications of the AIS **7**(5).

Denrell, J., N. Arvidsson, et al. (2004). "Managing knowledge in the dark: an empirical study of the reliability of capability evaluations." Management science **50**(11): 1491-1503.

DeSanctis, G. and R. B. Gallupe (1987). "A foundation for the study of group decision support systems." Management Science **33**(5): 589-609.

DeSanctis, G. and P. Monge (1999). "Introduction to the special issue: Communication processes for virtual organizations." Organization Science **10**(6): 693-703.

Dewett, T. and G. Jones (2001). "The Role of Information Technology in the Organization: A Review, Model, and Assessment." Journal of Management **27**(3): 313-346.

Dohan, D. and M. Sanchez-Jankowski (1998). "Using computers to analyze ethnographic field data: theoretical and practical considerations." Annual Review of Sociology **24**: 477-498.

Dourish, P. and V. Bellotti (1992). Awareness and coordination in shared workspace. CSCW, ACM Press.

Downing, C. E. (1999). "System usage behavior as a proxy for user satisfaction: an empirical investigation." Information & Management **35**(4): 203-216.

Drucker, P. (1998). Managing in a time of great change. New York, Dutton/Plume.

Dube, L. and G. Pare (2003). "Rigor in Information Systems Positivist Case Research: Current Practices." Management Information Systems Quarterly **26**(4): 597-635.

Dworan, G. (1998). Discovering patterns in organizational memory. Working paper, Massachusetts Institute of Technology.

Ebc Consulting. (2005). "Ebc Consulting." 2005, from www.ebcconsulting.com.

Edelmann, F. (1981). "Managers, computer systems and productivity." MIS Quarterly **5**(3): 1-19.

Edmonson, A. and B. Moingeon (1998). " From organizational learning to the learning organization." Management Learning **29**(1).

Eisenhardt, K. M. (1989). "Building Theories from Case Study Research." Academy of Management Review **14**(4): 532-550.

El Sawy, O., G. M. Gomes, et al. (1996). "Preserving institutional memory: the management of history as an organization resource." Academy of management Best Paper Proceedings **37**: 118-122.

Emory, W. C. (1980). Business Research Methods. Irwin.

Epple, D., L. Argote, et al. (1996). "An empirical investigation of the micro structure of knowledge acquisition and transfer through learning by doing." Operations Research **44**: 77–86.

Essex, P. A., R. R. Magal, et al. (1998). "Determinants of Information Center Success." Journal of Management Information Systems **15**(2): 95-117.

Etezadi-Amoli, J. and A. F. Farhoomand (1996). "A structural model of end user computing satisfaction and user performance." Information & management **30**(2): 65-73.

Évrard, Y., B. Pras, et al. (2003). Market : études et recherches en marketing. Paris, France, Dunod.

Fahey, L. and L. Prusak (1998). "The Eleven Deadliest Sins of Knowledge Management." California Management Review **40**(3): 265-276.

Fahy, J. and A. Smithee (1999). "Strategic Marketing and the Resource-Based View of the Firm." Academy of Marketing Science Review **99**(10): 1-21.

Favier, M., F. Coat, et al. (1998). <u>Le travail en groupe à l'âge des réseaux</u>. Paris, France, Editions Economica.

Fensel, D., S. Staab, et al. (2003). A future perspective: exploiting Peer-to-Peer and the Semantic Web for knowledge management. <u>Toward the semantic web: ontology driven knowledge management</u>. J. Davies, D. Fensel and F. van Harmelen. Chichester, England, John Wiley & Sons Ltd.**:** 288.

Ferran-Urdaneta, C. (1999). <u>Teams or communities? Organizational structures for knowledge management</u>. SIGCPR, New Orleans.

Finlay, P. N. and M. Forghani (1998). "A classification of success factors for decision support system." <u>Journal of Strategic Information System</u> **7**: 53-70.

Fishbein, M. and I. Ajzen (1975). <u>Belief, Attitude, Intention and Behavior. An Introduction to Theory and Research</u>. Reading, MA, Addison-Wesley.

Folkens, F. and M. Spiliopoulou (2004). <u>Towards an evaluation framework for knowledge management systems</u>. International Conference on Practical Aspects of Knowledge Management, Vienna, Austria.

Foner, L. N. (1996). <u>A multi-agent referral system for matchmaking</u>. Practical Applications of Intelligent Agents and Multi-Agents (PAAM), London.

Fox, S. (2000). "Communities of practice, Foucault and actor-network theory." <u>Journal of Management Studies</u> **37**(6).

Franz, C. R. and D. Robey (1986). "Organizational context, user involvement and usefulness of information systems." <u>Decision Sciences</u> **17**(3): 329-356.

Fromkin, H. L. and S. Streufert (1976). Laboratory Experimentation. <u>Handbook of Industrial and Organizational Psychology</u>. B. Dunnette. Chicago, USA, Rand McNally College Publishing Company**:** 415-465.

Fuerst, W. L. and P. H. Cheney (1982). "Factors Affecting the Perceived Utilization of Computer-Based Decision Support Systems." <u>Decision Sciences</u> **13**(4): 554-569.

Gable, G. (1994). "Integrating Case Study and Survey Research Methods: An Example in Information Systems." <u>European Journal of Information Systems</u>.

Galbraith, C. S. (1990). "Transferring Core Manufacturing Technologies in High-Technology Firms." <u>California Management Review</u> **32**(4): 56-70.

Galbraith, J. (1973). <u>Designing complex organizations</u>. Reading, MA, USA, Addison-Wesley.

Garrity, E. J., B. Glssberg, et al. (2005). "An experimental investigation of Web-based information systems success in the context of electronic commerce." <u>Decision Support Systems</u> **39**(3): 485-503.

Garrity, E. J. and G. L. Sanders (1998). Dimensions of information systems success. Information Systems Success Measurement. E. J. Garrity and G. L. Sanders. Hershey, PA, USA, Idea Group Publishing: 13– 45.

Gazeau, M. (1998). "Le Management de la Connaissance." Etats de Veille: 1-8.

Gefen, D. (2000). "It is Not Enough To Be Responsive: The Role of Cooperative Intentions in MRP II Adoption." DATA BASE for Advances in Information System **31**(2): 65-79.

Gefen, D. (2003). "Assessing unidimensionality through LISREL: An Explanation and Example." Communications of the AIS **12**(2): 1-26.

Gefen, D., D. Straub, et al. (2000). "Structural Equation Modeling and Regression: Guidelines for Research Practice." Communications of AIS **4**(7): 1-80.

Gelderman, M. (1998). "The relation between user satisfaction, usage of information systems, and performance." Information & management **34**(1): 11-18.

Gemmo, V. (2004). La tecnologia dei portali a supporto della gestione della conoscenza. Innovazione organizzativa e tecnologie innovative. A. D'Atri. Milano, Etas.

George, J. F., G. K. Easton, et al. (1990). "A study of collaborative group work with and without computer-based support." Information Systems Research **1**(4): 394-415.

Gerbing, D. W. and J. C. Anderson (1988). "An updated Paradigm for Scale Development Incorporating Unidimensionality and its Assessment." Journal of Marketing Research **25**: 186-192.

Ghoshal, S. and P. Moran (1996). "Bad for practice: a critique of the transaction cost theory." Academy of Management Review **21**(1): 13-47.

Gibson, R. (1996). Rethinking the future. London, Nicholas Brealey Publishing.

Gold, A. H., A. Malhotra, et al. (2001). "Knowledge management : an organizational capabilities perspective." Journal of Management Information Systems **18**(1): 185-214.

Gongla, P. and C. R. Rizzuto (2004). Where Did That Community Go? - Communities of Practice that "Disappear". Knowledge Networks: Innovation through Communities of Practice. P. Hildreth and C. Kimble, Idea Group Publishing: 295 - 307.

Goodhue, D. L. and R. L. Thompson (1995). "Task-technology fit and individual performance." MIS Quarterly **19**(2): 213-236.

Goodman, P. S. and E. D. Darr (1998). "Computer-aided systems and communities : mechanisms for organizational learning in distributed environments." MIS Quarterly **22**(4): 417- 441.

Goury, M.-L. and A. Spalanzani (2005). Facteurs structuraux et épistémiques comme supports au management des communautés de pratique. Colloque de l'AIM, Toulouse, France.

Granovetter, M. (1983). The strength of weak ties: a network theory revisited. Sociological Theory. **1:** 33.

Granovetter, M. S. (1973). "The Strength of Weak Ties." The American Journal of Sociology **78**(6): 1360-1380.

Grant, R. M. (1991). "The Resource-Based Theory of Competitive Advantage: Implications for Strategy Formulation." California Management Review **33**(1): 114-135.

Grant, R. M. (1996a). "Prospering in dynamically-competitive environments: organizational capability as knowledge integration." Organization Science **7**(4).

Grant, R. M. (1996b). "Toward a knowledge-based theory of the firm." Strategic Management Journal **17**.

Grawitz, M. (1996). Méthodes des sciences sociales. Paris, Éditions Dalloz.

Gray, P. H. and Y. E. Chan (2000). "Integrating knowledge management practices through a problem-solving framework." Communications of the AIS **4**(12).

Griffith, T. L., J. E. Sawyer, et al. (2003). "Virtualness and knowledge in teams: managing the love triangle of organizations, individuals, and information technology." MIS Quarterly **27**(2).

Grover, V., M. J. Cheon, et al. (1996). "The Effect of Service Quality and Partnership on the Outsourcing of Information Systems Functions." Journal of Management Information Systems **12**(4): 89-116.

Guida, G. and G. Berini (2000). Ingegneria della conoscenza : strumenti per innovare e per competere. Milano, Egea.

Guimaraes, T. and M. Igbaria (1997). "Client/server system success: Exploring the human side." Decision Sciences **28**(4): 851-876.

Gupta, A. K. and V. Govindarajan (2000). "Knowledge management's social dimensions: lessons from Nucro Stell." Sloan Management Review **42**(1): 71-80.

Hackbarth, G. (1998). The impact of organizaitonal memory on IT systems. Americas conference on Information Systems.

Hansen, M. T. (1999). "The search-transfer problem: The role of weak ties in sharing knowledge across organization subunits." Administrative Science Quarterly **44**(1): 82-111.

Hansen, M. T., N. Nohria, et al. (1999). "What's Your Strategy for Managing Knowledge?" Harvard Business Review **77**(2): 106-116.

Hansen, M. T. and B. V. Oetinger (2001). "Introducing t-shaped managers: Knowledge management's next generation." Harvard Business Review **79**(3): 107–116.

Harryson, S. J. (2000). Managing know-who based companies: a multinetworked approach to knowledge and innovation management. Cheltenham, Northampton, MA, Elgar.

Hartwick, J. and H. Barki (1994). "Explaining the Role of User Participation in Information System Use." Management science **40**(4): 440-465.

Hasan, H. and E. Gould (2001). "Support for the Sense-Making Activity of Managers." Decision Support Systems **31**(1): 71-86.

Hattori, F., T. Ohguro, et al. (1999). "Socialware: multiagent systems for supporting network communities." Communications of the ACM **42**(3).

Hayek, F. A. (1945). "The use of knowledge in society." American Economic Review **35**: 519-532.

Henderson, J. C. and S. W. Sussman (1997). Creating and exploiting knowledge for fast-cycle organizational response: The center for army lessons learned. Working paper. Boston, USA, Boston University.

Hendricks, P. H. J. and D. J. Vriens (1999). "Knowledge-based systems and knowledge management: friends or foes?" Information & management **35**(2): 113-125.

Hendrickson, A. R., P. D. Massey, et al. (1993). "On the Test-Retest Reliability of Perceived Usefulness and Perceived Ease of Use Scales." MIS Quarterly **17**(2): 227-230.

Heritage, J. (1984). Garfinkel and Ethnomethodology. Cambridge, Polity.

Hertzum, M. and A. M. Pejtersen (2000). "The information-seeking practices of engineers: searching for documents as well as for people." Information processing and Management **36**(5): 761-778.

Hickins, M. (1999). "Xerox Shares Its Knowledge." Management Review: 40-45.

Hildreth, P. M. and C. Kimble (2004). Knowledge Networks: Innovation through Communities of Practice. Hershey, Idea Group Publishing.

Hinds, P. and S. Kiesler (1995). "Communication across boundaries: Work, structure, and use of communication technologies in a large organization." Organization Science **6**(4): 373-393.

Hirshheim, R. "Information Systems epistemology: an historical perspective."

Hirshleifer (1980). Price theory and applications. Englewood Cliffs, NJ, Prentice-Hall.

Hodges, R., J. Moro, et al. (2005). Un framework per la classificazione dei sistemi di gestione della conoscenza. itAIS, Verona (Italy).

Hofer, C. and D. Schendel (1978). Strategy formulation: Analytical concepts. St. Paul, MN, West.

Hofstede, G., B. Neuijen, et al. (1990). "Measuring Organizational Cultures: A qualitative and Quantitative Study across Twenty Cases." Administrative Science Quarterly **35**(2): 286-316.

Holland, C., G. Lockett, et al. (1992). "Planning for Electronic Data Interchange." Strategic Management Journal **13**(7): 539-550.

Holloway, P. (2000). How to capture and deploy tacit knowledge in your organization. Braintrust, Scottsdale.

Holsapple, C. W. and K. D. Joshi (2002). "Knowledge Management: A Three-Fold Framework." The Information Society **18**(1).

Holthman, C. and N. Courtney (1998). The executive learning ladder: a knowledge creation process grounded in the strategic information systems domain. Americas Conference on Information Systems, Baltimore, MD, USA.

Holtshouse, D. (1998). "Knowledge Research Issues." California Management Review **40**(3): 277-280.

Hoopes, D. G. and S. Postrel (1999). "Shared knowledge, "glitches," and product development performance." Strategic Management Journal **20**(9): 837-865.

Huber, G. P. (1990). "A theory of the effects of advanced information technologies on organizational design, intelligence decision making." Academy of Management Review, **15**(1).

Huber, G. P. (2001). "Transfer of knowledge in knowledge management systems: Unexplored issues and suggested studies." European Journal of Information Systems **10**(2): 72.

Husson, A.-M. (2003). "Préconisation pour une démarche d'assurance qualité en e-learning." Retrieved 18.03.2004, 2004, from http://www.initiatives.refer.org/Initiatives-2003/_notes/_notes/hussonfrench.htm.

Hutchins, E. (1991). "Organizing work by adaptation." Organization Science **2**(1): 14-38.

Huysman, M., M. Creemers, et al. (1998). Learning from the environment: exploring the relation between organizational learning, knowledge management and Information Communication Technology. Americas Conference on Information Systems, Baltimore, MD, USA.

IBM (2002). Locating Organizational Expertise with the Lotus Discovery Server. White paper. IBM, IBM**:** 22.

Igalens, I. and P. Roussel (1998). Méthodes de recherche en gestion des ressources humaines. Paris, Economica.

Igbaria, M. and M. Tan (1997). "The consequences of information technology acceptance on subsequent individual performance." Information & Management **32**(3): 113-121.

Inkpen, A. C. and A. Dinur (1998). "Knowledge management processes and international joint ventures." Organization Science, **9**(4).

IPD (1997). The IPD Guide on Implementing Computerised Personnel Systems. London, UK, IPD.

IPD (1999). The IPD Guide on Using Your Computerised Personnel Effectively. London, UK, IPD.

Jarvenpaa, S. L. (1988). The importance of laboratory experimentation in IS research. Communications of ACM. **31:** 1502 - 1504.

Jenkins, A. M. (1985). Research Methodologies and MIS Research. Research Methods in Information Systems. E. Mumford and et al. Amsterdam, Holland, Elsevier Science Publishers B.V.**:** 103-117.

Jennex, M. and L. Olfman (2005). "Assessing Knowledge Management Success." International Journal of Knowledge Management **1**(2): 33 - 49.

Jennex, M., L. Olfman, et al. (1998). An Organizational Memory Information Systems Success Model: An Extension of DeLone and McLean's I/S Success Model. Annual Hawaii International Conference on System Sciences.

Jennex, M. E. (2005). The Issue of System Use in Knowledge Management Systems. Annual Hawaii International Conference on System Sciences.

Jennex, M. E. (2006). Classifying Knowledge Management Systems Based on Context Content. Hawaii International Conference on System Sciences.

Jennex, M. E. and L. Olfman (2003). A Knowledge Management Success Model: An Extension of DeLone and McLean's IS Success Model. AMCIS.

Jensen, M. C. and W. H. Meckling (1976). "Theory of the firm: Managerial behavior, agency costs and ownership structure." Journal of Financial Economics **3**(4): 305-360.

Jensen, M. C. and W. H. Meckling (1992). Specific and general knowledge and organizational structure. Contract economics. L. Werin and H. Wijkander. Oxford, UK, Blackwell**:** 251-274.

Jessup, L. M. and D. A. Tansik (1991). "Decision making in an automated environment: the effects of anonymity and proximity with a group decision support system." Decision Science **22**(2): 266-279.

Jiang, J. J., G. Klein, et al. (2002). "MEASURING INFORMATION SYSTEM SERVICE QUALITY: SERVQUAL FROM THE OTHER SIDE." MIS Quarterly **26**(2): 145-166.

Jick, T. (1979). "Mixing qualitative and quantitative methods: triangulation in action." Administrative Science Quarterly **24**: 602-611.

Johnson, D. J. and L. L. Downing (1979). "Deindividuation and valence of cues: effects on prosocial and antisocial behavior." Journal of Personality and Social Psycology **37**(9): 1532-1538.

Johnson, P., I. Zualkernan, et al. (1987). "Specification of expertise." International Journal of Man-Machine Studies **26**: 161-181.

Jonquet, C. and S. A. Cerri (2005). "The STROBE Model: Dynamic Service Generation on the Grid." Applied Artificial Intelligence Journal **19**(9-10, Special issue on Learning Grid Services): 967-1013.

Joreskog, K. G. and D. Sorbom (1989). LISREL 7 User's Reference Guide. Chicago, IL, USA, Scientific Software.

Jurison, J. (1996). "The temporal nature of IS benefits: A longitudinal study." Information & management 30: 75-79.

Kamiya, K., M. Roscheisen, et al. (1996). Grassroots: providing a uniform framework for communicating, sharing information, and organizing people. CHI.

Kanfer, A., J. Sweet, et al. (1997). Humanizing the Net: Social Navigation With A "Know-Who" Email Agent. Conference on Human Factors & The Web, Denver, Colorado.

Kankanhalli, A. and B. C. Y. Tan (2004). A Review of Metrics for Knowledge Management Systems and Knowledge Management Initiatives. Hawaii International Conference on System Sciences.

Kaplan, B. and D. Duchon (1988). "Combining qualitative and quantitative methods information systems research: a case study." Management Information Systems Quarterly 12(4): 571-586.

Karahanna, E. and D. W. Straub (1999). "The psychological origins of perceived usefulness and ease of use." Information & management 35(4).

Kauntz, H., B. Selman, et al. (1996). Agent amplified communication. National Conference on Artificial Intelligence, Portland, OR.

Kauntz, H., B. Selman, et al. (1997). "Referral Web: combining social networks and collaborative filtering." Communications of the ACM 40(3): 63-65.

Kerlinger, F. N. (1964). Foundations of Behavioral Research. New York, USA, Holt, Rinehart, and Winston.

Kettinger, W. J. and C. C. Lee (2005). "Zones of Tolerance: Alternative Scales for Measuring Information Systems Service Quality." MIS Quarterly 29(4).

Kim, Y. J., A. Chaudhurry, et al. (2002). "A knowledge Management perspective to evaluation of entreprise information portals." Knowledge and Process management 9(2): 57-71.

Kimball, L. and A. Ladd (2004). Facilitator toolkit for building and sustaining virtual communities of practice. Knowledge Networks. P. Hildreth and C. Kimble. London, UK, Idea Group Inc.

Kimble, C. (2005). What are communities of practice? Montpellier, France.

Kimble, C. and P. M. Hildreth (2004). Communities of Practice: going one step too far? AIM conference, Evry (France).

Kimble, C. and P. M. Hildreth (2005). "Dualities, distributed communities of practice and knowledge management." Journal of Knowledge Management 9(4): 102-113.

King, W. R. and J. I. Rodriguez (1978). "Evaluating Management Information Systems." MIS Quarterly **2**(3): 43-51.

King, W. R. and J. I. Rodriguez (1981). "Participative Design of Strategic Decision Support Systems." Management Science **27**(6): 717-726.

Klein, H. K. and M. D. Myers (1999). "A Set of Principles for Conducting and Evaluating Interpretive Field Studies in Information Systems." Management Information Systems Quarterly **23**(1): 67-93.

Knorr-Cetina, K. (1999). Epistemic cultures: how the sciences make knowledge. Cambridge, MA, USA, Harward University Press.

Ko, D.-G., L. J. Kirsch, et al. (2005). "Antecedents of knowledge transfer from consultants to clients in enterprise System implementations." Management Information Systems Quarterly **29**(1): 59-85.

Kobsa, A. and J. Schreck (2003). "Privacy through Pseudonymity in User-Adaptive Systems." ACM Transactions on Internet Technology **3**(2): 149-183.

Koeglreiter, G., R. Smith, et al. (2006). "The Role of Informal Groups in Organisational Knowledge Work: Understanding an Emerging Community of Practice." International Journal of Knowledge Management **2**(1): 6 - 23.

Kogut, B. and U. Zander (1992). "Knowledge of the firm, combinative capabilities, and the replication of technology." Organization Science **3**(3): 383-397.

Kogut, B. and U. Zander (1996). "What firms do? Coordination, learning, and learning." Organization Science **7**(5).

Kondratova, I. L. and I. Goldfarb (2003). Design concepts for virtual research and collaborative environments. ISPE International Conference on Concurrent Engineering: Research and Applications, Madeira, Portugal.

Koskinen, K. U. (2001). Tacit Knowledge as a Promoter of Success in Technology Firms. HICSS, Maui, Hawaii.

Krackhardt, D. and J. R. Hanson (1993). "Informal networks." Harvard Business Review,.

Kreiner, K. and M. Schultz (1993). "Informal collaboration in R&D: the formation of networks across organizations." Organizational Studies **14**(2): 189-209.

Kuperman, R. (1998). An advertising agency without walls. The infinite resource-creating and leading the knowledge enterprise. W. L. Halal, Jossey-Bass**:** 213-222.

Lave, J. and E. Wenger (1991). Situated learning. Legitimate Peripheral Participation. Cambridge, Cambridge University Press.

Leavy, B. (1998). "The concept of learning in the strategy field: Review and outlook." Management Learning **29**(4): 447-466.

Lee, A. S. (1989). "A scientific methodology for MIS case studies." MIS Quarterly **13**(1): 33-50.

Lee, G. K. and R. E. Cole (2003). "From a firm-based to a community-based model of knowledge creation: the case of Linux Kernel development." Organization Science **14**(6): 633-649.

Legris, P., J. Ingham, et al. (2003). "Why people use information technology? A critical review of the technology acceptance model." Information & management **40**: 191-204.

Leidner, D. E. and J. J. Elam (1995). "The impact of EIS on organizational design, intelligence and decision making." Organization Science, **6**(6).

Leonard, D. and S. Sensiper (1998). "The Role of Tacit Knowledge in Group Innovation." California Management Review **40**(3): 112-132.

Lesser, E. L. and J. Strock (2001). "Communities of practice and organizational performance." IBM Systems Journal **40**(4).

Lesser, E. L. and J. Strock (2004). Overcoming Knowledge Barriers with Communities of Practice: Lessons Learned through Practical Experience. Knowledge Networks: Innovation through Communities of Practice. P. M. Hildreth and C. Kimble. Hershey, Idea Group Publishing**:** 14-23.

Levin, R. C., A. K. Klevorick, et al. (1987). "Appropriating the returns from industrial research and development." Brookings papers on Economics Activity: 783-820.

Levitt, B. and J. G. March (1988). "Organizational learning." Annual Review of Sociology, **14**.

Lewins, A. and S. Christina (2005). Choosing a CAQDAS package. Surrey, UK, CAQDAS Networking project.

Lewis, I. M. (1985). Social Anthropology in Perspective. Cambridge, Cambridge University Press.

Liao, M., K. Hinkelmann, et al. (1999). A Competence Knowledge Base System as Part of the Organizational Memory. Biannual German Conference on Knowledge-Based Systems – Survey and Future Directions, Würzburg, Germany.

Libby, R., K. T. Trotman, et al. (1987). "Member variation, recognition of expertise, and group performance." Journal of Applied Psychology **72**: 81–87.

Liberatore, M. J. and A. C. Stylianou (1995). "Expert support systems for new product development decision making: a modeling framework and applications." Management science **41**(8): 1296-1317.

Lichtenstein, S. and A. Hunter (2006). "Toward a Receiver-Based Theory of Knowledge Sharing." International Journal of Knowledge Management **2**(1): 24 - 40.

Liebeskind, J. (1996). "Knowledge, strategy, and the theory of the firm." Strategic Management Journal, **17**.

Lin, L., X. Geng, et al. (2005). "A Sender–Receiver Framework for Knowledge Transfer." MIS quarterly **29**(2).

Linden, G., B. Smith, et al. (2003). "Amazon.com recommendations: item-to-item collaborative filtering." IEEE Internet Computing **7**(1): 76 - 80.

Lindgren, R. (2002). Competence visualizer: a knowledge management system generating competence patterns of organizational groups. Hawaii International Conference in Computer Science, Hawaii.

Lindgren, R., O. Henfridsson, et al. (2004). "Design Principles for Competence Management Systems: A Synthesis of an Action Research Study." Management Information Systems Quarterly **28**(3): 435-472.

Lindsey, K. (2002). Measuring Knowledge Management Effectiveness: A Task-Contingent Organizational Capabilities Perspective. Americas Conference on Information Systems.

Linton, F. and H.-P. Schaefer (2000). "Recommender Systems for Learning: Building User and Expert Models through Long-Term Observation of Application Use." User Modeling and User-Adapted Interaction **10**(2-3): 181-208.

Lipparini, A. (2002). La Gestione Strategica del Capitale Intellettuale e del Capitale Sociale. Bologna, Italia, il Mulino.

Littlepage, G. E., W. Robison, et al. (1997). "Effects of task experience and group experience on group performance, member ability, and recognition of expertise." Organizational Behavior and Human Decision Processes **69**: 133–147.

Littlepage, G. E. and H. Silbiger (1992). "Recognition of expertise in decision-making groups: Effects of group size and participation patterns." Small Group Research **23**: 344–355.

Liu, P. (2003). An Empirical Investigation of Expertise Matching within Academia. School of Computing. Leeds, The University of Leeds**:** 214.

Liu, P. and P. Dew (2004). Expertise matcher: integrating multiple expertise indications to retrieve experts. Organizational Knowledge, Learning and Capabilities, Innsbruck.

Liu, S. C., L. Olfman, et al. (2005). "Knowledge Management System Success: Empirical Assessment of a Theoretical Model." International Journal of Knowledge Management **1**(2): 68 - 87.

Lucas, H. C. J. (1975). "Performance and the Use of Information Systems." Management Science **21**(8): 908-919.

Lucas, H. C. J. (1978). "Empirical Evidence for a Descriptive Model of Implementation." MIS Quarterly **2**(2): 27-41.

Maiden, N. and C. Ncube (1998). "Acquiring COTS Software Selection Requirements." IEEE Software: 46-56.

Maier, R. (2002). Knowledge management systems. Berlin, Springer.

Maier, R. (2004). Centralized versus peer-to-peer knowledge management systems. Organizational Knowledge, Learning and Capabilities, Innsbruck.

Maier, R., T. Hadrich, et al. (2005). Enterprise Knowledge Infrastructures. Berlin, Springer-Verlag.

Maish, A. M. (1979). "A User's Behavior Toward His MIS." MIS Quarterly **3**(1): 39-52.

Malone, D. (2001). "Knowledge Management: A Model for Organizational Learning." International Journal of Accounting Information Systems **3**(2): 111-123.

Manville, B. (2004). Building Customer Communities of practice for business value. Knowledge Networks. P. Hildreth and C. Kimble. London, UK, Idea Group Inc.

March, J.-G. and H. A. Simon (1974). Les organisations.

March, J. G. (1991). "Exploration and exploitation in organizational learning." Organization Science **30**(3).

Mari, L. (2003). "Epistemology of measurement." Measurement **34**(1): 17-30.

Markestijn, J. (2004). Communities of practice and supporting software. Faculty of Sciences. Amsterdam, The Netherlands, Vrije Universiteit**:** 112.

Markus, M. L. (2001). "Toward a theory of knowledge reuse: types of knowledge reuse situations and factors in reuse success." Journal of Management Information Systems **18**(1): 57-93.

Markus, M. L. and N. Bjorn-Andersen (1987). "Power over users: it's exercise by system professionals." Communication of the ACM **30**(6): 498-504.

Markus, M. L. and A. Majchrzak (2002). "A design theory for systems that support emergent knowledge processes." Management Information Systems Quarterly **26**(3): 179-113.

Marshall, N. and T. Brady (2001). "Knowledge management and the politics of knowledge: Illustrations from complex products and systems." European Journal of Information Systems **10**(2): 99.

Marti, C. (2005). L'apport des méthodes narratives à la gestion des connaissances : le partage et la réutilisation entre artisans Sciences de Gestion. Montpellier, Université Montpellier 2.

Martin, V. A., T. Hatzakis, et al. (2004). Cultivating a Community of practice between business and IT. Knowledge Networks. P. Hildreth and C. Kimble. London, UK, Idea Group Inc.

Martinez, M. (2004). Organizzazione, informazioni e tecnologie. Bologna, Il Mulino.

Mason, J. (1996). Qualitative researching. London, UK, Sage Publications.

Mason, R. O. (1978). "Measuring information output: a communication systems approach." Information & management **1**(5): 219-234.

Massey, A. P., M. M. Montoya-Weiss, et al. (2002). "Knowledge Management in Pursuit of Performance: Insights from Nortel Networks." MIS Quarterly **26**(3): 269-289.

Mathes, A. W. and T. A. Guest (1976). "Anonymity and group antisocial behaviour." Journal of Social Psychology **100**: 257-262.

Mattox, D., M. Maybury, et al. (1999). Enterprise expert and knowledge discovery. Human Computer Interaction, Munich, Germany.

McDermott, R. (1999a). "Learning across Teams: The Role of Communities of Practice in Team Organizations." Knowledge Management Review **7**(3).

McDermott, R. (1999b). "Why Information Technology Inspired But Cannot Deliver Knowledge Management." California Management Review **41**(4): 103-117.

McDermott, R. (2004). How to avoid a mid life crisis in your CoPs. KM Review, Melcrum Publishing. **7:** 10 - 13.

McDermott, R. and C. O'Dell (2001). "Overcoming cultural barriers to sharing knowledge." journal of Knowledge Management **5**(1): 76-85.

McDonald, D. W. (2000). Supporting nuance in groupware design: moving from naturalistic expertise location to expertise recommendation. Information and computer science. Irvine, University of California**:** 312.

McDonald, D. W. (2001). Evaluating expertise recommendations. International Conference on supporting group work, Boulder, CO, ACM.

McDonald, D. W. (2003). Recommending collaboration with social networks: a comparative evaluation. Conference on Human Factors in Computing Systems, Lauderdale, FL, ACM.

McDonald, D. W. and M. S. Ackerman (1998). Just talk to me: a field study of expertise location. CSCW, Seattle, WA.

McDonald, D. W. and M. S. Ackerman (2000). Expertise recommender: a flexible recommendation system and architecture. Computer Supported Cooperative Work, Philadelphia, PA, ACM.

McKeen, J. D., T. Guimaraes, et al. (1994). "The relationship between user participation and user satisfaction : an investigation of four contingency factors." MIS Quarterly: 427-451.

Mentzas, G., D. Apostolou, et al. (2003). Knowledge asset management: beyond the process-centred and product-centred approaches. Berlin; London; Heidelberg, Springer.

Miles, M. B. and A. M. Huberman (1994). Qualitative data analysis. Thousand Oaks, CA, SAGE Publications.

Millen, D. R., M. A. Fontaine, et al. (2002). "Supporting community and building social capital: Understanding the benefit and costs of communities of practice." Communications of the ACM **45**(4).

Mirani, R. and A. L. Lederer (1998). "An Instrument for Assessing the Organizational Benefits of IS Projects." Decision Sciences **29**(4): 803-838.

Money, W. and A. Turner (2005). "Assessing Knowledge Management System User Acceptance with the Technology Acceptance Model." International Journal of Knowledge Management **1**(1): 8-26.

Moran, J. and L. Weimer (2004). Creating a Multi-company Community of practice for chief information officers. Knowledge Networks. P. Hildreth and C. Kimble. London, UK, Idea Group Inc.

Morisio, M. and A. Tsoukiàs (1997). IusWare: A methodology for the evaluation and selection of software products. International Conference Software Engineering.

Moschera, L. (2000). Analisi di Teorie dell'Organizzazione. Milano, FrancoAngeli.

Mounier-Kuhn, P. E. (1994). Product policies in two French computer firms: SEA and Bull (1948-64). Information Acumen: The understanding and use of knowledge in modern business. L. Bud-Frierman. London, UK, Routledge**:** 113-135.

Myers, M. D. (1999). "Investigating Information Systems with Ethnographic Research." Communication of the AIS **2**(23): 1-20.

Myers, M. D. (2004). "Qualitative Research in Information Systems." MIS Quarterly **21**(2): 241-242.

Myers, M. D. (2006). "Qualitative Research in Information Systems." Retrieved 24/05/2006, 2006, from http://www.qual.auckland.ac.nz/.

Nabeth, T. (2004). Enhancing Knowledge Management Systems with Cognitive Agents. Journée de recherche de l'AIM. Paris.

Nabeth, T., A. Angehrn , et al. (2002). Toward personalized, socially aware and active knowledge management systems. E-business and E-work, Amsterdam, IOS Press.

Nadler, A., M. Goldbert, et al. (1982). "Effect of self-differentiation and anonymity in group on deindividuation." Journal of Personality and Social Psycology **42**(6): 1126-1136.

Nadler, J., L. Thompson, et al. (2003). "Learning Negotiation Skills: Four Models of Knowledge Creation and Transfer." Management science **49**(4): 529-540.

Nahapiet, J. and S. Ghoshal (1998). "Social capital, Intellectual capital and the organizational advantage." Academy of Management Review **23**(2): 242-266.

Nevis, E. C., A. J. Dibella, et al. (1995). "Understanding organizations as learning systems." Sloan Management Review,.

Nonaka, I. (1990). "Redundant, Overlapping Organization: A Japanese Approach to Managing the Innovation Process." California Management Review **32**(3): 27-38.

Nonaka, I. (1991). "The knowledge creating company." Harvard Business Review,.

Nonaka, I. (1994). "A dynamic theory of organizational knowledge creation." Organization Science, **5**(1).

Nonaka, I. (1997). Organizational knowledge creation. Knowledge advantage Conference.

Nonaka, I. and N. Konno (1998). "The concept of "Ba": building a foundation for knowledge creation." California Management Review **4**(3): 40-54.

Nonaka, I. and H. Takeuchi (1995). The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation, Oxford University Press.

Nooteboom, B. (2000). "Learning by Interaction: Absorptive Capacity, Cognitive Distance and Governance." Journal of Management and Governance **4**(1-2): 69-92.

Nunnally, J. C. (1978). Psychometric theory. New York, McGraw-Hill.

NWI. (2005). "Network world." from http://www.nwi.it/idg/networkworld/news.nsf.

O'Dell, C. and C. J. Grayson (1998a). If only we knew what we know. New York, USA, Free Press.

O'Dell, C. and C. J. Grayson (1998b). "If only we knew what we know : identification and transfer of internal best practices." California Management Review **40**(3): 154-174.

O'leary, D. E. (1998). "Knowledge-management Systems: converting and connecting." IEEE Intelligent systems & Their Application: 30-33.

Ochs, M. A., D. Pfahl, et al. (2001). A Method for Efficient Measurement-based COTS Assessment and Selection - Method Description and Evaluation Results. International Software Metrics Symposium, London, England.

Offsey, S. (1997). "Knowledge management: linking people to knowledge for bottom line results." Journal of Knowledge Management **1**(2): 113-122.

Olesen, K. and M. D. Myers (1999). "Trying To Improve Communication And Collaboration With Information Technology: An Action Research Project Which Failed." Information Technology & People **12**(4): 317-332.

Ong, C.-S., J.-Y. Lai, et al. (2005). An understanding of power issues influencing employees' acceptance of KMS: An empirical study of Taiwan semiconductor manufacturing companies, Big Island, HI, United States, Institute of Electrical and Electronics Engineers Computer Society, Piscataway, NJ 08855-1331, United States.

Oracle. (2005). "Oracle." 2005, from www.oracle.com.

Orlikowski, W. J. (2002). "Knowing in practice: enacting a collective capability in distributed organizing." Organization Science **13**(3): 249-264.

Orr, J. E. (1986). Narratives at work: story telling as cooperative diagnostic activity. Computer-supported cooperative work, ACM.

Orr, J. E. (1996). Talking about machines: an ethnography of a modern job. Ithaca, NY, USA, IRL Press.

Paavola, S., L. Lipponen, et al. (2002). "Epistemological foundations for CSCL: a comparison of three models of innovative knowledge communities."

Paavola, S., L. Lipponen, et al. (2004). "Models of Innovative Knowledge Communities and Three Metaphors of Learning." Review of Educational Research **74**(4): 557-576.

Padova, A. (2003). Enterprise Knowledge Portal of GCE&Y Italia. Castellanza.

Pan, S. L. and D. E. Leidner (2003). "Bridging communities of practice with information technology in pursuit of global knowledge sharing." Journal of Strategic Information Systems **12**(1): 71-88.

Parasuraman, A., V. A. Zeithaml, et al. (1988). "SERVQUAL: A Multiple-Item Scale for Measuring Consumer Perceptions of Service Quality." Journal of Retailing **64**(1): 12-40.

Paré, G. (2002). "Enhancing the Rigor of Qualitative Research: Application of a Case Methodology to Build Theories of IT Implementation." The Qualitative Report **7**(4).

Paré, G. (2004). "Investigating Information Systems with Positivist Case Research." Communications of the AIS **13**(18).

Patel, N. and V. Hlupic (2003). Technical Aspects of Knowledge Management: A Methodology for Commercial Knolwedge Management Tool Selection. Knowledge and Business Process Management. V. Hlupic, Idea Group Publishing.

Patil, S. and A. Kobsa (2004). Preserving privacy in awareness systems.

Paul, L. G. (2003). "Why three heads are better than one." CIO Magazine.

Penrose, E. T. (1959). The Theory of the Growth of the Firm. New York, Wiley.

PeopleSoft. (2005). "PeopleSoft." 2005, from www.peoplesoft.com.

Perrow, C. (1967). "A framework for a comparative analysis of organizations." American Sociological review **32**: 194-208.

Peter, J. P. (1979). "Reliability: A Review of Psychometric Basics and Recent Marketing Practices." Journal of Marketing Research **16**(1): 6-17.

Piccoli, G., D. Feeny, et al. (2002). Creating and Sustaining IT-Enabled Competitive Advantage. Competing in the Information Age: Strategic Alignment in Practice. J. Luftman. Oxford, UK, Oxford University Press: 107-136.

Piccoli, G. and B. Ives (2005). "Review: IT-Dependent Strategic Initiatives and Sustained Competitive Advantage: A Review and Synthesis of the Literature." MIS Quarterly **29**(4).

Pickering, J. M. and J. L. King (1995). "Hardwiring weak ties: Interorganizational computer-mediated communication, occupational communities, and organizational change." Organization Science **6**(4): 479-487.

Pikrakis, A., T. Bitsikas, et al. (1998). MEMOIR - Software Agents for Finding Similar Users by Trails. Practical Applications of Agents and multi-Agent Systems, London, UK.

Pinsonneault, A. and N. Heppel (1997-8). "Anonymity in Group Support Systems Research: A New Conceptualization, Measure, and Contingency Framework." Journal of Management Information Systems **14**(3): 89-108.

Pisoni, P. (1979). Il sistema informativo dell'impresa. Uno schema di studio. Milano, Italy, Giuffrè.

Pitt, L. F., R. T. Watson, et al. (1995). "Service quality: a measure of information systems effectiveness." MIS Quarterly **19**(2): 173-188.

Plu, M., L. Agosto, et al. (2004). "A contact recommender system for a mediated social media."

Polanyi, L. (1982). "Linguistic and social constraints on storytelling." Journal of Pragmatics **6**: 509-524.

Polanyi, M. (1966). The Tacit Dimension. London.

Pontiggia, A. (1997). Organizzazione dei sistemi informativi. Milano, Etas.

Pontiggia, A. (2001). L'impiego efficiente delle tecnologie d'informazione. Milano, Etas.

Porter, M. (1981). "The contributions of industrial organization to strategic management." Academy of Management Review **6**(4): 609-620.

Porter, M. E. (1985). Competitive Advantage. Creating and sustaining superior performance. New York, USA, The Free Press.

Porter, M. E. and V. Millar, E. (1985). "How information gives you competitive advantage." Harvard Business Review,.

Powell, W. W. (1998). "Learning from collaboration: knowledge and networks in the biotechnology and pharmaceutical industries." California Management Review **40**(3): 224-240.

Powell, W. W., K. Koput, et al. (1996). "Interorganizational Collaboration and the Locus of Innovation: Networks of Learning in Biotechnology." Administrative Science Quarterly **41**: 116-145.

Prahalad, C. K. and G. Hamel (1990). "The core competence of the corporation." Harvard Business Review,.

Priem, R. L. and J. E. Butler (2001a). "Is the Resource-Based "View" a Useful Perspective for Strategic Management Research?" Academy of Management Review **26**(1): 22-40.

Priem, R. L. and J. E. Butler (2001b). "Tautology in the Resource-Based View and the Implications of Externally Determined Resource Value: Further Comments." Academy of Management Review **26**(1): 57-66.

Profili, S. (2004). Diffusione di conoscenze e innovazione organizzativa nelle organizzazioni professionali. Innovazione organizzativa e tecnologie innovative. A. D'Atri. Milano, Etas.

Propst, L. R. (1979). "Effects of personality and loss of anonymity on aggregation: a reevaluation of deindividuation." Journal of Personality **47**(3): 531-544.

Qian, Z. and G.-W. Bock (2005). An Empirical Study on Measuring the Success of Knowledge Repository Systems. Annual Hawaii International Conference on System Sciences.

Qureshi, S. and P. Keen (2004). Activating knowledge through electronic collaboration: vanquishing the knowledge paradox. ERIM report series research in management. ERIM. Rotterdam, The Netherlands, ERIM.

Rai, A., S. S. Lang, et al. (2002). "Assessing the validity of IS success models: an empirical test and theoretical analysis." Information systems research **13**(1): 50-59.

Rapoport, R. N. (1970). "Three Dilemmas in Action Research." Human Relations **23**(4): 499-513.

Raymond, L. (1985). "Organizational Characteristics and MIS Success in the Context of Small Business." MIS Quarterly **9**(1): 37-52.

Razmerita, L., A. Angehrn, et al. (2003). On the role of user models and user modeling in Knowledge Management Systems. HCI International, Greece.

Reed, R. and R. J. DeFillippi (1990). "Casual Ambiguity, Barriers to Imitation, and Sustainable Competitive Advantage." The Academy of Management Review **15**(1): 88-103.

Resnick, P. and H. R. Varian (1997). "Recommender systems." Communications of the ACM **40**(3).

Robertson, M., J. Swan, et al. (1996). "The role of networks in the diffusion of technological innovation." Journal of Management Studies **33**(3): 333-359.

Robertson, S. E. (1977). "The Probabilistic ranking principle in IR." Journal of documentation **33**: 294-304.

Robey, D. and D. Farrow (1982). "User involvement in information system development: a conflict model and empirical test." Management science **28**(1): 73-85.

Rogers, T. B. (1995). The Psychological Testing Enterprise. Pacific Grove, CA, USA, Brooks/Cole Publishing Company.

Roldán, J. L. and A. Leal (2003). A validation test of an adaptation of the DeLone and McLean's model in the Spanish EIS field. Critical reflections on information systems. A systemic approach. J. J. Cano. Hershey, PA, USA, Idea Group Publishing**:** 66-84.

Rosen, S. (1991). Transaction costs and internal labor markets. <u>The nature of the firm</u>. O. E. Williamson and S. G. Winter. New York, USA, Oxford University Press**: 75-89.

Ross, A. (2003). <u>What we can learn from organic online communities? how communities of practice seed themselves with conflict</u>. Virtual Communities 2003, London.

Ruggles, R. (1998). "The state of the notion: knowledge management in practice." <u>California Management Review</u> **40**(3): 80-89.

Rumelt, R. (1984). Toward a strategic theory of the firm. <u>Competitive Strategic Management</u>. R. Lamb. Englewood Cliffs, NJ, Prentice-Hall**: 556-570.

Ruta, C. D. and C. Turati (2002). <u>Organizzare il Knowledge Management</u>. Milano, Italia, Egea.

Ruuska, I. and M. Vartiainen (2003). Communities and other social structures for knowledge sharing - A case study in an Internet consultancy company. <u>Communities and Technologies</u>. M. Huysman, E. Wenger and V. Wulf. Dordrecht, Germany, Kluwer Academic Pub.

Ryu, C., Y. J. Kim, et al. (2005). "Knowledge acquisition via three learning processes in enterprise information portals: learning-by-investment, learning-by-doing, and learning-from-others." <u>MIS Quarterly</u> **29**(2).

Salton, B. and C. Buckley (1988). "Term weighting approaches in automatic text retrieval." <u>Information processing and Management</u> **25**(5): 513-523.

Salton, B., A. Wong, et al. (1975). "A vector space model for Information Retrieval." <u>communications of the ACM</u> **18**(11): 613-620.

Sambamurthy, V., A. Bharadwaj, et al. (2003). "Shaping agility through didital options: reconceptualizing the role of information technology in contemporary firms." <u>MIS Quarterly</u> **27**(2): 237-263.

Sambamurthy , V. and M. Subramani (2005). "Special Issue on Information Technologies and Knowledge Management." <u>MIS Quarterly</u> **29**(2).

Sambamurthy, V. and M. Subramani (2005). "Special issues on Information Technologies and knowledge management." <u>Management Information Systems Quarterly</u> **29**(1): 1-7.

Sanchez, R., A. Heene, et al. (1996). <u>Introduction: Towards the Theory and Practice of Competence-Based Competition</u>. Oxford, UK, Pergamon Press.

Sarmento, A., I. Ramos, et al. (2005). <u>A research approach classification for knowledge management</u>. IRMA International Conference.

Saxenian, A. (1996). <u>Regional Advantage: culture and competition in Silicon Valley and Route 128</u>. Cambridge, MA, USA, Harward University Press.

Scherer, E. M. (1980). <u>Industrial market structure and economic performance</u>. Boston, USA, Houghton-Mifflin.

Schultze, U. and D. E. Leidner (2002). "Studying knowledge management in information systems research: discourses and theoretical assumptions." Management Information Systems Quarterly **26**(3): 213-243.

Schwab, I. and A. Kobsa (2002). "Adaptivity through Unobstrusive Learning." Kunstliche Intelligenz **3**: 5-9.

Seddon, P. B. (1997). "A respecification and extension of the DeLone and McLean model of IS success." Information Systems Research **8**(3): 240-253.

Seddon, P. B. and M.-Y. Kiew (1994). A Partial Test and Development of the DeLone and McLean Model of IS Success. International Conference on Information Systems, Vancouver, Canada.

Seddon, P. B., D. S. Staples, et al. (1999). "Dimensions of information systems success." Communications of the AIS **2**(20).

Segars, A. H. (1997). "Assessing the Unidimensionality of Measurement: a Paradigm and Illustration Within the Context of Information Systems Research." Omega, **25**(1): 107-121.

Shannon, C. E. and W. Warren (1949). The mathematical theory of communication. Urbana, Illinois, USA, University of Illinois Press.

Sharda, R., S. H. Barr, et al. (1988). "Decision Support System effectiveness: a review and empirical test." Management science **34**(2): 139-159.

Silverman, D. (1993). Interpreting qualitative data. London, Sage Publications.

Silverman, D. (1997). Qualitative research. London, Sage Publications.

Silverman, D. (2002). Come fare ricerca qualitativa. Roma, Carocci Editore.

Sim, Y.-W. and R. Crowder (2004). Evaluation of an approach to expertise finding. International Conference on Practical Aspects of Knowledge Management, Vienna, Austria.

Simon, H. A. (1991). "Bounded rationality and organizational learning." Organization Science **2**(1): 125-133.

Sitkin, S. B. and D. Stickel (1996). The road to hell: The dynamics of distrust in an era of quality. Trust in organizations: Frontiers of theory and research. R. M. Kramer and t. R. Tyler. Thousand Oaks, CA, USA, Sage Publications.

Smith, D. K. and R. Alexander, C. (1988). Fumbling the future: how xerox invented, then ignored the first personal computer. New York, USA, Morrow.

Smith, H. A. and J. D. McKeen (2003). "Developments in practice IX: the evolution of the KM function." Communications of the Association for Information systems **12**: 69-79.

Smith, H. J., S. J. Milberg, et al. (1996). "Information Privacy: Measuring Individual's Concerns About Organizations Practices." MIS Quarterly **20**(2): 167-196.

Snyder, W. M. and X. d. S. Briggs (2003). Communities of Practice: A New Tool for Government Managers. Collaboration Series. Arlington, The IBM Center for The Business of Government.

Snyder, W. M., E. Wenger, et al. (2003). "Communities of Practice in Government: Leveraging Knowledge for Performance." The Public Manager 32(4): 17 - 21.

Solomon, H., L. Z. Solomon, et al. (1982). "The effects of bystander's anonymity, situational ambiguity, and victim's status on helping." Journal of Social Psychology 117: 285-294.

Song, J., P. Almeida, et al. (2003). "Learning-by-Hiring: When Is Mobility More Likely to Facilitate Interfirm Knowledge Transfer?" Management science 49(4): 351-366.

Sorensen, J. B. and T. Stuart (2000). "Aging, obselescence and organizational innovation." Administrative Science Quarterly 45(1): 81-112.

Spectrum HR. (2005). "Spectrum HR." 2005, from www.spectrumhr.com.

Spender, J.-C. (1996a). "Organizational knowledge, learning and memory: three concepts in search of a theory." Journal of Organizational Change Management 9(1): 63-78.

Spender, J. C. (1989). Industry recipes: the nature and sources of managerial judgement. Oxford, UK, Blackwell.

Spender, J. C. (1996b). "Making Knowledge the Basis of a Dynamic Theory of the Firm." Strategic Management Journal 17: 45-62.

Spender, J. C. and R. Grant (1996). "Knowledge and the firm: overview." Strategic Management Journal 17(winter special issue): 5-9.

Spreng, R. A. and R. D. Mackoy (1996). "An Empirical Examination of a Model of Perceived Service Quality and Satisfaction." Journal of Retailing 72(2): 201-215.

Stein, E. W. (2005). "A qualitative study of the characteristics of a community of practice for knowledge management and its success factors." International Journal of Knowledge Management 1(3): 1-24.

Stein, W. and V. Zwass (1995). "Actualizing Organizational memory with information systems." Information Systems Research 6(2): 85-117.

Steiny, D. (2005). "Social network analysis and theory." from http://www.isnae.org/resources.html.

Stenmark, D. (2001). "Leveraging tacit organizational knowledge." Journal of Management Information Systems 17(3 Special Winter Issues): 9-24.

Stewart, T. (1997a). Intellectual Capital: The New Wealth of Organizations. New York, Doubleday.

Stewart, T. (1997b). Leading lights: author Tom Steward on Intellectual Capital. Interview, Knowledge Inc.

Storck, J. and P. A. Hill (2000). "Knowledge diffusion through strategic communities." Sloan Management Review.

Straub, D., D. Gefen, et al. (2004). Quantitative Information systems research methods: 21.

Straub, D., D. Gefen, et al. (2006). "Quantitative, positivist research methods in Information Systems." Retrieved 24/05/2006, 2006, from http://dstraub.cis.gsu.edu:88/quant/.

Straub, D., M. Limayem, et al. (1995). "Measuring System Usage: Implications for IS Theory Testing." Management Science 41(8): 1328-1343.

Straub, D. W. (1989). "Validating instruments in MIS Research." MIS Quarterly 13(2): 147-169.

Straub, D. W., M.-C. Boudreau, et al. (2004). "Validation Guidelines for IS Positivist Research." Communications of the AIS 13(24): 50.

Straub, D. W., D. Gefen, et al. (2005). Quantitative Research. Research in Information Systems: A Handbook for Research Supervisors and Their Students. D. Avison and J. Pries-Heje. Amsterdam, Elsevier: 221-238.

Stuckey, B. and J. D. Smith (2004). Building sustainable communities of practice. Knowledge Networks. P. Hildreth and C. Kimble. London, UK, Idea Group Inc.

Subramani, M. and N. Venkatraman (2003). "Safeguarding investments in Asymmetric Interorganizational Relationships: Theory and Evidence." Academy of management Journal 46(1): 46-62.

Sussman, S. W. and W. S. Siegal (2003). "Informational Influence in Organizations: An Integrated Approach to Knowledge Adoption." Information systems research 14(1): 47-65.

Sutton, D. C. (2001). "What is knowledge and can it be managed?" European Journal of Information Systems 10(2): 80.

Sveiby, K. E. (1997). The New Organizational Wealth, Managing and Measuring Knowledge-Based Assets.

Swanson, E. B. (1974). "Management Information Systems: Appreciation and Involvement." Management Science 21(2): 178-188.

Swap, W., D. Leonard, et al. (2001). "Using Mentoring and Storytelling to Transfer Knowledge in the Workplace." Journal of Management Information Systems 18(1): 95-114.

Szulanski, G. (1996). "Exploring Internal Stickiness: Impediments to the Transfer of Best Practice Within the Firm." Strategic Management Journal 17(Winter Special Issue): 27-43.

Takeishi, A. (2002). "Knowledge Partitioning in the Interfirm Division of Labor: The Case of Automotive Product Development." Organization Science 13(3): 321-338.

Taylor, S. and P. A. Todd (1995). "Understanding information technology usage : a test of competing models." Information Systems Research 6(2): 144-176.

Taylor, W. A. (2004). "Computer-mediated knowledge sharing and individual user differences: an exploratory study." European Journal of Information Systems **13**(1): 52.

Technology Evaluation. (2005). "Vendors." 2005, from http://www.technologyevaluation.com/request/vendor/search.asp.

Teece, D. J. (1987). Profiting from technological innovation: implications for integration collaboration, licencing and public policy. The Competitive Challange. D. J. Teece. Cambridge, MA, USA, Ballinger**: 185-219.**

Teece, D. J. (2000). Managing Intellectual Capital. Oxford, England, Oxford University Press.

Teece, D. J. (2003). Knowledge and competence as strategic assets. Handbook on Knowledge Management. C. W. Holsapple. Heidelberg, Germany, Springer-Verlag. **1: Knowledge Matters:** 129–152.

Teece, D. J., G. Pisano, et al. (1997). "Dynamic Capabilities and Strategic Management." Strategic Management Journal **18**(7): 509-533.

Teltzrow, M. and A. Kobsa (2004). Impacts of user privacy preferences on personalized systems. Designing Personalized User Experiences for eCommerce. K. A. Publishers. Dordrecht, Netherlands.

Teo, T. S. H. and P. K. Wong (1998). "An empirical study of the performance impact of computerization in the retail industry." Omega **26**(5): 611-621.

Terveen, L., P. Selfridge, et al. (1995). "Living design memory: framework, implementation, lessons learned." Human-Computer Interaction **10**(1): 1-38.

Thompson, J. D. (1967). Organizations in action. New York, USA, McGraw-hill.

Thompson, M. (2005). "Structural and Epistemic Parameters in Communities of Practice." Organization Science **16**(2): 151-164.

Tollmar, K. and y. Sundblad (1994). "The Design and Building of the Graphic User Interface for the Collaborative Desktop." Computer and Graphics **19**(2): 179-188.

Tonneis, F. (1971). On sociology: pure, applied, and empirical. Chicago, IL, USA, University of Chicago Press.

Torkzadeh, G. and W. J. Doll (1994). "The Test-Retest Reliability of User Involvement Instruments." Information & Management **26**(1): 21-31.

Tremblay, D.-G. (2004). Communities of practice: are the conditions for implementation the same for a virtual multi-organization community? Montréal, Québec, Canada, Télé-université**: 19.**

Trier, M. (2005). IT-supported visualization of knowledge community structures. Hawaii International Conference on System Sciences, Hawaii.

Tuomi, I. (1999). Data Is More Than Knowledge: Implications of the Reversed Knowledge Hierarchy for Knowledge Management and Organizational Memory. HICSS, Hawaii.

Turoff, M., S. R. Hiltz, et al. (1993). "Distributed group support systems." MIS Quarterly 17: 399-417.

Tushman, M. L. (1977). "Special Boundary Roles in the Innovation Process." Administrative Science Quarterly 22(4): 587-605.

Van de Ven, A. H., A. L. Delbecq, et al. (1976). "Determinants of coordination modes within organizations." American Sociological review 41: 322-338.

Van Maanen, J. and S. R. Barley (1984). Occupational communities: culture and control in organizations. Research in organizational behavior. B. M. Staw and L. L. Cummings. Greenwich, CT, USA, JAI Press.

Vance, D. (1997). Information, knowlegde and wisdom : the epistec hierarcy and computer-based information systems. AIS, Indianapolis.

Vandenbosch, B. and M. J. Ginzberg (1996). "Lotus Notes and Collaboration: Plus ca Change." Journal of Management Information Systems 13(3): 65-81.

Venkatesh, V. (2000). "Determinants of Perceived Ease of Use: Integrating Control, Intrinsic Motivation, and Emotion into the Technology Acceptance Model." Information systems research 11(4): 342-366.

Venkatesh, V. and F. D. Davis (2000). "A Theoretical Extention of the Technology Acceptance Model: Four Longitudinal Fields Studies." Management Science 46(2): 186-204.

Venkatesh, V., M. G. Morris, et al. (2003). "USER ACCEPTANCE OF INFORMATION TECHNOLOGY: TOWARD A UNIFIED VIEW." MIS Quarterly 27(3): 425-478.

Venkatraman, N. (1994). "IT-Enabled Business Transformation: From Automation to Business Scope Redefinition." Sloan Management Review 35(2): 73-87.

Vessey, I., V. Ramesh, et al. (2002). "Research in Information Systems: An Empirical Study of Diversity in the Discipline and its Journal." Journal of Management Information Systems 19(2): 129 - 174.

Vestal, W. and K. Lopez (2004). Best Practices: developing communities that provide business value. Knowledge Networks. P. Hildreth and C. Kimble. London, UK, Idea Group Inc.

Viginier, P., S. Paillard, et al. (2002). La France dans l'économie du savoir : pour une dynamique collective. La Documentation Française. Paris, France, Commissariat Général du Plan.

Vignollet, L., M. Plu, et al. (2005). "Regulation mechanisms in an open social media using a contact recommender system."

Vivacqua, A. and H. Lieberman (2000). <u>Agents to Assist in Finding Help</u>. Computers and Human Interface, Hague, Netherlands.

von Hippel, E. (1994). "Sticky Information" and the Locus of Problem Solving: Implications for Innovation." <u>Management science</u> **40**(4): 429-439.

von Hippel, E. (1998). "Economics of product development by users: The impact of "sticky" local information." <u>Management Science</u> **44**(5): 629-645.

Von Krogh, G. (1998). "Care in knowledge creation." <u>California Management Review</u> **40**(3): 133-153.

Wade, M. and J. Hulland (2004). "Review: The resource-based view and information systems research: review, extention, and suggestions for future research." <u>MIS Quarterly</u> **28**(1): 107-142.

Walsh, J. P. and G. R. Unson (1991). "Organizational memory." <u>Academy of Management Review,</u> **16**(1): 57-91.

Wasko, M. M. and S. Faraj (2005). "Why should I share? Examining social capital and knowledge contribution in electronic networks of practice." <u>Management Information Systems Quarterly</u> **29**(1): 35-57.

Wegner, D. M. (1986). Transactive memory: a contemporary analysis of the group mind. <u>Theories of group behavior</u>. B. Mullen and G. R. Goethals. New York, Springer-Verlag**:** 185-208.

Weick, K. E. (1979). Cognitive processes in organizations. <u>Research in organizational behavior</u>. B. M. Staw. Greenwich, CT, USA, JAI Press. **1:** 41-74.

Weill, P. and M. Vitale (1999). "Assessing the health of an information system portofolio: an example from process engineering " <u>MIS Quarterly</u> **23**(4): 601-624.

Weiser, M. and J. Morrison (1998). "Project Memory: Information Management for Project Teams." <u>Journal of Management Information Systems</u> **14**(4): 149-166.

Wellins, R. S., W. C. Byham, et al. (1993). <u>Empowered Teams: Creating Self-directed Work Groups that Improve Quality, Productivity and Participation</u>. San Francisco, Jossey-Bass.

Wenger, E. (2000a). "Communities of Practice and Social Learning Systems." <u>Organization</u> **7**(2): 225 - 246.

Wenger, E. (2001). "Supporting communities of practice: a survey of community-oriented technologies." from http://www.ewenger.com/tech/executive_summary.html.

Wenger, E. C. (1998). <u>Communities of practice: learning, meaning and identity</u>. New York, Cambridge University Press.

Wenger, E. C. (2000b). Communities of practice: the structure of knowledge stewarding. Knowledge horizons. The present and the promise of knowledge management. C. Despres and D. Chauvel. Boston**: 205-224.

Wenger, E. C., R. Mc Dermott, et al. (2002). Cultivating Communities of Practice: A Guide to Managing Knowledge. Cambridge, MA, Harvard Business School Press.

Wenger, E. C. and W. M. Snyder (2000). "Communities of practice: the organizational frontier." Harvard Business Review **78**(1): 139-145.

Wernerfelt, B. (1984). "A Resource-based View of the Firm." Strategic Management Journal **5**(2): 171-180.

Wernerfelt, B. (1989). "From critical resource to corporate strategy." Journal of General Management **14**(3): 4-12.

Wilson, T. (1995). Information-seeking behavior: designing information systems to meet our client's needs. ACURIL Conference, San Juan, Puerto Rico.

Winter, S. G. (1987). Knowledge and competence as strategic assets. The competitive challange: Strategies for industrial renewal. D. J. Teece. Cambridge, MA, USA, Ballinger Publishing.

Wood, M., J. Daly, et al. (1999). "Multi-method research: An empirical investigation of object-oriented technology." Journal of Systems and Software **48**: 13-26.

Wynekoop, J. (1985). Strategies for implementation research: combining research methods. International Conference on Information Systems.

Yan, A. and M. R. Louis (1999). "The migration of organizational functions to the work unit level: Buffering, spanning, and bringing up boundaries." Human Relations **52**(1): 25-47.

Yimam-Seid, D. and A. Kobsa (2000a). Centralization vs. Decentralization Issues in Internet-based Knowledge Management Systems: Experiences from Expert Recommender Systems. Workshop on Organizational and Technical Issues in the Tension Between Centralized and Decentralized Applications on the Internet, University of California Software Institute, Irvine, CA.

Yimam-Seid, D. and A. Kobsa (2000b). DEMOIR: A hybrid architecture for expertise modeling and recommender systems. International Workshops on Enabling Technologies: Infrastructure for Collaborative Enterprises, Gaithersburg, Maryland.

Yimam-Seid, D. and A. Kobsa (2003). "Expert Finding Systems for Organizations: Problem and Domain Analysis and the DEMOIR Approach." Journal of Organizational Computing and Electronic Commerce **13**(1): 1-24.

Yin, R. K. (1994). Case study research: design and methods. Thousand Oaks, USA, Sage Publications.

Yin, R. K. (2002). Case study research: design and methods. Thousand Oaks, California, USA, Sage Publications.

Yoon, Y. and T. Guimaraes (1995). "Assessing expert systems impact on users' jobs." Journal of Management Information Systems **12**(1): 225-249.

Yoon, Y., T. Guimaraes, et al. (1995). "Exploring the Factors Associated With Expert Systems Success." MIS Quarterly: 83-106.

Young, T. R. (1984). "The lonely micro." Datamation **30**(4): 100--114.

Yukawa, T. and K. Kasahara (2001). An Expert Recommendation System using Concept-based Relevance Discernment. International Conference on Tools with Artificial Intelligence, Dallas, Texas.

Zhu, J., M. Eisenstadt, et al. (2005). BuddyFinder-CORDER: Leveraging Social Networks for matchmaking by Opportunistic Discovery. Technical Report kmi-05-13.

Zuckerman, I. and D. Albrecht (2001). "Predictive statistical models for user modeling." User Modeling and User-Adapted Interaction: 5-18.

Zviran, M. and Z. Erlich (2003). "Measuring IS user satisfaction: review and implications." Communications of the AIS **12**: 81-105.

Annexes

Example of the interview guide of the interviews of the CKO

Ce guide d'entretien sert de structure générale à l'entretien sur les systèmes de knowlegde management dans l'organisation. Certains thèmes seront plus développés que d'autres, des questions pourront être laissées de côté. Les thèmes abordés avec les responsables sont les suivants :

- renseignements concernant le répondant
- définition et présentation des systèmes de knowlegde management et d'expériences
- objectifs du système, problèmes rencontrés,
- utilisation du système : nombre d'utilisateurs, mode d'utilisation,
- organisation : rôle du responsable, rôle de l'encadrement, mode d'évaluation,
- formation, expérience, attitude des utilisateurs,
- avantages et inconvénients du système
- évolution future du système

L'entretien pourra être guidé par les questions plus précises, qui suivent :

Caractéristiques du répondant et de l'entreprise

Renseignements signalétiques : nom, fonction, ancienneté, ...

Caractéristiques de l'entreprise : secteur d'activité, nombre de salariés, ...

Description du KM dans l'organisation

L'entreprise a t elle une stratégie de KM ?

Quelle terminologie utilisez- vous le plus souvent ?

Depuis combien de temps l'entreprise a t-elle une politique de KM ? Y a t-il un service dédié ?

Quels systèmes d'aide à la gestion des connaissances existent ? Systèmes documentaires, autres systèmes (substituabilité, complémentaire?)

Quels sont les outils de capitalisation utilisés ? (Serveur de connaissances, GED, …)

Quels sont les outils de diffusion utilisés ? (Messagerie, intranet …

Description du système: définition, objectifs, organisation, …

Qui a accès à quoi ? Pourquoi ?

Quels étaient les objectifs ?

Mise en place et développement

Des statistiques ? Date de mise place, connexions, nombre d'utilisateurs potentiels, utilisateurs reels.

Implication de la direction, des services ?

Quelle formation ? Quelle communication ?

Comment les gens sont ils incités à utiliser le système ? (À l'enregistrement d'expérience)

Quels sont les principaux problèmes ?

Utilisation

Le processus d'alimentation du système (soumission, contribution)

Comment est alimenté le système ? Quels types de ressources sont gérées ? Qui peut soumettre ?

Y a t-il un contrôle ? Quels sont les critères de sélection des soumissions ?

Le processus de Consultation du système (réutilisation) :

Comment on consulte une connaissance ? Description des modalités de consultation

Statistiques d'utilisation et perception du système: nombre de soumissions, nombre de consultations, mode de suivi …

Quelles sont les applications les plus utilisées ? Certaines applications sont- elles abandonnées faute d'utilisateurs ?

Le système est- il favorablement perçu ? Y a t- il des opposants ?

Quels sont les facteurs qui selon vous favorisent ou freinent l'usage ? Ou qu'est ce qui a motivé les gens à utiliser ou au contraire quels blocages ont été sensibles ?

Avantages et inconvénients du système ?

Attentes et résultats

Quels sont les résultats ? Gains, pertes, mesure de performance …

Existe t - il des différences notables avec les attentes ?

Quelles évolutions ?

Divers :

Éléments à ajouter ? Si projet à refaire : idem ?

Extensive description of the Expert Recommending Service and Knowledge Communities in the five organizations of the first preliminary study

FDE

Knowledge Communities

The Knowledge Communities of the experts and specialists started to promote the importance to develop a Knowledge Management initiative. They hardly contrasted the opinion of some managers who did not foresee a significant return of this investment.

One of the first initiatives was the official constitution, by the CIO, of a "Club of Knowledge Management", gathering 150 employees strongly involved in activities related to the management of knowledge in the company.

The CIO noticed a limited cohesion among some members who were performing the same kind of working activity. This limited cohesion was causing a scarce awareness of the knowledge distribution in the organization. This reduced awareness regularly led to the occurrence of the same errors by different employees. There was not an effective learning by the previous experiences and by the best practices, existing elsewhere in the organization.

The CIO realized the importance to increase the knowledge sharing and the knowledge awareness among the employees doing the same kind of working activity.

Operatively, his new organizational structure, "Club of Knowledge Management", had to fill a database in order to have a repository containing information on the previous experiences. The expected benefits were an enhancement of the capitalization of the previous experiences, for the benefit of the whole organization.

The CIO appointed also a steward of this "Club of Knowledge Management", named Chief Knowledge Officer. The 150 selected employees were a sample which included representatives of different organizational roles and professions. The members of the Club were invited by the organization to report the points of view, the requests, and the instances of the people out of the Club. The membership was defined by the CIO limiting the adhesion of other colleagues and the abandon of members.

All the members met each 2 months, they had an explicit agenda, so at each meeting they had a different specific topics to debate. During each meeting, returns from the knowledge management initiatives, both within and outside the company, were shared. The lesson-learnt and other

information on the knowledge management initiatives were also published on an organizational intranet.

This involvement in the Club did not include any explicit incentive by the organization and the resources for performing the meetings and maintaining the intranet were sourced by collateral projects which involved the individuals of the Club.

The participation, in terms of elicitation and storage of information in this intranet remained very heterogeneous: some individuals did not store information at all, while others uploaded even too much in comparison with their actual knowledge, determining some low-quality contributions. Moreover, some responsible direct superiors did not want that their subordinates participate in this kind of activities as they considered those knowledge management activities a waste of time and a risk to loose the control over their subordinates.

After this first official Knowledge Community, the company started to promote the strengthening of the relationships among individuals doing the same kind of working activity.

Firstly, the organization entitled some individuals, considered as expert in their specific knowledge domain, to verify the existence of some sort of Knowledge Community among colleagues doing the same kind of working activity. In case it seemed that a Knowledge Community was not existing, the organization, through the same experts, actively contributed to its creation, through the networking of the individuals doing the same kind of working activity.

The organization worked in order to well fit each individual within a consistent professional field and to assists managers in mastering their colleagues. The CIO perceived that this condition granted the achievement of the objectives of the Knowledge Community. These planned objectives were defined by the organization and related to the improvement in the capitalization of the existing knowledge and the encouragement in the exploration of new business ideas.

So, once the individuals were networked, the organization tried to assure the coordination among its members, through the assignment of a responsible of the Knowledge Community.

The organization recognized as fundamental for the existence of the Knowledge Communities that the Knowledge Community were only partially managed by the organization. Part of the activities of the Knowledge Communities was, therefore, autonomously developed by their members.

In the opinion of the CIO, the promotion of the Knowledge Communities, sharing the same kind of working activity, caused the increase in the interactions among the colleagues, which brought in some cases to an evident advantage for the organization in terms of effectiveness in problem-solving.

Expert Recommending Service

FDE has not a formal Information System providing the Expert Recommending Service. Nevertheless, the CIO pointed out the lack of awareness by the employees on the distribution of knowledge among the colleagues. The CIO also recognized the costs of this lack of awareness in terms of wasting of resources.

The initiative of the organization was the encouragement for the creation of Knowledge Communities, but no formal Information System was indicated as a possibility or as an opportunity for enhancing awareness.

Tluaner

Knowledge Communities

The CIO of Tluaner did not explicitly mention the promotion of Knowledge Communities in the company, but the interview's content confirmed their existence among the managers.

The initiatives of the top management in Knowledge Management were toward the reduction of the development costs, through the capitalization of existing knowledge. This aim was pursuit without directly leveraging on the creation and the promotion of the Knowledge Communities. The CIO doubted on the effectiveness of this organizational stewardship. From the analysis of the behavior and the attitude of the personnel, CIO concluded that someone would have not reuse the existing knowledge, in a tentative to be original and to find new solutions.

The lack of knowledge capitalization was directly noticed by the top management. The CIO noticed that there were inconsistencies among the various managers' behaviors and policies, in some cases against knowledge capitalization and in some case in favor. In the opinion of the CIO, the official communications toward the capitalization of knowledge were only partially successful as the top management did not give the right example.

Expert Recommending Service

The CIO did never mention the problem of lack of knowledge awareness among the employees and the existence of some sort of formal Expert Recommending Service.

Regrebmulhcs

Knowledge Community

Regrebmulhcs established a plan to promote and assist Knowledge Communities, however the behavior differed at the different corporate hierarchical levels.

In the opinion of the CKO, the top management gave its support. The top management accorded to the individuals the time for capitalizing knowledge, for sharing knowledge and for maintaining the personal online Curriculum Vitae. The middle management, on the contrary, saw the knowledge capitalization a lost of time, and a resource distraction, from the accomplishment of the organizational objectives.

To capitalize knowledge and to store the CV, the organization had developed an application, labeled Eureka, where the employees had the possibility to store information on their job and their experiences. These contributions in the Eureka database were eventually promoted by the responsible direct superior, who assigned to their subordinates, as professional objective, the effectuation of a certain number of contributions to Eureka. No other incentives were explicitly defined to stimulate the use of the application to store information on their work and their CV.

This application was available to the 5000 people registered in the application, and they were officially grouped in Knowledge Communities. The organization had established that one or two members of each Knowledge Community were elected as community leaders for 1 year, by all the members. These elections included the spontaneous candidatures of the members of the Knowledge Community whishing to steward it and the performance of an election campaign, during which the candidates proposed their programs. From the point of view of the CKO, the election campaigns contributed to the understanding of the importance of Knowledge Communities for the individuals and the organization and to the strengthening of the cohesion of the Knowledge Community's members.

In the opinion of the CKO, people in the same community seemed recognize themselves as members of the Knowledge Community and this cohesion seemed stronger where there was awareness of the knowledge domains of the other members and reciprocal acknowledgement. In this case, complicity and trust became levers to motivate people to participate in the Knowledge Community.

The responsible direct superior of the potential candidate had to authorize the candidature and to grant 25% of the working time of the candidate to the stewarding of the Knowledge Community in case of successful election. The elected leader, with the other members of the Knowledge Community, had to formalize a document describing the direction, and the initiatives which would have been taken for the future and this document was presented to the CKO.

For the CKO, stewarding a Knowledge Community meant the participation to several reunions with the members of the Knowledge Community and with the top management, the validation of the contributions to Eureka, concerning the respective Knowledge Community, and the promotion of the contributions to Eureka.

The statistics from Eureka showed that some individuals did not participate into Eureka and once questioned they justified that behavior for a lack of time. Some others accessed Eureka but only as observer and searcher of information, without storing their information into the application. Some others, instead, actively were contributing to Eureka putting information and updating regularly their CV. The newcomers were among the most active users of Eureka, as they were exploiting it to show their competences toward the rest of the colleagues. The most experts felt, instead, overwhelmed by the requests of assistance: for helping to find a solution to a specific problem, and for controlling the quality of the others' contributions.

The CKO noticed also two correlations. The first one between the requirement of the validation of the contributions and the number of contributions: in the Knowledge Communities where the validation is not required the contributions are more frequent. The second correlation between the rapidity of this validation and the numbers of contributions: where the validation is granted rapidly the number of contributions increases. The validation seemed to the CKO important to assure the quality of the content of Eureka, but the organization did not find a way to motivate Knowledge Community leaders and the other experts to engage in the validation and assure rapidity.

All the 5000 people registered in Eureka regarded the technical/scientific personnel. The access to the same application made them officially members of the Eureka Knowledge Community. Within this Knowledge Community, the CKO organized 17 other Knowledge Communities. Each of these 17 communities had other sub-communities inside.

Each Knowledge Community was specialized on a specific technical/scientific knowledge domain and included both newcomers and experienced employees, geographically dispersed worldwide, and culturally very heterogeneous.

Each Knowledge Community disposed of a dedicated area in Eureka where the members had specialized information on their work. At this regard, the CKO noticed that the heterogeneity of the members, in terms of working activity, reduced the participation to the Knowledge Community. Consequently, some Knowledge Communities were spitted in smaller and more homogeneous ones. The geographical dispersion limited the face to face meetings of the members of the same Knowledge Community. Nevertheless, some official meetings among the members and unnumbered unofficial contacts were carried out among the members, especially within the members of the same location.

The Knowledge Community leaders were sustained by the CKO to meet the other members of the Knowledge Community working in the remote locations when the leaders had job trips in those locations. Beyond the face to face meeting, the interactions were performed through communication tools, some of them available directly in Eureka.

The official Knowledge Communities were created only by the CKO, through the definition of a dedicated area in Eureka and the distribution of the authorization access at this dedicated area to the selected set of individuals. The unofficial Knowledge Communities, through their members, had the possibility to demand to the CKO to be recognized as official Knowledge Community and to have a dedicated area in Eureka.

The CKO recognized that some members of the Knowledge Communities were also members of other Knowledge Communities which were not under control of the company. These Knowledge Communities were inter-organizational and they gathered individuals specialized on the same knowledge domain, but hired by different companies. The participation in these inter-organizational Knowledge Communities was noticed as more frequent for the individuals who were members of Knowledge Communities which did not concern the core businesses of the company, like the Knowledge Community on Information Technology. For these members, the researched knowledge was rarely inside the company and so they searched it outside in these inter-organizational Knowledge Communities. Different behavior is hold by the members of the Knowledge Communities concerning knowledge domains, which were core businesses of the company. These members found easily the information they needed inside the company, like the Knowledge Community on Geology. This opportunity to find the answers inside the company reduced the need to search the specialized knowledge outside, hence limiting the degree of interaction with the external Knowledge Communities.

Expert Recommending Service

Eureka included the Information System functionalities granting the provision of the Expert Recommending Service to its users.

Each employee had the possibility to describe his knowledge domains and his membership to the official Knowledge Communities in the online Curriculum Vitae. This information was stored in Eureka, and it was accessible internally and externally via the company extranet.

The employees were described by their personal pages which gave information on their respective knowledge domains, their Knowledge Community memberships, and their contact information.

The organization's members browsed among these pages and searched, through a keyword search engine, the list of the colleagues with that keyword in the Curriculum Vitae. The keywords and the membership of the searcher to the official Knowledge Community were the parameters for the retrieval of the list of employees. By this list, the user saw the different CV of the different employees and accessed to the contact information.

The CKO considered this Expert Recommending Service very important. The CKO appreciated the ERS as it enhanced the awareness on the knowledge distribution among the employees, accelerated

the identification of the correct expert within the company, and stimulated the internal mobility of the personnel to match the local needs. The CKO thought also that the usefulness of the Expert Recommending Service was recognized by the colleagues and he supported this opinion explaining that 2700 employees edited their online CV.

Selaht

Knowledge Community

The CKO perceived the existence of two major Knowledge Communities: the first one gathered the engineers and the second one the researchers, independently on their longstanding of experiences. The CKO reported that there were large differences in culture, management aspects, and attitudes between engineers and researchers.

These 2 main Knowledge Communities were complemented by 40 official Knowledge Communities each one specialized in a different knowledge domain. 17000 employees were distributed among these 40 Knowledge Communities, basing on the homogeneity of their working activity. The gathering of individuals on the homogeneity of their working activity brought to the creation of Knowledge Communities with more than one thousand members and Knowledge Communities with less than one hundred members.

The geographical distribution of the members of the Knowledge Communities limited the face to face meetings, and the large part of the relationships among the members passed through the corporate intranet and the available groupware solutions.

The organizational support and recognition of the Knowledge Communities aimed at increasing the effectiveness of the organization through the enhancement of the knowledge capitalization and newcomers' integration and training.

Each official Knowledge Community had a steward, in charge of its animation and a budget for their internal initiatives. The steward predicated the usage of the corporate intranet as a solution to store information on the working activities, in order to make information available to the colleagues, through the intranet.

Also the CEO established a communication policy favoring the contribution to the intranet, and the information sharing among colleagues. In the official communications, the organization highlighted the importance of knowledge and knowledge transfer as a competitive lever. The contributions to the intranet and the information sharing were appointed as professional objectives of the part of the personnel and so employees were evaluated for their contributions and information sharing. Moreover, CKO assured that the whole organization granted that a portion of the working hours

was dedicated to the initiatives of the Knowledge Community and to the sharing of information among the members.

The organization took also in consideration the possibility to financially incentive the contributions to the intranet, but the idea was discharged for the risk of biasing the quality and quantity of the job. The CKO nevertheless evidenced the possible cultural conflict between the request of working, without incentives, and the request of answering the demands of colleagues, which were not strictly a prescribed working activity, in particular if the organization were demanding a high quality of the answers.

The CKO underlined that however the persuasion activities did not seem to give the expected results, in terms of contributions. The engineers declared the lack of time for contributing to the intranet. On the contrary, the researchers seemed to appreciate the solutions and contributed more frequently. The lack of contributions by the engineers was perceived by the CKO as a signal that the engineers did not appreciate solutions already used by others. They preferred to develop new and original solutions, falling in the "not invented hire syndrome".

This was the general tendency highlighted by the CKO, but within these Knowledge Communities important differences existed in terms of information sharing through the intranet.

Expert Recommending Service

In the corporate intranet an Expert Recommending Service existed. There was a series of lists of colleagues in position to help on the different knowledge domains.

Moreover the organization developed an email system which allowed the diffusion of demand for assistance throughout the company: when an employee had a problem he had the possibility to write an email containing the request of help and sent it to a formal organizational unit, appointed to assist colleagues. The members of this unit read the content of the email and forwarded the email to the colleague who was expected to be in the position to address the problem. The members of this unit were assessed by the organization as experts on specialized knowledge domains and they were in charge of rapidly responding to the emails of the colleagues in search for help.

The CKO highlighted the advantage of this solution in comparison of the contribution to a database where the employees stored the information on their working activities. The email system overcame the problem of the time, required to formalize the professional experiences, before storing them, and of the effort of writing reports, eventually never read. For the CKO, the email system had the advantage to require the time and effort of the experts only when they were required for a specific contextualized problem. They transferred knowledge directly to the seeker of knowledge, without passing through the information storage in a repository.

The CKO was convinced that this email system was satisfying the users and was a useful complementary solution to the information stored in the database on the intranet. However, the answers of the experts were evaluated sometimes partial or mediocre.

Ronisu

Knowledge Community

The organization had several official Knowledge Communities and the CKO vaguely perceived the existence of many others. The official Knowledge Communities had members located in different sites, in different states, but with a homogeneous working activity.

The most structured official Knowledge Community was the one concerning the quality assurance. It had 150 members, meetings twice a year, an explicit agenda with objectives and awards for the members, and other social events for stimulating the participation.

The geographical dispersion limited the possibilities of face to face meetings and the trips organized for business projets were exploited to meet the other members of the Knowledge Community. ICT supported, otherwise, the information exchanges among the members, usually about technical documentation.

However the exchanges were perceived by the CKO reduced by the fact that some employees feared to expose their knowledge in front of the other colleagues, who were perceived as experts in the specific knowledge domain. The exchanges were more frequent among the experts and the project leaders as they acknowledged the other members of the Knowledge Community and the reciprocal specializations. Another restrain to the information exchange was noticed, by the CKO, in the personnel evaluation system as it stimulated internal competition, instead of cooperation. Moreover, the CKO underlined how the employees had different cultures and different languages, which hindered the information exchanges between members of different locations.

To overcome these obstacles, the organization officially promoted the information exchanges, awarding the best contributions, and financing the Knowledge Community meetings.

Expert Recommending Service

The company had not a formal Expert Recommending Service, but the CKO affirmed that the organization perceived the importance of increasing the awareness of the individual on the knowledge distribution among the colleagues, to favor knowledge transfer.

In order to enhance this awareness, the company programmed to intensify the relationships cross location. Complementary, the organization tried to develop a positive knowledge sharing culture. With these initiatives the organization aimed at the enhancement of the knowledge transfer among the different sites of the company.

The organization expected that these knowledge transfers would have improved the efficiency of the business units, through the sharing of the best-practices among the different organizational sites, and the reciprocal assistance between colleagues.

Example of the interview guide to the Knowledge Community members

Introduction

- Project presentation

- Definitions of the Expert Recommending Service

- Thanks for agreeing to the interview

- Reasons of the interviews and of the study

- Way of exploitation of the collected data

- Major topics of interests: the Knowledge Community, the ERS, the success of the ERS

- Liberty to add information on correlated aspects

Questions

5. Role and responsibilities in the organization

6. Means for the retrieval of experts

7. Tools for the retrieval of experts

8. Opinion of the retrieval of experts

9. The reasons and benefits of retrieving experts

10. The relations with the colleagues

11. The relations with the management

Example of the short presentation of the project proposal "The role of communities in the success of the IT-based Expert Recommending Services"

Forewords

This document describes "The role of communities in the success of the IT-based Expert Recommending Services" project proposal. The first section gives a brief presentation of the project, while the rest of the document includes in-depth descriptions of the main aspects of the project.

The following project proposal should be seen as a starting point for the definition of the actual project agreement that will match your organization requirements.

Research team

This project is coordinated by a **joint research team** composed by:

1. Centro di ricerca sull'Economia e le Tecnologie dell'Informazione e della Comunicazione (CETIC - Center on information and communication technology and economics) of Cattaneo University in Castellanza (Varese – Italy)

2. Centre de Recherche En Gestion des Organisations (CREGO – Center for Research into the Management of Organizations) of Montpellier 2 University in Montpellier (France)

Keywords

To create a common understanding of the terms used in this document, the following keywords are briefly explained:

- **Expert Recommending Service (ERS)**: the service that counsels individuals who could likely help the customers of the service to solve problems of business process breakdowns. This service could be provided by software, organizational units, or single community members and could be obtained through a variously complex elaboration process of very heterogeneous data on individuals concerning: their competences, their knowledge, their project participations, their task attributions, their responsibilities, their training programs, etc.

- **Community**: group of people that share a common practice, work, or interest.

Benefits

The participant organizations will benefit of:

- the **evaluation** of: the community, the ERS success, the use of the ERS.
- the definition of IS **initiatives** for improving the potential of the community, the success of the ERS, the use of the ERS.
- the **assistance** in the application of these IS initiatives.

Hence, your organization will advantage of:

3. A **report** containing the result of the evaluation and of the definition of the IS initiatives.
4. The **participation**, in the role of advisor, of a research team representative in the implementation of the IS initiatives, in case you agree on their implementation.

Requirements

In order to benefit of this project, your organization should allow a research team representative to:

1) **interview** a selected set of individuals (approximately for one hour each):
   a) the responsible of the ERS,
   b) the responsible of the ERS development project.
   c) the responsible of each community of the customers of the ERS,
   d) a customer of the ERS, for each community.
   e) spread and collect a ten minute long multiple choice **questionnaire** throughout the customers of the ERS in order to have in return at least 100 completed questionnaires,
2) **advise** during the (eventual) implementation of the IS initiatives.

Contacts

For any inquiry

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Bernard Fallery: fallery@polytech.univ-montp2.fr

Aurelio Ravarini: aravarini@liuc.it

Characteristics of the Interviewees of NSS

Each interviewee of this organization is shortly described to favor an overall understanding of their positions and roles.

Human resource management department member

The interviewee works in the human resource management department. He has the responsibility to control the respect of the deadlines in the processes of personnel evaluation and development. In case of not respect of a deadline by an employee, this member informs the direct superior of the employee inviting the superior to directly intervene on the subordinate to make up for the delay. In this way, this member is responsible of the constant update of the data of the computer-based ERS, as the information tracked during the personnel evaluation and development is the source of data for the computer-based ERS.

Resource manager

The interviewee works in the resource management department. He has the responsibility to coordinate the allocation of the employees within and across the business units to satisfy the demand of human resources with some specialized knowledge. As the organization works mainly on projects the demand of resources is irregular. Therefore the resource manager coordinates the satisfaction of the demand of human resources to put on the specific phases of the projects for a certain lapse of time. This demand is satisfied through the identification of employees with the specialized knowledge, but not completely charged of work. As within a single business unit there is a responsible in charge of the managing the resource of the respective business unit on the business unit projects, the resource manager is mainly involved for the allocation of human resources across business units. To absolve to this responsibility, the resource manager has regular contacts with the responsible of each business unit and has accessibility to the computer-based ERS. These regular contacts and the access to the computer-based ERS give to the resource manager a wide visibility on the work charge of the employees and favor the aware of the knowledge domains of the employees.

Delivery manager

The interviewee works for, and has he responsibility of the business unit that is dedicated to the Media vertical market. This business unit carries on projects concerning the implementation, by the customers of software solutions for the publishing market.

This delivery manager defines the project leaders and, with the project leader, he defines the project team. The definition of project leaders and project teams is supported by the access to the computer-based ERS, to deepen the understanding of the work charge of the subordinates. However the limited numbers of subordinates and the regular contact with them facilitate the maintenance of an adequate level of awareness on the knowledge domains of the subordinates by the delivery manager, also without the use of the computer-based ERS.

In case the human resources, within the business unit, are not enough, the delivery manager dialogues with the resource manager in order to find other resources, internal to the organization. In case of unavailability, the organization demands the provision of the required specialized knowledge to a series of partners. Finally, in order to maintain adequate visibility on the prosecution of the projects, the delivery manager has regular meetings with the project leaders and, at these events, the planning for the next months is delineated.

Skill manager

The interviewee works for and has the responsibility of the business unit on the Microsoft's architectures. This business unit is charged of the development of software solutions based on Microsoft package software.

The skill manager principally defines, with his subordinates, their training plans, and he staffs the project teams, basing on the knowledge domains of his subordinates. The awareness on the knowledge domains of the subordinates is obtained by the direct contact with all his subordinates and the access to the computer-based ERS. Based on the long-term human resource demand for the prospected projects the skill manager plans the training for his subordinates and the needs for additional resources that can be obtained from other business units or from external business partners.

Consultant

This interviewee works for the business unit dedicated to the vertical market of the Financial Services, which market is dominated by projects for the assurances and the banks. He is a newcomer consultant with the responsibility of the execution of a project, for which he is the only employee in charge of it. This autonomy of the consultant is balanced by the supervision of the business unit responsible, who assists also the consultant. The assistance is requested by the consultant especially to find the adequate experts on specific business problems. The consultant does not have access to the computer-based ERS to find experts and so he asks this service, in the informal way, to his direct superior,

Developer

This interviewee works for the business unit on the Microsoft's architectures. He is a consultant dedicated to the development of software solutions based on Microsoft package software. He works autonomously on certain projects, while on some other projects he works in team. He has the title to assume all the possible roles in a project team combined to the development of a Microsoft software solution. His long experience in the same business unit grants him an adequate level of awareness on the distribution of knowledge within the business unit, making him able to recognize the correct expert with the requested specialized knowledge. He does not have access to the computer-based ERS and, when he needs to identify an expert, he demands to the colleagues or to his superior.

Characteristics of the Knowledge Communities of NSS

After the presentation of the interviewees, the characteristics of the Knowledge Communities are delineated.

The Knowledge Communities are not explicitly recognized by the employees, but from their discourses, the existence of Knowledge Communities can be noticed.

These Knowledge Communities are described based on the characteristics outlined in the literature review section.

Lifetime

Knowledge Communities seem to exist in the organization since its very beginning. Their actual forms nevertheless can be traced back to the mid '90s when the organization radically restructured itself and its business: from an IT manufacturer, the organization became an IT service provider. The gradual change did not break up completely the relationships between colleagues but did shape them significantly, determining the end of some Knowledge Communities and the growth of other Knowledge Communities around the new businesses.

Size

The organization has around 550 employees organized in the different businesses. These organizational businesses are the gathering points of the Knowledge Communities. The size of each Knowledge Community equals approximately the number of employees involved in the business.

Composition

Each Knowledge Community gathers employees around a common knowledge domain, independently on the length of the professional experience of each individual in that domain. Knowledge Communities are composed around each business sector and vertical market and

include both experienced and novice employees. The presence of newcomers is enlarging, because the personnel turnover is reducing the number of employees with several years in the organization.

Fragmentation

The fragmentation of the Knowledge Community reflects the structure of the organization and the differences in the working activities of the employees. The structure of the organization in business units and the specialization in different vertical markets determine the fragmentation of the personnel in different Knowledge Communities each of them around a market and around a professional activity. The geographical dispersion of employees determines a further fragmentation of the employees. Another fragmentation is produced by the structure of the international corporation into different subsidiaries, each one dedicated to business originating from the single country. This structure, in fact, causes a fragmentation among the colleagues doing the same job, but in different countries.

Geographical dispersion

If one major aggregation factor for employees is a common knowledge domain, geographical dispersion is an obstacle for an effective participation to the Knowledge Communities. The distribution of the personnel in three main offices in Italy, Milan, Rome, and Naple, determines the maintenance of the local Knowledge Communities in the different offices.

Beyond the dispersion across the organizational offices, some employees remain for long time by a single customer, as they are involved in a series of projects for the same customer. These employees are weakly connected with the other colleagues who do not work for the same customer, because they are never in the organizational offices.

This geographical dispersion is replicated internationally with the colleagues in the other national subsidiaries.

Mode of interaction

The interactions are realized via both IT and face-to-face. Face-to-face interactions concern colleagues who are assigned on the same project or employees who share the same offices because their jobs allow to constantly meeting.

Otherwise, IT is largely used to support distant interactions. The mobile phones, provided by the organization, are the preferred solution. In alternative, office phone and professional email are available to all the employees and they are used on regular basis. Instant messaging systems, audio and video conferences are, on the opposite, uncommon in the organization, even if technically available.

Degree of interconnection

The majority of the interactions are between two employees of the same business unit, or between the subordinate and his direct superior. These personal interactions are the main source of awareness on the knowledge distribution among the personnel and through these interactions a large part of the ERS is provided.

The rest of the interactions are generally official ones and originate by the directors of some specific organizational units to all the employees interested to the content of the communication.

Frequency of interaction

The most frequent interactions happen among the employees working on the same project or in the same business unit. The interactions are less frequent among employees of different business units, and of different locations. To stimulate interactions, the direct superiors regularly propose some meetings, which link different business units and locations.

Between different hierarchical levels, the subordinates keep constantly update their respective superior, on their working activities, while among the superiors the interactions are less frequent.

Anonymity

All the colleagues are recognized by their name and there is not the possibility to keep anonymity among the members of the same Knowledge Community in the organization.

Openness

The Knowledge Communities have well-defined boundaries toward the outside of the organization. Some inter-organizational Knowledge Communities are observed only among the colleagues in different subsidiaries of the same corporation.

Purpose

For the organization, Knowledge Communities have the principal aim of giving "career and development opportunities" to the employees. These opportunities give to the organization the possibility "to lever the individual potential" in order to capitalize their knowledge "where is adequately recognize in the business market".

On the other hand, for the single employees, the inclusion in a Knowledge Community is determined by the willing "to interact with the colleagues and to discuss with them on business matters", to receive suggestions on working behavior, to transfer knowledge in order to improve the individual competencies.

Cohesion

The interviewees point out that there is cohesion among the colleagues and the analysis of the interview content supports their assertions.

Especially among the same business unit, cohesion seems strong, as interviewees declare that they help each others, they esteem their colleagues, and they recognize a certain professional homogeneity. Moreover the permanence in the same organization and business unit gave the possibility to establish a long lasting relationship and trust among colleagues. However the increase in the turnover of the personnel could reduce this cohesion in the future.

Cohesion declines between different business units because competition rises. A typical recurrent conflict concerns the request of human resources by the responsible of a business unit to the responsible of another business unit. The second responsible would prefer to maintain full control and complete availability on his resources and he would not temporarily give their resources away to another business unit.

Also for these recurrent conflicts, the corporate communication favors the strengthening of the cohesion among employees. Moreover, this cohesion favors the identification of the correct experts without the request for the provision of the ERS.

Degree of governance

The Knowledge Communities are largely influenced by the organization as they reflect the organizational structure in business units and vertical markets.

Most of the behavior of the members of the Knowledge Communities is caused by their professional tasks and objectives. Nevertheless part of the behavior of the members is volitional, since it is not strictly determined by organization.

Among the compulsory activities, it is important to point out that all the employees have to perform periodically their self-evaluation, their development planning. In addition, they have to meet their superior for their hetero-evaluation and the approval of their development planning. This information is the main source of data for the computer-based ERS. Subordinates do not have access to the computer-based ERS and so they are obliged to ask for the ERS to the colleagues and to the superior.

In general, the superiors incite the establishment of relationships among the employees of their business unit, in order to facilitate the knowledge transfers. This incitement is complemented by their provision of the ERS services to their subordinates. The ERS is provided basing on the personal awareness on the knowledge distribution among the colleagues, instead of employing the available computer-based ERS. This choice for the informal ERS is based on the personal belief that they have an adequate awareness to counsel the correct experts. Nevertheless sometime the

direct superior has to recur to his further hierarchical head for the provision of the ERS, as he does not have an immediate answer for his subordinates.

The spontaneous relationships within the same organizational unit are welcomed and sponsored by the organization. On the contrary the support from the employees of the other organizational units mainly originates by the initiative of the superior who interfaces the superior of the other organizational unit or the resource manager.

Characteristics of the Expert Recommending Services of NSS

Capturing

Computer-based ERS

The majority of the data used for the ERS is captured in the electronic repository of the human resource management module of the corporate ERP. The main sources of data are the evaluation of the personnel, the electronic curriculum vitae, the job accomplishments, and the job position of each employee.

The evaluation of the personnel is registered in the repository through the fulfillment of a set electronic forms compiled by each employee and by his superior during the evaluation process. The curriculum vitae is edited by the employees using MS-Word and uploaded as a MS-Word document in the central repository. The job accomplishment is accounted autonomously by the employees, through a web-based calendar of the human resource management module, where the employees indicate their working hours, dedicated to the different projects. The job position is fixed by the Human Resource department using the human resource management module which allows to the department staff to control also the degree of update, by the employees, of the previously listed data.

Informal ERS

Data for the informal ERS, provided by the colleagues, is collected through the electronic repository, and the personal interactions between the colleagues during the working activities.

The superiors have access to the electronic repository which stores the information on the individual evaluation, on the job accomplishment, on the job position, and on the curriculum vitae of their subordinates. In addition, superiors have regular official meetings with their subordinates and colleagues, where a lot of information on the knowledge domains of the employees is collected.

The subordinates do not have access to the electronic repository, so the only sources are the colleagues and the superiors. During the working activities and the informal meetings, they become aware of the knowledge distribution among their colleagues.

Manipulating

Computer-based ERS

The software application memorizes in a central database all the captured information. The manipulation of the data is inexistent, for the main part, because, during the retrieval, data is reproduced as captured. Only a limited manipulation is performed when some synthetic reports are queried by the superiors and the human resource management staff. In these cases, the application aggregates data and offers its summary.

Informal ERS

The individual manipulations of the autonomously collected data on the knowledge of the colleagues are not regulated by the organization. Each individual therefore defines his personal idea on the distribution of knowledge among the colleagues.

Retrieving

Computer-based ERS

The access to the software application, providing the ERS, is possible only for the superiors and for the human resource management staff. The superiors have an access limited to the information ontheir subordinates, while the human resource management staff accesses the information on all the employees. Whoever the role, the users of the application can browse among the list of the employees and see their respective knowledge domains. The browsing is guided by the organizational structure, so the application allows the browsing between the different organizational units and the seeing of the information of the employees in each unit.

Complementary, the users can research, using the application search engine, the employees who satisfy the parameters specified in the search engine by the users. Some parameters are compulsory, while many others are optional. The researcher of an expert has to specify the researched values of the compulsory parameters which the employees have to satisfy in order to be retrieved.

Informal ERS

The informal retrieving of the experts is performed asking to the colleagues or to the superior about the colleagues who could help on a specified problem. In case the colleagues or the superior cannot directly recommend an expert, the higher hierarchical level, or the resource manager, is charged of the question. The superior of the resource manager can eventually use the computer-based ERS, to provide the ERS to the subordinate or the colleague. In case, no expert seems available, the request is forward to a series of external partners, who offer their consulting services.

Displaying

Computer-based ERS

The displaying of the information is accomplished through the description of the knowledge domains of the employee, reporting the terms and values gathered during the capturing operations, as no manipulation is performed. In case of summaries the individual profile is aggregated on request loosing the direct connection between a knowledge domain and the employees having it.

Informal ERS

At the individual level, the displaying, performed by the employees, is not regulated. Nevertheless, the exchange of information on the knowledge domains of the colleagues seems effective, giving the possibility to be aware on the knowledge distribution among the personnel.

Characteristics of the interviewees of MM

Each interviewee of this organization is shortly described to favor an overall understanding of their positions and roles.

Director of the research center GRC

The director of the research center GRC is in charge of representing his research center toward the external institutions such as: the university, the other research centers, and all the other partners. In addition to this responsibility, he is also director of one of the five research groups of his center and he has a teaching charge in the engineering school of the university. His domain of research and his domain of teaching are the Information Systems, on which he follows the training of some new teachers and some PhD students.

Director of the research center FR

The director of the research center FR is, at the same time, co-director of the MSM business school, and co-director of the scientific council of the DPS. As director of the FR, he manages the internal structure of the research center and he looks constantly for new opportunities of fund raising for new research projects. Moreover he is actively involved in moving closer the different research centers on management and the different business schools of the town.

As co-director of MSM, he is responsible of the scientific production and strategy of the business school. He has a similar responsibility as co-director of the scientific council of the DPS. Finally, the research interests and taught courses are on competitive strategies and entrepreneurship.

Director of the research center MRC

The director of the research center MRC has the main responsibilities: the correct functioning and the output quality of the research center MRC. To accomplish these responsibilities he coordinates

the research projects, the research events, the internal organization of the center and the partnerships with external institutions, such as other research centers. Moreover he assigns the research assistants of the different universities of the town to the PhD professors of the research center.

He has also an active research program in three different areas: Entrepreneurship, Knowledge Management, and Competence Management.

Dean of the business school AIO

The dean of the business school AIO has the main responsibilities of the internal coordination of the activities and the external representation of the school. The coordination and the representation are aimed at the management and at the promotion of the business school to attract students and funds. These two charges are counterbalanced by a limited teaching charge: he holds only one course in management during the academic year. Also the research activities are reduced: he is chief of the research group in human resource management of the GRC research center, and he is PhD director of several PhD students of this group.

Dean of the business school DPS

This business school is a private teaching institution and the dean is named by the shareholders. The present dean of the business school is in charge for 14 years and he defines the school strategy with the board of directors and the shareholders.

A major element of the actual strategy of the school is toward the development of the MM consortium, for which the dean dedicates a lot of energies. The responsibility of the school restrains the teaching and research activities of the dean. He has only a limited number of hours of teaching and he completely stopped his research.

PhD student GRC/MRC

He is PhD student at the research center GRC at the fourth year of the PhD course. His research domain is the Human Resource Management and he conducts the research mainly on the PhD thesis subject. Also a complementary research stream is performed in association with a PhD professor of the DPS business school. This secondary research field is multidisciplinary and it combines human resource management and information systems. This relationship is justified by the hiring of this PhD student, for the present year, by the DPS business school, as research assistant.

PhD professor MRC/DPS

He is teacher, in marketing, at the UCEDPUS business school, after a long experience as teacher abroad. He personally requested at the beginning of his career at the UCEDPUS business school to have a reduced teaching charge balanced with a higher research charge. The school accorded it to

this professor and so, in comparison with his colleagues, he has less hours of teaching and more important objectives in research. This research charge is all dedicated to the research in marketing.

PhD student DPS/FR

He is teacher at the DPS business school since several years, after a long experience as a full time consultant. He teaches management and specifically marketing and human resources management. Marketing is his main research domain and the main reference discipline of his PhD thesis.

Concerning his PhD study, he is in the same position of all the other teachers of the DPS business school without the PhD title. All the teachers of the DPS business school were charged to complete their formation through the obtainment of the PhD title. He adhered to the FR research center to start his PhD course and he is actually at the third and final year of the PhD course.

PhD professor GRC

He is PhD professor at the GRC research center and he dedicates his main research interests on Information Systems. The teaching activities are held in the engineering school of the university, but this engineering school is not part of the MM consortium. So, his courses are on management and Information Systems to the engineering school students. Finally, he had the responsibility of different research contracts with some external institutions.

PhD student GRC/MRC

He is a PhD student at his fourth year by the research center GRC and he is research assistant at the MRC. This assistantship is a mid-time contract it obliges him for three days.

At MRC, he is in charge of the following of some students and the redaction of some articles. He is not charged of any course, for this year, but he taught on several courses the previous ones, on human resource management and on other different subjects of management.

PhD student FR/MRC

He is a PhD student at his second year by the research center FR and he is specializing in the management of the agronomic business. For the present year, he is charged of the role of research assistant at the MRC research center so he is assigned to a PhD professor as assistant.

Moreover, he was elected by the FR PhD students as a representative of all the PhD students of the three universities of town. In addition, he actively participates as organizer of some meetings on his research interests.

PhD professor DPS/MRC

He is a professor in Entrepreneurship at the DPS business school, he is vice-director of the research center MRC and he is responsible of one research axe.

His vice-directorship imposes to manage the international relations, and the external communication of the research center, through the web site, the research reports, and the monthly newsletter. He is in charge of the following of the publication plans of the researchers of the MRC research center.

In addition to his vice-directorship, he is responsible of the research axe in Entrepreneurship and this responsibility means that he has to promote the research activities on this area.

PhD professor FR/MSM

Concerning education, he is teacher at the MSM business school in finance and he is responsible of a master course on the same subject, after previous responsibilities in other master courses. The direction of the master imposes an internal coordination effort: to find the professors, who will teach at the master, and to fix the course planning. In addition he has to manage the external communication with the enterprises interested in the recruitment of the outgoing students of the master.

In terms of research, he is interested in the intersection between marketing and finance and there he focuses his main research. In addition he is the PhD director of some PhD students on finance.

PhD student GRC/AIO

He is a PhD student at his fourth year of the PhD course by the research center GRC. His PhD thesis is in marketing and he is member of the research group in marketing of the GRC. Marketing is also his teaching subject at the AIO business school. Finally, he is one of the PhD students' representatives for the ensemble of the three universities of the town.

PhD student MSM/GRC/AIO

He is PhD student at the GRC research center and at his third year of the PhD course. At the same time he is teacher at the MSM business school and at the AIO business school. At MSM he teaches accountability, while at the AIO his courses are in finance.

Moreover he is the responsible of the relationships with the inter-university library for the research center GRC and he is in charge of the coordination of the research group in finance of the same center. Within the finance research area, his PhD thesis combines the fields of finance and of entrepreneurship.

PhD professor DPS/MRC/GRC

He is professor of the DPS business school, at his first year of hiring. He teaches Management discipline and he has a specialization in Information Systems. Information Systems are also his main research theme, with a preference for the Knowledge Management topic.

At the same time, he is member of two research centers: the MRC and the GRC.

Characteristics of the Knowledge Communities of MM

After the presentation of the interviewees, the characteristics of the Knowledge Communities are delineated.

The Knowledge Communities are explicitly recognized by some of the members of the consortium as they talks about "communauté". Also the others, who do not expressly mention the Knowledge Communities, give clear indications of the existence of some Knowledge Communities in the consortium. These Knowledge Communities are described based on the characteristics outlined in the literature review section.

Lifetime

The consortium MM is legally taking form and the underlying Knowledge Community is strengthening. Before the MM consortium started up, a Knowledge Community was already existing among the PhD students and PhD professors on Management in the town, but not so active. Moreover inside each business school and research center, some internal Knowledge Communities are longstanding. Their origin can be traced back to the foundations of the different business schools and the different research centers.

In addition the Knowledge Communities, of each business school or of each research center, have always had relationships with the other Knowledge Communities on Management in the town before the creation of the consortium MM.

Size

The consortium has about 220 members distributed across the three business schools and on the three research centers.

The main part of the researchers of each research center is also teacher in the respective business school. Nevertheless that is not always true: some researchers do their studies also in other research centers of the consortium or in research centers outside the consortium. Complementary, some researchers do not teach at all, while others are teachers in other teaching institutions in town or in other towns.

Definitively, around 110 members are involved in the Knowledge Community aggregated around the AIO business school and its research center GRC. Around 80 members are involved in the Knowledge Community aggregated around the MSM business school and its research center FR. Around 40 members are involved in the Knowledge Community aggregated around the DPS business school and its research center MRC.

Composition

The consortium is composed of PhD students and PhD professors who teach or research on Management. The main communality in terms of background is derived from their doctoral education, even if in different disciplines, from engineering to psychology, passing obviously through the management discipline.

The actual relationship is based on their research and teaching involvement in management discipline. The teaching and the research areas have different specializations and perspectives so teaching and research activities of the members are very heterogeneous.

Fragmentation

The MM Knowledge Community is fragmented in different sub-communities which intersect each other. Around each business school and each research center a sub-community is established sharing a higher degree of teaching or research knowledge. Within each business school, further sub-communities exist around the different teaching subjects, such as: marketing, finance, or strategy, which have reduced intersections each other.

At the same time, within each research center, the sub-communities gather the researchers studying specific themes, like: information systems, marketing, or agronomic business, and they largely overlap each others. For example a researcher could study marketing of the agronomic business and being member of the marketing Knowledge Community and the agronomic business Knowledge Community. The directors of the research centers refer to these Knowledge Communities as the ensemble of the researcher on the same research discipline (e.g. marketing) or the same research axe (e.g. agronomic business).

The sub-community gathering researchers on a specific discipline or on a specific research axe could be even further fragmented, as the members could research on different aspects of the same main theme (discipline or axe). The specialization of a researcher arrives to make each researcher isolated from the rest of the MM Knowledge Community.

On the opposite, the internal fragmentation of each research center is counterbalanced by the re-aggregation of the members, working on the same research discipline, or on the same research axe,

across the different research centers. These research centers could be the research centers of the MM consortium, or research centers outside the town and the country, or in other disciplines.

Geographical dispersion

The MM Knowledge Community is geographically centered in the town. Most of the members work in one of the business schools, and all the business schools have their buildings in the town. Some teachers and researchers work also in other institutions inside or outside the town, even hundred kilometers far.

Not all the members have a personal writing desk or office and so they do not always work in the afferent building for problem of space. This is particularly true for many PhD students, who therefore stay at home or in other buildings.

the teachers and the researchers at DPS have all their offices in the same building and all the PhD students, who have a research assistant contract there have some offices. These offices are shared basing on th job rotation of the PhD students, at this business school.

The teachers and the researchers at the AIO are for the main part separated in two buildings in the same campus. The majority of the PhD professors have an assigned office in one building, while the majority of the PhD students share the offices in the other building.

The teachers and the researchers of the MSM business school have all the offices in the same building. The PhD professors have their respective office or writing desk, while the PhD students share an under-dimensioned space. This limited space causes the absence of the majority of them in the building, and they arrange their work in some other spaces elsewhere.

Mode of interaction

The two principal means of interaction are the face to face meetings and the email. The geographical proximity in same town, or even in the same building, facilitates the face to face interactions. These interactions take the form of informal chance encounters, in the shared spaces, to formal meetings, in meeting rooms or conference auditoriums. Antecedent to the face to face interactions, the email or the telephone are the tools largely used to define the meetings, but the members definitvely prefer the richness of the face to face meetings.

The email is the second major mean of interaction. It is used for sending attachments, for its speed in comparison to the traditional mailing service and for the possibility to reach many recipients with a single posting. Beyond this general opinion of its advantages, the personal attitude toward the email and its use is very different among the members.

Heterogeneous are also the email solutions adopted by the members: some of them use the email service provided by the business school, while others prefer to exploit the services of public email

service providers. Moreover, some members make their email address public on the internet, while others prefer to maintain it reserved.

Beyond the two major modes of interaction, the fixed telephones, the mobile phones, the instant messaging, and the traditional postal service are modes used by the members to interact with each other.

Degree of interconnection

The interactions are of different kind: one-to-one, one-to-many, and many-to-many. The one-to-one interactions take place in general between members teaching the same subject or doing some similar research. The one-to-many interactions happen mainly when a member communicates with the rest of its sub-community. The many-to-many interactions exist when two sub-communities exchange information between them, involving all the members of the respective sub-communities.

One-to-one interactions have the prevalence in terms of quantity, but all the three ways of interactions seem very relevant for the existence and the functioning of the MM Knowledge Community.

Frequency of interaction

The frequency of interaction varies enormously among the members and along time. The working autonomy, granted to the members of the MM Knowledge Community, allows having very few compulsory interactions, mainly with the director of his the research center, or the dean of his business school. In addition to the previous interactions, the PhD students have a set of imposed interactions with their PhD directors.

Beyond this limited set of prescribed interactions, the rest of the interactions is volitional and mainly based on the personal attitude toward communication and the respective degree of individualism. Some members teach and research autonomously and so do not have frequent interactions. Others share regularly information on their teaching activities and on their research efforts. The teachers and the researchers have the possibility to teach or research together and this joint work determines a further increase in the frequency of the interactions.

The frequency of interaction is also influenced by the frequency of the meetings, which are fixed by each sub-community, and the kind of the relationship established between the PhD students and their respective PhD director.

Anonymity

The members are all recognized by their name and their affiliation. There are not practices of anonymity, but, at maximum, the communications and interactions can be signed by the sub-

community as a whole, without defining precisely the members of the sub-community who perform them.

Openness

The members of the MM Knowledge Community are the individuals who are members at least of one of the three business schools or one of the three research centers. From this point of view the membership is clear cut, but the conditions to be members of a research center of business schools are fuzzy. To be member of a business school, an individual has to teach in that business school, while to be member of a research center, an individual has to obtain the authorization of the research center director.

On the contrary, the boundaries are not clearly defined in the sub-communities. The sub-communities are largely open to the other members of the MM Knowledge Community and also do not restrain from the departure of the members. In these sub-communities, the teaching assignments and the research interests determine the participation and, at maximum, an approval is required by the eventual responsible of the sub-community.

Purpose

The purpose of the MM Knowledge Community is toward the success of the teaching and of the research in the town on management. This success takes the form of a higher visibility and recognition of the teaching initiatives and of the research production at national and at the international levels.

To improve the visibility and recognition, the directors of the research centers and the deans of the business schools try to leverage the synergies among the teachers, among the researchers, among the research centers, and among the business schools.

The existing sub-communities contribute to the visibility of the main Knowledge Community stimulating the teaching and the research in their respective areas of interest. This stimulation can take the form of a defined agenda of objectives, like project developments or publication achievements.

At the individual level, the membership to the MM Knowledge Community aims at improving the quality of the respective teaching and research. The expectations from being a member of the MM Knowledge Community concern the sharing of the teaching experiences, in order to improve the personal expertise in teaching. The expectations for the researchers are related indeed to the enhancement of the research, thanks to the cooperation with other members and the reciprocal support.

Cohesion

The cohesion in the MM Knowledge Community is growing due to the interventions of the research center directors and the business school deans. At the present, a part of the members does not recognize the existence of this Knowledge Community, while some others realize its existence. The membership to a business school or to a research center prevails in the mind of the members. The long standing existence of the research centers and the business schools determines the recognition of the Knowledge Communities around these institutions. The new born MM consortium has to create the cohesion among its members, yet.

The purpose, the direction and the management of the MM Knowledge Community are still not clear defined among the deans and the directors. This uncertainty makes the members cautious and conservative, maintaining their strength relationships within their existing sub-communities. Moreover, some rivalries exist between the different sub-communities, especially if they are of different research centers and or different business schools. There is a creeping or explicit competition between research centers and business schools that determine a lack of willingness to cooperate between members of different institutions. In the cases, where this obstacle is overcome, the individuals of the different research centers or the different business schools have strengthen their cohesion up to the point of working voluntarily together.

Degree of governance

The management of the MM consortium has a direct impact on the MM Knowledge Community. The MM consortium is coordinated by the research directors of the three research centers and the deans of the three business schools.

The DPS dean is appointed by the stakeholders of the business school and he names the MRC director. The AIO dean, the MSM dean, the FR director, and the GRC director are elected by the members of the respective business schools or the respective research centers.

The three directors and the three deans have agreed for the establishment of the MM consortium and complementary they have established some other contracts and partnerships. The decisions of the MM consortium are taken by these six persons and then each one has to make those decisions operational in his respective institution.

The levers in the hand of the deans and of the directors remain limited. The enhancement of the quality of the teaching and of the research which is as appointed as the first aim of the MM Knowledge Community, seems possible only through the voluntary contribution of each member of the Knowledge Community. The imposition of any decision, from the top, could have the effect of reducing the motivation of the members. The eventual low motivation would contrast with the aim of excellence in the teaching and in the research, causing the failure of the MM consortium project.

The main role of the directors and deans is to motivate the members to behave cooperatively among the members of the MM Knowledge Community, instead of competitively. This motivation passes by the institutional communication, the restructuring of the organizations, and the favoring meetings and projects together.

About the communication, the directors and the deans inform via email, and face to face, to the members of their respective institutions, of the advantages of the MM consortium.

At the same time they try to reorganize the business schools' teaching and the centers' research in order to make it complementary among the institutions instead maintaining rivals the institutions. The three deans are modifying their education offer of their business schools and the three research directors are reshaping the research axes and the research groups.

Finally the deans and the directors are promoting the creation of meetings and projects across the schools and the research centers in order to make concrete this enhancement potential.

Characteristics of the Expert Recommending Services of MM

Capturing

Computer-based ERS

The research center MRC has a Microsoft Excel worksheet where all the members of the center have to input data on their competences, their published articles, their teaching activities, and their projects' participation.

The research center GRC has a web-based application which allows the members of this research center to list their research outputs and their actual research interests and they can directly upload their research outputs.

Informal ERS

Data for the informal ERS, provided by the colleagues, is mainly collected from 2 sources: the work outputs, and the meetings.

The first way of data capturing is by reading the work outputs of the other members. The articles, the books, the research reports, and the pedagogical materials are the typical work outputs of the members and they contain many indications of the knowledge domains of the authors.

In addition to the work output, the members capture data on the knowledge domains of the other members from the meetings they have. The meetings can be formal or informal ones and they can concern a predefined set of members or they can be open to the public, even external to the MM consortium.

The organizations, where each researcher is recruited, regularly propose a set of formal group meetings which gather the researchers on a specific research area. Several external meetings, such

as conferences and workshops, gather the researchers of different organizations and there another part of the data on the domains of knowledge is captured.

Finally, many informal meetings exist as the members meet freely and informally each other, during the work hours and they can talk about their respective interests and competences.

Manipulating

Computer-based ERS

The computer-based ERS of the research center MRC stores all the captured information in a Microsoft Excel worksheet. The manipulation of data does not exist as the data from all the members is just put together in the same worksheet. The file is then diffused to all the members of the research center as is.

The computer-based ERS of the research center GRC stores all the captured information in a database accessible through the web. Data is not manipulated and immediately available for retrieval after its storage.

Informal ERS

Individually, the manipulations of the collected data on the knowledge among the members of the Knowledge Community are absolutely not regulated by the business schools or the research centers. Each individual therefore autonomously defines his idea on the distribution of knowledge among the other Knowledge Community members.

Retrieving

Computer-based ERS

The access to the computer-based ERS of the research center MRC is restricted only to the members of the MRC as the Microsoft Excel worksheet is sent by email only to them. The retrieving of the potential experts is done using the keyword search function of the Microsoft Excel application.

The access to the computer-based ERS of the research center GRC is not restricted as it is publicly available from a freely accessible web page. This web site does not allow any retrieving operation: users can only browse among the pages of all the members to find the potential experts on a specific knowledge domain.

Informal ERS

The informal retrieving of the experts is performed asking about the colleagues who could help on a specified problem. In case the colleagues cannot directly recommend an expert, an alternative potential recommender can be eventually indicated or otherwise some scientific or pedagogical publications suggested. Also the web-based search engines are used to retrieve possible adequate experts or documents.

Displaying

Computer-based ERS

The computer-based ERS of the MRC research center displays the information which has been stored in the Microsoft Excel worksheet for each member. The user can browse through the lines and the columns of the worksheet to find the knowledge domains of each individual.

The computer-based ERS of the GRC research center displays the information as web pages which are dynamically retrieved from the database where the data is stored. Each page describes a single research center's member including the description of his knowledge domains.

Informal ERS

At the individual level, the displaying performed by the members is not regulated and this displaying is mainly orally achieved during the informal and the formal discussions.

Characteristics of the interviewees of FST

Each interviewee of this organization is shortly described to favor an overall understanding of their positions and roles.

CEO

The Chief Executive Officer is the head of FST at the national level and he is in the board of directors of the controlled company FST ETC. He is the legal, operative, and financial responsible of the organization in Italy. Moreover he is responsible of the corporate project of development of the organization in the Middle East and in the North Africa regions. His duties determine frequents contacts with the international homologues and the corporate headquarters.

Sales Director

The Sales Director is in charge not only of the sales of the organization, but also of the sales logistics and of the sales administration. He has responsibility on all the sales personnel and he defines with them their sales targets, their sales area and the coordination mechanisms among them. Moreover he organizes the coaching and training activities for the sales personnel and he evaluates the achievement of their professional objectives.

Sales area manager

The Sales area manager has responsibility over the sales personnel of an Italian region and so he directs the sales representatives for its geographical area. Moreover he is the customer service consultant for the same geographical area and so he is in charge of improving the customer service to the clients and promoting the service provisions to the clients, in addition to the product selling.

Finally, he is responsible for the creation and composition of the selling team in case a client demands complex services or products, which overwhelm the single sales representative capabilities.

IT Director

The Information Technology Director is responsible of the computer-based Information System of FST and of FST ETC. His main responsibilities are related to the management of the IT infrastructure of the organization in Italy and the network connections with the headquarters. For the IT projects, he coordinates with the headquarters the activities to perform in Italiy and he is responsible of the national side of the IT projects.

Chief Human Resource Officer

The Chief Human Resource Officer has the responsibility of the recruitment, selection, training, carrier, and compensation of the personnel.

He is in charge since one year and therefore he points out that he has not yet the full control of the tasks of his position. Up to now, he has taken the responsibility of the selection, training and evaluation of the personnel. These activities are performed in coordination with the business managers and superiors in order to select, to train and to evaluate the personnel, consistently with the market requests.

Chief Operation Officer FST ETC

The Chief Operation Officer of FST ETC is also the director of the FST ETC organization. He is responsible of the definition of the commercial offer of the FST ETC and it means the definition of the education and the training programs for the potential customers. Basing on the market demand, the COO builds, with his staff, the list of the competences requested by their potential customers and he finds the trainers and the teachers with the qualifications required to satisfy the customer demand.

Characteristics of the Knowledge Communities of FST

After the presentation of the interviewees, the characteristics of the Knowledge Communities are delineated.

The Knowledge Communities are not explicitly recognized by the employees, but the existence of Knowledge Communities can be noticed, from their discourses. These Knowledge Communities are described based on the characteristics outlined in the literature review section.

Lifetime

The present shape of the Knowledge Community is the consequence of the restructuring of the Italian subsidiary in the '90s, when the organization closed the production site.

At the present time the Knowledge Communities are newly changing for the internationalization of the business. The links with the members of the other subsidiaries around the world are increasing and also the links with the external partners are augmenting. The growing of the education, training and consulting businesses extents the numbers of the employees and the number of the free lancers on these subjects and in these new Knowledge Communities.

Size

The organization has around 180 employees structured around the different organizational businesses and functions. In addition around 100 free lancers, of the FST ETC, exist.

The different businesses are the gathering points around which the Knowledge Communities inform. The internationalization of the business, in terms of clients, determines the inclusion in the Knowledge Communities also of the foreign colleagues, making them bigger.

Composition

Each Knowledge Community gathers employees around a common knowledge domain, independently on the lasting of their professional experience in that domain. There are Knowledge Communities around each profession, such as engineering, or sales, and these Knowledge Communities include both experienced and novice employees.

In addition, Knowledge Communities gather also employees with the same interests, without caring of the actual types of professionalism they have.

Fragmentation

The fragmentation of the Knowledge Community reflects the structure of the organization and the differences in the working activities of the employees. The structure of the organization in different businesses and in different activities determines also a fragmentation of the Knowledge Communities.

The geographical dispersion of employees, in Italy and abroad, caused a further fragmentation of the employees. Even if, there is a formal separation of the organization with the rest of the subsidiaries around the world, there is not a very significant fragmentation among the employees since the business activities are very standardized worldwide with frequent cross-border interactions.

Geographical dispersion

The organization locates the employees doing the same kind of activities in the same offices, facilitating the interactions among the members of the same professional Knowledge Community. However, the geographical dispersion of the employees of the organization in 5 different locations reduces the easiness of the interaction among the employees geographically distributed. Nevertheless, the business needs determine regular relationships between the members in the different locations and in the different states, strengthening the Knowledge Communities around the same profession.

Mode of interaction

The interactions are realized both via IT and face-to-face. The face-to-face interactions concern the colleagues who are assigned in the same team or the employees who share the same offices, because they have the possibility to constantly meet. Otherwise, the IT is largely used to support distant interactions.

Lotus Notes is the organization-wide IT support for communication, which facilitates simultaneous multiple interactions. For the one-to-one communication, in addition to the Lotus Notes, the mobile phones and the fixed phones are very frequently used solutions. The instant messaging systems, the audio and the video conferences are, on the opposite, uncommon in the organization, even if technically available.

Degree of interconnection

The majority of interactions are performed between two employees in same organizational unit or in the same value chain of activities, as peers, or between the subordinate and his direct superior. These personal interactions are the main source of awareness on the knowledge distribution among the personnel. Through these interactions a large part of the ERS is provided, while the remaining part of the ERS provision is done by the computer-based ERS.

Another important portion of the interactions is among the members of the same team, such as project teams or selling teams. In these cases, a member communicates with the rest of the team, establishing one-to-many interactions.

Finally, there is a set of interactions which comprehends the organization-wide official communications. They originate by the chiefs of a specific organizational unit and are directed to all the employees, interested to the content of the communication for their official role in the organization.

Frequency of interaction

The most frequent interactions happen among the employees working in the same organizational unit, on the same business process, or on the same site. The interactions are rarer among employees of different business units, processes, or locations, but even less frequent they overcome the national boundaries.

The frequency of interactions with the foreign colleagues increases with the increase of the hierarchical level and so the Chief Executive Officer is the person who is in constant contact with their homologues internationally. The organization proposes also some meetings to stimulate these interactions and the cooperation and they seem to have the pursued effect of strengthening the links among the colleagues and overcoming personal conflicts.

Anonymity

Colleagues are all recognized by their names and there is not the possibility to keep anonymity among the members of the same Knowledge Community.

Openness

The Knowledge Communities have well-defined boundaries with the outside of the FST organization. On the contrary, the Knowledge Communities which involve the trainers, the consultants and the teachers of the FST ETC are quite open to the outside. This openness is stimulated by the constant research and development of new teaching competences and the rearrangement of the existing teaching activities. Some inter-organizational Knowledge Communities are observed also with the colleagues in order subsidiaries in different countries, but of the same corporation where the openness is limited to the foreign employees of the corporation.

Purpose

For the organization, the Knowledge Communities have the principal aim of giving support for the solution of the individual problems in the accomplishment of their job tasks. The second aim that the organization pursues, through the Knowledge Communities, is the sharing of information and the visibility of the individuals' knowledge domains organization-wide.

Although, the organization values that a presence of a Knowledge Community facilitates the support offered by the peers, it restrains the development of these Knowledge Communities for purposes going beyond these two aims. The presence of the Knowledge Communities is seen by the management, for some aspects risky, because they could negatively interfere with the hierarchical order. The risk of going beyond these two aims is real as the employees they joint a Knowledge

Community by the willing to share information on business matters, but not exclusively toward the aims appointed by the organization.

Cohesion

The interviewees pointed out that the cohesion among the colleagues exists, and the analysis of the interviews supports their statements. This cohesion favors the identification of the correct experts directly by the colleagues without the request of the provision of the ERS.

An organizational survey on the cohesion of the personnel is yearly performed and the results support the existence of cohesion in the organization. Nevertheless, the respondents of the survey and of the interviews underline the desire to strengthen this cohesion. This request, by the employees, is justified by the always increasing importance of the strengthening of the national relationships and of the international relationships to face the clients' demands.

The long permanence in the same organization and in the same business unit gives the possibility to consolidate the relationships and the trust among colleagues. This cohesion is contrasted by the presence of personal conflicts. These conflicts are directly pointed out by the interviewees and the organization intervenes to report an effective professional relationship, overcoming the personal disagreements. The organization acts also to avoid the overlapping of the personal affinities with the job activities, in order to prevent that personal relationships damaged the required efficiency of the business process. One intervention of the organization in this direction is, for example, the imposition of the rotation of the personnel in the constitution of the selling teams.

Degree of governance

The Knowledge Communities are largely influenced by the company as they reflect the organizational composition in different professional activities. Much of the behavior of the members of the Knowledge Communities is determined by their professional tasks and their professional objectives. Nevertheless, a part of their behavior is volitional as not strictly determined by organization.

Among the compulsory activities, there is the accomplishment of the annual evaluation with the related definition of the training plan and the professional objectives. this information is the main source of data for the computer-based ERS.

The introduction of the team selling by the organization has influenced the way and the frequency of the interactions among the employees, since they are obliged to participate in these teams. These obligations and many others are determined by the hierarchical superiors, who leave a limited margin of autonomy to the subordinates.

Beyond the stimulation of the awareness on the knowledge distribution and the knowledge transfers, during the working hours, the organization offers also few initiatives off the work's hours. The last initiatives refer to the sponsorship of a sport team and the participation to a corporation championship and to the offer of a fitness area in the organizational buildings.

The direct superiors contribute to the building of the Knowledge Communities, through some activities directed toward their respective subordinates. Among the variety of these activities the direct superiors provides the ERS to their subordinates. The subordinates do not have access to the computer-based ERS and so they are obliged to ask for this service to the colleagues and the superiors. This informal ERS is provided basing on the personal awareness on the knowledge distribution among the colleagues, instead of employing the available computer-based ERS.

Characteristics of the Expert Recommending Services of FST

Capturing

Computer-based ERS

The majority of data used for the ERS is captured in the electronic repository of the human resource management module of the corporate ERP. The main sources of data are the annual evaluation of the personnel, the curriculum vitae, and the job position description of each employee. The evaluation of the personnel and the curriculum vitae are registered in the repository through the fulfillment of a set of electronic forms edited by each employee and by his superior during the evaluation process. The job position is fixed by the Human Resource department using the human resource management module.

Informal ERS

Data for the informal ERS provided by the colleagues is collected by the retrieval of information from the electronic repositories, by the internal magazine, and by the personal interactions with the colleagues, during the working activities.

The superiors have access to the electronic repository, where the information on the individual evaluations of their subordinates is stored, while the subordinates do not have this authorization. Moreover, the superiors have regular official meetings with their subordinates and their colleagues and during these meetings a lot of information on the knowledge domains of the employees is collected.

The organization issues regularly an internal magazine, which reports the description of the professional profile of the just-hired employees. The working activities, especially in team, and the informal meetings are some other complementary solutions to become, at least, partially aware of the knowledge distribution of the colleagues.

Manipulating

Computer-based ERS

The software application memorizes in a central database all the captured information, but the data is not manipulated and this data is reproduced, as captured, during the retrieving operation.

Informal ERS

The manipulations, by the individuals, of the collected data on the knowledge distribution among the colleagues, are absolutely not regulated by the organization. Therefore each one autonomously defines his idea on the distribution of knowledge among the colleagues.

Retrieving

Computer-based ERS

The access to the software application, providing the ERS, is differently restricted, basing on the position of each employee in the organization. All the employees can browse the organizational chart of the corporation, with all the subsidiaries worldwide, and they can drill down to the single employee. For each employee, a description of his position and of his role is provided, and for each position and each role, the organization publishes the list and level of the competences required to cover it. The public definition, by the organization, of the minimum level of competencies required for each position and role, facilitates the assessment of the potential experts, through the browsing in the organizational chart.

The superiors, for their role, have a larger visibility on the information of their subordinates, while the human resource management staff has visibility on all the information of all the employees of their respective subsidiary. Within these authorized limits, the superiors and the HRM staff can browse among the employees and see the respective knowledge domains which are obtained from the personnel evaluation and the curriculum vitae.

Informal ERS

The informal retrieving of the experts is performed asking to the colleagues or to the superior about the colleagues who could help on a specified problem. In case the colleagues or the superior cannot directly recommend an expert, the higher hierarchical level is charged of the question, and so forth upward to the headquarters.

Displaying

Computer-based ERS

The displaying of the information is accomplished through the description of the knowledge domains of the employee, using the terms employed during the capturing operation, as no manipulation is performed. The degree of information access on the knowledge domains of the employees is limited by the position and responsibility of the user: the subordinates can see only the

role and the position of the others, while the superiors and the HRM staff can see also the personnel evaluation and the CV.

Informal ERS

At the individual level, the displaying performed by the employees is not regulated and every one self-regulates his information displaying.

Example of the questionnaire in Italian

Indicazione degli Esperti

Egregio Signore, Gentile Signora,

Il Centro di Ricerca per l'Economia e le Tecnologie dell'Informazione e della Comunicazione (CETIC) dell'Università Carlo Cattaneo (LIUC) La invita a partecipare a un'inchiesta, sponsorizzata da FST, sugli scambi d'informazione tra colleghi. In particolare, l'inchiesta si concentra su: **gli scambi d'informazione che Lei normalmente ha con i Suoi colleghi per sapere quali, fra loro, potrebbero contribuire alla risoluzione di un Suo problema lavorativo**. All'interno di questa inchiesta, tale scambio d'informazione è definito: **"Indicazione degli Esperti"**.

La singola **iniziativa d'Indicazione degli Esperti** è composta da:

- la Sua richiesta, rivolta ad un collega, per ottenere un contatto di un altro collega (l'Esperto), che possa contribuire alle risoluzione di un Suo problema lavorativo;
- la risposta del collega a cui Lei si è rivolto/a.
  Si considerano risposte anche quelle in cui Lei non riceve alcuna effettiva indicazione su chi possa essere l'Esperto.

L'**Esperto** è definito colui che potrebbe contribuire alla risoluzione di un Suo problema lavorativo.
Il **Suo problema lavorativo** riguarda uno qualsiasi dei problemi che Lei riscontra nell'ambito della Sua attività alle dipendenze di FST.
I **Colleghi** sono tutti i dipendenti di FST Italia e delle altre sedi FST nel mondo.
Ecco un esempio d'iniziativa d'Indicazione degli Esperti
Lei ha un dubbio sulla compatibilità di due software e per cercare di scioglierlo potrebbe:
1. leggere i manuali dei due software;
2. leggere i rapporti dei progetti precedenti per vedere se i due software siano stati già utilizzati contemporaneamente;
3. rivolgersi a un collega che ha già utilizzato tali software per chiedergli se e come siano compatibili;
4. **rivolgersi a un collega per chiedergli se conosca qualcuno che abbia già utilizzato tali software;**
5. cambiare software e non dissipare il dubbio.
La numero 4 è - tra quelle elencate - l'unica opzione definibile come iniziativa d'Indicazione degli Esperti.

Questo studio ha l'obiettivo di estendere la comprensione delle iniziative d'Indicazione degli Esperti, al fine di migliorare l'organizzazione aziendale.

Per raggiungere gli obiettivi di questo studio Le chiediamo di rispondere alle domande di seguito elencate. Alcune di queste Le potranno sembrare ripetute o poco interessanti, ma sono tutte ugualmente importanti per gli scopi della ricerca. Voglia pertanto rispondere sinceramente a tutte le domande, riferendosi alla Sua diretta e quotidiana esperienza di lavoro all'interno di FST. Selezioni l'opzione che meglio corrisponde alla Sua opinione sul tema proposto. Le Sue risposte saranno trattate garantendo il Suo anonimato.

In questa prima parte, La invitiamo a indicare il suo grado d'accordo o di disaccordo con le affermazioni seguenti.

1.In FST, i Colleghi riconoscono gli ambiti di competenza altrui.

totalmente in disaccordo ⬇   completamente d'accordo ⬇

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6   ☐ 7

2. In generale, in FST le iniziative d'Indicazione degli Esperti migliorano la mia performance.

totalmente in disaccordo ⬇   completamente d'accordo ⬇

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6   ☐ 7

3. In generale, in FST le iniziative d'Indicazione degli Esperti semplificano la raccolta di informazioni di cui ho bisogno.

totalmente in disaccordo ⬇   completamente d'accordo ⬇

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6   ☐ 7

4. In FST, è possibile identificare, tra i Colleghi, quelli competenti nei differenti ambiti.

totalmente in disaccordo ⬇   completamente d'accordo ⬇

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6   ☐ 7

5. In generale, in FST le iniziative d'Indicazione degli Esperti non migliorano il mio lavoro.

totalmente in disaccordo ⬇   completamente d'accordo ⬇

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6   ☐ 7

6. In generale, in FST ritengo che le informazioni ricevute dalle iniziative d'Indicazione degli Esperti siano di buona qualità.

totalmente in disaccordo ⬇   completamente d'accordo ⬇

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6   ☐ 7

7. In FST, io sono in grado d'identificare, tra i Colleghi, quelli competenti nei differenti ambiti.

totalmente in disaccordo ⬇   completamente d'accordo ⬇

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6   ☐ 7

8. In generale, in FST le iniziative d'Indicazione degli Esperti riducono il tempo di raccolta delle informazioni di cui ho bisogno.

totalmente in disaccordo ⬇   completamente d'accordo ⬇

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6   ☐ 7

9. In generale, in FST le iniziative d'Indicazione degli Esperti accelerano il recupero delle informazioni.

totalmente in disaccordo ⬇   completamente d'accordo ⬇

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6   ☐ 7

10. In FST, i Colleghi mi riconoscono come competente in certi ambiti.

totalmente in disaccordo ⬇   completamente d'accordo ⬇

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6   ☐ 7

11. In generale, in FST le iniziative d'Indicazione degli Esperti migliorano il mio problem-solving.

totalmente in disaccordo ⬇   completamente d'accordo ⬇

347

$\square$ 1 $\square$ 2 $\square$ 3 $\square$ 4 $\square$ 5 $\square$ 6 $\square$ 7

totalmente in disaccordo   completamente d'accordo

12. In generale, in FST le iniziative d'Indicazione degli Esperti mi forniscono delle informazioni di pessima qualità.

$\square$ 1 $\square$ 2 $\square$ 3 $\square$ 4 $\square$ 5 $\square$ 6 $\square$ 7

totalmente in disaccordo   completamente d'accordo

13. In FST, ho una specializzazione che mi permette d'essere riconosciuto/a, tra i Colleghi, come competente in certi ambiti.

$\square$ 1 $\square$ 2 $\square$ 3 $\square$ 4 $\square$ 5 $\square$ 6 $\square$ 7

totalmente in disaccordo   completamente d'accordo

14. In FST, ricorro molto frequentemente alle iniziative d'Indicazione degli Esperti.

$\square$ 1 $\square$ 2 $\square$ 3 $\square$ 4 $\square$ 5 $\square$ 6 $\square$ 7

totalmente in disaccordo   completamente d'accordo

15. In generale, in FST le iniziative d'Indicazione degli Esperti riducono lo sforzo di raccolta delle informazioni di cui ho bisogno.

$\square$ 1 $\square$ 2 $\square$ 3 $\square$ 4 $\square$ 5 $\square$ 6 $\square$ 7

totalmente in disaccordo   completamente d'accordo

16. In FST, i Colleghi conoscono quali sono gli ambiti nei quali io sono competente.

$\square$ 1 $\square$ 2 $\square$ 3 $\square$ 4 $\square$ 5 $\square$ 6 $\square$ 7

totalmente in disaccordo   completamente d'accordo

17. In generale, in FST le iniziative d'Indicazione degli Esperti aumentano la mia produttività.

$\square$ 1 $\square$ 2 $\square$ 3 $\square$ 4 $\square$ 5 $\square$ 6 $\square$ 7

totalmente in disaccordo   completamente d'accordo

18. In generale, in FST valuto positivamente la qualità delle informazioni ricevute dalle iniziative d'Indicazione degli Esperti.

$\square$ 1 $\square$ 2 $\square$ 3 $\square$ 4 $\square$ 5 $\square$ 6 $\square$ 7

totalmente in disaccordo   completamente d'accordo

19. In generale, in FST le iniziative d'Indicazione degli Esperti semplificano l'accesso alle informazioni.

$\square$ 1 $\square$ 2 $\square$ 3 $\square$ 4 $\square$ 5 $\square$ 6 $\square$ 7

totalmente in disaccordo   completamente d'accordo

20. In FST, tra i Colleghi, ognuno conosce chi sono quelli competenti nei differenti ambiti.

$\square$ 1 $\square$ 2 $\square$ 3 $\square$ 4 $\square$ 5 $\square$ 6 $\square$ 7

In questa seconda parte, La invitiamo a indicare le Sue opinioni relativamente alle frasi seguenti.

estremamente deluso/a   estremamente gratificato/a

21. A proposito delle risposte alle richieste d'Indicazione degli Esperti in FST, io sono:

$\square$ 1 $\square$ 2 $\square$ 3 $\square$ 4 $\square$ 5 $\square$ 6 $\square$ 7

estremamente scarsa   estremamente buona

22. In generale, in FST qual è la

qualità delle risposte alle richieste d'Indicazione degli Esperti?

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6   ☐ 7

☐   ☐   ☐   ☐   ☐   ☐   ☐

meno di 1 volta al mese	una volta al mese	qualche volta al mese	una volta alla settimana	qualche volta alla settimana	una volta al giorno	più volte al giorno

23. In FST, ricorro alle iniziative d'Indicazione degli Esperti mediamente:

estremamente insoddisfatto/a   estremamente soddisfatto/a

24. A proposito delle risposte alle richieste d'Indicazione degli Esperti in FST, io sono:

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6   ☐ 7

molto elevata   molto bassa

25. In generale, in FST qual è la qualità delle risposte alle richieste d'Indicazione degli Esperti?

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6   ☐ 7

molto rare   molto frequenti

26. In FST, le mie iniziative d'Indicazione degli Esperti sono:

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6   ☐ 7

estremamente frustrato/a   estremamente compiaciuto/a

27. A proposito delle risposte alle richieste d'Indicazione degli Esperti in FST, io sono:

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6   ☐ 7

mediocre   eccellente

28. In generale, in FST qual è la qualità delle risposte alle richieste d'Indicazione degli Esperti?

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6   ☐ 7

estremamente scontento/a   estremamente contento/a

29. A proposito delle risposte alle richieste d'Indicazione degli Esperti in FST, io sono:

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6   ☐ 7

In questa parte finale, La preghiamo gentilmente di rispondere a qualche domanda di carattere generale.

30. La Sua età:

☐ meno di 25 anni

☐ da 25 a 34 anni

☐ da 35 a 44 anni

☐ da 45 a 54 anni

☐ 55 anni o più

34. Qual è il Suo livello di formazione?

☐ diploma di scuola media superiore

☐ laurea (qualsiasi livello) o formazione post-laurea

☐ altro

Se ha risposto "altro", indichi per cortesia quale:

31. Il Suo sesso:

☐ maschio

☐ femmina

32. In quale unità organizzativa lavora ?

☐ Direzione commerciale

☐ Forza vendita

☐ Amministrazione vendite

☐ Direzione tecnica

☐ Direzione finanziaria

☐ Sistemi informativi

☐ Gestione processi e quality management

☐ FST CTE

☐ Altro

Se ha risposto "altro", indichi per cortesia quale:

[   ]

33. In quale sede Lei principalmente lavora?

☐ Assago (MI)

☐ Padova

☐ Bologna

☐ S. Benedetto del Tronto (AP)

☐ Torino

[   ]

35. Da quanto tempo lavora per FST?

☐ meno di 1 anno

☐ da 1 a 5 anni

☐ da 6 a 10 anni

☐ più di 10 anni

36. Da quanto tempo svolge lo stesso tipo di mansione in FST?

☐ meno di 1 anno

☐ da 1 a 5 anni

☐ da 6 a 10 anni

☐ più di 10 anni

37. Valuti come il Suo lavoro è ripartito tra operare in sede e fuori sede:

☐ sempre in sede

☐ principalmente in sede

☐ equamente ripartito

☐ principalmente fuori sede

☐ sempre fuori sede

Unicamente alfine di evitarLe di ricevere i prossimi promemoria per la compilazione di questo questionario, La invitiamo ad indicare, qui di seguito, il Suo nome e cognome. Le assicuriamo che il Suo nominativo, non sarà utilizzato per nessuna altra ragione e confermiamo che il trattamento dei dati garantirà il Suo anonimato.

[   ]

[Invia] [Annulla]

Example of the questionnaire in French

Localisation des Experts

Madame, Monsieur,

Les partenaires du projet " MM " vous demandent de participer à une enquête sur les échanges d'informations entre enseignants-chercheurs. Plus spécifiquement, nous sommes intéressés par **les échanges d'informations que vous réalisez avec les collègues, pour savoir quelle(s) personne(s) pourrai(en)t vous aider dans la résolution d'un problème professionnel donné**. Nous définissons cette activité d'échanges d'informations " **Localisation des Experts** ". Ainsi la Localisation des Experts est composée des:

- Demandes adressées auprès des collègues pour obtenir un contact qui vous aiderait dans votre travail : c'est l' " Expert ".
- Réponses formulées par les collègues que ce soit les cordonnées d'un contact ou non : c'est la " Localisation des Experts " .

Nous illustrons la Localisation des Experts par deux exemples.

Premier exemple : vous avez un doute sur une méthode quantitative d'analyse des données. Vous pourriez :
1. Lire les livres sur les méthodes quantitatives d'analyse des données.
2. Lire les articles scientifiques qui ont utilisé la même méthode.
3. Demander à un collègue qui a déjà appliqué la même méthode, de vous l'expliquer.
4. **Demander à un collègue s'il connait quelqu'un qui a déjà appliqué la méthode dont vous avez besoin.**
5. Changer de méthode et ne pas ôter votre doute.
Le seul cas qui nous intéresse est le quatrième : " Demander à un collègue s'il connait quelqu'un qui a déjà appliqué la méthode, dont vous avez besoin. "

Deuxième exemple : vous avez un doute sur la pertinence de développer un point précis durant un cours d'introduction à la gestion. Vous pourriez :
1. Lire les livres d'introduction à la gestion et voir s'ils ont expliqué l'argument et suivre leurs organisations de la matière.
2. Demander au collègue qui a déjà enseigné ce cours et de comparer vos programmes.
3. **Demander à un collègue s'il connait quelqu'un qui a déjà enseigné ce cours, pour comparer vos programmes.**
Le seul cas qui nous intéresse est le troisième : " Demander à un collègue s'il connait quelqu'un qui a déjà enseigné ce cours, pour comparer vos programmes. "

Cette étude a pour objectif de mieux comprendre le succès et l'usage de la Localisation des Experts. Elle permettra de faire un bilan et d'apporter des changements organisationnels pour améliorer la qualité de l'enseignement et la recherche.

Certaines questions peuvent vous paraître répétitives ou sans intérêt, mais elles sont toutes fondamentales pour les objectifs de cette étude, ainsi nous vous demandons de répondre à toutes les questions même si vous n'êtes pas sûr(e) de la réponse. Pour garantir la qualité des données recueillies, nous vous prions de répondre sincèrement. Seule votre opinion constitue la meilleure réponse. Pour répondre aux questions qui vous sont posées, vous devez cocher le chiffre qui

correspond le mieux à votre position à l'égard de l'affirmation proposée.
Avant d'aborder les questions nous vous rappelons que :

- La **Localisation des Experts** est l'activité d'échanges d'informations que vous réalisez avec les collègues, dont le but est de savoir qui pourrait vous aider dans la résolution d'un problème professionnel donné.
- L'**expert** est celui qui pourrait vous aider dans votre travail pour la résolution d'un problème professionnel donné.
- Le **problème professionnel donné** peut concerner soit le travail de recherche soit le travail d'enseignement.
- Les **collègues** sont tous les enseignants-chercheurs qui font de la recherche dans un laboratoire de recherche scientifique ou de l'enseignement supérieur en Gestion dans la ville.

Nous vous remercions de votre participation, qui peut se réaliser en répondant aux questions suivantes par cette page web ou en l'imprimant et en adressant vos réponses par Fax au 0467144220 ou par courrier à
Claudio Luigi Vitari
Centre de Recherche en Gestion des Organisations (CREGO) - IAE - c.c. 028
Université Montpellier II Sciences et Techniques du Languedoc
Place Eugène Bataillon
34095 Montpellier CEDEX 5
Dans cette partie, veuillez indiquer votre degré d'accord sur les propositions suivantes.

	pas du tout d'accord						tout à fait d'accord
1. La démarche de Localisation des Experts augmente ma performance :	1	2	3	4	5	6	7
2. J'estime que les informations reçues de la démarche de Localisation des Experts sont de bonne qualité :	1	2	3	4	5	6	7
3. La démarche de Localisation des Experts n'améliore pas mon travail :	1	2	3	4	5	6	7
4. La démarche de Localisation des Experts accélère l'obtention d'informations :	1	2	3	4	5	6	7
5. Les collègues reconnaissent les domaines dans lesquels les autres sont qualifiés :	1	2	3	4	5	6	7
6. La démarche de Localisation des Experts simplifie la collecte des informations dont j'ai besoin :	1	2	3	4	5	6	7

7. La démarche de Localisation des

Experts me fournit des informations
de mauvaise qualité :

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6   ☐ 7

pas du tout d'accord   tout à fait d'accord

8. La démarche de Localisation des
Experts améliore mon efficacité :

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6   ☐ 7

pas du tout d'accord   tout à fait d'accord

9. Je donne une évaluation positive à
la qualité des informations reçues de
la démarche de Localisation des
Experts :

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6   ☐ 7

pas du tout d'accord   tout à fait d'accord

10. Il est possible d'identifier les
experts dans les différents domaines
parmi les collègues :

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6   ☐ 7

pas du tout d'accord   tout à fait d'accord

11. Je suis capable d'identifier les
experts dans les différents domaines
parmi les collègues :

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6   ☐ 7

pas du tout d'accord   tout à fait d'accord

12. Les collègues me reconnaissent
en tant que qualifié(e) dans certains
domaines :

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6   ☐ 7

pas du tout d'accord   tout à fait d'accord

13. La démarche de Localisation des
Experts réduit le temps de collecte
des informations dont j'ai besoin :

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6   ☐ 7

pas du tout d'accord   tout à fait d'accord

14. La démarche de Localisation des
Experts simplifie l'accès aux
informations :

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6   ☐ 7

pas du tout d'accord   tout à fait d'accord

15. La démarche de Localisation des
Experts réduit l'effort de collecte des
informations dont j'ai besoin :

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6   ☐ 7

pas du tout d'accord   tout à fait d'accord

16. J'ai une spécialisation qui me
permet d'être reconnu(e) parmi les
collègues en tant que qualifié(e) dans
certains domaines :

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6   ☐ 7

pas du tout d'accord   tout à fait d'accord

17. Les collègues connaissent quels
sont les domaines dans lesquels je
suis qualifié(e) :

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6   ☐ 7

pas du tout d'accord   tout à fait d'accord

18. J'ai trés souvent recours à la
démarche de Localisation des

Experts :

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7

pas du tout d'accord   tout à fait d'accord

19. La démarche de Localisation des Experts réduit ma productivité :

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7

pas du tout d'accord   tout à fait d'accord

20. Parmi les collègues chacun connait qui sont les experts dans les différents domaines :

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7

Dans cette partie, veuillez indiquer votre opinion sur les propositions suivantes.

extrêmement pauvre   extrêmement riche

21. Quelle est la qualité des réponses à vos démarches de Localisation des Experts ?

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7

extrêmement mécontent(e)   extrêmement content(e)

22. A propos des réponses à mes démarches de Localisation des Experts, je suis :

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7

très rare   très fréquente

23. Ma démarche de Localisation des Experts est :

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7

extrêmement déçu(e)   extrêmement comblé(e)

24. A propos des réponses à mes démarches de Localisation des Experts, je suis :

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7

très élevée   très faible

25. Quelle est la qualité des réponses à vos démarches de Localisation des Experts ?

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7

très insatisfait(e)   très satisfait(e)

26. A propos de mes démarches de Localisation des Experts, je suis :

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7

médiocre   excellente

27. Quelle est la qualité des réponses à vos démarches de Localisation des Experts ?

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7

28. A propos des réponses à mes démarches de Localisation des Experts, je suis :

extrêmement désenchanté(e)   extrêmement enchanté(e)

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7

☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐

moins d'une fois par mois | une fois par mois | quelques fois par mois | une fois par semaine | quelques fois par semaine | une fois par jour | plusieurs fois par jour

29. J'ai recours à la démarche de Localisation des Experts environ :

Dans cette partie finale, veuillez répondre à quelques questions supplémentaires.

30. Votre âge ?

☐ Moins de 30 ans

☐ 30 à 39 ans

☐ 40 à 49 ans

☐ 50 à 59 ans

☐ 60 ans et plus

31. Votre sexe ?

☐ Masculin

☐ Féminin

32. De quel laboratoire de recherche êtes-vous membre ?

☐ FR

☐ MRC

☉ GRC

☐ MESEG

☐ Aucun

☐ Autre

Si vous avez répondu "Autre", indiquez lequel :

[   ]

33. De quel établissement d'enseignement êtes-vous membre ?

☐ DPS

☐ univ1

☐ Univ2

☐ Univ3

35. Depuis combien d'années êtes-vous dans ce laboratoire de recherche ?

☐ Moins de 3 ans

☐ 3 à 10 ans

☐ 11 à 20 ans

☐ 21 à 30 ans

☐ Plus de 30 ans

36. Depuis combien d'années êtes-vous dans cet établissement d'enseignement ?

☐ Moins de 3 ans

☐ 3 à 10 ans

☐ 11 à 20 ans

☐ 21 à 30 ans

☐ Plus de 30 ans

37. Depuis combien d'années faites-vous de la recherche scientifique ?

☐ Moins de 3 ans

☐ 3 à 10 ans

☐ 11 à 20 ans

☐ 21 à 30 ans

☐ Plus de 30 ans

38. Depuis combien d'années faites-vous de l'enseignement supérieur ?

○ Aucun

○ Autre

Si vous avez répondu "Autre", indiquez lequel :

[   ]

34. Quel est votre statut ?

○ Doctorant(e)

○ Docteur

○ Maître de Conférences

○ Professeur des Universités

○ Autre

Si vous avez répondu "Autre", indiquez lequel :

[   ]

○ Moins de 3 ans

○ 3 à 10 ans

○ 11 à 20 ans

○ 21 à 30 ans

○ Plus de 30 ans

39. Evaluez ci-dessous en pourcentages la recherche et l'enseignement dans votre travail d'enseignant/chercheur sur l'année ?

○ 100% recherche; 0% enseignement

○ 90% recherche; 10% enseignement

○ 80% recherche; 20% enseignement

○ 70% recherche; 30% enseignement

○ 60% recherche; 40% enseignement

○ 50% recherche; 50% enseignement

○ 40% recherche; 60% enseignement

○ 30% recherche; 70% enseignement

○ 20% recherche; 80% enseignement

○ 10% recherche; 90% enseignement

○ 0% recherche; 100% enseignement

Envoi   Annulation

Example of the email sent to the MM members to invite them to participate to the survey.

Bonjour à tous,

Claudio VITARI, thésard italien en co-tutelle CREGO-CETIC, a terminé une série d'entretiens sur notre manière de "localiser les experts" dans notre communauté d'enseignant-chercheurs de la ville en Management.
Une première analyse de ces entretiens l'a convaincu de l'importance de compléter par un questionnaire, pour effectuer une comparaison entre chercheurs universitaires et sociétés de conseil,

1. Nous avons le plaisir de vous envoyer un résumé (PJ) des premiers résultats de quinze entretiens.
2 Nous vous demandons de consacrer 10 minutes de votre temps pour répondre au questionnaire que vous pouvez trouver en ligne à l'adresse suivante http://elearning.liuc.it/kms/mm.htm

Vous comprendrez tout de suite l'importance capitale de vos réponses pour ce travail, et nous vous remercions de votre participation.

Example of the email sent to the FST members to invite them to participate to the survey.

L'Università Carlo Cattaneo sta conducendo una ricerca sugli scambi d'informazione tra colleghi e FST ha deciso di partecipare alla ricerca promuovendo la raccolta dei dati per la fase di indagine. La nostra adesione è stata determinata dalla constatazione dei benefici che potremmo trarre dai risultati della ricerca per meglio finalizzare i futuri interventi di miglioramento nei rapporti interpersonali.

Una prima fase della ricerca ha già coinvolto alcuni nostri colleghi, che sono stati intervistati per conoscere le modalità con cui identificano i colleghi più esperti all'interno di FST. I primi risultati ci incoraggiano a continuare la nostra partecipazione e a invitarLa a dedicare 15 minuti alla compilazione del questionario alla pagina web seguente: http://elearning.liuc.it/kms/FST.htm

La Sua partecipazione, assieme a quella di tutti i Suoi colleghi, permetterà di conoscere quali interventi realizzare al fine di favorire le relazioni tra i colleghi con competenze diverse ma complementari, per affrontare le quotidiane situazioni di problem-solving. Il questionario riguarda specificatamente gli scambi d'informazione che Lei normalmente ha con i colleghi per sapere quali, fra loro, potrebbero contribuire alla risoluzione dei problemi, migliorando la qualità dei risultati. Il questionario è sviluppato per conoscere la Sua opinione sugli scambi d'informazione finalizzati a identificare gli esperti e non al contenuto di questi scambi.

I risultati offriranno una valutazione su tali scambi d'informazione. Inoltre il rapporto finale conterrà le indicazioni sugli opportuni interventi per migliorare lo scambio di informazioni sulle competenze tra colleghi, affinché si possano identificare gli esperti, il più rapidamente possibile in caso di necessità.

Legga attentamente l'introduzione al questionario, risponda alle domande, e invii le Sue risposte. Le segnalo che non è prevista la possibilità di ripetere l'invio di differenti parti delle Sue risposte in momenti successivi e quindi suggeriamo una completa compilazione del questionario prima dell'invio.

La ringrazio per l'attenzione prestata alla compilazione del questionario.
Distinti saluti

Example of the email sent to the NSS members to invite them to participate to the survey.

Il giorno 18 maggio u.s. avete ricevuto un mail da Knowledge Network Program che vi invita a partecipare ad una survey sul Knowledge Management per meglio indirizzare gli investimenti in questa importante area.
Il miglioramento delle relazioni interpersonali e' condizionato dalla conoscenza e dall'uso degli strumenti di Knowledge Management.
A conferma di cio' c'e' un interesse crescente su queste tematiche anche da parte del mondo accademico.

Anche l'Università Carlo Cattaneo sta conducendo una ricerca sugli scambi d'informazione tra colleghi e NSS ha deciso di partecipare alla ricerca promuovendo la raccolta dei dati per la fase di indagine. La nostra adesione è stata determinata dalla constatazione dei benefici che potremmo trarre dai risultati della ricerca, oltre che dalla possibilità di integrare i dati raccolti dalla corporation per meglio finalizzare i futuri interventi di miglioramento nei rapporti interpersonali.

Una prima fase della ricerca ha già coinvolto alcuni nostri colleghi, che sono stati intervistati per conoscere le modalità con cui identificano i colleghi più esperti all'interno di NSS. I primi risultati ci incoraggiano a continuare la nostra partecipazione e a invitarLa a dedicare 15 minuti alla compilazione del questionario alla pagina web seguente: http://elearning.liuc.it/kms/NSS.htm <http://elearning.liuc.it/kms/NSS.htm>

La Sua partecipazione, assieme a quella di tutti i Suoi colleghi, permetterà di conoscere quali interventi realizzare al fine di favorire le relazioni tra i colleghi con competenze diverse ma complementari, per affrontare le quotidiane situazioni di problem-solving. Il questionario riguarda specificatamente gli scambi d'informazione che Lei normalmente ha con i colleghi per sapere quali, fra loro, potrebbero contribuire alla risoluzione dei problemi, migliorando la qualità dei risultati. Il questionario è sviluppato per conoscere la Sua opinione sugli scambi d'informazione finalizzati a identificare gli esperti e non al contenuto di questi scambi.

I risultati offriranno una valutazione su tali scambi d'informazione. Inoltre il rapporto finale conterrà le indicazioni sugli opportuni interventi per migliorare lo scambio di informazioni sulle competenze tra colleghi, affinché si possano identificare gli esperti, il più rapidamente possibile in caso di necessità.

Legga attentamente l'introduzione al questionario, risponda alle domande, e invii le Sue risposte. Le segnalo che non è prevista la possibilità di ripetere l'invio di differenti parti delle Sue risposte in momenti successivi e quindi suggeriamo una completa compilazione del questionario prima dell'invio.

La ringrazio per l'attenzione prestata alla compilazione del questionario.
Distinti saluti

Extract of a transcript of an interview

For privacy reasons, the transcripts are not publicly accessible.

B: OK, abbiamo la nuova versione di Peoplesoft, quindi di EmployeeSelfService che sostanzialmente non modifica quello che avevo presentato nel corso di quell'incontro con voi in primavera

C: Quando è entrato in produzione questa nuova versione?

B: E' entrata in produzione un mese fa

C: Ah, quindi è proprio   [fresca   ]

B: Sì,   [recente, (.4)   ]c'è stato prima dell'estate una fase appunto di test, dove è stato richiesto a me come funzione del personale e altri colleghi, insomma appunto utilizzatori, diciamo, tipici del sistema di fare delle prove per vedere di riscontrare eventuali bachi o problemi da segnalare (.2) e poi si è andati. Devo dire che non (.2), salvo piccoli dettagli di natura tecnica è andata (.2), il rodaggio è stato molto, molto veloce, quindi non ci sono stati, (.4) non sono stati riscontrati dei problemi significativi.

C: Bene! Quindi l'utilizzatore, immaginiamo un consulente, un commerciale, un dipendente, nel momento in cui ha un problema, diciamo, nel processo di consulenza che sta svolgendo presso un cliente o di proposta commerciale presso un potenziale cliente. Ha un problema perché deve affrontare un progetto che non ha mai visto, o un aspetto che non ha mai approfondito. Utilizza questo strumento? Può utilizzare questo strumento?

B: Allora, direi che il tema, il tema va posto nel modo diverso, perché (1.0), volendo, se il focus è sui sistemi gestionali del personale,

C: Esatto.

Abstract

In the diversity of the Information Systems research, this thesis is mainly backed up by the reference disciplines of Information Systems and Management. The research topic is Knowledge Management, which is studied at the level of the individuals, who are considered members of Knowledge Communities. The author adopted a positivist research approach to this topic and applied the survey methodology as main research method.

In our society, knowledge is considered, by individuals and by organizations, an economic resource and it surges as the only long-term sustainable competitive advantage. Nowadays, Information and Communication Technology (ICT) are giving chances to enhance the management of knowledge in the organizations containing its costs. In this attempt to contain costs, organizations are trying to train their members basing on the existing knowledge, because transferring existing knowledge is cheaper than creating new knowledge. Within this document, "knowledge transfer" refers to the communication of knowledge from an individual or an organization and its reception and application by another individual or organization.

Knowledge involves cognitive structures and processes and it cannot be embodied in texts or other explicit representations. Even though knowledge transfer requires always human action, ICT can play an important role in the knowledge transfer, by the very beginning.

Empirical results demonstrate that the ability to transfer knowledge positively contributes to the organizational performance of firms in both the manufacturing and service sectors. Although the benefits of the knowledge transfer have been documented in many settings, the effectiveness of this transfer varies considerably among the organizations. Moreover computer-based systems supporting the transfer of knowledge are less diffused and successful, justifying the research effort on this theme.

The first step to knowledge transfer is the recognition of the heterogeneous distribution of knowledge among individuals. ICT supports this activity, but some significant steps could be done toward much more efficient solutions.

Knowledge redundancy refers to the existence between the parties of common information, in addition to the specific information required immediately by each individual. This knowledge redundancy is assured by the participation to the same Knowledge Community, which is definable as a group of people who share a common practice, work, or interest. Whether there is knowledge redundancy among the sender and the potential recipient of knowledge, the recognition of the

heterogeneous distribution of the knowledge among the individuals makes the knowledge transfer possible. The Knowledge Community has therefore a crucial role in knowledge transfer.

Since previous research reports the central role of knowledge for competitive advantage, it is imperative for organizations to explore more effective solutions for levering this knowledge. This research study is proposed in an attempt to contribute in solving this lag, and under the hypothesis that Knowledge Communities and computer-based systems can facilitate the transfer of knowledge. In the research area where Knowledge Communities, computer-based systems and Knowledge Management overlap, this study focused on the computer-based systems that counsel the individuals that could be potential sources of specialized knowledge within a Knowledge Community. The author calls this type of computer-based systems "Expert Recommending" systems because they counsel the individuals who could likely help the users to solve problems of business process breakdowns.

In this research, the author studies the Expert Recommending systems as a service. Instead of focusing on the computer-based system in it-self, the author is interested in the service it delivers, the Expert Recommending Service. Consistently with this service perspective, the research object would include also the cases in which this ERS is delivered without any computer-based support, thus by a specific department or by the members of the Knowledge Community by them-selves. Its specificity reposes on its functionality of supporting the individual awareness on the knowledge domains of the other individuals.

The awareness regards the acknowledgement of the domains of Knowledge of the Others. Being aware of the individuals who could be source of specialized knowledge, i.e. knowing what the other members know, is a precursor to search a specific individual out, when some specialized knowledge is required.

This study approaches the research object with three research questions:
- What are the dimensions of the success of the Expert Recommending Services?
- What are the properties of the Knowledge Community that influence the success of the Expert Recommending Services?
- To what degree the success of the Expert Recommending Services is influenced by the properties of the Knowledge Community?

They concern the Expert Recommending Service and the Knowledge Community, because this study assumes that an increase in the success of the ERS has a positive effect on the amount of the knowledge transfer. Nevertheless, the author considers the analysis of the knowledge transfer out of

the research scope, limiting the research scope at the enhancement of the awareness in the knowledge distribution among the members.

With these three research questions the author aims to contribute:

1. To describe the success of the Expert Recommending Services within Knowledge Communities.

2. To predict the degree of the success of the ERS within the KC, depending on the characteristics of the ERS and of the KC.

3. To identify recommendable interventions to enhance the success of the Expert Recommending Services within Knowledge Communities.

The answers to the three research questions and the attainment of the aims of this research are obtained through the completion of a research process that includes a preliminary literature review and a subsequent empirical testing of the research model.

The literature review started from the theory of the resource-based view of the firm. An evolution of this theory, the knowledge-based view of the firm gave the theoretical ground to the organizational knowledge management. Within the topic of knowledge management, the role of the Information Systems was analyzed. At the end the specific type of Information Systems, aiming at the enhancement of the knowledge awareness, the Expert Recommending Services, was explored.

Subsequently, the research model and the research methodology were developed. The literature review backed up the design of the conceptual model that was employed in the empirical part of the research.

The Information Systems Success theories and models were declined to the research object, the Expert Recommending Services in the Knowledge Communities, in order to build the specific conceptual model for this research.

The conceptual model involved three main elements:

1. The Expert Recommending Service.

2. The Knowledge Community.

3. The success of the Expert Recommending Service.

The model assumed the existence of two causal relations linking:

1. The Expert Recommending Service to the Success of the ERS.

2. The Knowledge Community to the success of the ERS.

This conceptual model was converted into the empirical research model.

Among the various IS success models, the choice of the one relied on its fitness to the research questions, aims, and context. The model that better matched these criteria was the DeLone and McLean's IS Success Model, which was therefore taken as reference model.

The methodological guidelines of Straub, Igalens and Roussel, and Evrard, Pras et al. were followed to promote the quality of the results.

This research combined complementary qualitative and quantitative research methods to:

- provide a richer contextual basis for interpreting and validating results,
- compensate the weaknesses inherent in each single individual method,
- grant a more precise development and investigation of the hypotheses,
- favor the reliability and generalizability of the results.

Multi-method research can assume different perspectives and the one followed in this study was the evolutionary perspective. The evolutionary perspective is particularly useful when little research has been conducted so far on a particular phenomenon, or where research hypotheses require increased focus. This was exactly the case of this study because little research in IS discipline was done and the hypothesized relationships between Knowledge Communities and ERS Success needed to be developed.

Through an initial explorative study, qualitative data was gathered to interpret a wide range of topics in the area of investigation. The collected data was analyzed and the findings represented the basis for the development of the hypotheses for the following quantitative study.

The definition of a first qualitative phase followed by a quantitative one has to be associated with the selection of the specific method for the qualitative study and the selection of the specific method for the quantitative study.

Using the selection criteria proposed by Wood, the selected method for the exploratory phase is case study research. This choice has been mainly influenced by the cost and the potential for theory generation of case study research. The selected method for the confirmatory phase was opinion research for the cost and the potential of the opinion survey for the theory confirmation.

The qualitative method is adopted to explore the characteristics of the Knowledge Communities, the characteristics of the Expert Recommending Services and the characteristics of the Success of the ERS and the potential relationships between them.

The application of the selected IS success model to the context of the Expert Recommending Services leaded at the definition of two preliminary propositions:

- P1: The characteristics of the Knowledge Community have an influence on the Success of the ERS.
- P2: The characteristics of the Expert Recommending Service have an influence on the Success of the ERS.

These propositions were explored through the qualitative method in order to establish precise hypotheses.

In the qualitative phase the unit of analysis was the organization, with its ERS and its KC. This organization was studied through the analysis of the Knowledge Communities that exist in the organization, the understanding of the Expert Recommending Services that are provided in the organization, and the exploration of the relationship between Knowledge Communities and Expert Recommending Services.

The case unit was analyzed through the collection of primary and secondary data. Primary data sources were interviews, direct observation, and informal discussions. Secondary data sources were mainly a set of documents of the organization that are normally produced by the organizational information system.

A preliminary gathering of background information about the case foreran the collection of primary data and the main source of information was the internet web site of the organization. Supplementary, some internal secondary data was provided by the organizational referee.

After this preliminary step, the names and the positions of all the potential participants were obtained, in collaboration with the internal referee. The potential participants were contacted for an interview and the collection of some complementary secondary data.

The interviews were semi-structured interviews to different people of the selected organization, in order to cover the maximum heterogeneity of the interviewees and explore convergence of information from the different sources.

The interview guide listed the main themes and sub-themes to discuss in the interview and was drafted beforehand to find out the view of the different individuals. At the beginning of each interview an introduction on the reasons and the objects of the interview was performed. This explanation was expected to reduce the researcher effects at the site, which biases the data collection.

The interview guide was designed to learn what the individual's view was on: the characteristics of the interviewee, the description of the ERS, the description of the Knowledge Communities in the organization, the opinion on the success of the ERS.

The qualitative data produced by the interview survey was transcribed, following the convention proposed by Silverman. These transcriptions, the field notes on the direct observation and the collected secondary data were achieved in a repository.

Each transcript was analyzed in parallel with the prosecution of the other interviews in order to use the content of the previous interviews as source of questions to ask in the next interviews. This

continuous refinement influenced the composition of the interview guide and the deepness of the interviews on some specific aspects.

For the data analysis, the author assumed that interview data was giving access to facts about the world. The author processed the content to explain the characteristics of the ERS, the characteristics of the Knowledge Communities and the success of the ERS. For the data analysis and interpretation, the author chose the thematic content analysis method, which is based on a system of themes and sub-themes. The premise of content analysis is that the repetition of units in speech (such as words, phrases, sentences or paragraphs) points out the centers of the interests and the opinions of the speakers. The sentences, the parts of the sentences or the groups of the sentences were grouped based on the relation to the themes of: Knowledge Communities, Expert Recommending Services and success of the ERS. As well as, the interview guide changed in the prosecution of the interviews also the list of themes and sub-themes was refined based on the relevance and interest of the different themes and sub-themes.

Moreover, the closeness in time of the interviews and the analysis of their content gave the sensitivity on the saturation of the themes and the sub-themes. This closeness allowed the interruption of the scheduling of new interviews, as soon as the analysis revealed the saturation and repetition of the same themes.

A computer aided qualitative data analysis system was employed to support codification and analysis. Several instruments were reviewed, direct and indirectly by Lewins, and the choice favored the use of HyperResearch package. The selection of this packaged software was based on its easiness of use and its flexibility in building reports.

The quantitative method was adopted to confirm the results coming from the qualitative exploratory method. This confirmation aimed at measuring the relationships among the Knowledge Communities, the Expert Recommending Service and the Success of the ERS. The empirical research model was corroborated through the test of the hypotheses rising from the qualitative phase and the conceptual model.

The application of the selected IS success model to the context of the Expert Recommending Services and the results of the qualitative phase leaded at the definition of the following constructs.

- Perceived Usefulness to the Organization. It measures the effects of the ERS on the organizational performance in line with the proposal of DeLone and McLean with the variable Organizational Impact.

- Perceived Usefulness to the Individual. It measures the effects of the ERS on the individual performance in line with the proposal of DeLone and McLean with the variable Individual Impact.

- Use. It measures the utilization of the ERS by the individuals in line with the proposal of DeLone and McLean with the variable IS Use.

- User Satisfaction. It measures the satisfaction of the user on the provision of the ERS that means on the answers obtained from the demands for counseling some experts.

- ERS Quality. It measures the global judgment relating to the superiority of the ERS.

- Knowledge of the Others. It measures the degree to which people know each other and in relation to the ERS context, Knowledge of the Others is specifically related to the Knowledge of the Others' knowledge domains.

The process and ecology concepts provided the theoretical base for developing the temporal and causal influences among the dimensions of the IS success to DeLone and McLean. So the hypotheses on the ERS Success were the following ones:

- H1: Perceived Usefulness for the Individual affects Perceived Usefulness for the Organization.

- H2: Use affects Perceived Usefulness for the Individual.

- H3: User Satisfaction affects Perceived Usefulness for the Individual.

- H4: Use affects User Satisfaction.

- H5: ERS Quality affects User Satisfaction.

- H6: ERS Quality affects Use.

In addition, the grounding relevance of Knowledge of the Others for the informal ERS success determines the addition of three more hypotheses:

- H7: Knowledge of the Others affects User Satisfaction. The degree of awareness on the knowledge domains of the members of the Knowledge Community could influence the satisfaction on the provision of the ERS. The individual who knows the knowledge domains of the other members could directly target the individuals who could provide a fully satisfying ERS.

- H8: Knowledge of the Others affects ERS Quality. The Knowledge of the Others could influence the choice of the person, whom to ask the provision of the ERS. The persons who have an extensive Knowledge of the Others could question the individuals who are more likely able to provide a high quality ERS.

- H9: Knowledge of the Others affects Use. The knowledge of the other knowledge domains could influence the use of the ERS. The complete Knowledge of the Others' knowledge

domains makes the use of the ERS superfluous, since the individual can directly target the right expert, with the required knowledge, without passing through the ERS. On the other hand, the complete absence of awareness on the knowledge domains of the other could restrain the use of the ERS, since the individual does not know whom to ask for the ERS provision.

At this phase, the required data was too specific to have the possibility to find appropriate secondary data sources. Exclusively primary data were collected and the instrument employed to collect it was a questionnaire.

The questionnaire was composed by the existing measures that the author evaluated as the most suitable to the research model. For each construct the existing scales were identified and then adjusted to the research object and to the context.

The administration of the questionnaire was anticipated by its reviewed by several people. They suggested adjustments to the terminology, in order to improve the fitting of the questionnaire with the organizational context. The final version of the questionnaire was published on a web server, accessible by all the members.

The answering to the questionnaire was promoted through an email that was sent to the targeted individuals. The targeted individuals were the organization members who performed the activities of recommending and searching experts. At the moment, the response rate per week decreased at zero, a recall by email was sent.

The questionnaire was proposed via email but the answers were collected via a web form. In this way, the responses' data was automatically stored in the database.

Data was mainly analyzed through Structural Equation Modeling statistical technique but a preliminary analysis on the quality of data was performed before testing the structural model.

The data analysis was performed following the validation guidelines written by Straub, Bourdeau, and Gefen. These guidelines proposed to assure: the content validity, the construct validity, the reliability, the manipulation validity, the statistical conclusion validity.

The statistical data analysis was supported by packaged software and SPSS and Amos were selected, after that several packages were reviewed, directly and indirectly. The choice of these statistical packages resided in their partial integration and in the previous experience of the author on them.

This combination of qualitative and quantitative methods allowed the triangulation of the data, which cross-validated the achieved results as these results, coming from different sources,

converged and were congruent. The different sources were related to the different studies of cases, as a mean to overcome the problems involved in the study of a single case.

The entire empirical research, i.e. the qualitative and the quantitative phases, was applied in different contexts following the specification for a multiple-case study proposed by Yin. The choice toward a multiple case study aimed at exploring the Expert Recommending Services, the Knowledge Communities and their relationships with the Success of the ERS, in contrasting situations. The author researched the theoretical replication, which meant that the same methodology was replicated in the tentative to find similarities and differences among the values of the independent and the dependent variables, and to find relations between the cases. So, few heterogeneous cases with contrasting characteristics were deliberately selected, instead of seeking a direct replication in similar cases. The multiple-case study strengthened the external validity of the findings since the findings, from the different cases, supported the hypotheses.

This sampling method gave the freedom to change the number of cases, in the multiple case study, during the prosecution of the research. So, the sampling of the cases followed a reasoning that aimed at identifying cases with contrasting situations and was based on the previously described theoretical framework. The cases were selected taking into consideration the objects of this study: the Expert Recommending Service, the Knowledge Community and the Success of the ERS. Hence, the principle of theoretical replication induced the selection of cases with different characteristics on these three elements.

For all the cases, data were analyzed, firstly, by keeping separated the single cases, and, secondly, by comparing the cases.

The analysis of the data on the three cases, through qualitative and quantitative methods, supported the research hypotheses. This successful test of the research model favored some constructive discussions on the obtained results and a series of conclusions on the different elements taken into consideration during the research.

The most important results of this research concerned: the characteristics of the Knowledge Communities, the characteristics of the Expert Recommending Services and the influence that the Knowledge Communities have on the Success of the Expert Recommending Service.

This research put in evidences the heterogeneousness of the Knowledge Communities in different organizations on the set of characteristics identified in the literature. And this heterogeneousness was in line with the results of several authors.

This study highlighted also the differences existing among the Expert Recommending Services. Following the classification of Martinez, the observed Expert Recommending Services were from

informal to computer-based ERS and several differences were also noticed among the ERS of the same type.

In addition, the author explored and confirmed the influence of the Knowledge Community on the Success of the Expert Recommending Service. Seddon highlighted that the observations, the personal experiences, and the reports of the consequences of the IS use have an impact on IS success. Whether these observations, personal experiences and reports take places in a Knowledge Community, then the characteristics of this Knowledge Community can influence directly the IS Success.

Raising from the qualitative phase, knowledge the other people seemed the most important element of influence on the ERS Success, among the several elements characterizing a KC. This novelty was grounded on the results of the quantitative phase. Knowledge of the Others has been already considered a factor influencing IS success and, with this research, the role of this variable was risen and tested in the ERS context.

Riassunto

Nel panorama generale della ricerca scientifica, questa tesi poggia le sue basi sulle discipline scientifiche di Organizzazione Aziendale e Sistemi Informativi. L'argomento principale di ricerca riguarda la Gestione della Conoscenza studiata a livello dei singoli individui, membri di una Knowledge Community. In questo contesto di riferimento l'autore adotta un approccio positivista e applica la metodologia dell'inchiesta come principale metodo empirico di indagine.

In questo documento, "trasferimento di conoscenza" è inteso come la comunicazione di conoscenza da un individuo e la sua ricezione e applicazione da parte di un altro individuo. Questa attenzione sul trasferimento deriva da due considerazioni principali. La prima è relativa al riconoscimento della conoscenza come una risorsa economica in grado di determinare un vantaggio competitivo sostenibile nel lungo periodo. La seconda riguarda invece la convenienza del trasferimento di conoscenza rispetto alla creazione di nuova conoscenza. L'importanza della conoscenza e la convenienza dei suoi trasferimenti portano le organizzazioni a prestare molta attenzione sull'argomento, e a sviluppare interventi per gestire la conoscenza. Nell'ambito di questi interventi, le Tecnologie dell'Informazione e della Comunicazione (TIC) stanno offrendo la possibilità di migliorarne la gestione, contenendone i costi.

La conoscenza coinvolge strutture e processi cognitivi che non permettono la sua incorporazione in testi o in altre esplicite rappresentazioni. Ciononostante le TIC possono svolgere un ruolo importante nel trasferimento di conoscenza, sebbene l'intervento umano sia obbligatorio perché vi sia un trasferimento di conoscenza.

Alcuni dati empirici dimostrano come l'abilità nel trasferire conoscenza contribuisca positivamente alla determinazione dei risultati economici delle organizzazioni, sia del settore manifatturiero, sia del settore dei servizi. L'efficacia del trasferimento di conoscenza varia comunque molto tra le differenti organizzazioni. In aggiunta, i sistemi informatici a supporto del trasferimento di conoscenza sono poco diffusi e di scarso successo.

Questi elementi congiuntamente hanno giustificato la seguente ricerca sul tema.

La prima condizione per il trasferimento di conoscenza é il riconoscimento della eterogenea distribuzione della conoscenza tra gli individui. Le TIC favoriscono già in qualche misura questa attività, ma significativi progressi possono essere realizzati verso sistemi informatici più efficienti.

Una seconda condizione è la ridondanza di conoscenza, vale a dire la condivisione di informazione, tra le parti coinvolte nel processo di trasferimento di conoscenza, in aggiunta ovviamente alla

conoscenza specifica di ciascuna delle parti. Questa ridondanza di conoscenza é assicurata dalla partecipazione alla stessa Knowledge Community. Essa é definita come un insieme di persone che condividono una stessa attività, uno stesso lavoro o uno stesso interesse, attorno al quale scambiano informazioni.

La presenza di ridondanza di conoscenza tra la sorgente e il destinatario del trasferimento di conoscenza e il riconoscimento della eterogenea distribuzione della conoscenza tra gli individui, sono le condizioni preliminari perchè il trasferimento di conoscenza possa avere luogo. Pertanto la Knowledge Community svolge un ruolo cruciale nel trasferimento della conoscenza, giacché assicura la presenza della ridondanza di conoscenza.

Precedenti ricerche hanno già messo in luce il ruolo centrale della conoscenza per il raggiungimento di un vantaggio competitivo. E' fondamentale ora che si esplorino delle soluzioni più efficaci per sfruttare la conoscenza esistente nelle organizzazioni. Questa ricerca si propone di contribuire a ridurre queste inefficienze assumendo che le Knowledge Community e i sistemi informatici possano facilitare il trasferimento della conoscenza.

Questo studio si pone all'intersezione degli ambiti di ricerca sulle Knowledge Community, sui sistemi informatici e sulla Gestione della Conoscenza, e l'investigazione si concentra sui sistemi informatici che offrono all'utilizzatore una lista di membri della stessa Knowledge Community, in grado di fornire una specifica conoscenza. L'autore designa questo tipo di sistemi informatici con il titolo di "Expert Recommending Systems", poiché tali sistemi propongono gli individui che dovrebbero essere esperti e quindi in grado di contribuire alla risoluzione dei problemi di business emergenti.

In questa ricerca, l'autore studia gli Expert Recommending Systems da una prospettiva di servizio. Invece che concentrarsi sul sistema informatico in sé, l'autore é interessato al servizio che erogano, l'Expert Recommending Service (ERS). Coerentemente con questa prospettiva sul servizio, l'oggetto di ricerca includerà anche i casi in cui l'ERS é erogato senza il supporto delle TIC, ma da una unità organizzativa a cui é stata assegnata tale responsabilità, o indistintamente dai membri della stessa Knowledge Community. La specificità dell'ERS risiede cosi' non più su una specifica tecnologia, ma sulla funzionalità di supportare il riconoscimento della distribuzione della conoscenza tra i membri. Questo riconoscimento è preliminare alla messa in contatto con la persona dotata della conoscenza richiesta.

Questo studio affronta l'oggetto di ricerca con tre domande:

- Quali sono le dimensioni del successo dell'ERS?
- Quali sono le proprietà della Knowledge Community che influenzano il successo dell'ERS?
- In che proporzione il successo dell'ERS é influenzato dalle proprietà della KC?

Queste tre domande riguardano l'Expert Recommending Service e la Knowledge Community, giacché questo studio assume che un aumento del successo dell'ERS abbia un effetto positivo sulla quantità di conoscenza trasferita. L'autore considera tuttavia l'analisi del trasferimento effettivo di conoscenza oltre gli obiettivi di questa ricerca, limitandosi al miglioramento del riconoscimento della distribuzione della conoscenza tra gli individui.

Con le suddette domande di ricerca l'autore vuole contribuire a:

- Descrivere il successo degli ERS all'interno delle Knowledge Community,
- Predire il grado di successo dell'ERS nelle KC, a partire dalle caratteristiche dell'ERS e della KC,
- Identificare proposte di intervento, affinché il successo dell'Expert Recommender Service possa migliorare.

Le risposte a queste tre domande e il raggiungimento degli obiettivi supposti sono stati possibili attraverso il completamento di un progetto di ricerca che ha incluso una preliminare revisione critica della letteratura e un successivo test empirico del modello di ricerca proposto.

La revisione della letteratura é cominciata con l'approfondimento della Resource-based View Theory. Una sua evoluzione, la Knowledge-based View Theory, ha fornito le basi teoriche alla Gestione della Conoscenza a livello organizzativo. In seguito, é stato oggetto d'approfondimento il ruolo dei Sistemi Informativi nella Gestione della Conoscenza. Alla fine, è stato studiato lo specifico tipo di Sistemi Informativi avente lo scopo di migliorare il riconoscimento sulla distribuzione della conoscenza, ovvero l'Expert Recommending Service.

La revisione della letteratura precedente ha dato sostegno teorico alla costruzione del modello concettuale e della metodologia che sono stati in seguito utilizzati empiricamente.

Le teorie e i modelli sul successo dei Sistemi Informativi sono stati declinati per essere compatibili con l'oggetto della ricerca, l'Expert Recommending Service nelle Knowledge Community, al fine di ottenere il modello concettuale adatto alla ricerca stessa.

Il modello concettuale coinvolge tre elementi principali:

- L'Expert Recommending Service,
- La Knowledge Community,
- Il successo dell'Expert Recommending Service.

Il modello assume l'esistenza di due relazioni causali che legano:

- L'Expert Recommending Service al successo dell'ERS,

- La Knowledge Community al successo dell'ERS,

Questo modello concettuale é stato in seguito convertito nel modello empirico. Tra i vari modelli che descrivono il successo dei Sistemi Informativi, la scelta del modello da impiegare in questa ricerca é dipeso dalla loro corrispondenza con le domande di ricerca, gli obiettivi dello studio e il dominio applicativo. Il modello che meglio di tutti gli altri ha risposto a questi criteri é stato il modello di successo dei Sistemi Informativi proposto da DeLone e McLean, che pertanto é stato usato come riferimento.

La linee guida metodologiche proposte da Straub, Igalens, Roussel, Evrard, Pras et al. sono state seguite al fine di garantire la qualità dei risultati.

Questa ricerca ha combinato metodi qualitativi e quantitativi al fine di:
- fornire una base contestuale più ricca per l'interpretazione e la validazione dei risultati,
- bilanciare le debolezze intrinseche in ogni singolo metodo di ricerca,
- garantire una precisa definizione delle ipotesi,
- favorire la solidità e generalizzabilità dei risultati.

Una ricerca coinvolgente più metodi puo' assumere differenti forme e avere diverse prospettive di indagine, e tra le possibili l'autore ha scelto la prospettiva evolutiva. Questa prospettiva evolutiva è particolarmente utile quando poca ricerca é stata condotta su un particolare fenomeno, oppure quando le ipotesi di ricerca richiedono un loro raffinamento. Dato che entrambe le condizioni erano presenti in questo specifico studio, la prospettiva evolutiva é stata privilegiata.

Attraverso uno studio esplorativo, i dati qualitativi sono stati raccolti e interpretati per coprire una vasta gamma di argomenti di indagine. I risultati ottenuti hanno sostenuto lo sviluppo delle ipotesi che poi sono state testate nella fase quantitativa.

La definizione di una fase qualitativa e di una fase quantitativa ha imposto la selezione degli specifici metodi di indagine per queste due parti della ricerca. Attraverso l'utilizzo dei criteri di scelta proposti da Wood, il metodo del caso studio é stato selezionato per la fase esplorativa qualitativa. Questa scelta é stata condizionata dal costo del metodo e dal suo elevato potenziale nella generazione di nuova teoria. La ricerca d'opinione é stata invece riconosciuta come il metodo più valido per la fase confermativa quantitativa, per il suo costo e per la capacità di confermare la teoria.

Il metodo qualitativo é stato adottato per esplorare le caratteristiche delle Knowledge Community, le caratteristiche degli Expert Recommending Services, le caratteristiche del successo degli ERS e le possibili relazioni tra loro esistenti.

L'applicazione del selezionato modello di successo dei Sistemi Informativi al dominio degli Expert Recommending Service conduce alla definizione di due proposizioni preliminari di ricerca:

- P1: le caratteristiche della Knowledge Community hanno influenza sul successo dell'ERS.
- P2: le caratteristiche dell'ERS hanno influenza sul successo dell'ERS.

Queste proposizioni sono state esplorate attraverso il metodo qualitativo scelto affinché siano stabilite le precise ipotesi per la fase quantitativa.

Nella fase qualitativa, l'unità di analisi é stata l'organizzazione, con il suo ERS e le sue KC. L'organizzazione é stata studiata attraverso l'analisi delle Knowledge Community esistenti, la comprensione dell'ERS a disposizione dei membri delle KC e l'esplorazione delle relazioni tra le KC e l'ERS.

Il caso é stato analizzato attraverso la raccolta di dati primari e secondari. Le principali fonti di dati primari sono state le interviste, l'osservazione diretta e le discussioni informali con i membri delle Knowledge Community. Le fonti di dati secondari sono state invece principalmente i documenti che l'organizzazione normalmente produce attraverso il suo Sistema Informativo.

Una raccolta iniziale di informazioni ha preceduto la raccolta dei dati primari sul terreno, e il sito web dell'organizzazione é stata la principale fonte di questi dati preliminari. Accanto a essi, il referente interno dell'organizzazione ha fornito una serie di dati secondari a sua disposizione sull'oggetto della ricerca.

Dopo questa operazione preliminare, grazie al referente interno, sono stati raccolti i nomi e le posizioni dei possibili membri da intervistare. I potenziali intervistati sono stati contattati, al fine di ottenere l'intervista e di raccogliere alcune informazioni complementari.

Le interviste sono state semi strutturate e rivolte a un campione più eterogeneo possibile di persone, affinché si riuscisse a coprire una grande varietà di situazioni e quindi verificare la convergenza delle informazioni provenienti da fonti differenti.

La guida d'intervista conteneva la lista dei temi e sottotemi da discutere, ed é stata stilata in anticipo prestando attenzione al ruolo ricoperto dall'intervistato. All'inizio di ogni colloquio si introducevano le ragioni e gli obiettivi dell'intervista, per meglio indirizzare i discorsi dell'intervistato.

Le guide d'intervista sono state preparate per conoscere nel modo più completo possibile le caratteristiche dell'intervistato, le caratteristiche dell'ERS, le caratteristiche delle KC e l'opinione sul successo dell'ERS.

I dati qualitativi ottenuti con le interviste sono stati tutti trascritti, seguendo la convenzione di trascrizione proposta da Silverman. Queste trascrizioni, le note sulle osservazioni sul campo, e i dati secondari sono stati tutti ordinatamente archiviati.

Ogni trascrizione é stata analizzata in parallelo alla prosecuzione delle altre interviste, cosicché il contenuto delle precedenti interviste potesse essere fonte di ispirazione per le questioni da indagare nei successivi incontri. Questo continuo raffinamento ha influenzato la composizione della guida d'intervista e il grado di dettaglio delle domande sui vari aspetti indagati.

Per l'analisi dei dati, l'autore ha assunto che i dati delle interviste riproducessero direttamente i fatti del mondo reale. L'autore ha elaborato il contenuto al fine di spiegare le caratteristiche dell'ERS, le caratteristiche delle KC e il successo degli ERS. Per l'analisi e l'interpretazione dei dati, l'autore ha scelto il metodo di analisi tematica dei contenuti, che prevede la presenza di una serie di temi e sottotemi. La chiave di volta di questo tipo di analisi consiste nel considerare che la ripetizione di unità di discorso (parole, parti di frasi, frasi, insieme di frasi) indichino i centri di interesse e le opinioni degli intervistati. Le frasi, le parti di frasi e i gruppi di frasi sono stati quindi raggruppati in base alle loro relazioni con i temi: Knowledge Community, Expert Recommender Service, successo dell'ERS. Coerentemente con le modifiche alla guida d'intervista tra le varie interviste, anche la lista dei temi e sottotemi é stata adattata in base alla rilevanza emergente di alcuni aspetti.

Inoltre, la prossimità temporale delle interviste con l'analisi del loro contenuto ha dato all'autore una certa sensibilità sulla saturazione dei temi e dei sottotemi. Questa prossimità ha permesso l'interruzione della pianificazione di nuove interviste nel momento in cui si è registrata la saturazione e la ripetizione dei temi.

La codificazione e l'interpretazione dei dati sono stati supportati da un software dedicato all'analisi dei dati qualitativi. Diversi strumenti sono stati revisionati, direttamente o indirettamente grazie al lavoro di Lewins, e la scelta finale é caduta sul pacchetto denominato HyperResearch, per la sua semplicità e la sua flessibilità nella costruzione di rapporti sui differenti temi.

Il metodo quantitativo é stato cruciale per la conferma dei risultati qualitativi e ha permesso di corroborare il modello di ricerca e di misurare le relazioni tra le Knowledge Community, l'Expert Recommender Service, e il successo dell'ERS.

L'applicazione del selezionato modello di successo dei Sistemi Informativi al dominio degli ERS e i risultati della fase qualitativa hanno portato alla definizione delle seguenti variabili:

- Utilità Percepita per l'Organizzazione. Misura gli effetti dell'ERS sui risultati economici organizzativi e riprende la variabile "Organizational Impact", proposta da DeLone e McLean.

- Utilità Percepita per l'Individuo. Misura gli effetti dell'ERS sui risultati individuali e recupera la variabile "Individual Impact" di DeLone e McLean.

- Uso. Misura l'utilizzo dell'ERS da parte degli individui e ripropone il costrutto "IS Use" definito da DeLone e McLean.

- Soddisfazione dell'Utilizzatore. Misura la soddisfazione dell'utilizzatore dell'ERS e quindi delle risposte ottenute alle sue richieste di suggerimento di alcuni esperti.

- Qualità dell'ERS. Misura il giudizio globale relativo alla superiorità dell'ERS.

- Conoscenza degli Altri. Misura il grado di conoscenza delle altre persone e, nello specifico degli ERS, il grado di conoscenza degli ambiti di conoscenza altrui.

Il modello concettuale e la determinazione delle variabili ha consentito la definizione delle influenze temporali e causali tra le differenti variabili. Pertanto le ipotesi sul successo dell'ERS, definite a partire dal modello di DeLone e McLean, sono:

- H1: L'Utilità Percepita per l'Individuo influisce sull'Utilità Percepita per l'Organizzazione.

- H2: L'Uso influisce sull'Utilità Percepita per l'Individuo.

- H3: La Soddisfazione dell'Utilizzatore influisce sull'Utilità Percepita per l'Individuo.

- H4: L'Uso influisce sulla Soddisfazione dell'Utilizzatore.

- H5: La Qualità dell'ERS influisce sulla Soddisfazione dell'Utilizzatore.

- H6: La Qualità dell'ERS influisce sull'Uso.

L'emergere, nella fase esplorativa, della rilevanza della Conoscenza degli Altri soprattutto per il successo degli ERS informali, ha determinato l'aggiunta di altre tre ipotesi.

- H7: La Conoscenza degli Altri influisce sulla Soddisfazione dell'Utilizzatore. Il grado di riconoscimento degli ambiti di conoscenza degli altri membri della Knowledge Community potrebbe influire sulla soddisfazione per la fornitura dell'ERS. L'individuo che conosce quali sono gli ambiti di conoscenza degli altri, potrebbe individuare le persone in grado di fornire un ERS pienamente soddisfacente.

- H8: La Conoscenza degli Altri influisce sulla Qualità dell'ERS. La conoscenza degli altri potrebbe influire sulla scelta della persona a cui chiedere la fornitura dell'ERS. Gli individui con una vasta conoscenza degli altri potrebbero porre le loro domande a chi stimano sia nella condizione migliore per fornire un ERS di alta qualità.

- H9: La Conoscenza degli Altri influisce sull'Uso. Il riconoscimento degli ambiti di conoscenza potrebbe influire sull'uso dell'ERS. La totale conoscenza di quali sono gli ambiti di conoscenza degli altri renderebbe superfluo l'uso dell'ERS, giacché tale persona potrebbe direttamente indirizzarsi al corretto esperto, senza dover interpellare l'ERS. D'altra parte, la totale assenza di riconoscimento di quali possano essere gli ambiti di conoscenza degli altri potrebbe limitare l'uso dell'ERS, poiché tale persona non saprebbe a chi indirizzarsi per l'erogazione dell'ERS.

A questo punto della ricerca i dati richiesti sono risultati troppo specifici per poter essere recuperabili a partire da fonti di dati secondari. Sono stati quindi raccolti solo dati primari, e il questionario é stato lo strumento utilizzato per tale scopo.

Il questionario era composto dalle misure esistenti che l'autore aveva valutato come più rispondenti al modello di ricerca. Per ogni variabile, le scale esistenti sono state identificate e adattate per renderle compatibili con l'oggetto di ricerca e il dominio applicativo.

L'amministrazione del questionario é stata anticipata da una revisione delle stesso da parte di differenti persone, al fine di verificare che la terminologia rispondesse al linguaggio utilizzato nella specifica organizzazione. La versione finale del questionario é stata pubblicata su un server web e resa accessibile a tutti i partecipanti.

La compilazione del questionario é stata promossa tramite una email, spedita a tutto il campione. Esso comprendeva tutti i membri dell'organizzazione, che svolgevano anche solo saltuariamente attività di proposta o di ricerca di esperti. Nel momento in cui il tasso di risposta nella settimana é sceso a zero, un richiamo, sempre via email, é stato effettuato.

Il questionario, sebbene proposto via email, è stato predisposto per una sua compilazione tramite un formulario online, in modo tale che le risposte fossero direttamente archiviate in un database.

I dati raccolti sono stati analizzati attraverso la tecnica statistica di modelizzazione con equazioni strutturali, ma un'analisi preliminare sulla qualità dei dati é stata eseguita prima di testare il modello strutturale.

L'analisi statistica é stata effettuata seguendo le linee guida di Straub, Boudreau e Gefen. Queste linee guida propongono di assicurarsi: la validità del contenuto, la validità dei costrutti, l'affidabilità, la validità manipolativa e la validità conclusiva delle statistiche.

Queste operazioni sono state eseguite grazie all'uso di alcuni software. Tra i vari prodotti analizzati direttamente o indirettamente, SPSS e Amos sono stati i due pacchetti selezionati per tale compito. Questa scelta é stata determinata dalla loro parziale integrazione e dalla precedente esperienza dell'autore con entrambi.

La combinazione di metodi qualitativi e quantitativi ha permesso la triangolazione dei dati, che ha assicurato la congruenza dei dati provenienti da fonti differenti. Queste fonti differenti sono legate ai diversi casi studio completati, per evitare i problemi degli studi svolti con un singolo caso.

L'intero modello empirico, ovvero la fase qualitativa e la fase quantitativa, é stato applicato in differenti organizzazioni seguendo le direttive sui casi multipli di Yin. La scelta a favore di una molteplicità di casi ha avuto lo scopo di esplorare, in situazioni contrastanti, gli ERS, le KC e le loro relazioni con il successo degli ERS. L'autore ha ricercato pertanto una replica della teoria,

ovvero una ripetizione della stessa metodologia in vari casi, al fine di determinare similarità e differenze tra i valori delle variabili considerate. Pochi ma eterogenei casi con caratteristiche differenti sono stati pertanto deliberatamente selezionati.

L'utilizzo di una molteplicità di casi rafforza notevolmente la validità esterna dei risultati, giacché tali risultati sono già originati da una molteplicità di situazioni. I principi della replica della teoria danno libertà di scelta sul numero di casi da studiare, e offrono la possibilità di modificare il numero degli stessi durante il protrarsi della ricerca. Il campionamento ha puntato dunque a trovare casi con situazioni contrastanti, basandosi sugli apporti teorici precedenti. I casi sono stati selezionati tenendo in conto gli oggetti di studio: gli ERS, le KC e il successo degli ERS. Coerentemente con i principi della replica della teoria, i casi devono avere valori differenti sulle caratteristiche degli elementi suddetti.

Per tutti i casi studio, i dati sono stati analizzati, in principio, tenendoli separati caso per caso, e in seguito confrontando i dati tra i casi.

L'analisi dei dati sui tre casi, attraverso metodi qualitativi e quantitativi, ha confermato le ipotesi. Questo successo nel test delle ipotesi ha permesso l'elaborazione di alcune considerazioni costruttive sui differenti elementi studiati.

I più importanti risultati sulla ricerca riguardano: le caratteristiche delle Knowledge Community, le caratteristiche degli Expert Recommending Services e l'influenza che le KC hanno sul successo degli ERS.

Questa ricerca ha evidenziato l'eterogeneità delle Knowledge Community tra le differenti organizzazioni sulla base delle caratteristiche identificate in letteratura, confermando quanto osservato già da altri ricercatori.

Questo studio ha riscontrato anche le differenze esistenti tra gli Expert Recommending Services. Basandosi sulla classificazione di Martinez, gli ERS osservati erano sia informali sia informatizzati, e importanti differenze sono state riscontrate all'interno della stessa classe di ERS.

In aggiunta, l'autore ha esplorato e confermato l'influenza della Knowledge Community sul successo dell'ERS. Seddon già evidenzio' che le osservazioni, le esperienze personali, i racconti sulle conseguenze dell'uso dei sistemi informativi hanno un impatto sul successo dei sistemi informativi. Se queste osservazioni, esperienze, racconti hanno luogo all'interno dei confini di una Knowledge Community, allora questi elementi come i tanti altri elementi caratterizzanti le Knowledge Community possono avere un'influenza diretta sul successo dei sistemi informativi.

La conoscenza degli altri é emersa, dalla fase esplorativa, come l'elemento maggiormente determinante il successo dell'ERS tra le varie caratteristiche delle KC. Questa novità é confermata

dai risultati della fase quantitativa. La conoscenza degli altri era già stata considerata un fattore influenzante il successo dei sistemi informativi. Con questa ricerca il suo ruolo é emerso ed è stato confermato anche nel contesto degli ERS.

Résumé

Cette thèse s'inscrit à l'interface du Management et des Systèmes d'Information. Le sujet est celui de la Gestion des connaissances, étudié au niveau d'un individu, considéré comme appartenant à une Communauté de Pratiques. L'approche épistémologique est positiviste, et la méthodologie principale est celle de l'enquête.

La connaissance est considérée aujourd'hui, par les individus comme par les organisations, comme une source d'avantage concurrentiel durable. Les Technologies de l'Information et de la Communication (TIC) offrent la possibilité actuellement d'améliorer le management des connaissances dans les organisations tout en contrôlant son coût. Dans l'optique de réduire les coûts, les organisations tentent de former leurs membres sur la base de la connaissance existante, puisque le coût du transfert de connaissances existantes est plus faible que celui de la création de nouvelles connaissances. Tout au long de ce document, les termes "transfert de connaissance" seront utilisés pour signifier la communication d'une connaissance d'un individu à une organisation puis sa réception et son utilisation par un autre individu ou une autre organisation.

La connaissance implique des structures cognitives et des processus qui ne permettent pas de stocker la connaissance dans des textes, ni dans d'autres représentations explicites. Même si le transfert de connaissance nécessite obligatoirement l'intervention humaine, les TIC peuvent jouer dès le début un rôle important dans le transfert de connaissance.

Plusieurs résultats démontrent que la capacité de transfert de connaissance contribue positivement à la performance globale de l'entreprise, aussi bien pour les entreprises de services que pour les entreprises industrielles. Toutefois, l'efficace de ce transfert de connaissance varie considérablement d'une organisation à l'autre. De plus, les systèmes informatiques qui permettent le transfert de connaissance sont encore peu répandus et peu performants, ce qui justifie ce thème de recherche.

La première phase du transfert de connaissance concerne l'identification de la distribution de la connaissance parmi les individus. L'utilisation des TIC est déjà possible lors de cette phase, cependant des améliorations conséquentes seraient à envisager pour accroître l'efficience de ces outils.

La redondance de la connaissance indique l'existence entre les individus d'information commune, à coté de l'information spécifique demandée par chaque individu. Cette redondance de connaissance est assurée par la participation à la même Communauté de Pratiques, qui est définie comme un ensemble d'individus partageant la même pratique, le même travail, ou le même intérêt. Les conditions préalables au transfert de connaissance sont la présence de connaissances redondantes

parmi les individus ainsi que l'identification de la distribution hétérogènes des connaissances. La Communauté de Pratiques a donc un rôle clé dans le transfert de connaissance.

Depuis que la recherche antérieure a démontré le rôle central joué par la connaissance pour l'atteinte d'avantages compétitifs, il devient crucial pour les organisations d'explorer des solutions plus efficaces pour renforcer cette connaissance.

Cette recherche tente de contribuer à l'atteinte de cet objectif, en partant de l'hypothèse que les Communautés de Pratiques et les systèmes informatisés facilitent le transfert de connaissance.

Au croisement de la recherche sur les Communautés de Pratiques, les systèmes informatisés, et la Gestion de la Connaissance, cette étude se focalise sur les systèmes informatiques qui permettent d'identifier, parmi les membres de la Communauté de Pratiques, les individus qui devraient avoir la connaissance spécifique recherchée par l'utilisateur. Nous nommerons ce type de systèmes informatiques les « Systèmes de Localisation des Experts » (SLE) (en anglais « Expert Recommending Systems »), car ils localisent les individus qui devraient être capables d'aider à la résolution d'un problème donné.

Dans cette recherche, nous étudions les « Systèmes de Localisation des Experts » en tant que service. Au lieu de se focaliser uniquement sur le système informatique, nous nous intéressons au service que ces systèmes fournissent, le « Service de Localisation des Experts » (SLE) (en anglais « Expert Recommending Service »). Conformément à cette orientation focalisée sur le service, l'objet de la recherche comprendra aussi les cas où le SLE est offert sans aucun support informatique, par un département spécifique ou par les membres de la Communauté de Pratiques. La spécificité du SLE repose sur sa capacité à aider un individu à reconnaître les domaines de connaissance des autres membres la Communauté de Pratiques. Cette reconnaissance des connaissances acquises par les autres membres est une condition préalable à la recherche menée par l'individu. Une fois que l'individu sait reconnaître quels membres parmi le groupe peuvent être sources de connaissances spécialisées, c'est à dire une fois qu'il connaît le domaine de connaissances des autres membres, sa recherche est alors bien plus ciblée lorsqu'il a besoin de trouver une connaissance spécialisée.

Cette étude aborde cet objet d'investigation avec trois questions de recherche :

Quelles sont les dimensions du succès des SLE ?

Quelles sont les propriétés de la Communauté de Pratiques qui influencent le succès du SLE ?

A quel degré le succès de le SLE est influencé par les propriétés de la Communauté de Pratiques ?

Ces questions sont directement liées aux SLE et aux Communautés de Pratiques puisque cette étude part de l'hypothèse que l'amélioration du succès d'un SLE aura un effet positif sur la quantité de connaissances transférée.

Néanmoins, l'analyse du transfert de connaissance n'est pas prise en considération dans le cadre de cette recherche. Nous nous limitons donc à l'étude des facteurs qui influencent la conscience de la distribution de la connaissance, parmi les membres de la Communauté de Pratiques.

A partir de ces trois questions, cette recherche a pour ambition de contribuer à :

La description du succès des SLE dans les Communautés de Pratiques.

La prédiction du degré du succès des SLE, selon les caractéristiques du SLE et les caractéristiques de la Communauté de Pratiques.

L'identification d'interventions possibles, pour améliorer le succès des SLE dans les Communautés de Pratiques.

Les réponses aux trois questions de recherche et l'atteinte des objectifs fixés ont été possibles en poursuivant un processus de recherche incluant, dans un premier temps, une revue de la littérature, et, dans un deuxième temps, une analyse empirique du modèle conceptuel développé.

La revue de la littérature a débuté par la théorie intitulée « resource-based view of the firm ». Une évolution de cette théorie, la « knowledge-base view of the firm », a donné les fondations conceptuelles à la Gestion de la Connaissance organisationnelle. Le rôle des Systèmes d'Information, à l'intérieur du thème de la Gestion des Connaissances, a été pris en compte. Finalement, ce sont les SLE qui ont été principalement étudiés, pour les raisons évoquées plus haut.

Ensuite, le modèle de recherche et la méthodologie de recherche ont été structurés. La revue de la littérature a permis la formalisation du modèle conceptuel qui a constitué la base de l'étude empirique.

Les théories et les modèles sur le succès des systèmes d'information ont été adaptés au sujet de recherche, les SLE dans les Communautés de Pratiques, dans le but de définir un modèle conceptuel répondant aux contraintes de l'objet d'étude.

Le modèle conceptuel final comprenait trois éléments principaux :

Le Service de Localisation des Experts (SLE),

La Communauté de Pratiques,

Le succès du Service de Localisation des Experts,

Le modèle pose l'hypothèse de l'existence de deux relations causales liant :

Le Service de Localisation des Experts au succès du SLE,

La Communauté de Pratiques au succès du SLE.

Un modèle empirique de recherche a suivi le modèle conceptuel. Parmi les différents modèles existant sur le succès des systèmes d'information, le choix a été déterminé par le modèle qui répondait au mieux aux questions, buts et contexte de cette recherche. Le modèle de DeLone et McLean sur le succès des systèmes d'information est celui qui était le plus adapté à ces critères, c'est pourquoi il a été retenu.

Les conseils méthodologiques de Straub, Igalens, Roussel, Evrard, Prass et al. ont été suivis dans le but d'améliorer la qualité des résultats.

La méthodologie combine à la fois des méthodes qualitatives et quantitatives dans le but de :

Fournir une compréhension du contexte plus riche pour l'interprétation et la validation de résultats.

Balancer les faiblesses intrinsèques à chaque méthode.

Garantir une élaboration et une analyse plus fine des hypothèses.

Favoriser la fiabilité et la généralisation des résultats.

Différentes perspectives peuvent être envisagées lorsqu'on recourt à une combinaison de méthodes. Celle qui a été choisie est la perspective évolutionnaire. Celle-ci est particulièrement efficace lorsque le phénomène a été peu étudié ou lorsque les hypothèses de recherche ont besoin d'être affinées. Ce qui est le cas dans cette recherche, puisque la recherche en Systèmes d'Information est encore pauvre sur le phénomène étudié dans cette thèse, et puisque les hypothèses de liens entre les communautés de pratique et le succès des SLE ont besoin d'être développées.

A partir d'une étude exploratoire initiale, des données qualitatives ont été recueillies dans le but d'interpréter un grand nombre d'aspects concernant l'objet principal de recherche. Les données recueillies ont été analysées et ont servies de base pour l'élaboration des hypothèses de la phase quantitative.

Pour ces deux premières phases qualitative et quantitatives, une méthode devait être choisie.

En suivant les critères de sélection de Wood, la méthode sélectionnée pour la phase exploratoire est l'étude de cas. Ce choix a été déterminé par le coût de la méthode et son potentiel pour la génération de la théorie. La méthode sélectionnée pour la phase quantitative confirmatoire a été l'enquête d'opinion, choisie également pour son coût et pour sa capacité à tester les hypothèses.

La méthode qualitative est adoptée pour explorer les caractéristiques des Communautés de pratiques, les caractéristiques des Systèmes de Localisation des Experts et les caractéristiques du succès des SLE et enfin les éventuelles relations les liant.

L'application du modèle de succès des systèmes d'information que nous avons retenu a conduit à la définition de deux propositions préliminaires :

P1 : les caractéristiques de la Communauté de Pratiques influencent le succès du SLE.

P2 : les caractéristiques du SLE influencent le succès du SLE.

Ces propositions ont été explorées à travers la méthode qualitative afin de déterminer des hypothèses plus précises.

Dans la phase qualitative, l'unité d'analyse était l'organisation avec son SLE et ses Communautés de Pratiques. L'organisation a été étudiée à travers l'analyse de ses Communautés de Pratiques (CP), la compréhension des SLE disponibles dans l'organisation et l'exploration des relations entre CP et SLE.

Le cas a été complété par le recueil de données primaires et de données secondaires. Les sources de données primaires étaient les entretiens, l'observation directe et les colloques informels avec les membres de l'organisation. Les sources de données secondaires étaient principalement les documents produits par les systèmes d'information de l'organisation.

Une première collecte d'information sur le cas fut conduite à travers l'utilisation de son site web. A cette source, il faut ajuter une séries d'informations obtenues par avance par la personne avec qui nous étions en contact dans l'organisation.

Après cette étape préliminaire, les noms et les positions des participants potentiels aux entretiens ont été définit avec l'aide de notre contact. Ces participants potentiels ont été contactés afin de leur proposer un entretien semi-structurés. Les interviewés occupaient différents postes dans l'organisation, ce qui nous permettaient d'explorer la convergence de l'information en provenance de différentes sources.

Le guide d'entretien indiquait les thèmes et les sous thèmes à aborder. Il était rédigé préalablement à l'entretien, selon les caractéristiques professionnelles de l'interviewé. Au début de l'entretien, une introduction présentant son intérêt et les thèmes à aborder était effectuée. Cette présentation initiale avait pour objectif d'améliorer la qualité des réponses de l'interviewé.

Le guide d'entretien a été développé pour déterminer les caractéristiques de l'interviewé, la description du SLE, la description de la Communautés de Pratiques et l'opinion de la personne sur le succès du SLE.

Les données qualitatives recueillies grâce à ces interviewes ont été retranscrites, suivant la convention de retranscription proposée par Silverman. Ces retranscriptions, les notes sur les observations directes et les données secondaires recueillies ont été enregistrées dans un répertoire.

Chaque retranscription a été analysée conjointement à la poursuite des autres entretiens. Cela nous a permis d'améliorer constamment le guide d'entretien.

Pour l'analyse des données, nous avons supposé que les données des entretiens informaient directement sur la réalité des choses. Ce qui nous a permis d'expliquer les caractéristiques du SLE, les caractéristiques des Communautés de Pratiques et le succès du SLE. Pour l'analyse et

l'interprétation des données, nous avons choisit la méthode d'analyse thématique de contenu, fondée sur le système des thèmes et sous thèmes. Le point clé de cette méthode est lié à la répétition des unités des discours (comme mots, phrases, paragraphes) qui indique les centres d'intérêt et les opinions des interviewés. Les phrases, les pertes de phrases, ou les groupes de phrases ont été regroupées sur la base de la relation qu'ils avaient avec un des thèmes majeurs : SLE, les CP, le succès du SLE. La liste des thèmes et sous thèmes a également été modifiée au fur et à mesure que changeait le guide d'entretien.

De plus, le rapprochement dans le temps entre les entretiens et leur analyse nous a permis de percevoir aisément la saturation des thèmes et sous thèmes. Concrètement, cela nous a conduit à interrompre la planification d'entretiens supplémentaires dès que l'analyse a montré la saturation et la répétition des thèmes.

Un logiciel d'analyse des données qualitatives a été employé pour la codification et l'analyse des entretiens. Différents instruments ont été étudiés, directement ou indirectement par Lewins, et notre choix s'est porté sur le progiciel HyperResearch. Ce choix est fondé sur la facilité d'utilisation de ce progiciel et sur sa flexibilité dans la construction des rapports.

La méthode quantitative a été employée pour confirmer les résultats résultants de la méthode qualitative. Cette confirmation avait aussi pour but de mesurer les relations entre les Communautés de Pratiques, les SLE et le succès des SLE. Le modèle empirique de recherche a été corroboré à travers le test des hypothèses ressorties de la phase qualitative et le modèle conceptuel.

L'application du modèle de succès des systèmes d'information au contexte du SLE et les résultats de la phase qualitative ont conduit à la définition des variables suivantes :

Utilité Perçue pour l'Organisation. Elle mesure les effets du SLE sur la performance organisationnelle, suivant la proposition de DeLone et McLean avec leur variable « Organizational Impact ».

Utilité Perçue pour l'Individu. Elle mesure les effets du SLE sur la performance individuelle, suivant la proposition de DeLone et McLean avec leur variable « Individual Impact ».

Usage. Elle mesure l'utilisation du SLE par les individus, suivant la proposition de DeLone et McLean avec leur variable « IS use ».

Satisfaction de l'Utilisateur. Elle mesure la satisfaction de l'utilisateur à propos de la fourniture du SLE, c'est à dire la satisfaction des réponses obtenues par les demandes de localisation des experts.

Qualité du SLE. Elle mesure l'évaluation globale de la supériorité du SLE.

Connaissance des Autres. En général, elle mesure le degré de connaissance des autres individus, mais, spécifiquement dans le contexte du SLE, elle mesure la reconnaissance des domaines de connaissance des autres membres.

Ce processus a fourni la base théorique pour le développement des influences temporales et causales entre les dimensions du succès des systèmes d'information proposé par DeLone et McLean. Les hypothèses sur le succès des SLE ont été les suivantes :

H1 : L'Utilité Perçue pour l'Individu influence l'Utilité Perçue pour l'Organisation.

H2 : L'Usage influence l'Utilité Perçue pour l'Individu.

H3 : La Satisfaction de l'Utilisateur influence l'Utilité Perçue pour l'Individu.

H4 : L'Usage influence la Satisfaction de l'Utilisateur.

H5 : La Qualité du SLE influence la Satisfaction de l'Utilisateur.

H6 : La Qualité du SLE influence l'Usage.

De plus, la Connaissance des Autres, ressortie dans la phase qualitative, pour le succès du SLE informel, conduit à proposer trois hypothèses supplémentaire :

H7 : La Connaissance des Autres influence la Satisfaction de l'Utilisateur. Le degré de reconnaissance des domaines de connaissance des autres membres de la Communautés de Pratiques semble influencer la satisfaction des utilisateurs du SLE. L'individu qui connaît les domaines de connaissance des autres membres devrait éprouver plus de facilité à localiser les individus qui pourraient lui fournir un service de localisation des experts satisfaisant.

H8 : La Connaissance des Autres influence la Qualité du SLE. La connaissance des autres pourrait influencer le choix de la personne à qui demander le service de localisation des experts. Les individus qui possèdent une connaissance étendue sur les autres pourraient poser leurs requêtes de localisation des experts aux membres supposés être à la hauteur de fournir une bonne qualité du SLE.

H9 : La connaissance des Autres influence l'Usage. La reconnaissance des domaines de connaissance des autres pourrait influencer l'utilisation du SLE. La reconnaissance exhaustive des domaines de connaissance de tous les membres rend inutile le SLE, car l'individu a la possibilité de localiser directement l'expert avec la connaissance recherchée, sans la nécessité de demander aux autres. D'un autre coté, l'absence totale de reconnaissance sur le domaines de connaissance des autres limite l'usage du SLE, car l'individu ne pourrait même pas être dans la position de savoir à qui demander le service de localisation des experts.

Pour cette phase, les données nécessaires étaient à tel point spécifiques que le recueil de données par des sources secondaires a été impossible. Seules des données primaires ont donc été collectées et l'instrument employé pour la collecte a été le questionnaire.

Le questionnaire était composé de mesures existantes qui selon nous paraissaient le plus appropriées au modèle de recherche. Pour chaque variable, les échelles existantes ont été identifiées et adaptées à l'objet de recherche et au contexte.

L'administration du questionnaire a été effectuée après la révision du questionnaire par différentes personnes. Ces contributeurs ont proposé des modifications concernant les termes employés afin d'améliorer la correspondance avec le contexte organisationnel dans lequel le questionnaire avait été diffusé. La version finale du questionnaire a été publiée sur un serveur Web et accessible à tous les membres de l'organisation.

Le questionnaire a été diffusé par courriel à tous les membres ciblés. Ceux-ci étaient les membres de l'organisation qui effectuaient des activités de localisation ou de recherche des experts. Quand le taux de réponse par semaine est descendu à zéro, un rappel par courriel a été effectué.

Le questionnaire a donc été proposé par courriel mais les réponses ont été recueillies par un formulaire en ligne. Cette solution a permis de stocker les données automatiquement dans une base de données.

Les données ont été analysées selon la technique statistique de modélisation avec équations structurelles, mais, d'avance, une analyse préliminaire sur la qualité globale des données a été menée. L'analyse des données a été effectué suivant les indications de Straub, Bourdeau et Gefen. Ces indications proposent d'assurer : la validité du contenu, la validité des variables, la fiabilité, la validité de manipulation, et la validité statistique conclusive.

L'analyse statistique a été menée à l'aide des progiciels SPSS et Amos, après un examen, direct et indirect, de différents progiciels. Ces progiciels ont été sélectionnés en raison de leur intégration partielle et de notre connaissance de ces derniers.

La combinaison d'une méthode qualitative et d'une méthode quantitative a permis la triangulation des données, afin de valider les résultats provenant des différentes sources. Les sources différentes étaient relatives aux différentes études de cas qui ont été effectuées pour combler les limitations des études avec un seul cas.

Toute la recherche empirique a été appliquée dans différents contextes suivant les spécifications définies par Yin pour les cas multiples. Le choix en faveur de plusieurs études de cas avait pour objectif d'explorer les SLE, les CP, et leurs relations avec le succès des SLE, dans des contextes contrastants. Nous avons recherché une réplique théorique sur les différents cas et donc des cas expressément hétérogènes, avec des caractéristiques contrastantes, ont été volontairement choisis. La multiplicité des cas a renforcé la validité externe car les résultats étaient cohérents alors même qu'ils provenaient de différents contextes.

La sélection des cas a été accomplie suivant les principes de la réplication théorique, qui prévoit la réplication de la même méthodologie dans le but de trouver des similarités et des différences parmi les valeurs des variables dépendantes et indépendantes, et de trouver des relations entre les cas.

La méthode de sélection a la souplesse de permettre de changer le nombre de cas durant la conduite de la recherche. La sélection a été conduite avec comme objectif de sélectionner des cas présentant différentes caractéristiques tout en respectant le cadre théorique de référence. Le choix des cas prenait en compte les objets principaux de l'étude, à savoir le SLE, la CP, et le succès du SLE. Le principe de réplication théorique a induit la sélection des cas, avec des caractéristiques différentes pour les trois éléments cités.

Pour tous les cas, les données ont été analysées, au début séparément pour chaque cas, et ensuite par une comparaison entre les cas.

L'analyse de données sur les trois cas, à travers les méthodes mentionnées, a confirmé les hypothèses de recherche.

Les résultats les plus importants dans cette recherche concernent : les caractéristiques des Communautés de Pratiques, les caractéristiques des Systèmes de Localisation des Experts et l'influence des Communautés de Pratiques sur le succès des SLE.

La recherche a mis en évidence l'hétérogénéité des Communautés de Pratiques dans les différentes organisations selon les caractéristiques retrouvées dans la littérature. Cette hétérogénéité était déjà explorée par plusieurs auteurs et donc cette recherche confirme les résultats précédents.

Cette étude a également souligné les différences existant entre les Systèmes de Localisation des Experts. Suivant la classification proposée par Martinez, les SLE observés étaient soit informels soit informatisés. Des différences importantes ont également été relevées parmi des SLE de même type.

De plus, nous avons exploré et confirmé l'influence de la Communautés de Pratiques sur le succès des SLE. Seddon avait déjà souligné que les observations, les expériences personnelles, et les rapports sur les conséquences de l'utilisation des systèmes d'information avaient une influence sur le succès des systèmes d'information. Nous avons observé que ces observations, ces expériences personnelles, et ces rapports sur les conséquences de l'utilisation des systèmes d'information existent aussi dans les Communautés de Pratiques. D'autres caractéristiques des CP peuvent influencer le succès des systèmes d'information. La phase qualitative montre que la connaissance des autres membres, parmi les nombreuses caractéristiques décrivant les CP, semble être une variable très importante pour le succès des SLE. Cette découverte a été confirmée dans la phase quantitative de la recherche. La connaissance des autres a été déjà prise en compte comme facteur

influençant le succès des systèmes d'information. Dans le cadre de cette recherche, le rôle de cette variable a été mis en évidence et testé positivement dans le contexte des SLE.

Index of tables

Title

Success of expert recommending information systems: the role of knowledge community

Keywords

Information Systems, Expert, Awareness, Recommend, Knowledge, Community

Abstract

Knowledge is surging as a major resource of sustainable competitive advantage. The Knowledge Community, informal group of individuals that share a common practice, work or interest, is a favourable mechanism to lever knowledge. Organizations are investing, sometimes with little success, in Information Systems supporting the management of knowledge, in order to exploit the knowledge of their experts.

Specific Information Systems, the Expert Recommending Services, are conceived to facilitate, in the Knowledge Communities, the identification of the experts that could contribute to solve the business process breakdowns.

This research aims at understanding what factors affect the success of this type of Information Systems in order to help the organizations to manage their experts. To attain this aim a multi-method approach has been applied to three different case studies. The main original result is the demonstration that the success of the Expert Recommending Services is influenced by the awareness on the knowledge of the other members of the Knowledge Community.

Titre

Le succès des Systèmes d'Information de localisation des experts : le rôle de la Knowledge Community

Mots clé

Systèmes d'information, Expert, Conscience, Localisation, Connaissance, Communauté

Résumé

La connaissance est reconnue, de plus en plus, comme une ressource clé pour acquérir un avantage concurrentiel durable. D'un coté, les Knowledge Community, groupes informels d'individus qui partagent une même pratique, travail, ou intérêt, semblent être des espaces sociaux qui aident le partage de connaissance. De l'autre coté, les organisations investissent, parfois sans succès, en Systèmes d'Information, qui supportent la gestion de connaissance, afin d'exploiter au mieux la connaissance de leurs experts.

Des Systèmes d'Information spécifiques, les Expert Recommending Services, sont mis en place pour aider, dans les Knowledge Community, la localisation des experts afin d'apporter leur contribution dans la résolution des problèmes émergents.

Cette recherche a le but de comprendre quels facteurs influencent le succès de ce type de Systèmes d'Information, afin d'aider les organisations dans la gestion de leur experts.

Nous avons répondu, à cet objectif à travers une approche multi méthode, employée dans une série de trois cas. Le résultat original de cette recherche est la démonstration que le succès des Expert Recommending Services est influencé par la conscience de la connaissance des autres membres de la Knowledge Community.

Titolo

Il successo dei sistemi informativi di identificazione degli esperti : il ruolo della Knowledge Community

Parole chiave

Sistemi informativi, Esperto, Riconoscimento, Identificazione, Conoscenza, Comunità

Riassunto

La conoscenza si sta rivelando una risorsa strategica per ottenere un vantaggio competitivo sostenibile nel tempo. Da una parte, le Knowldge Community, gruppi informali di persone che condividono una stessa attività, uno stesso lavoro o uno stesso interesse, si rivelano degli ottimi strumenti per la condivisione della conoscenza. D'altra parte, le organizzazioni stanno investendo, a volte con scarso successo, in Sistemi Informativi in grado di migliorare la gestione della conoscenza al fine di favorire l'impiego degli esperti e della loro conoscenza.

Dei Sistemi Informativi dedicati allo scopo, gli Expert Recommending Services, sono sviluppati per facilitare, all'interno di una Knowledge Community, l'identificazione degli esperti in grado di contribuire alla risoluzione dei problemi di business emergenti.

Questa ricerca ha lo scopo di comprendere quali fattori influenzano il successo di tale tipo di Sistemi Informativi, affinché le organizzazioni possano meglio impiegare gli esperti di cui dispongono. Questo obiettivo é raggiunto applicando un approccio multi-metodologico nello studio di tre casi.

Il principale risultato originale é la dimostrazione che il successo degli Expert Recommending Services è influenzato dal riconoscimento della conoscenza detenuta dagli altri membri della Knowledge Community.

Discipline / **Disciplina**

Sciences de Gestion / Gestione Integrata d'Azienda

Centre de recherche / **Centro di ricerca**

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